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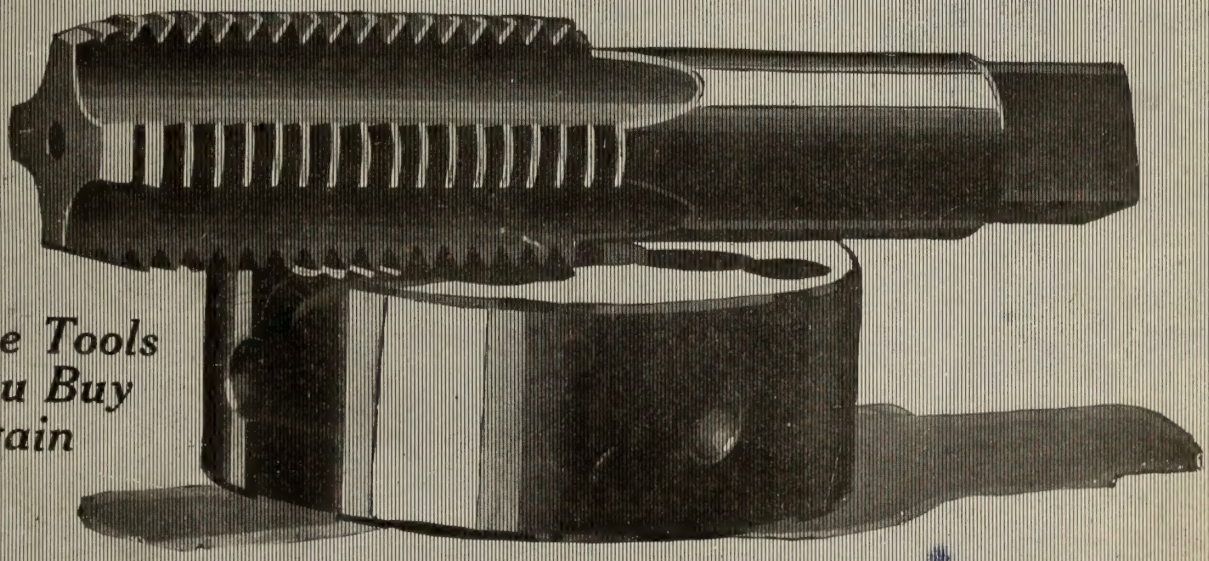


# CANADIAN MACHINERY
## AND MANUFACTURING NEWS

Vol. XXV., No. 1 | Published by the MacLean Publishing Company, Limited, Toronto | January 6, 1921 | $4.00 a Year Subscription Price


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# Butterfield



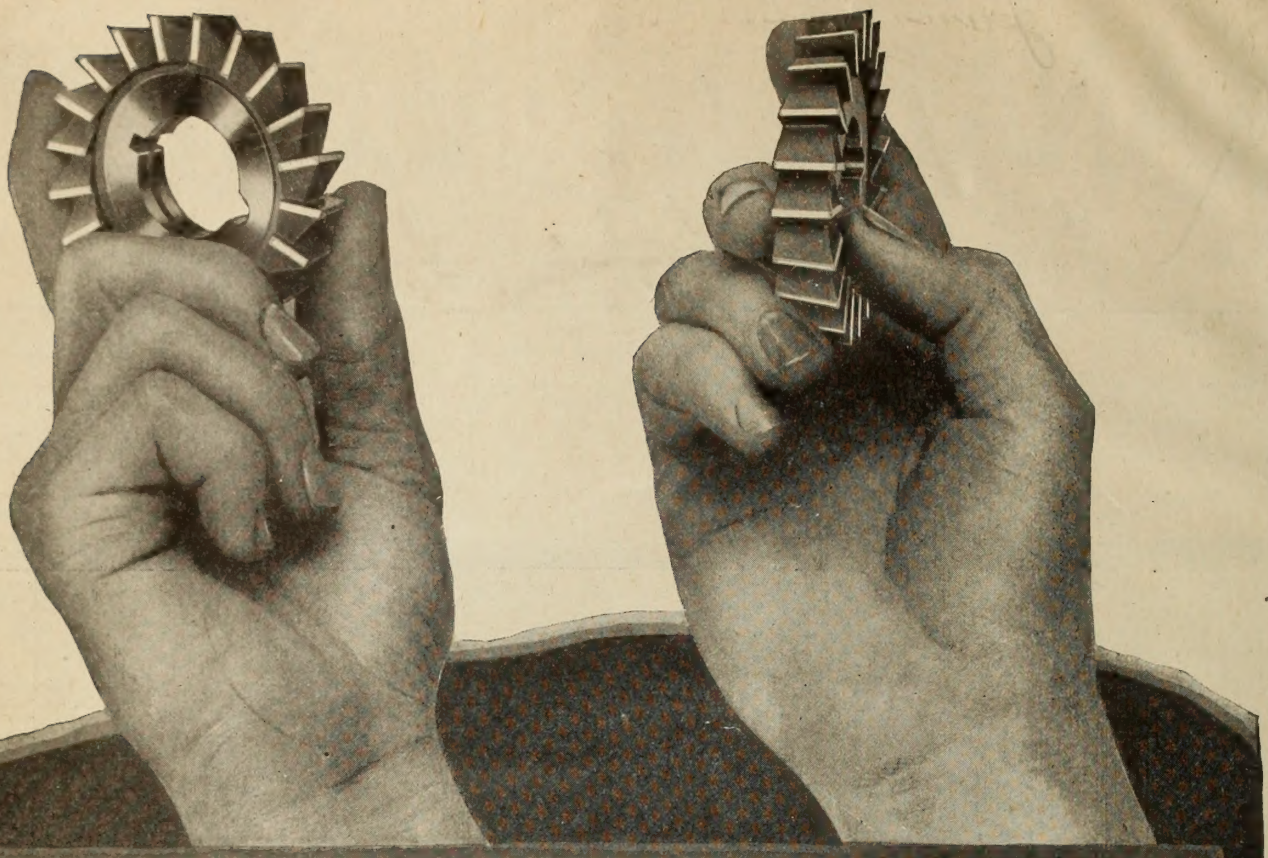
*The Tools You Buy Again*

IF you once use Butterfield Taps and Dies you cannot use any others without the superiority in Butterfield being apparent. The same may be said for Butterfield Drills, Reamers and Milling Cutters. They are "The Tools You Buy Again."

*Send for Catalog of the Butterfield Line*

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**UNION TWIST DRILL CO.**
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# *If it's speed you need—*

One trial will prove the advantage of Pratt & Whitney Milling Cutters. No matter what the nature of the work they will give you the highest production the machine is capable of.

They're designed for free, fast cutting. And tempered and seasoned to last longer.

## PRATT & WHITNEY MILLING CUTTERS

Ask us for prices and details on Plain Milling Cutters, Side Milling Cutters, Inserted Blade End and Side Cutters, Screw Slot Cutters, Coarse Tooth Side or Plain Milling Cutters, Involute Gear Cutters, Concave, Convex and Double Angle Cutters, Cutters for Spiral Mills, Roll Thread Die Hobs, Key-Seating and Slotting Cutters, Straight and Spiral Cut End Mills (B. & S. and M. T. Shank), Spiral and Straight Shell End Mills, etc.

And we make formed cutters for special work also. All are backed by the guarantee for goodness that the P. & W. trademark indicates.

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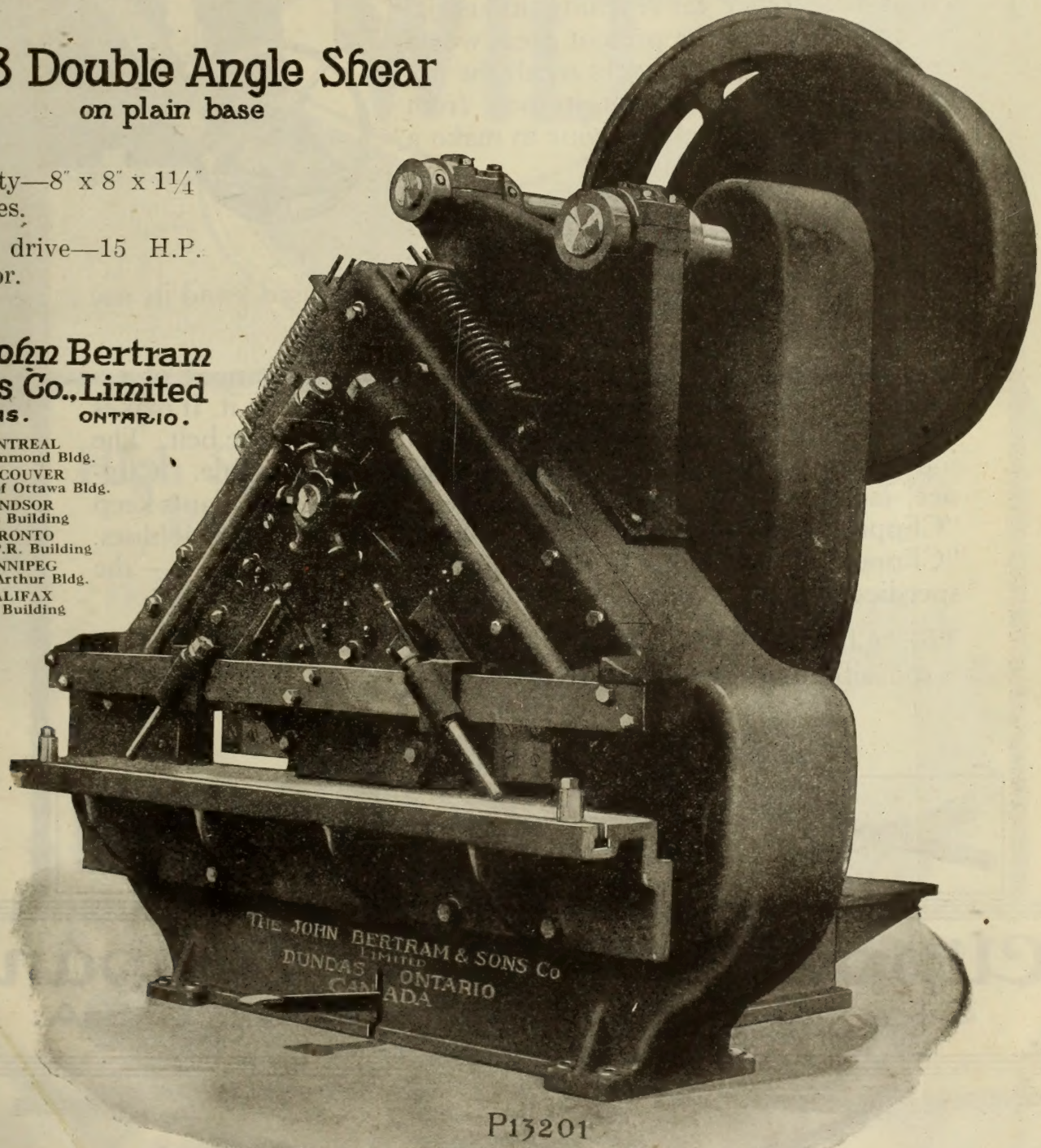
# The BERTRAM Page

## MACHINE TOOLS

## No. 8 Double Angle Shear
on plain base

Capacity—8" x 8" x 1¼" angles.

Motor drive—15 H.P. Motor.



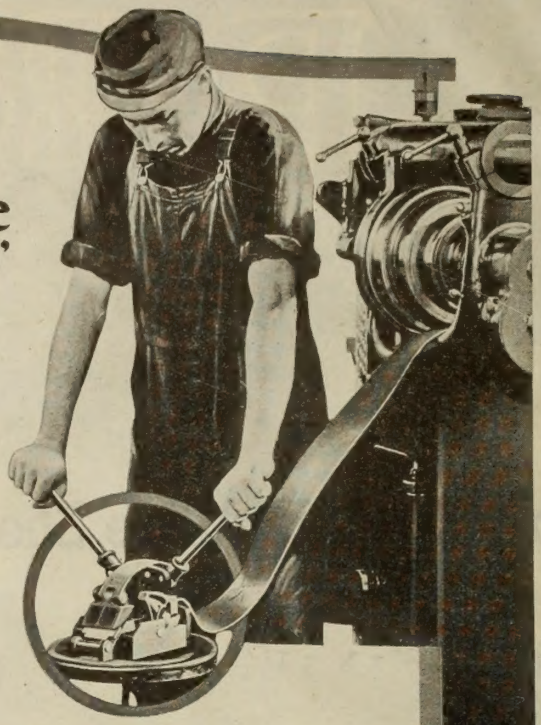

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# Only Three Minutes to Lace a Belt with the "Clipper"



THE rapid development of Clipper Belt Lacing to its present efficiency ranks with other far-reaching industrial feats which mark the present great world era. Many plant managers recall the not so far distant days when it took from fifteen minutes to half an hour to make a crude, make-shift joint.

Idle machines, workmen at rest, production curtailed (due to belt repairs), are things unknown where Clipper Belt Lacing is used—and its use is world-wide.

The simplicity of the "Clipper" tool eliminates the need of experts. Any workman can successfully lace a belt with it. It makes a hinge-joint of perfect smoothness on both sides of the belt. The joint hugs the pulley, runs true, and is extremely durable. "Clipper"-laced belts develop maximum power. The larger plants keep "Clipper" tools and hooks handy to every battery of machines. "Clipper" Belt Lacing is real economy, real efficiency — the speediest known to industry.

The "Clipper" is sold under a perpetual guarantee and goes to responsible parties for free trial.



*Most mill supply houses sell the "Clipper." Dealers not stocking it write for particulars*

"The Connecting Link Between Power and Production"

BY INVITATION MEMBER OF

NEW YORK, U.S.A.



## Clipper Belt Lacer Company

GRAND RAPIDS, MICHIGAN, U. S. A.

Clipper Belt Lacer Co. REGISTERED TRADE MARK

# The Seal of Quality

WILT

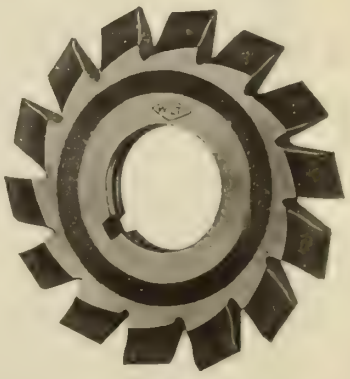
## High Speed and Carbon Twist Drills, Reamers and Milling Cutters

*Wilt Tools Insure Quality*

A steady, healthy demand for a product is secured only by quality. If your product is of consistently high quality people will buy it again and again **because they know it is good!**

Wilt Tools enable you to secure quality through clean, accurate cutting. And they permit the speed necessary to meet the demand built by quality goods!

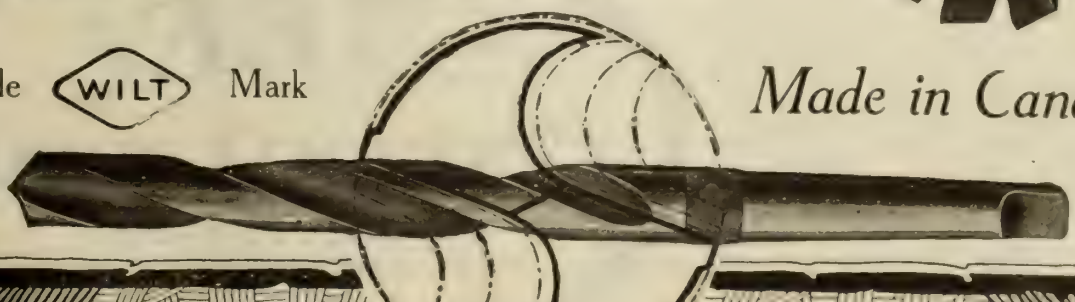
**Ask your dealer or write direct for Catalog "C."**



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"Little David" Hoist Serving a Boring Mill.

## *"RUNNING MATES"*

## The "Little David" Air Hoist
and
## The Heavy Machine Tool

In heavy machining operations your big expensive lathe, planer, slab miller, or boring mill often stands idle, while the work is being lifted, set-up or moved around.

You can make these machines more efficient by reducing this non-productive time. Use a "Little David" Motor Air Hoist; they are simple, easy to install, and easy to operate, and quickly pay for themselves in productive time saved. Capacities up to 10,000 lbs. and lifts up to 20 feet.

**Bulletin 8106 describes Little David Hoists and bulletin K-602 CIRCO Straight Lift Air Hoists. Send for them both.**

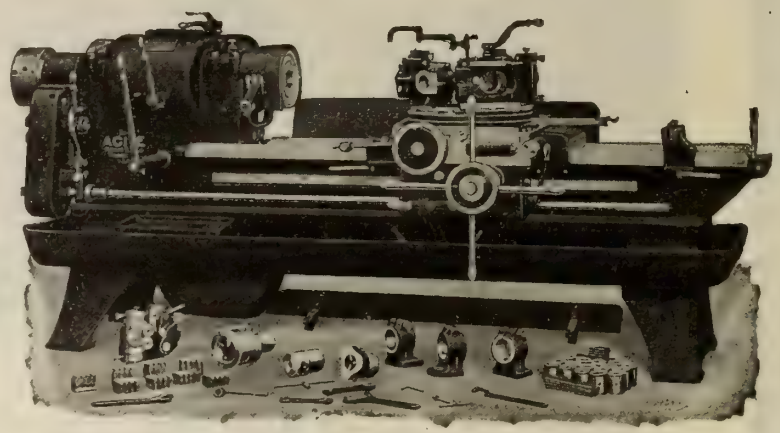
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## Efficiency Demanded! Not Merely Desired

In those wonderfully organized shops where every machine is made to do its best, where the slightest increase in established production cost is rigidly guarded against, where efficiency in every sense of the word is obtained; it is in these shops you will find Cincinnati Acme Turret Lathes and Screw Machines.

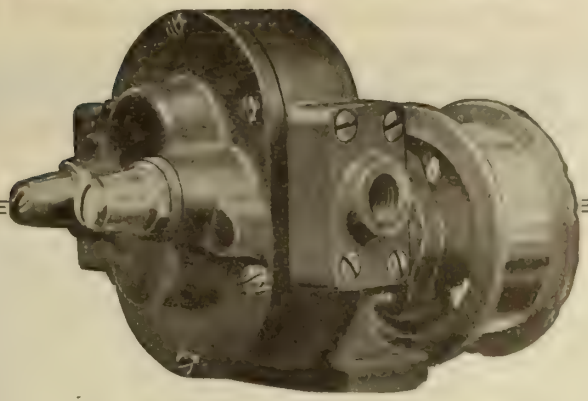
Indifferent machines may serve their purpose in shops of the same type. But—*are they good enough for you?* Send for our catalog and decide with the facts before you.



## The Acme Machine Tool Co.

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**Canadian Agents: Rudel-Belnap Machinery Company of Montreal and Toronto**



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## Keeps Cutting Tools Cool

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**YOU CAN PROFIT BY THEIR EXPERIENCE**

Any capacity up to 161/2 gals. per minute. Reversible types if desired; smooth, even flow; no priming necessary. Delivery from stock. Prices low.

*Let us send our Bulletin No. 44 explaining in detail.*

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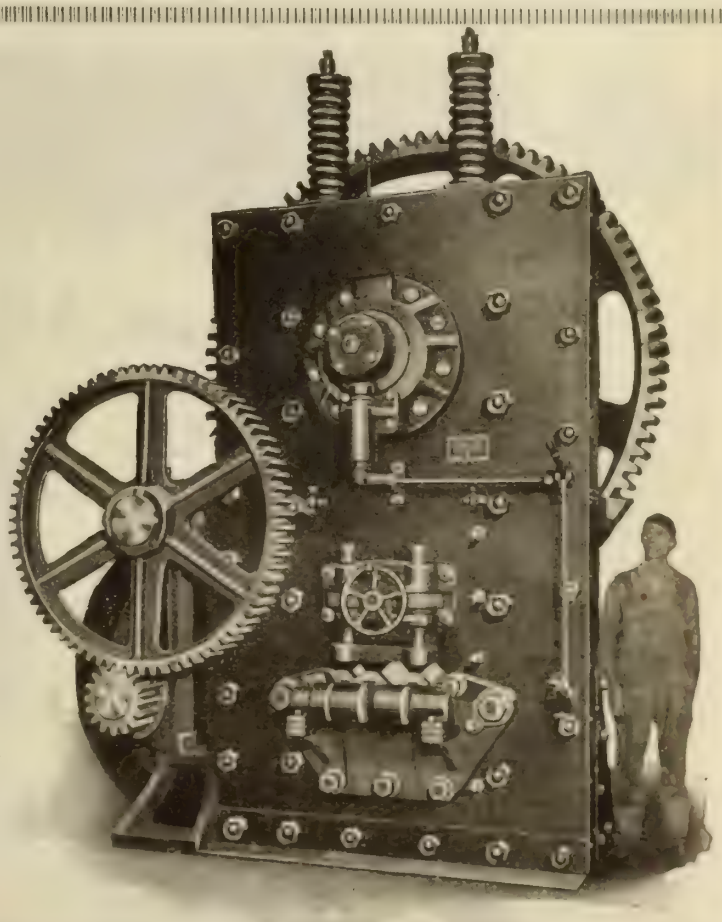
# Buffalo "Armor Plate"

## Punches and Shears

These machines have frames made of tough, unbreakable rolled steel plates—bolted and doweled together to form one solid integral whole that will withstand continuous maximum capacity service.

Yet, capacity for capacity, "Armor Plate" machines are lighter and occupy less floor space than any cast-iron or steel machine.

**Our catalogs tell why. Write Dept. 16 for a copy.**



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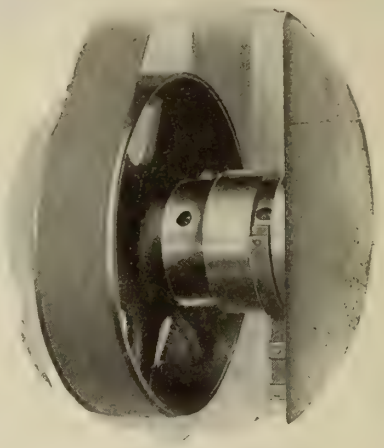
# THE JOHNSON FRICTION CLUTCH

## Put Johnson Clutches on Your Machines

The tight and loose pulley is passing from favor. With all its disadvantages, it long survived because a reliable friction clutch was not in evidence.

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*Single Clutch with Pulley Mounted*

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TRADE MARK

MAGNOLIA ANTIFRICTION METAL

TRADE MARK

*New Truths and Old Fallacies*

# Fusibility of Alloys—*Continued*

## HARDNESS OF ALLOYS

The foregoing brings us to the discussion of the relative hardness of White Metal Alloys.

Many babbitt users lay great stress upon obtaining extra hard metals; usually specifying tin base metals with high copper content. We shall submit, further on, some comparative figures which do not bear out the usually accepted belief in that connection, and are as subversive in their way as are the figures relating to the melting points of metals. These figures do not sustain the reputation of copper as a hardener, nor of the superior hardness of tin base metals.

They also disclose the fact that if a babbitt's value depends upon its hardness, the lowest grades of babbitt would sustain the load put upon a majority of bearings, which rarely exceed 500 pounds per square inch, and often much less.

Extreme hardness can only be obtained at the expense of malleability. The hardest babbitt is a lead base metal containing a high percentage of antimony, which is quite brittle, and, therefore, its use is confined largely to Rolling Mill and other similar bearings where the lining is thick and securely backed to prevent the metal cracking.

Magnolia is often loosely characterized as being a soft metal. This is doubtlessly due to its velvety feeling to the touch, a less metallic ring than Genuine and its being easier to break. Not even the Brinell test is a safe guide in determining the relative resistance of babbitts under a crushing strain. In fact, there is a surprisingly small difference in the sustaining powers throughout the entire list of babbitts in general use.

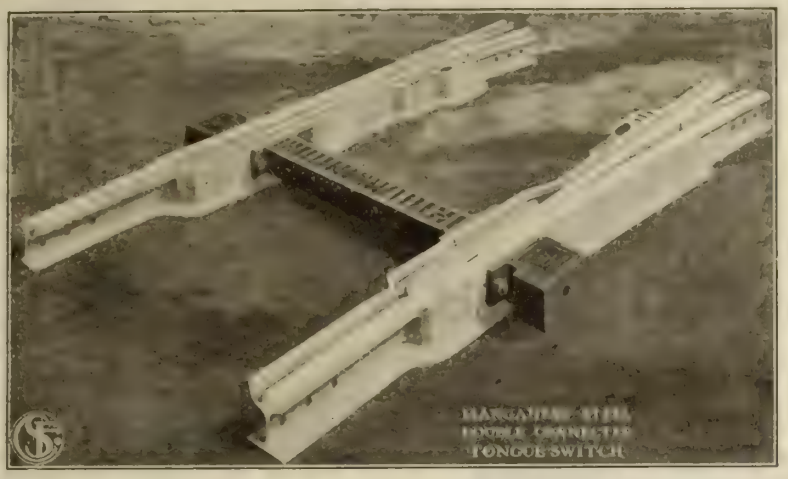
Continued next month.

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# MANGANESE STEEL TRACKWORK

*for*

**Steam and Electric Railways**

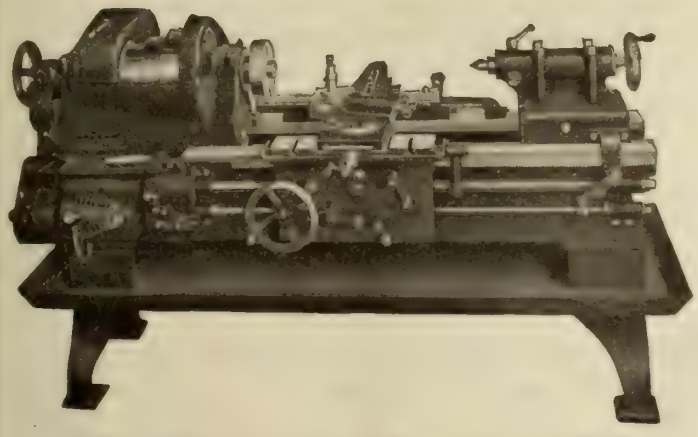
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TWO SIZES—16", Swing 18¼" and 18", Swing 20¼"

Because they are constructed "right" of the best material, workmanship and design, and therefore are adaptable to all conditions, whether it be work requiring accuracy to the highest standards or for the heavy duty where power, strength and rigidity are required.

Convince yourself of these facts! Let us send you complete specifications of this superior lathe and the names of some of the larger concerns who are using "LEHMANN LATHES" for better results.

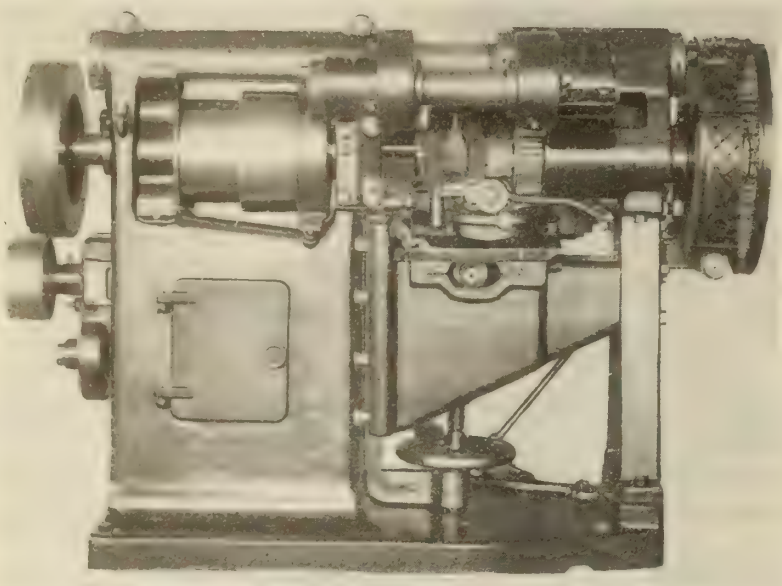
***We know you are interested, so don't put off writing us. Do it to-day. Now!***

**LEHMANN MACHINE COMPANY,** 612 S. BROADWAY, ST. LOUIS, U. S. A.

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# If it's a Special Machine We Can Make it



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ONE of our customers, a large motor firm, required a special miller for milling their transmission cover. We designed and built the machine here illustrated. Something new and special; now running every day and getting the required output.

## We Can Make You Any Style of Machine

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"BB" dies will get your article out in the least possible number of operations, which is the real key to the metal-stamping business. Send us samples or drawings and we will quote you and guarantee satisfaction.

**Die-making is a business with us — not a side-line**

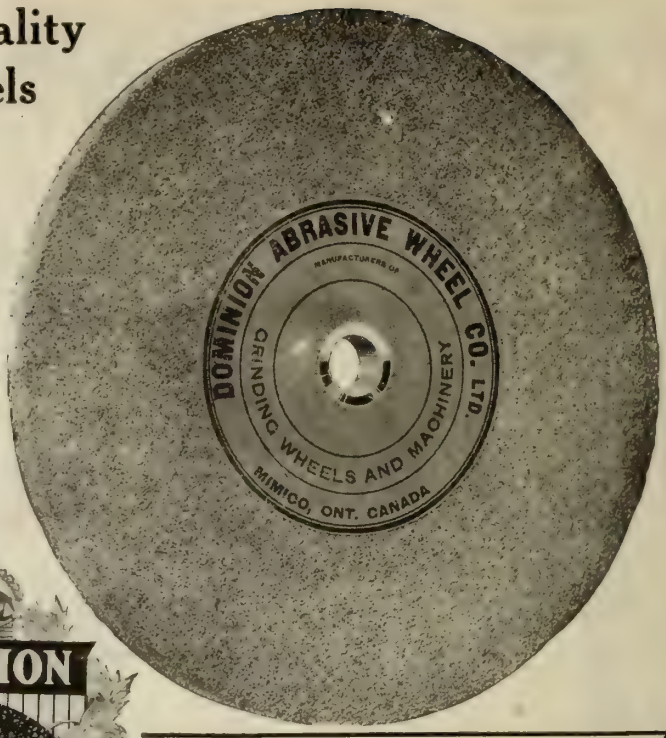
***Manufacturers of Sheet Metal Working Machinery, Presses, Shears, Rolls, etc.***

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**Dominion Wheels are Numbered Among the World's Best!** They Have the QUALITY

Made from Canadian abrasives from our own furnaces—the **quality** is thus assured.

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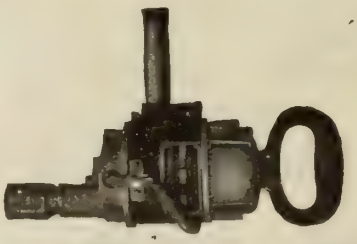
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**Save Time, Labor and Money**



They can be attached to any lamp socket.

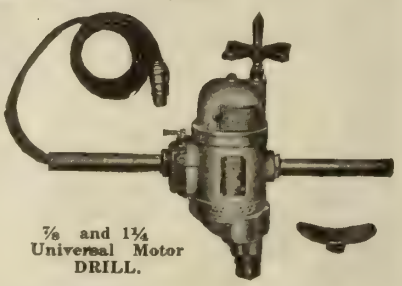
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All motors wound for 110 or 220 volts.

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Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



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**Any Thickness** **Any Lengths**

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**"ARGO"** BRAND *HIGH-SPEED* **STEEL**

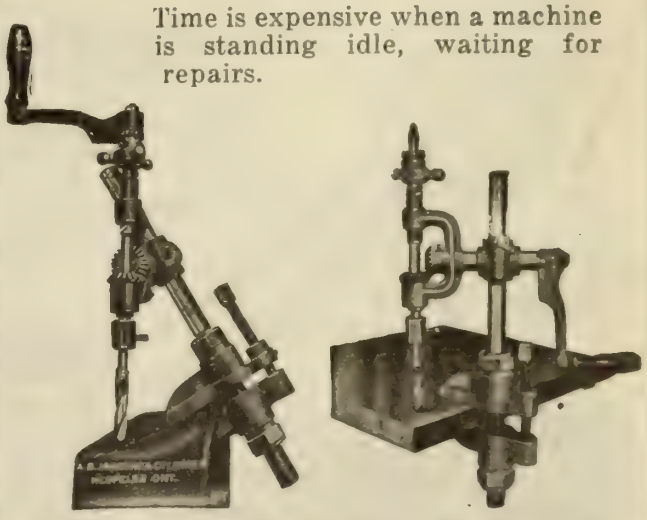
**The John Illingworth Steel Co.**
1856

Frankford, Phila.
New York Office 217 Broadway

*RALPH B. NORTON, AGENT*
124 Craig St. W.
Montreal, Canada

**Jardine Universal Ratchet Drill**

Time is expensive when a machine is standing idle, waiting for repairs.

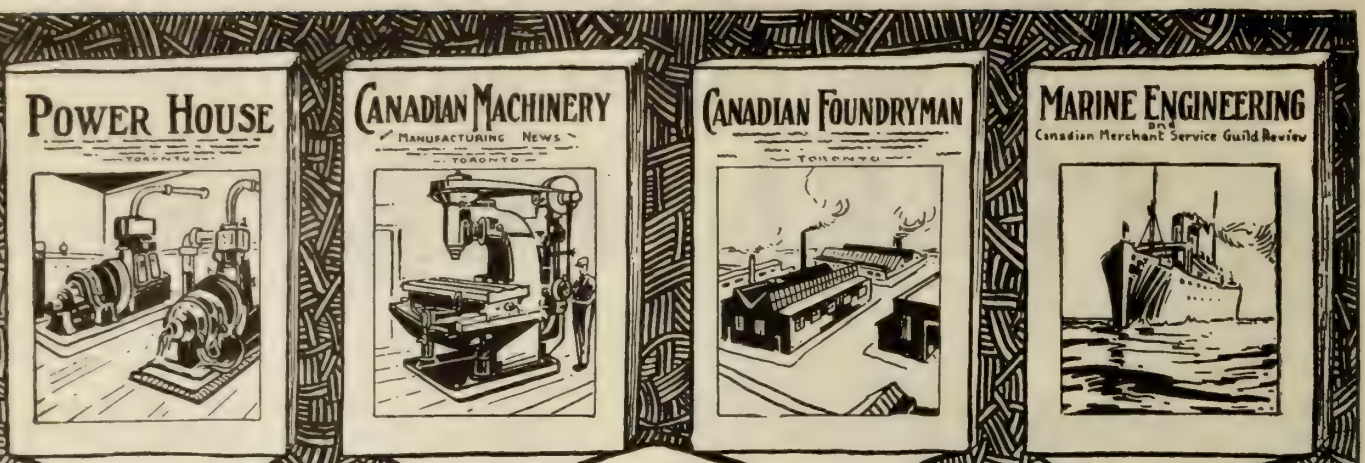


On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.
Sold by all Machinery and Supply Houses.

**A. B. JARDINE & CO., Limited**
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A paper for the foundry owner, superintendent and foreman. Claimed by its readers to be unexcelled.

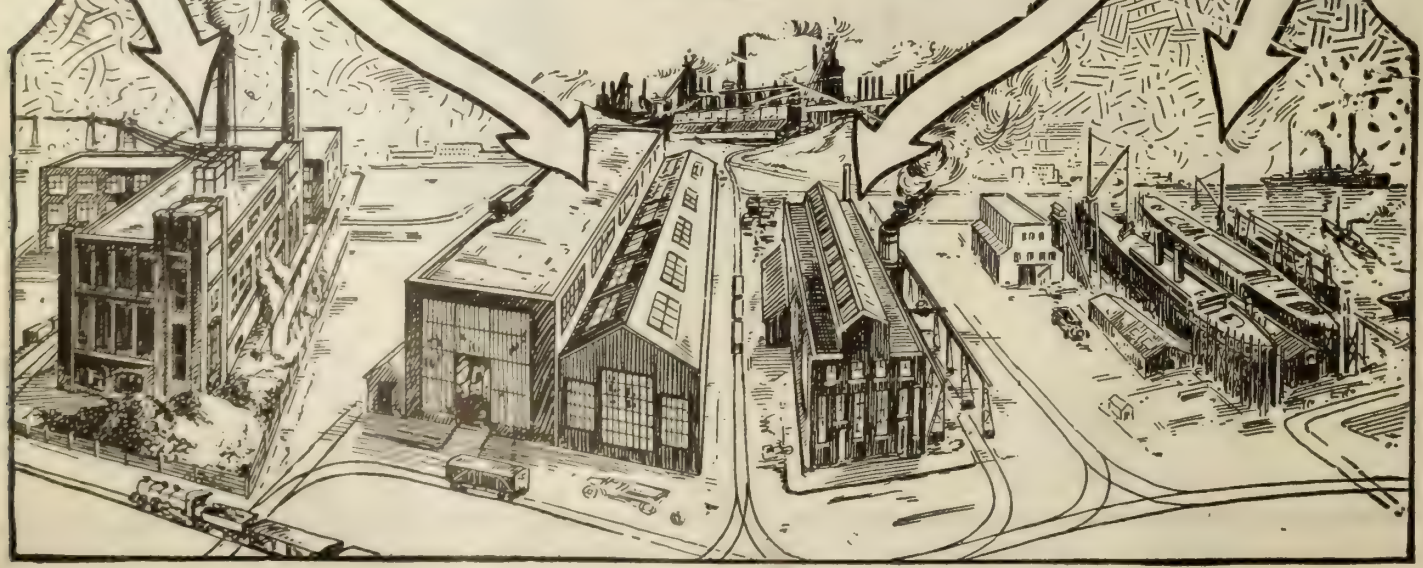
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**Monthly—$2.00 per year.**
Interprets marine engineering in its broad sense, serving the ship builders, navigation companies and their officers. (The editor holds an extra first-class B.O.T. certificate).

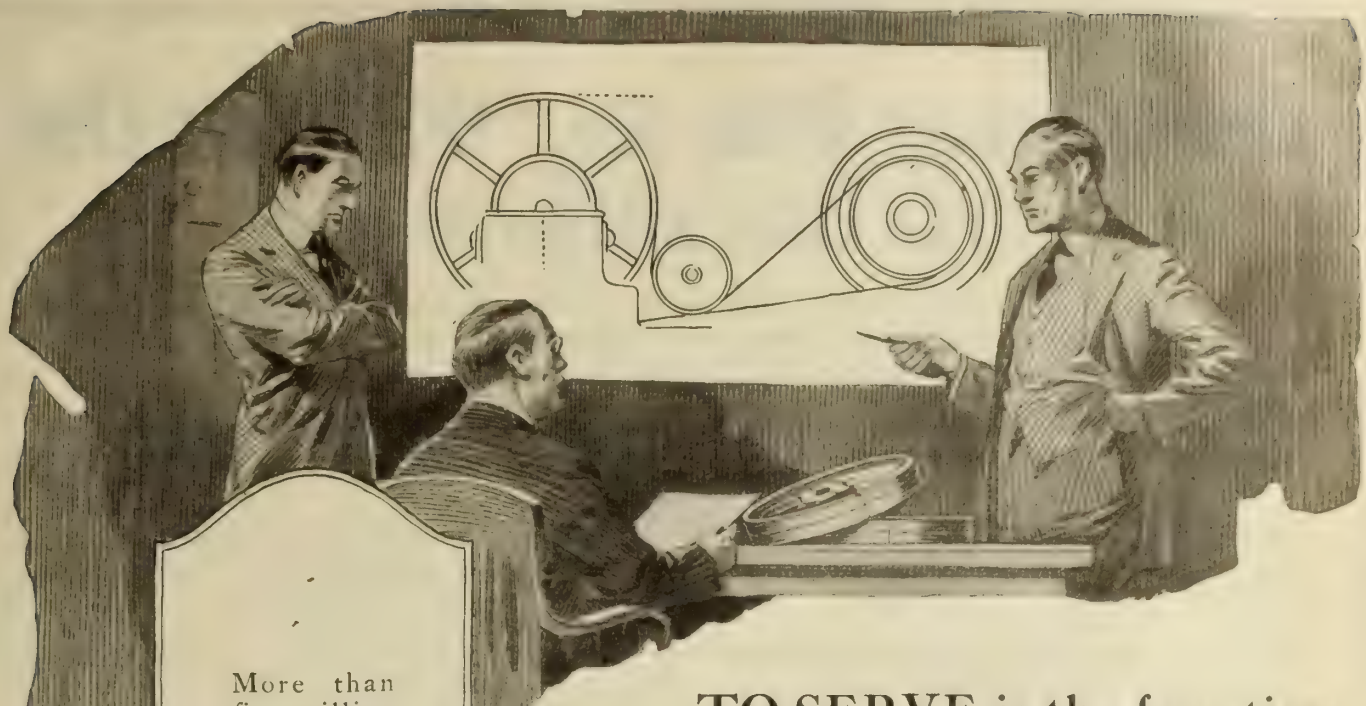
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A company whose idea of service has made it the largest concern of its kind in the British Empire.

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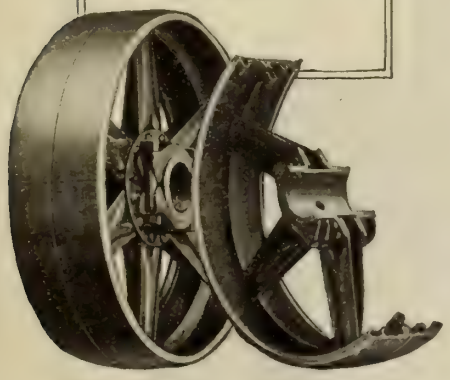




More than five million "American" Pulleys now save power in efficient plants here and abroad.

**AMERICAN STEEL SPLIT PULLEYS**

Write for book, "Getting Maximum Pulley Efficiency." It is free.



## TO SERVE is the function of this Engineering Staff—

THE tremendous sale of "American" Pulleys exemplifies the correctness of the principle that he who serves best sells most.

One reason for the unprecedented success of the "American" is that we were never so eager to sell it as we were to make certain that it was right according to every approved principle of power transmission.

The value of the American Pulley Engineering Service to you will be particularly emphasized, if you are confronted with an *unusually* difficult driving problem.

The engineers who comprise this service will welcome an opportunity to frankly discuss your transmission problems with you regardless of whether a sale may or may not result — their interest is solely centered in rendering you efficient service.

**For name and address of nearest Agent, see Donnelley's Red Book, on file at all leading libraries, national banks and hotels.**

**THE AMERICAN PULLEY COMPANY**
**PHILADELPHIA, PA.**

# The AMERICAN PULLEY

"A wheel with a broad rim transmitting power from or imparting power to machinery, or changing the direction of motion by means of a flat belt."

*If interested tear out this page and place with letters to be answered.*

# Gear Cutting With the "IFS" Left Out

## The Gear Shaper Way

A production manufacturer knows that he will secure good gears IF he has an accurate cutter, an accurate machine and a machine working on the correct principle. The whole question of good gears is resolved in this one little word "IF."

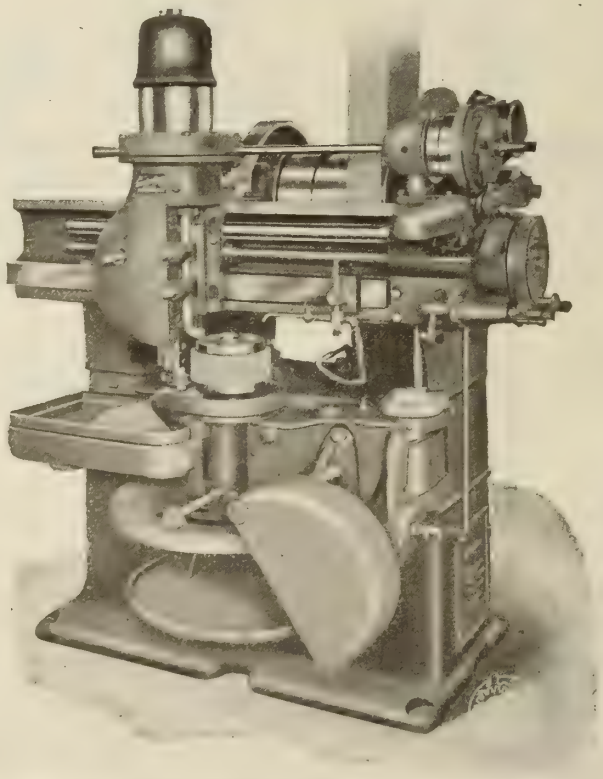
When the Gear Shaper was originally designed, the question of "IF" was taken into consideration and every possible means known to mechanical engineering was employed to eliminate the "IFS" from gear cutting.

That we have been successful in solving the problem is evidenced by the fact that each ensuing year sees a larger number of manufacturers adopting the Gear Shaper method.

How the Gear Shaper has accomplished this is clearly explained in our general catalog "Commercial Gear Cutting," which is a treatise on the subject of:—

Gear Cutting with the "IFS" Left Out.

**Send for your copy to-day.**



The Fellows Gear Shaper—the machine which has taken the "IFS" out of gear cutting.

# The Fellows Gear Shaper Company

## Springfield, Vermont, U.S.A.

FOREIGN AGENTS:—Alfred Herbert, Limited, Coventry, England; Societe Anonyme Alfred Herbert, Paris, France; Societa Anonima Italiana Alfred Herbert, Milan, Italy; Alfred Herbert, Limited, Yokohama, Japan; Societe Anonyme Alfred Herbert, Barcelona, Spain; Societe Anonyme Belge Alfred Herbert, Brussels, Belgium; Alfred Herbert (India), Limited, Calcutta, India.

# *A Machine that is Part Mechanic*

Boring, Turning, Reaming, Finishing the operation on pieces follow one another with clock-like regularity without attention from the operator and without danger of error. While the machine is running he is free to chuck one or two or three other machines, this feature alone multiplying many times the production ability of operators and plant.

The machine is the Potter & Johnston 6-A-Automatic Chucking and Turning Machine.

Details of this machine, as applied directly to your problem, are bound to interest you.

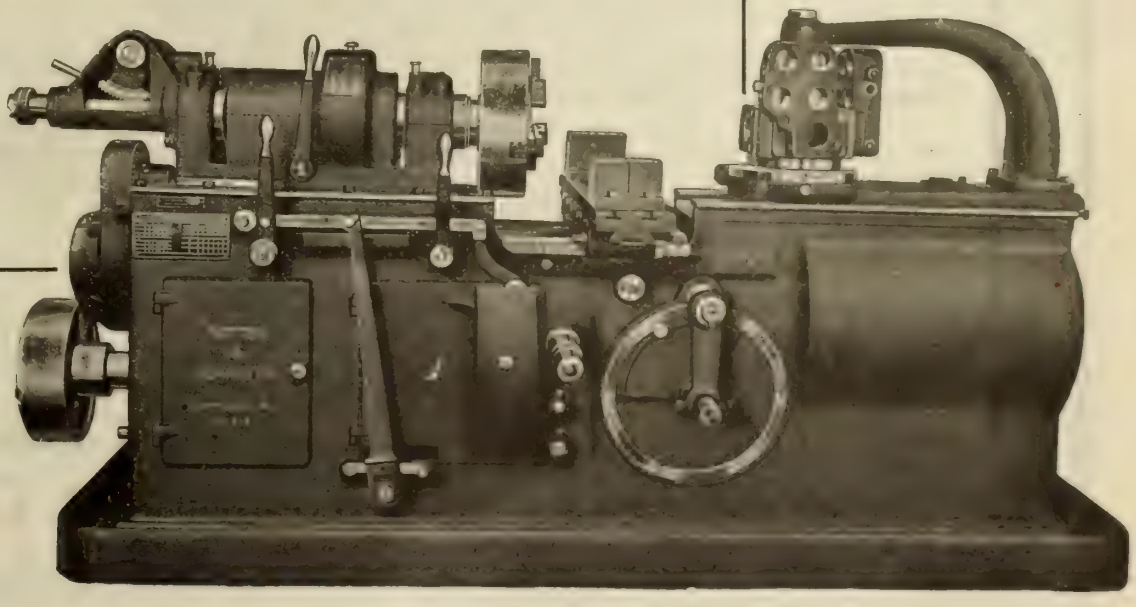
Drop a line to us to-day.

*Canadian Offices :* POTTER & JOHNSTON MACHINE CO.

**ROELOFSON MACHINE & TOOL CO., LIMITED**

***Head Office and Showrooms :***

***11 Wellington Street East—Toronto, Canada***



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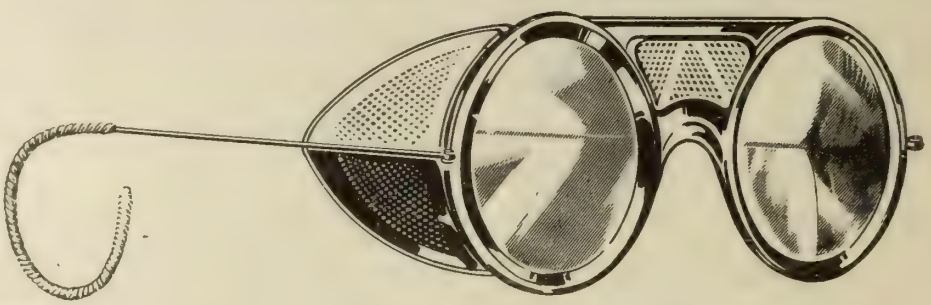
# The Comfortable Way to Protect Eyes

## STOCO SAFETY GOGGLES

(Pat. Dec. 12, 1916)

*with*

## "CELOGLAS" Shatter-Proof Lenses





A safety goggle may be efficient in every other respect, but if it cannot be put on and then forgotten; if it cannot be worn day in and day out for long hours at a stretch without irritating the nose or tiring the eyes; if, in short, it is not thoroughly comfortable, it is not a practical protection glass—neither is it a STOCO Safety Goggle.

The patented one-piece front construction of the STOCO Safety Goggle, in addition to increasing the protection afforded (see illustrations) makes possible a very wide, smooth bridge, which comfortably distributes the weight of the goggle over a wide area instead of uncomfortably concentrating it on the sensitive bridge of the nose. This feature, combined with the light weight of the STOCO Safety Goggle, results in a protection glass that is truly comfortable.

Celoglas Shatter-Proof Lenses—laminated lenses which cannot shatter into the eye—are plane and practically colorless so that they cannot tire or strain the eyes. (Incidentally, STOCO Safety Goggles may be worn over regular glasses if desired.)

If you are responsible for the buying of eye protection for your shop or plant and have not yet found a really comfortable protection glass, we suggest that you try out the STOCO Safety Goggle. A request on your own or your firm's letterhead will bring you a sample by return mail. There will be no charge or obligation.

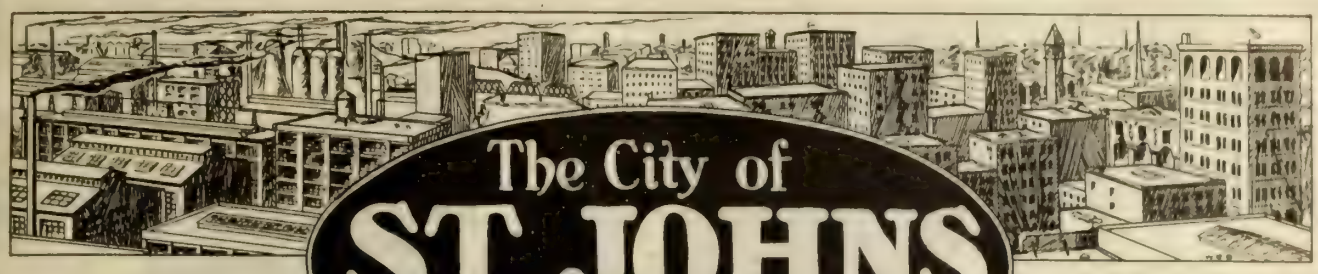
### The STOCO Safety Goggle

Price Each
(F. O. B. Geneva, N.Y.)

| | |
|---|---|
| Set with "Celoglas" shatter-proof lenses | $1.15 |
| Set with optical glass lenses | .90 |

Attractive discounts for quantity orders.
Easy cable earbows or black elastic headbands at the same price.

## THE STANDARD OPTICAL CO.
## GENEVA, N.Y. U.S.A.



# The City of ST. JOHNS QUEBEC

## Locate in this Real Transportation Centre

St. Johns is a nerve centre of the network of railways connecting Central and Western Canada with the Maritime Provinces and with the Eastern States. Seven railways, including the C.P.R. and G.T.R., run through the city and are interconnected in the St. Johns yards by a terminal switching company. The manufacturer locating in St. Johns enjoys the advantages of competitive freight rates and dispatch in the assembling of raw materials and distribution of the finished product. The city in fact commands lower freight rates and a cheaper coal supply than any other centrally located manufacturing city on the North American continent.

St. Johns is directly connected by rail with the Montreal docks, 27 miles distant, affording first-class facilities for foreign trade. The city is an ideal location for the American manufacturer opening a branch plant in Canada; having direct connections by water with New York, the St. Lawrence and Great Lakes and the Eastern Seaboard of the United States.

Unlimited electric power is developed at Chambly, eleven miles north-east of the city, and distributed at prices that will compete with any city or town in the Dominion.

Cheap living conditions and low rents and taxes have resulted in cheap labor and an abundant supply of both skilled and unskilled workers is always available. Labor troubles are quite unknown.

In addition to the natural advantages of St. Johns as an industrial site the city also offers extraordinary inducements, such as: Tax exemptions; street extensions; bonus of five per cent. on your payroll for five years, making it an unusual industrial opportunity.

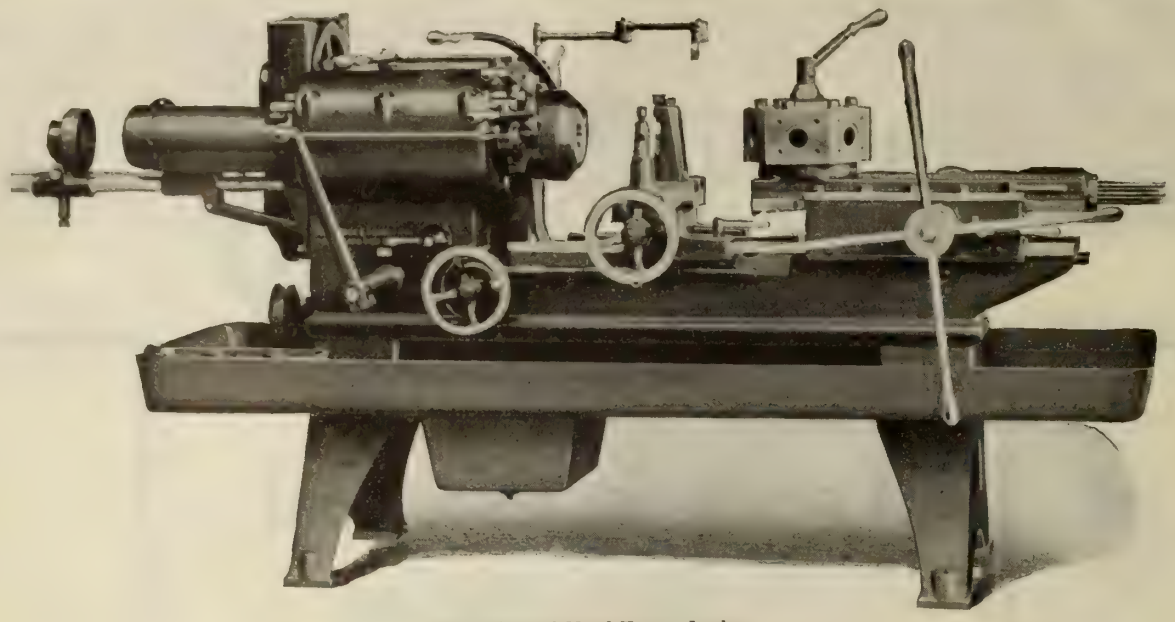
*Without a knowledge of your business or the conditions affecting it, we do not claim that St. Johns is rationally your location; but we know that St. Johns possesses extraordinary advantages, that in all probability it is the best site for your plant from every point of view, that you will be running the risk of serious mistake if you do not include this city in your investigations.*

*Seven railroads, including Canada's great transcontinental lines.*
*Finest ocean shipping facilities.*
*Canal connections with New York, the Eastern States, and the Great Lakes.*
*Cheapest labor market in Canada.*
*Plentiful supply of skilled and unskilled labor.*
*Cheap and abundant electric power.*
*Cheap coal and lower freight rates.*
*Desirable factory sites with all public conveniences immediately available.*
*Extraordinary inducements to new industries.*

**For more specific information write**

## The Secretary, City Council
## ST. JOHNS, QUE., CAN.

*If interested tear out this page and place with letters to be answered.*



No. 6 Geared Head Turret Lathe

# The New Nos. 4 and 6 Geared Head Turret Lathes

## Features:

1—Double the power obtained by cone drive.

2—Double the spindle speeds—twelve through this type head—instead of six using the customary 3 step cone.

3—Motor (constant speed) may be mounted on the head geared direct, or with chain or belt drive to driving shaft.

4—Considerable time saved in changing speeds.

5—All steel gears run in oil bath and lubricate the bearings by splash.

6—With the additions of the heavy duty carriage the No. 6 provides more productive capacity than any similar size machine obtainable to-day.

These turret lathes fill an ever increasing demand for machines to take heavy facing and forming cuts, long drilling operations in the solid—for machining alloy steel gear blanks as well as providing the best solution for direct motor drives.

With their wide diversity of feeds and speeds, these turret lathes are flexible enough to embrace the feeds and speeds ideal for operating on the many different metals in use to-day and for facing, forming and cutting off operations on all diameters within the capacities of the machine.

| Capacities | No. 4 | No. 6 |
|---|---|---|
| Swing over bed | 16″ | 20 3/8″ |
| Swing over carriage slide | 7″ | 9 1/4″ |
| Automatic Chuck Capacity | 1 1/2″ | 2 1/4″ |
| Length that can be turned | 10″ | 12″ |

# The Warner & Swasey Company

## Cleveland, U.S.A.

BRANCH SALES OFFICES:

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Buffalo: Iroquois Building.
Detroit: Ford Building.
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Milwaukee: 209 Sycamore Building.
Minneapolis: 4841 Columbus Ave.
St. Louis: 2080 Railway Exchange Building.
Indianapolis: 940 Lemcke Annex.
Dayton: 518 Mutual Home Building.

CANADIAN AGENTS
A. R. Williams Machinery Company, Ltd., Toronto, Winnipeg, Vancouver, St. John.
Williams & Wilson, Ltd., Montreal.

FOREIGN AGENTS—
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Allied Machinery Company, Paris, Turin, Zurich, Barcelona, Brussels.
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Yamatake Company, Tokyo.
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Andersen, Meyer & Company, Ltd., Shanghai.
Brossard-Mopin & Company, Saigon, Singapore, Haiphong.

*PRODUCING WITH—*

# ECONOMY

Turning out great quantities of quality work at a remarkably low figure. That's what 13 Landis Threading and Cutting Machines did in the plant of The American International Shipbuilding Corp., of Hog Island, Pa., during two years of unprecedented activity.

Landis Machines will do the same for you. They'll actually reduce lower than any other machine the cost of accomplishing quality threading.

They'll save money. It's guaranteed!

Don't you want to know how?

We'll gladly tell you if you'll but ask us.



**Landis Machine Co.**

**Waynesboro, Pa.**

Canadian Agents :
The Canadian Fairbanks Morse Co.,
Limited


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# REAL FIRE BRICK SERVICE

When you buy Elk Fire Brick we sell you a brand with the qualifications equal to the duty for which it is intended. We do not recommend the best quality brick for a certain job if a lower-priced brand will stand up just as well. Each brand of

# ELK FIRE BRICK

has some particular qualification which fits it to give better results in certain places than other brands we produce.

OUR BRANDS:

"Elkco" "Keystone"
"Elkco" Special "M.D. Elk"
"Elk Steel" "Rotex"
"St. Marys" "Elk Ladle"
"Elk Dust"
"Keystone Dust"
"Rotex Dust"

Try us on your next fire brick needs. You'll find both our quality and service right.

Large stocks of various shapes carried in warehouse in Hamilton.

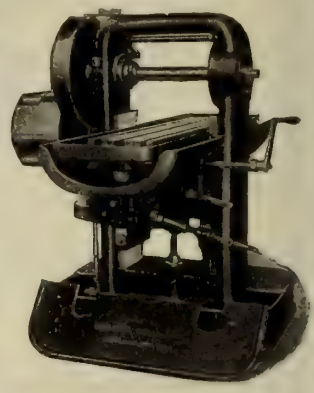
**ELK FIRE BRICK CO. OF CANADA**
LIMITED
Sun Life Building, HAMILTON, ONTARIO

# BRIGGS MILLERS

## *Production Tools*

Machine tools to-day are judged by their ability to do efficient work, save time, labor and expense. These have ever been the measures by which Briggs Millers have been designed and constructed. That our engineers have succeeded in meeting these requirements is evidenced by the increasing popularity of Briggs Millers.

No matter what the nature of the work or how severe the service the Briggs Miller will stand up to it. Its unusual rigidity, great strength and ability to take wide deep cuts when running at a high rate of speed, has established a wide reputation that is unexcelled. We would like to show how "Briggs" adaptability and convenience can increase output and lower costs for you. A letter will bring full details by return mail.



**Gooley & Edlund, Inc.**
**CORTLAND, N.Y.**

Canadian Representative:
Garlock-Walker Machinery Company, Ltd., Toronto

**ELECTRIC STEEL AND ENGINEERING, LIMITED** *Head Office:* Welland, Ont.

*Works*
**ELECTRIC STEEL & METALS COMPANY, LIMITED,** Welland, Ont.

## *Steel Castings*
### *of Any Analysis*

Carbon, Manganese, Nickel, Chrome and Forging Ingots, etc.

**WABI IRON WORKS COMPANY, LIMITED,** New Liskeard, Ont.

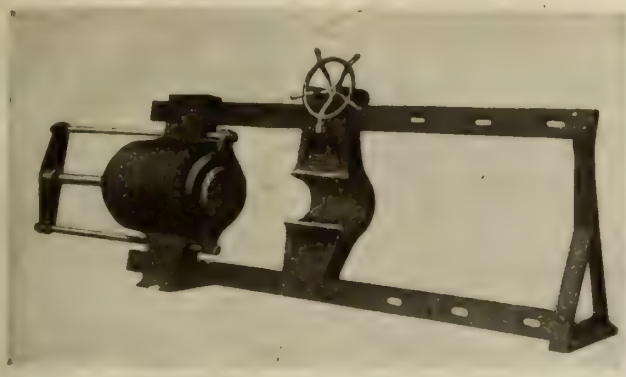
## *Mining Machinery*

Iron Castings, Crushers, Rolls, Tanks, Pumps, etc.

**BOVING HYDRAULIC AND ENGINEERING COMPANY, LIMITED**
Lindsay, Ont.

## *Turbine Water Wheels*

Pumps for pulp and paper mills, Pumping Engines for municipal purposes, Centrifugal Pumps.



# PERRIN
## 400-Ton Hydraulic Wheel Press

This Made-in-Canada Press is built to operate direct from Accumulator at 1500 pounds per square inch pressure.

*Perrin for Reliability*

**WILLIAM R. PERRIN, LIMITED**
TORONTO

# BABBITT METALS



**Imperial Genuine**

Made for extra heavy duty, such as Main Bearings on Turbine Generators, Calender Rolls in Pulp Mills, is specially adapted for Marine Engines.




**HARRIS HEAVY PRESSURE**

THE BABBITT METAL WITHOUT A FAULT

For Donkey Engines, Saw Carriages, Small Motors, Transmission Line Shafting and all steady heavy pressure duty.



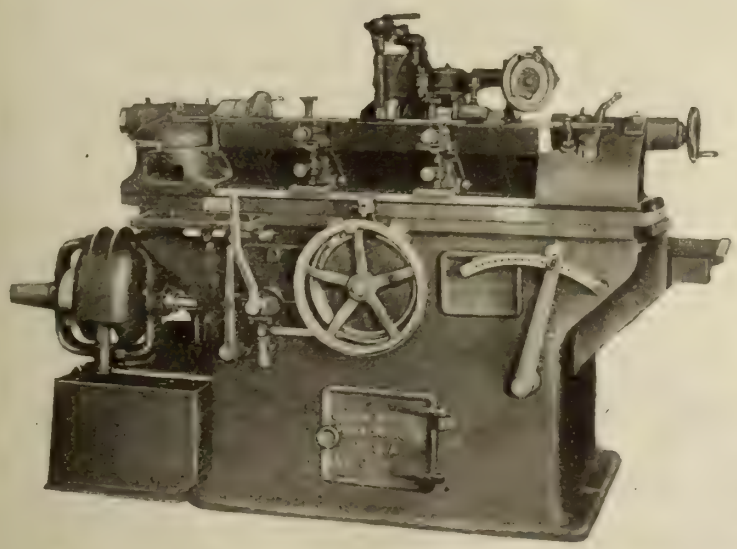
**Matchless**

Suitable For Slow-Moving Bearings

**THE CANADA METAL CO., LIMITED**
TORONTO HAMILTON MONTREAL
WINNIPEG VANCOUVER

**LANDIS**

# 100 Per Cent. Production



THE New Landis Piston Grinding Machine meets both essentials 100 per cent. strong.

A brief summary of the principal features and what they accomplish in better pistons and greater production:

Cylinder part and relief, ground complete without removing from the machine, insuring concentricity of all grinding operations. Work practically remains in plane with grinding wheel centre at all times as the work swings directly over the fulcrum point. A number of different sized or shaped cams can be placed in attachment at the same time, thus enabling different shaped pistons to be ground with slight adjustment.

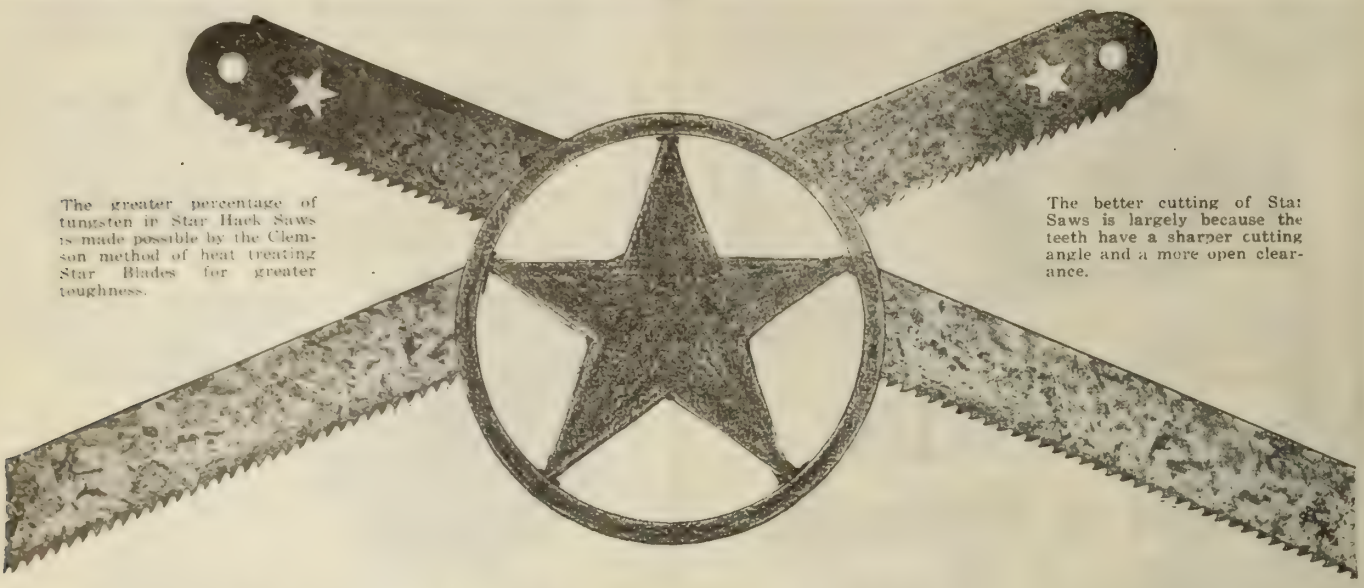
Universal driver furnished with each attachment, facilitating round and accurate work.

**Write to-day for complete description.**

## Landis Tool Company, Waynesboro, Pa.

***Canadian Agents:*** A. R. Williams Mach'y Co., Toronto, Winnipeg, Vancouver; Williams and Wilson, Montreal

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# *Does It Pay to Order Just*
# "HACK SAW BLADES?"

Many hack saw users grow careless. They order just "hack saw blades."

Because it has been the standard blade for 35 years, most dealers will fill this order by sending you Star Saws, but —

It doesn't pay to take the chance. You might get fooled some day by receiving an inferior saw blade. It's much safer to specify "Star," every time.

The poorer blade will mean a loss, both in time and material that will amount to much more than the difference in price between Star and ordinary blades.

Slow cutting blades waste valuable time not only in cutting but in frequent changing. They run up your production costs and cut down your profits more than many manufacturers realize.

Ordinary blades have the old "wood saw" tooth and two-way clearance. Star blades have an undercut tooth and three-way clearance that are made for cutting the hardest metal and do a variety of work that is impossible with ordinary blades.

Star saws prove their better quality very quickly in two ways — they will go through metal that other blades refuse to cut. And one Star blade will cut a far wider variety of sizes, shapes and metals than is possible with ordinary saws.

Make these two tests yourself with Star saws and you will never be satisfied to have other blades used in your shop. Our service men will be glad to help you solve your production problems on Hack Saws if you will write us.

**STAR SAWS NOW SOLD BY THE MAKERS**

We now sell our own product for we believe no other organization is in such a good position to give selling service on Star Saws as our own factory that has made them for 37 years.

We are not satisfied only to sell you Star Blades but stand ready to render you every service in getting the best results in their use.

## CLEMSON BROS. INC.
**MIDDLETOWN. N.Y.**

***Canadian Office and Warehouse:***

**304 Imperial Office Building, Hamilton, Ont.**

# Snapped While on the Job



Heald Style No. 60 Cylinder Grinder.

## 600-Pound Cylinder as a Test

Innumerable jobs of all kinds are submitted to our Engineering Service Department. Here is a 600-pound cylinder with a hole 6¾ dia. x 20″ long. Two cylinders are to be ground, two reamed, and the four connected, after running a while, disassembled for examination and comparison.

***If it is too far to send samples, send prints. We can work from them.***



Heald Style No. 65 Cylinder Grinder.

## A Manufacturing Proposition

You cannot afford to take chances in reaming cylinders or using any grinder not built expressly for the purpose. 85% of the automobile manufacturers are grinding their cylinders and using Heald machines.

To increase production, the Heald Company have just designed a new cylinder grinder which is a single purpose machine for manufacturers. This Heald No. 65 shown grinding a Stutz cylinder was built primarily for production of massive and heavy work, but it will handle single and two enbloc cylinders equally as rapidly.

***Eighty-five per cent. of the motor manufacturers grind. Are you one of them?***



Heald Style No. 70 Automatic Internal Grinder.

## Grinding Large Radii on Tubing Dies

Grinding tubing dies called into use the radius truing device which can be furnished on either the style No. 70 or No. 75. The dies were of various sizes requiring special shaped wheels that not only had a radius but part of the face was straight.

**No matter how odd your work is, send in a quantity of samples or blue prints. Our experience is yours for the asking.**

# The Heald Machine Co.

**51 New Bond St.**

**WORCESTER, MASS., U.S.A.**

BRANCH OFFICES: New York, 839 Singer Bldg., Philadelphia, 1308 Commonwealth Bldg.; Chicago, 26 South Jefferson St.; Detroit, 401 Marquette Bldg.; Cincinnati, 311 Provident Bank Bldg.; Cleveland, 721 Engineers' Bldg.; Buffalo, 331 Jewett Ave. WESTERN AGENTS: Eccles & Smith Co., Los Angeles, San Francisco, Seattle and Portland; Salt Lake Hardware Co., Utah and Idaho; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.

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Simonds Simonds

## Hack Saw Blades That Reduce Cutting Cost

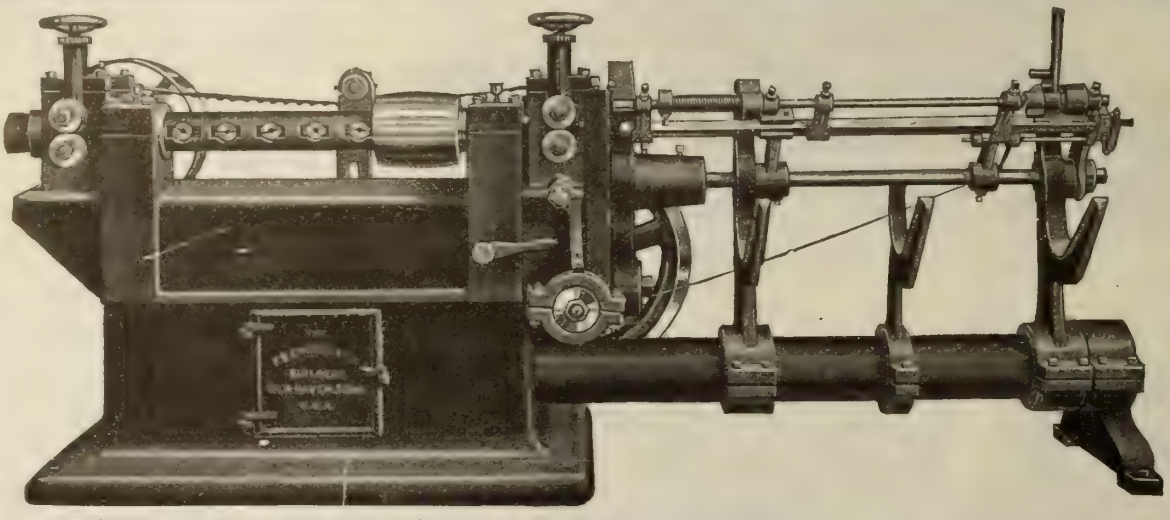
# SIMONDS

For Machine or Hand Use. Hardness in the teeth for rapid cutting—Flexibility in the blade for long wear. They do not break when properly used.

SIMONDS CANADA SAW COMPANY, LIMITED

St. John, N.B. Montreal, Que. Vancouver, B.C.

Simonds Simonds



## Perfect Wire Straightening Quickly and Profitably Done on Our

# Automatic Wire Straightening and Cutting Machine

Just put your coil of wire on the reel, adjust the rolls and dies, and set the gauge for the length you want. The machine does the rest—thousands of feet per day, perfectly straight and cut to accurate lengths.

**Catalogue tells more about them, and we will be glad to send you a copy.**

# THE F. B. SHUSTER CO., New Haven, Conn.

FORMERLY JOHN ADT & SON ESTABLISHED 1886

*ALSO MAKERS OF STRAIGHTENERS FOR SQUARES, HEXAGONS, FLATS, ETC.*



Rotary Continuous Heat-Treating Furnaces Used in Quantity Production of Pressed Steel Parts.

# METALLURGISTS

***The following advantages are secured by the Continuous Method of Heat-Treatment:***

Bringing material up gradually to the final temperature.
Utilizing heat in spent gases to preheat material.
Exposing each piece to heat in same manner, to same temperature, for same length of time.
Uniformity not only of the individual piece but of the sections thereof as compared with the corresponding sections of other pieces.

**DO THESE ADVANTAGES APPEAL TO YOU?**

***Write for Bulletin 217-T and learn whether the continuous method is adaptable to your product and manufacturing conditions.***

W. S. ROCKWELL COMPANY

*Furnace Engineers and Contractors*

50 Church St. (Hudson Terminal Bldg.) New York

*We make Industrial Heating Furnaces for Every Requirement "FURNACE AND FUEL TO SUIT CONDITIONS."*

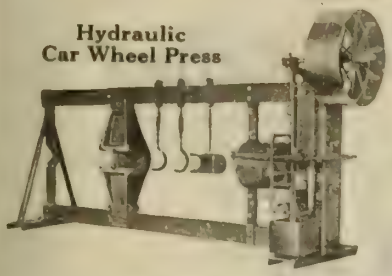
Address Canadian Representative:
R.J. McLEAN, 604 Southam Bldg. MONTREAL, P.Q.

W.S. ROCKWELL CO. INDUSTRIAL ESTABLISHED 1888 FURNACES 50 CHURCH ST. NEW YORK

# LOURIE HYDRAULIC PRESSES

**For Every Purpose Requiring Pressure**

Hydraulic Car Wheel Press



We manufacture a complete line of presses for bending, straightening, forcing, forming, broaching, welding, baling, and many other purposes.

Hydraulic Bulldozer



*Write for Catalogue*

**LOURIE MANUFACTURING CO.**
SPRINGFIELD, ILLINOIS, U.S.A.

# Open a Bank Account in Canada

The present abnormal exchange situation between Canada and the United States is affecting trade relations between the two countries. Exporters in the United States can meet this by opening Bank Accounts in Canada.

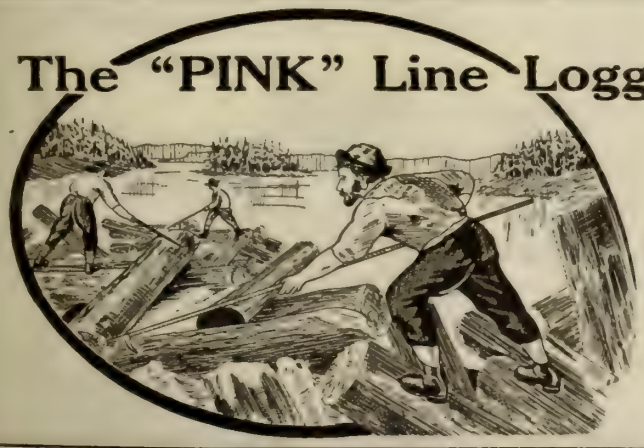
**This Bank has 717 Branches, of which 617 are located in Canada from the Atlantic to the Pacific Coast. Write for a complete list of Branches and for terms respecting a Canadian account.**

# THE ROYAL BANK OF CANADA

**Capital and Reserves $40,000,000** **Total Resources $595,000,000**

***Head Office:*** **MONTREAL**

# The "PINK" Line Logging Tools and Handles



**MADE-IN-CANADA Products---Headquarters for British Empire for all Lumbering Tools**

In every lumber camp in Canada you'll find PINK'S famous lumbering tools. They are the favorites there and have won the esteem of all woodsmen through their superior merit. They are world-renowned and are extensively used in Australia, New Zealand and other countries where the lumbering industry thrives.

**EXPORTERS TO EUROPE**

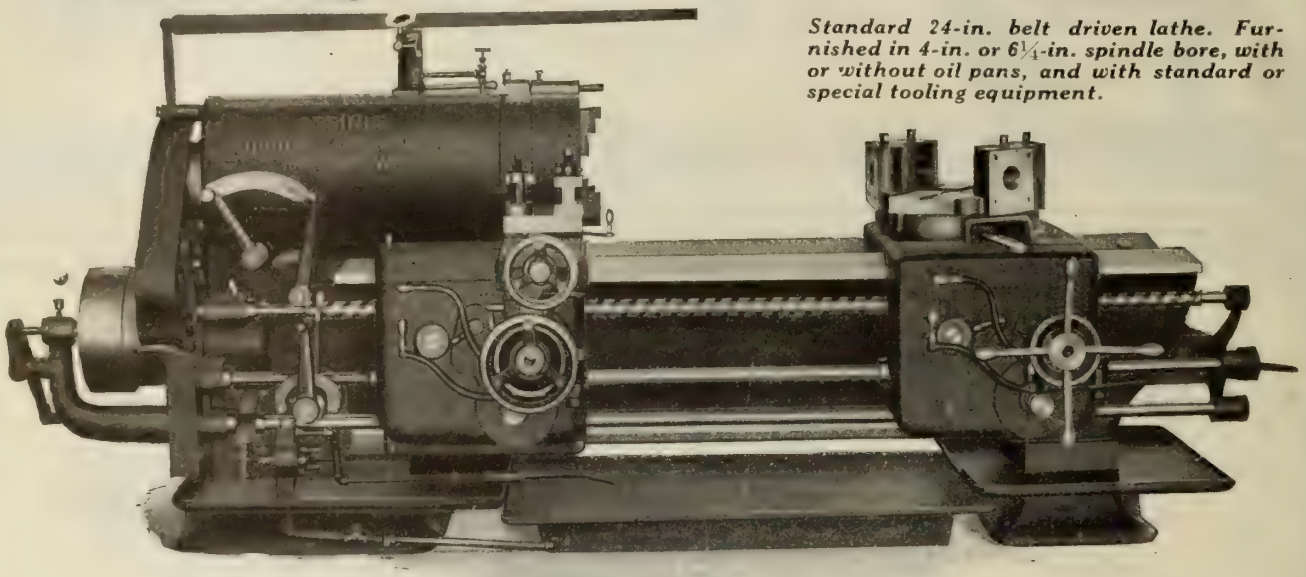
We export the same good quality of lumbering tools that have made PINK'S TOOLS a by-word in the matter of good tools in all Canadian lumber camps. Enquiries cordially solicited.

**Thomas Pink Co., Limited**
PEMBROKE, ONT., CANADA

*If interested tear out this page and place with letters to be answered.*

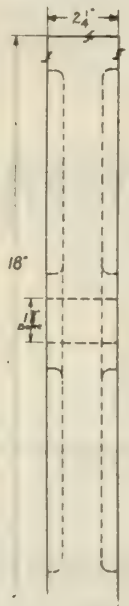
# STEINLE

## Full Swing Side Carriage Turret Lathes



*Standard 24-in. belt driven lathe. Furnished in 4-in. or 6¼-in. spindle bore, with or without oil pans, and with standard or special tooling equipment.*

## TIME—Floor to Floor—4½ Minutes Each




THE MACHINE was a standard 24-in. Steinle Turret Lathe with 4-in. spindle bore arranged for belt drive, and equipped on turret with boring bars and special overhead bar carrying a turning tool and on cross slide carriage with a special three-cutter tool block.

THE WORK was an 18-in. cast iron gas engine flywheel. The surfaces machined included boring hub with bars, rough turning rim with special overhead bar carrying turning tool, and shaving and facing both sides of rim with a three-cutter tool block on cross slide carriage.

Just one more record of rapid production on a machine designed and built for fast severe service in producing accurate work economically.

And this record is maintained not on one or two pieces, but on lots of several hundred—just steady, consistent production under average shop conditions.

***Do your records compare with this?***

***Why not send us your blueprints and let our Engineering Department determine what can be done on your own work, or ask to have a qualified representative call and go thoroughly into the matter?***

## STEINLE TURRET MACHINE CO.

*Originators of the Full Swing Side Carriage Turret Lathe*

**Madison, Wisconsin, U.S.A.**

AGENTS Machine Tool Engineering Company, Singer Building, New York City; Cadillac Tool Company, Dodge Power Building, Detroit, Michigan; L. G. Henes, 75 Fremont Street, San Francisco, California, and Title Insurance Building, Los Angeles, California. Foreign—Leo. C. Steinle, 53 Victoria Street, London, England.

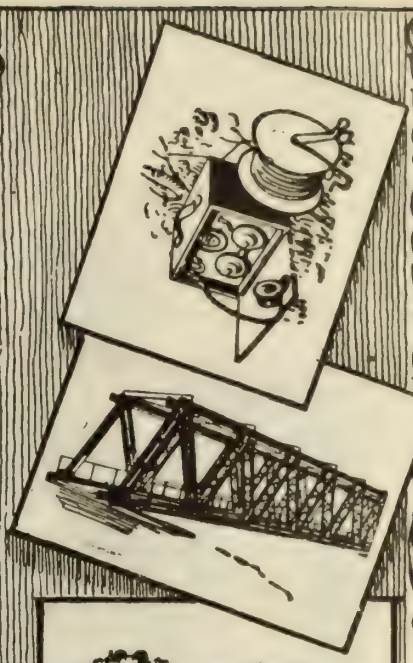
MINISTRY OF MUNITIONS
GR

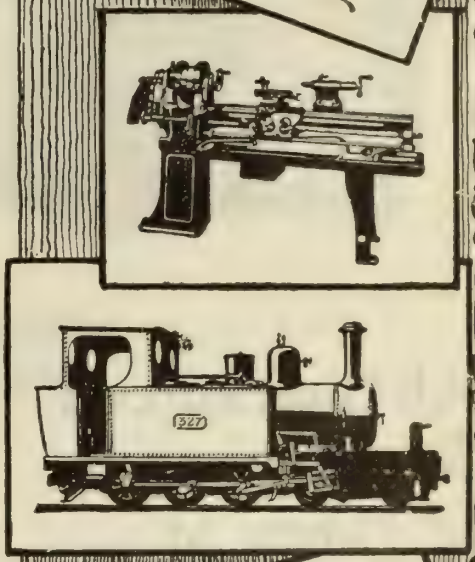
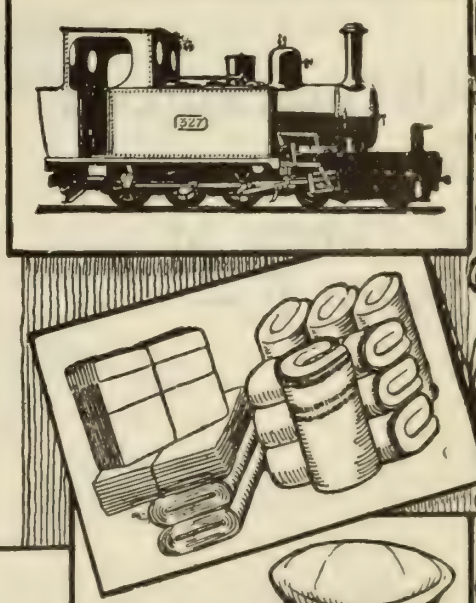
# The Disposal Board
Have
# STOCKS
## Lying in the United Kingdom and
## AVAILABLE FOR EXPORT
*of*
## ENGINEERING STORES

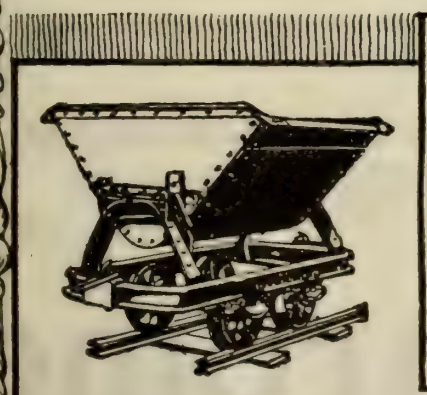
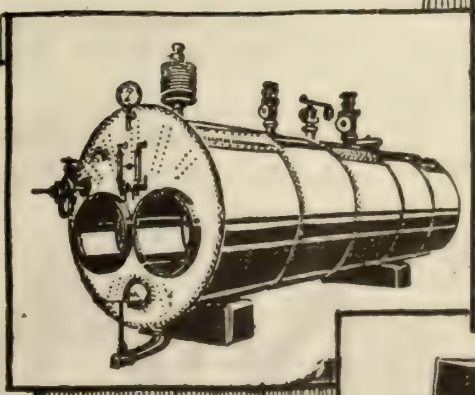
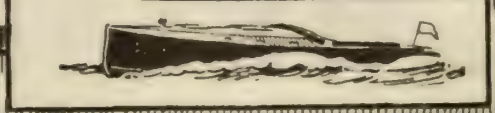
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*Buyers should instruct their representatives in the United Kingdom to communicate with The Secretary, Disposal Board, Ministry of Munitions, Caxton House, Tothill Street, London, S.W. 1.*

*Cable Address :*
*"DISPEXPORT, MUNORGIZE, LONDON."*





# Stock Patterns in Hundreds of Sizes

—Special Designs for Special Requirements

*Manufactured under HENDERSON Patents*

## All Guaranteed for Thousands of Hours at 1800° F.—

YOU do not experiment when you use Cast Nichrome heat-treating containers, racks, furnace muffles, etc. Both special designs and stock patterns are guaranteed for a definite term of service—length of guarantee, of course, depending on operating conditions.

The large variety of stock patterns is the result of the extensive use of Cast Nichrome and takes care of most practical requirements. Bulletin N-21 shows lists of stock patterns in the different designs.

A new book, "Case Carbonizing," describes modern standardized methods as practiced in many of the foremost plants, and is free to heat-treating men and men who are responsible for heat-treating results.

Be sure to give your official title when asking for this Case Carbonizing Book.

*Cast Nichrome can be manufactured only under the Henderson Patents which are owned by the*

## Heat-Treating Containers of

**CANADIAN DRIVER-HARRIS CO., Ltd.**

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WALKERVILLE, ONT. CANADA AMERICAN OFFICE AND WORKS HARRISON, N J

BRITISH WORKS MANCHESTER ENGLAND

# Cast Nichrome

ENDURE IN HIGH TEMPERATURE

IN the bearings sponsored by S K F its type of anti-friction bearings have been developed to their highest perfection. And S K F further provides an engineering service not only to assume to itself proper application and use of S K F products but to help the buyer to fully capitalize the mechanical value built into each device. This service is freely offered and is being continually broadened and advanced by laboratory research that is international in scope. You are assured a similar service behind every product bearing the mark—

# SKF

*Among the* **SKF** *products now offered are:*

Single row deep groove ball bearings
Double row self aligning ball bearings
Steel balls
Transmission equipment

**CANADIAN SKF COMPANY LIMITED**

MONTREAL
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*SKF Research Laboratory established at Philadelphia to co-operate with the big Gothenberg Laboratories in the study of the Canadian manufac:urers' friction problems.*

*If interested tear out this page and place with letters to be answered.*

# H. W. PETRIE LIMITED




*Canada's Dependable Machinery and Supply House*

The "PETRIE" policy represents the standard in high-grade tools and efficiency in service.

Prompt Service

## Machinery and Supplies of All Kinds

### A Few of the Lines We Stock

Hyatt Roller Bearings
Pioneer Steel Hangers
American Steel Split Pulleys
Wood Split Pulleys
Cold Rolled Shafting
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## H. W. PETRIE LIMITED

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MADE
IN CANADA

# MALLEABLE AND CAST IRON PIPE FITTINGS

Quality Products

Annual Capacity
6000 Tons

Prompt Service

M Brand Pipe Fittings, Screwed or Flanged, Black or Galvanized.

We are equipped to make the general run of malleable and grey iron castings for machinery manufacturers, agricultural implements, automobiles and specialties.

**Cast Iron Fittings**

stamped with our trade-mark mean fittings made with iron of high tensile strength — proper proportions and correct tappings.

**RECESSED DRAINAGE FITTINGS**

**Malleable Fittings**

of our brand mean fittings made of *Air Furnace Refined Iron*, reamed and tapped to gauge with perfect threads.

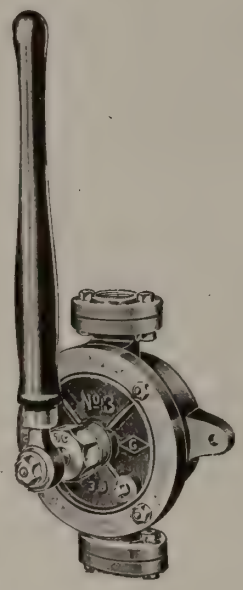
A trial of our pipe fittings will prove the quality of service they give.

**International Malleable Iron Company, Limited**
GUELPH, CANADA

CANADA
FOUNDRIES & FORGINGS
LIMITED

# Red Wing Semi-Rotary Pumps

# Smart's Jack Screws





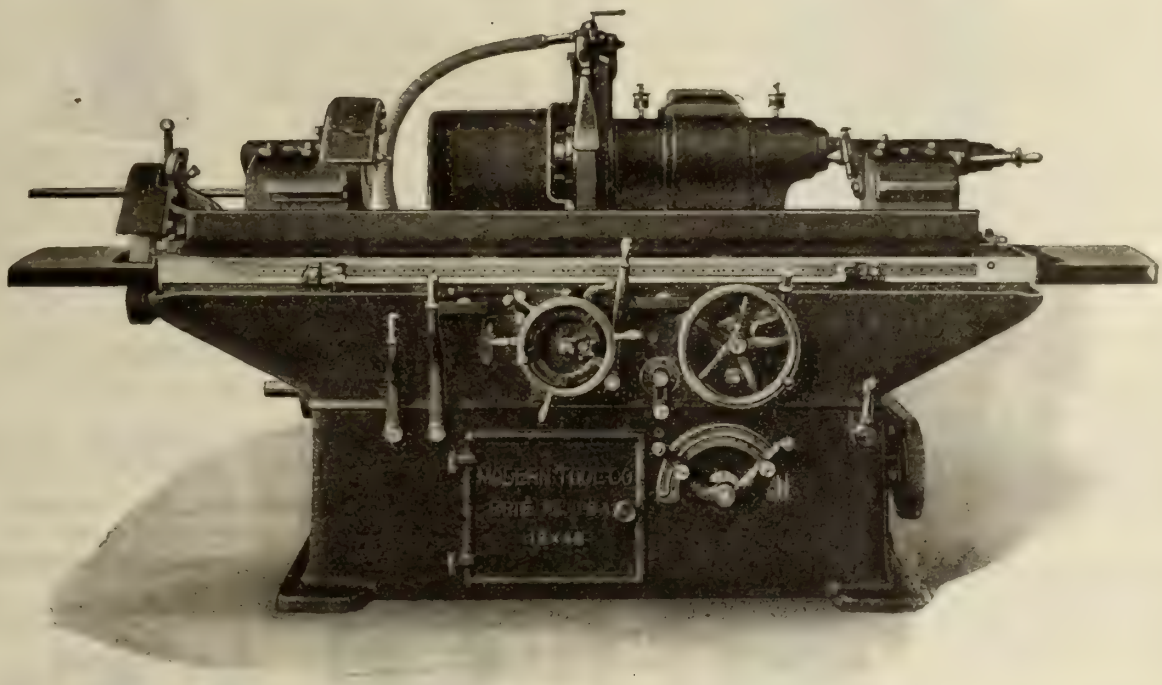

OFFERING SHIPMENT FROM STOCK

also

Makers of Thousand Island Hammers and Axes

JAMES SMART PLANT
BROCKVILLE, CANADA

# MODERN



## *Send For Our New Bulletins*
## *They Point the Way to Better Grinding*

We make Plain Grinding Machines in eight sizes:—

| | | |
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| 8″ x 18″ | 8″ x 30″ | 12″ x 36″ |
| 12″ x 48″ | 12″ x 60″ | 16″ x 36″ |
| 16″ x 48″ | 16″ x 60″ | |

It's the "Modern" design, plus "Modern" painstaking workmanship, that takes Modern out of the ordinary class of machines, and gives it a rating entirely distinctive. Moderns are rigid, and strong—they're built for heavy duty without being continually laid up for repairs, or adjustment. Find out now about "Modern". Dependable production is our pride.

## MODERN TOOL CO. - ERIE, PA.

Main Office and Works: State and Peach Sts.

*CANADIAN AGENTS:*

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**Toronto and Montreal**

**Foreign Representatives:** Yamatake Company, Tokyo, Japan; Leo. C. Steinle, 53 Victoria St., London, S. W., England; Glaenzer & Perreaud, 18 and 20 Faubourg du Temple, Paris, France; Rylander & Asplund, Stockholm, Sweden; C. Civita & Co., Milan, Italy; J. Lambercier & Co., Geneva and Zurich, Switzerland.


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# Wear Out Files —But Not Men

It is easier and less expensive to replace files than men.

Keep your workmen supplied with sharp files and they will do their filing jobs well and remain contented.

Let them go on using a dull file, and you may save money on files, but you will lose it on labor and have discontented workmen and poor work.

Replace a dull file with one of the following standard brands:

**Kearney & Foot**
**Great Western**
**American**
**Arcade**
**Globe**

# FILES

*Made in Canada by*

**Nicholson File Company**

Port Hope - Ontario

# LA SALLE

**Has an Advantage Over Other Grinders**

There is some outstanding feature of all La Salle Grinding Machines that lends it exceptional productive ability.
The American Drill Grinder is especially adaptable for grinding twist, flat and three-lipped drills, because it has automatic lip rest and caliper jaw device, which assures proper clearance on all sizes of drills automatically. Send for descriptive matter covering our entire line of grinding machinery.

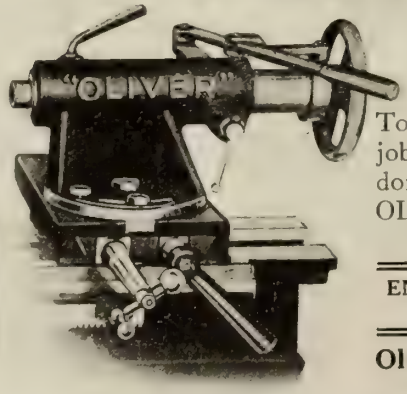


American Drill Grinder
For Wet or Dry Drill Grinding 1/8" to 2¼". Also 1/8" to 3½" dia.

**LA SALLE TOOL CO.**
La Salle, Illinois, U.S.A.
Represented in Canada by
**A. R. Williams Machinery Co., Ltd.**
64-66 Front Street W., Toronto
Halifax St. John, N.B. Montreal Winnipeg Vancouver



"Oliver" 12-Inch Speed Lathe




# NO LIMIT

To the number of jobs that can be done on this 12-inch OLIVER SPEED LATHE

**ENGINE LATHES OF ALL KINDS**

**Oliver Machinery Company**
Grand Rapids, Mich.

MAPLELEAF

# MOTOR TRUCKS

*Velvet Smooth—Giant Strong*

That describes the clutch in a Mapleleaf Truck.

It doesn't grab with a jerk which threatens to strip the gears—they shift as quietly as a whisper. Its 12 to 16 discs being small, are very easy to slow down.

Two other important things:

1. A Mapleleaf Clutch, being of the dry plate type, **does not gum up.**
2. The surfaces being unusually large the wear is evenly distributed over good honest metal.

A clutch smooth in action, powerful in performance.

**Mapleleaf Manufacturing Company**
LIMITED
MONTREAL - CANADA

ON THE LISTS OF ADMIRALTY, WAR OFFICE, CROWN AGENTS FOR COLONIES, ETC.

Manufacturers of EXTRUDED BRASS and BRONZE RODS and SECTIONS.

HOT BRASS and BRONZE STAMPINGS and PRESSINGS.

GUN METAL, PHOSPHOR BRONZE, BRASS and WHITE METAL INGOTS.

CHILL CAST PHOSPHOR BRONZE BARS.

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BRASS ROD, STAMPINGS AND METAL MANUFACTURERS

ROTTON PARK STREET

**BIRMINGHAM, ENGLAND**

We stock in Montreal Free Turning Brass and Bronze Rods, suitable for high speed Turning both in Round and Hexagon.

We shall also be pleased to quote for shipments direct from Birmingham, shipping in two weeks' time.

**Sole Canadian Agents;**

**Thomas Moore & Son**

**224 Lemoine Street, Montreal**

***We excel in quantity production***




Thor Chipping, Calking and Beading Hammer

***Thor* punch has helped put across many a job**

Time is one of the most important items involved in every contract job.

The speed with Thor Hammers, Drills and other Tools work has pulled many a contract through on time.

*Write for our Thor Catalog No. 11*

**Independent Pneumatic Tool Company**

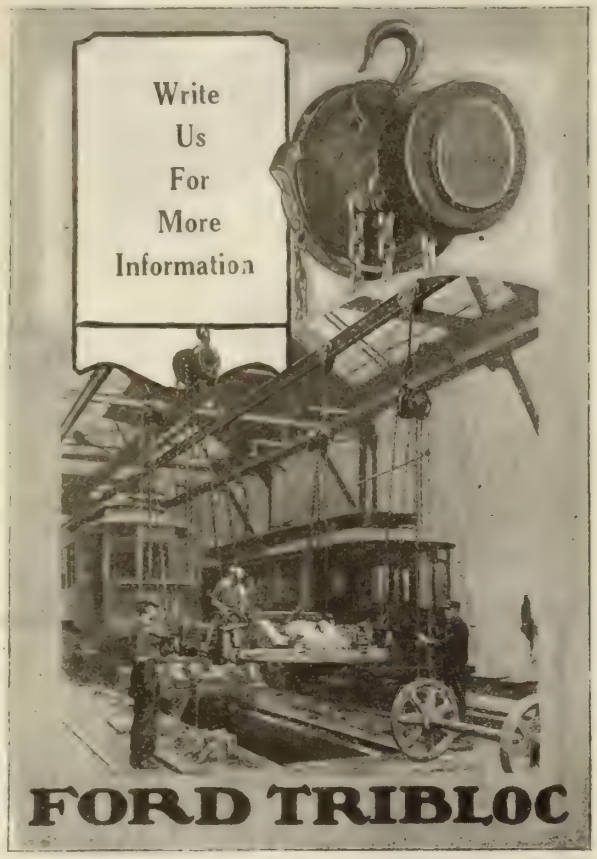
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123 Bannatyne Ave. E.

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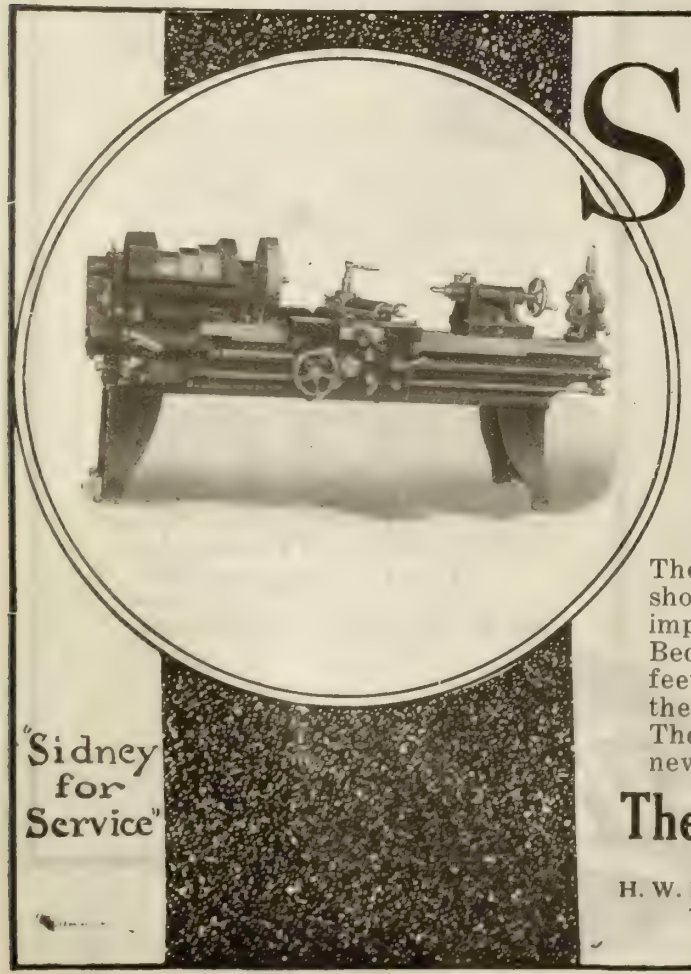

## "—to be trusted"

FORD CHAIN HOISTS are built to be trusted. With them men lift heavy loads, where a slip would be fatal, in the same confidence that they swing a sledge or pick up a crowbar. Because those who have used the FORD TRIBLOC know that it can be trusted to carry with safety and work with speed and sureness.

The Loop Hand Chain Guide is a feature which will commend itself to any one who has tried to work an ordinary chain hoist from the side—and found trouble.

2718-D

**FORD CHAIN BLOCK CO.**
2ND & DIAMOND STREETS PHILADELPHIA, PA.
OVER-SEAS REPRESENTATIVE
ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA
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# SIDNEY

## Heavy Duty Engine Lathes

### Noted for Their Power and Rigidity

One of the outstanding features of the Sidney is the manner in which it takes deep cuts through tough metals. Clean cuts without chatter, without pause. The Sidney is so designed that rigidity is maintained under severe conditions, and, in normal service.

The 25-inch Heavy Duty Quick Change Sidney here shown is the last word in lathe construction. Every improvement will be found in this, the latest model. Bed lengths available are: 10, 12, 14, 16, 18 and 20 feet. 27-inch swing design can also be supplied in these lengths.

The specific details of the Sidney are given in our new Bulletin. Write for your copy to-day.

## The Sidney Tool Co., Sidney, Ohio

*Canadian Agents:*

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Yeates Machinery & Supply Co.
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# STEEL *for*

## Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

**We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.**

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Steel Ingots
*by the*
**HARMET**
Liquid Process





# For SPEED use

# LARCUL CUTTING OILS

**Show us a job on which you are using ordinary cutting oils and we will show you how to get MORE speed. Here are three letters from users of Larcul. They speak for themselves:**

"On a Gould & Eberhardt, also B & L Milling Machines. Milling Cutter 6 in. diameter, 28-tooth, 8 in. wide. Stock 60 degrees carbon, 16% tungsten. Cutter speed 157 feet per minute. Milling cut across cutter 8 in. Time—8 minutes. Finish glass smooth and sharp."

"Used Larcul Amber on Acme Automatic. Stock 40-50 degrees carbon, 7% nickel. Long bolt size 4¾ in. Blank cut in 1 minute 9 seconds. Threading 12 seconds. Speed 150 surface. Spindle speed 500 R.P.M. The carbon steel chasers used for threading, averaging 3,000 pieces per day, stand up three and four days."

"We carefully compared the results obtained with the use of Larcul Ebony against a competitive brand on low carbon steel. The job was that of broaching a two-way key-lock. With Larcul Ebony we obtained 10,000 pieces as against 1,000 with the other brand."

Larcul Cutting Oil is made in two grades, AMBER, a transparent oil, for all types of automatics, turret machines, gear cutters, etc., and EBONY, for pipe and bolt threading, nut tapping, turrets, automatic turning and boring, etc.

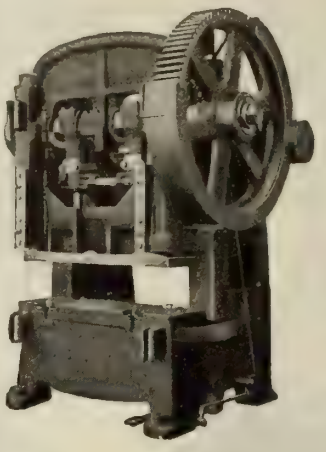
***A demonstration in your own plant is our most convincing argument. No obligations. Write us to-day.***

**Cataract Refining Co., Ltd.**
**Toronto, Ontario**

SCIENTIFIC LUBRICANTS for SCIENTIFIC LUBRICATION



# The "TOLEDO" Double Crank Presses



Durable, well-balanced construction insures continual performance of the highest character with low maintenance cost.

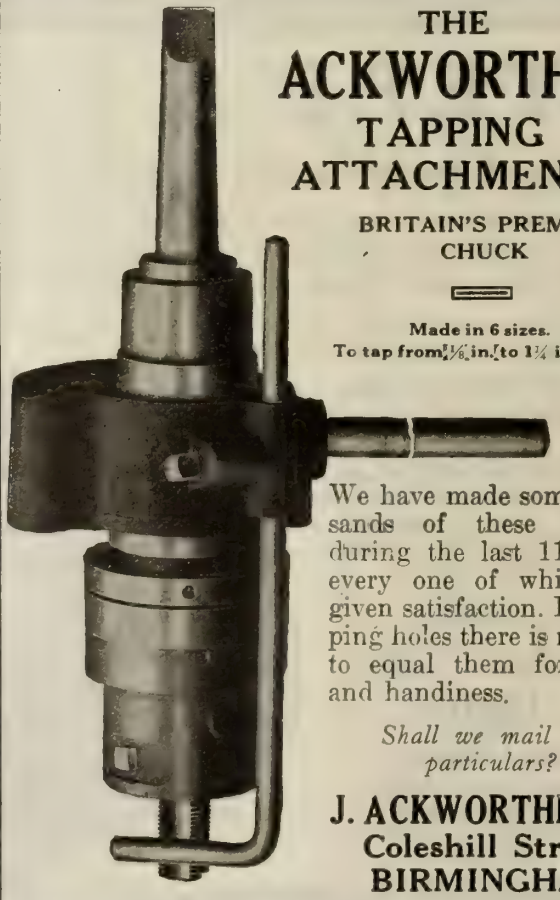
Many exclusive conveniences speed up the work and economize in labor.

Over 250 sizes — straight side and overhanging patterns adaptable to practically every requirement of general sheet metal and drop-forged work.

*We fit the press to the needs*

**THE TOLEDO MACHINE & TOOL CO.**
**TOLEDO, OHIO**





**THE ACKWORTHIE TAPPING ATTACHMENT.**

**BRITAIN'S PREMIER CHUCK**

**Made in 6 sizes.**
**To tap from 1/16 in. to 1¼ in. Whit.**

We have made some thousands of these Chucks during the last 11 years, every one of which has given satisfaction. For tapping holes there is nothing to equal them for speed and handiness.

*Shall we mail you particulars?*

**J. ACKWORTHIE, Ltd.**
**Coleshill Street,**
**BIRMINGHAM**

# 1/3 to 1/2 Reduction in Milling Cost

This will be the result of taking small milling jobs from your big millers and putting them up to



## The U.S. MILLER

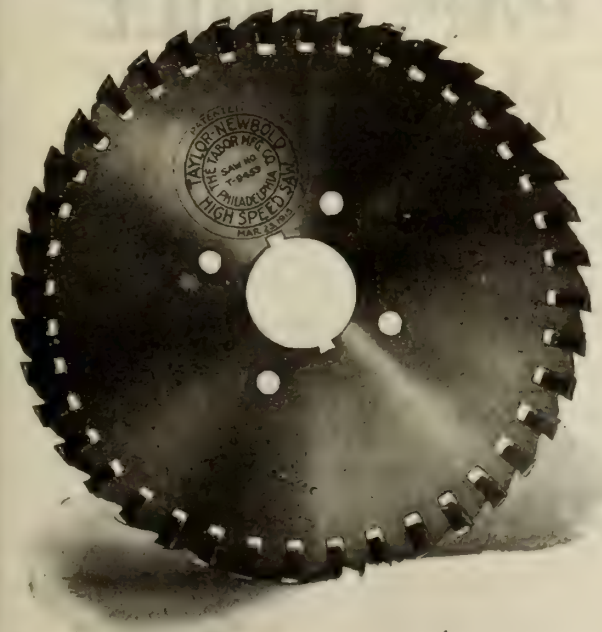
*The Miller for Small Work*

A small machine takes up less space, requires less power, is easier to operate and is more accurate.

**The Paramount Miller of its size.** Drop us a line for full details.

**United States Machine Tool Company**
Cincinnati, Ohio, U.S.A.

THE IMPROVED
# TAYLOR-NEWBOLD




INSERTED TOOTH COLD SAW
WRITE FOR BULLETIN T-S
**Tabor Mfg. Co., Philadelphia, Pa., U.S.A.**

# THERE is as much difference in the various makes of High Speed Steel as there is in men—

The practice and methods of manufacturers differ widely in every mill and anyone who is at all familiar with the manufacture of High Speed Steel thoroughly understands this

# "Red Cut Superior"

*The Nationally Known—First Quality*
## HIGH SPEED STEEL
is the best for all Machine Work

ARE YOUR TOOLS MADE OF "Red Cut"?

**VANADIUM-ALLOYS STEEL COMPANY**
Main Office and Works :
Latrobe, Pa.

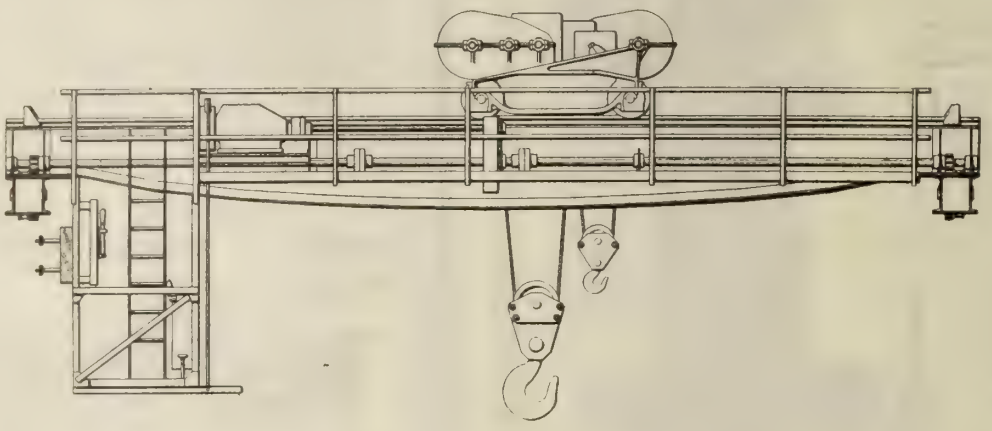
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# CRANES

## ELECTRIC AND HAND OPERATED



## DOMINION BRIDGE COMPANY, LIMITED

HEAD OFFICE AND WORKS: MONTREAL BRANCHES: OTTAWA, TORONTO, WINNIPEG

# HYDRAULIC TURBINES AND PUMPS

Our shops are equipped for building TURBINES of the largest sizes —also high speed PUMPS of large capacity for medium and low heads. Two turbines of 20,000 H.P. are now under construction.

# PAPER MILL MACHINERY

Pulp Drying Machines.
Millspaugh Suction Rolls.
Millspaugh Shower Pipes.
Davies Oscillating Suction Boxes.
Press and Felt Rolls.
Brass Covered Rolls.
Pulp Digestors.
Barking Drums.
P.A.P.A. Screens (Spangenburg System) for pulp and paper.

## DOMINION ENGINEERING WORKS, LIMITED

MONTREAL - QUE.

THE TUBE COMPANY OF CANADA LIMITED

# Electric and Oxy-Acetylene WELDED TUBING

## *Also BUTT SEAM TUBING*

We have a thoroughly equipped plant for Welding by Electric and Oxy-Acetylene processes. Butt Seam Tubing is also one of our specialties. Tubing made hot or cold rolled finish.

***Our Work Includes Tubing for***

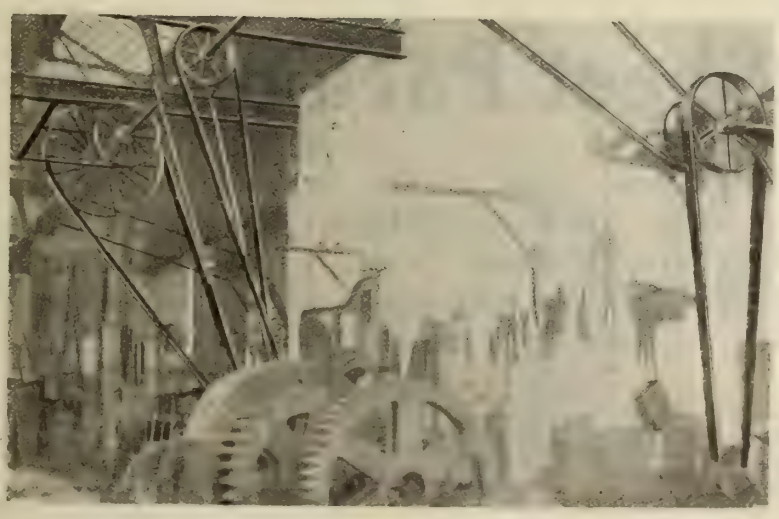
Bicycles, Bedsteads, Automobile Parts, Electric Fixtures, Gas Fixtures, etc. Round, Square, Rectangular and Special Shapes. Sizes ⅜ in. to 2 in. outside diameter, from 16 to 22 gauge. Also equipped for bending 16 gauge or lighter, any shape or radius.

Let us advise you of the kind of tubing that will best suit your requirements. Inquiries gladly answered.

**The Tube Company of Canada LIMITED**

**233 Dufferin Street, TORONTO, Canada**

# Solid Woven Belting



Solid Woven Hair Belting
Driving Heavy Machine Tools

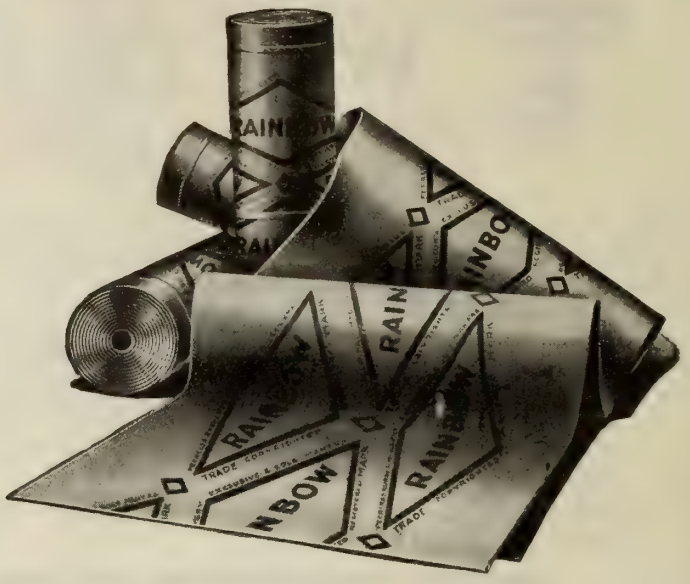
## Solid Woven Cotton Hair Twintex

*These beltings will solve your driving problems and save you money.*

**SUMNER & CO.**
108 WORTH ST.
NEW YORK

Representative for Eastern Canada
GEORGE F. SHEPPARD
702 Southam Bldg., Montreal

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# Steam Engineers Know Rainbow's Worth

Practical men best appreciate the sterling value of Rainbow Sheet Packing because they know the better service it gives.

They know the saving that is effected when joints are tight and stay tight. They appreciate the absence of frequent shutdowns to re-gasket steam lines.

# Rainbow Sheet Packing

is the *original red sheet.* Look for the "RAINBOW" Diamond trade mark — it means economy through service. Genuine Rainbow Sheet is made in Canada. Our technical experts are always at your service to help overcome your packing problems. Write for catalogue.

DOMINION RUBBER SYSTEM AND ASSOCIATED COMPANIES

## Dominion Rubber System

**Rainbow Rubber Products Department**

**201 Inspector Street - Montreal**

# Molybdenum Steels

**"MOLY"**
**Our Trade Name for Chrome-Molybdenum Steel**

The publicity being given to Molybdenum as an alloying element for commercial steels is pleasing to us in that it serves to direct attention to a very meritorious alloy steel.

The first Molybdenum Steel made in the United States in commercial quantities was produced in our open hearth and electric furnaces. We have made more Molybdenum Steel than any other alloy steel manufacturer in the world.

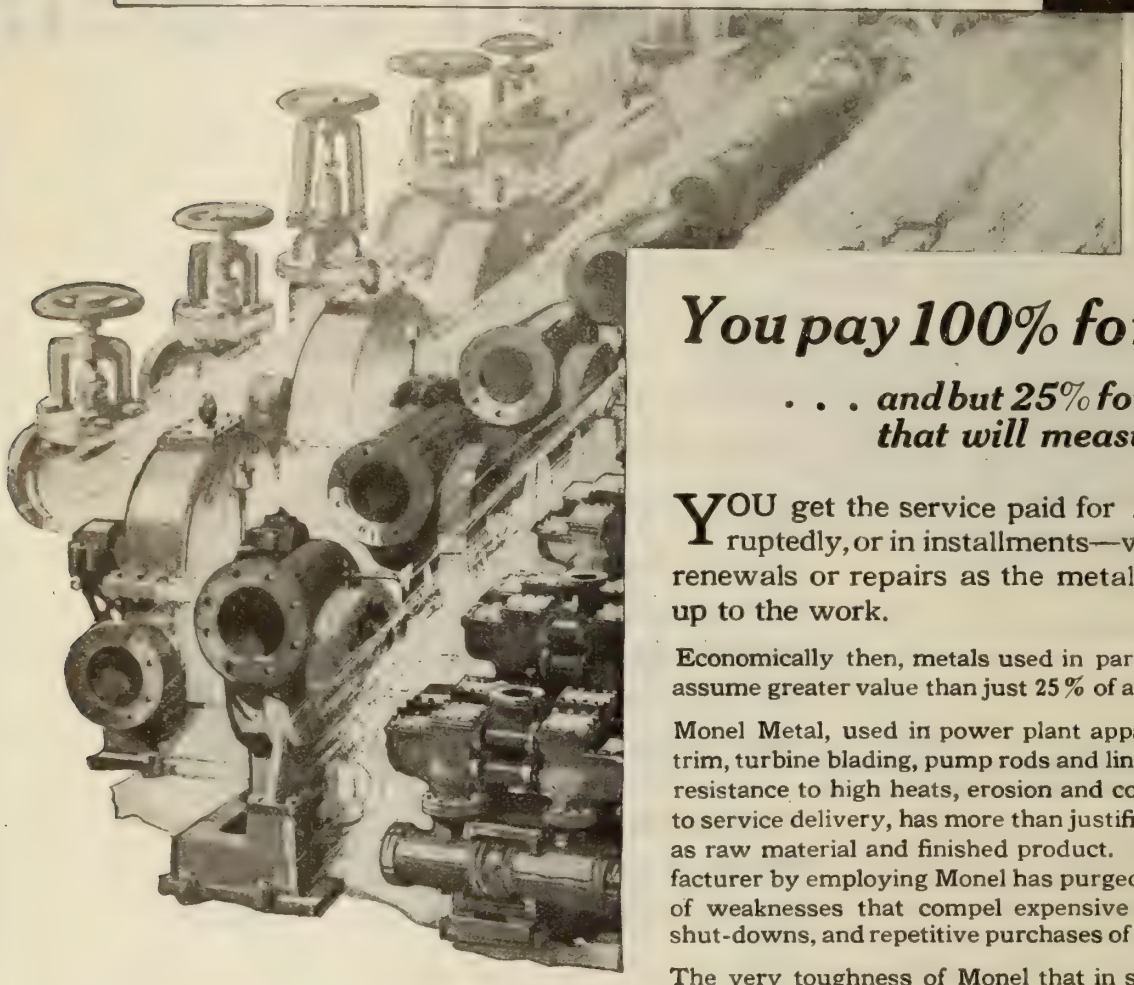
Our success in making Molybdenum Steels is undoubtedly due to our long specialization in alloy steel manufacture.

## United Alloy Steel Corporation

Canton
Ohio

*If interested tear out this page and place with letters to be answered.*

**Design-time and Production costs 75%** **Metal costs 25%**



## *You pay 100% for service*

### *. . . and but 25% for the metal that will measure its life*

YOU get the service paid for . . . uninterruptedly, or in installments—with repeated renewals or repairs as the metals used stand up to the work.

Economically then, metals used in parts manufacture assume greater value than just 25% of apparatus costs.

Monel Metal, used in power plant apparatus as valve trim, turbine blading, pump rods and liners, etc., where resistance to high heats, erosion and corrosion is vital to service delivery, has more than justified its cost both as raw material and finished product. For the manufacturer by employing Monel has purged his apparatus of weaknesses that compel expensive repairs, costly shut-downs, and repetitive purchases of new machines.

The very toughness of Monel that in some cases will slightly raise manufacturing costs is pledge of its ability to deliver service continuously.

Monel Metal is absolutely untouched by rust, is strong as steel, resists the eating action of most alkalies and acids. Monel retains its strength under high heats that break down the very structure of most metals and successfully withstands the eroding action of high pressure and superheated steam.

The name Monel is given to a line of metal products produced by The International Nickel Company from a natural nickel alloy—67% nickel, 28% copper and 5% other metals. These products include Monel blocks, Monel rods, Monel castings, Monel wire, Monel strip stock, Monel sheets, etc. The name Monel identifies the natural nickel alloy as produced by The International Nickel Company.

**The International Nickel Company of Canada, Limited**

Harbor Commission Building
Toronto, Ont.

INCo Monel metal Machine parts

THE INTERNATIONAL NICKEL COMPANY

INCo MONEL METAL INCo NICKEL




# Progress in Transportation

THE modern automobile, truck, motorcycle and aeroplane would have been impossible had not manufacturing methods kept pace with the demand for progress in transportation.

Franklin Die-Castings have played an essential part in this development, and today they fill an important place in the specifications for automobiles and accessories.

Ever since 1892, when we established the die-casting industry in this country, we have been adapting die-castings to numberless lines of manufacture, and our nearly 30 years' experience is at the disposal of progressive engineers.

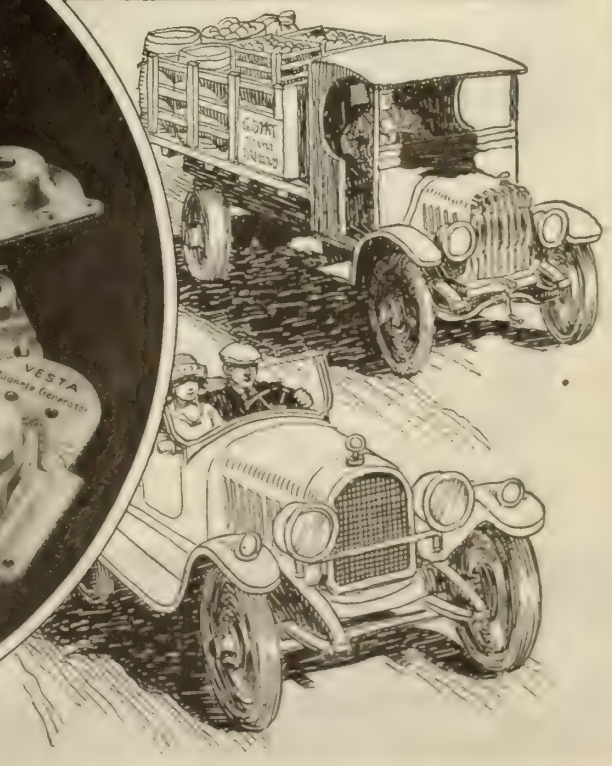
We cast in aluminum, tin, lead and zinc base alloys, and quote from samples or blueprints.

FRANKLIN DIE-CASTING CORPORATION
Gifford and Magnolia Streets, Syracuse, N. Y.

# FRANKLIN DIE-CASTINGS

Our booklet, "Franklin Die-Castings in Many Fields," relates in detail some of these accomplishments. Write for it.



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# TIME

**HIGH SPEED STEEL and GRINDING WHEELS**

are a few of the expensive items which you can save by using ARMSTRONG TOOL HOLDERS ON YOUR LATHES and PLANERS.

Refuse Imitations and Substitutes.




**One Armstrong Tool Holder** with a few cutters which can be quickly and cheaply made from the bar by any machinist will do any job on the lathe or shaper; roughing, facing, finishing, corner and fillet work and—

Effectively Equals a Dozen Forged Tools

Makes one Pound of High Speed Tool Steel Equal 10 Pounds in Forged Tools

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Write for free catalog (new) B-20

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"THE TOOL HOLDER PEOPLE"

STRONG STRONG

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# STEEL CASTINGS

*QUICK DELIVERIES*

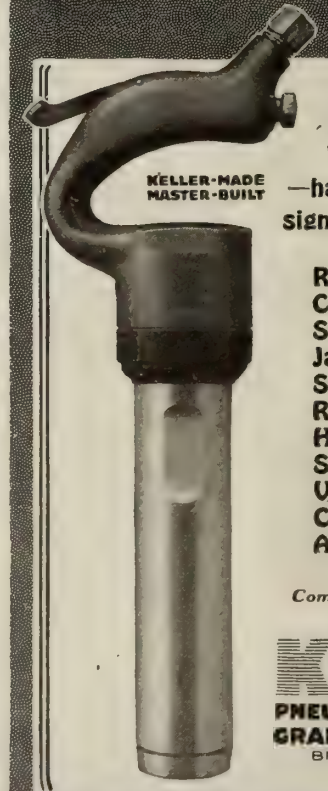
**High Carbon Steel**
**Manganese Steel**
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*QUALITY GUARANTEED*

Sizes—½ lb. to 5,000 lbs. each

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*LIMITED*
OWEN SOUND, ONTARIO
ESTABLISHED 1860

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## Experience

KELLER-MADE MASTER-BUILT —has been the Master Designer of "Keller-Master"

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*Complete Catalog on Request*

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PNEUMATIC TOOL COMPANY
GRAND HAVEN, MICHIGAN
BRANCHES EVERYWHERE

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Steel Castings — Lithographed Ware
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Made by the Acid Electric process up to fifteen tons. Castings made by this process are free from blow holes, easy to machine, and superior in every way to ordinary Steel Castings.

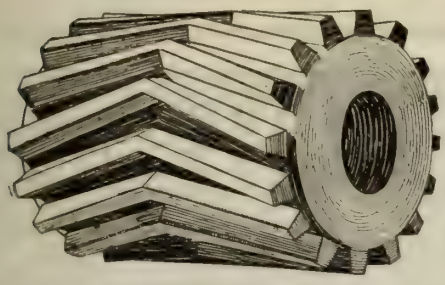
Castings supplied for shipbuilding, cars, locomotives, all classes of machinery, etc.

*The Thos Davidson Mfg Co Limited*

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Branches: Toronto and Winnipeg

Steel Foundry Division: Lachine Canal, Turcot






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Made in Canada

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**Lockers** for the personal belongings of your employees.
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The installation of any or all of this equipment, as the case demands, solves the space problem, and promotes tidiness and efficiency.
Then, too, they are ever-wearing and FIREPROOF.

**We also make**

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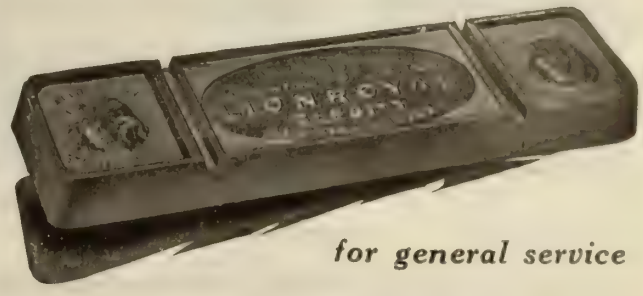
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DENNISTEEL
Made in Canada

*"Alloyed under the Stanley Process"*



*for general service*

# *Lionroyal*

*Made in Canada*

This BABBITT Metal has a greater range of service than is possible in any other Bearing Metal at a corresponding cost—it has a strength which will easily withstand impact and pressure, yet will run cool at high speed with little lubrication—

*There are thousands of places in which high-priced Genuines are used where "LIONROYAL" will serve as well.*

***Try a Sample Case and Judge for Yourself.***

BRITISH SMELTING & REFINING COMPANY LIMITED

MONTREAL


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# HANNA

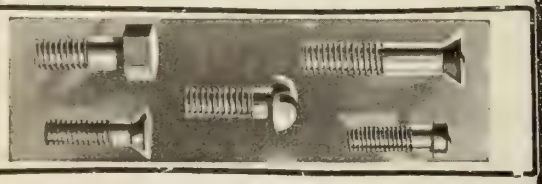
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## Wood Screw Making Machinery

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For sixty years we have constantly manufactured machinery for making screws, always studying to improve and refine our product.

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Cable address: "Cook,"
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### ACCURACY ASSURED

You can always depend upon Dunbar Springs being accurate. Before proceeding with any order the first few springs are carefully tested and checked up for this very purpose.
Seventy-two years' experience making flat and spiral springs of every description enables us to furnish you with springs of the highest quality, that can be depended upon under all conditions.

**Send blue prints for estimates**

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*Theoretically Correct*

PROMPT SERVICE

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## For Truing Grinding Wheels

A new and large assortment of the finest diamonds for dressing emery wheels has been added to our stock. Canadian manufacturers will do well to let us know their requirements.

**Canadian Desmond-Stephan Mfg. Co., Limited**
Hamilton, Ontario, Canada

# MacKINNON STEEL CO., LTD.

***Engineers, Manufacturers and Erectors of Steel Structures***

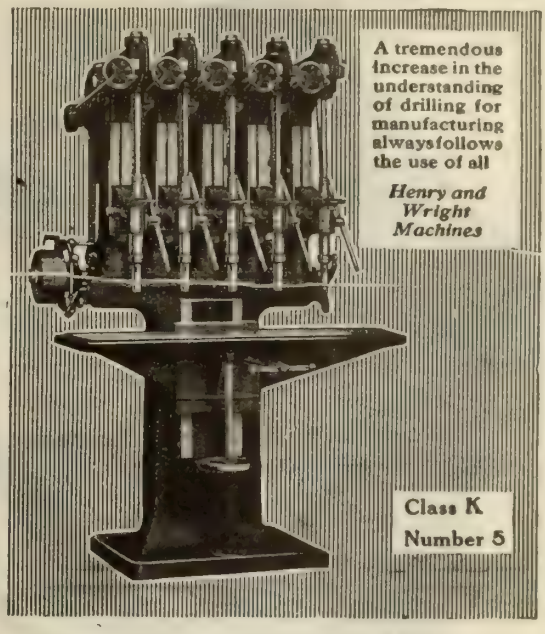
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Structural Steel and Steel Plate Work, and a combination of the two lines.

***Prompt Deliveries Assured***

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Montreal Office: 404 New Birks Building

# HENRY & WRIGHT
## Drilling Machines



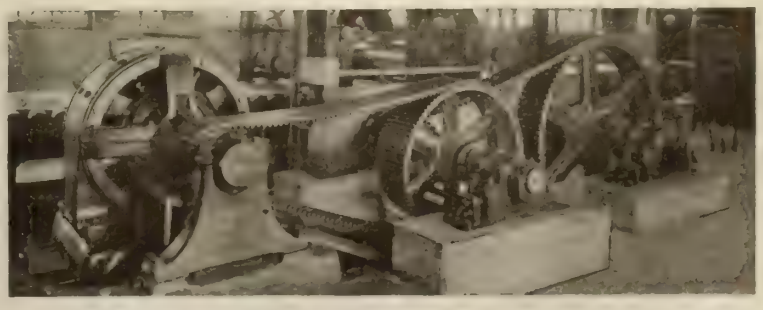

**The Henry & Wright Mfg. Co.**
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New York Office: 136 Cedar Street
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# THE MORSE CHAIN CO.
are the
Largest Manufacturers in the world
of
High Speed Silent Chains

Why?

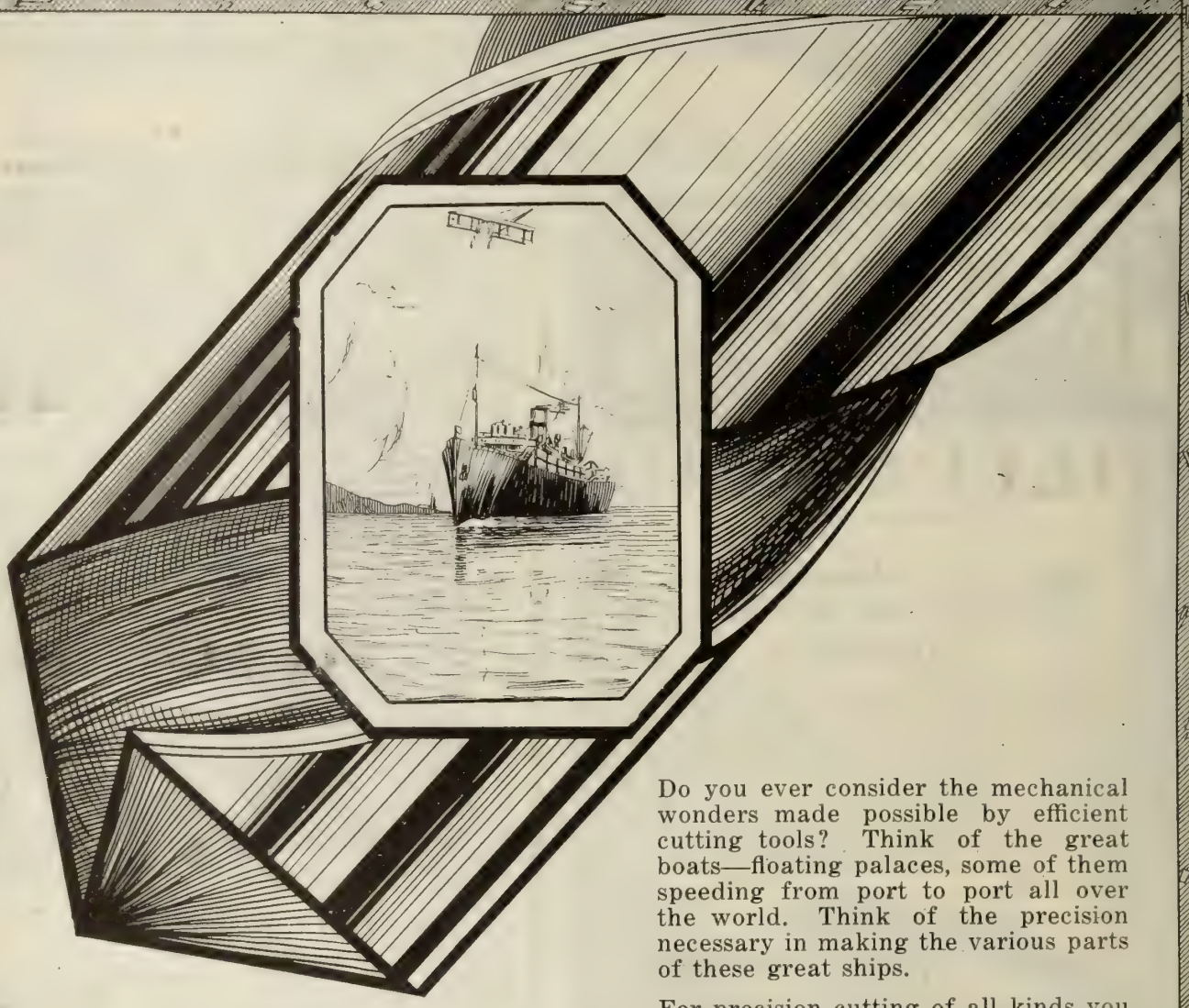
Morse Chain possesses the exclusive
**Rocker Joint**
Frictionless—Requires no Oilbath.

**Jones & Glassco** (Reg'd.)
Canadian Agents
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80 H.P. Morse Drive to Rolls, reverses direction every 45 seconds

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Do you ever consider the mechanical wonders made possible by efficient cutting tools? Think of the great boats—floating palaces, some of them speeding from port to port all over the world. Think of the precision necessary in making the various parts of these great ships.

For precision cutting of all kinds you will get satisfaction if you use "Imco" Tools.

Catalog of drills, reamers and milling cutters upon request.

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Ingersoll, Ontario.

Toronto Office — 80 Bay St. Phone Adelaide 7227.

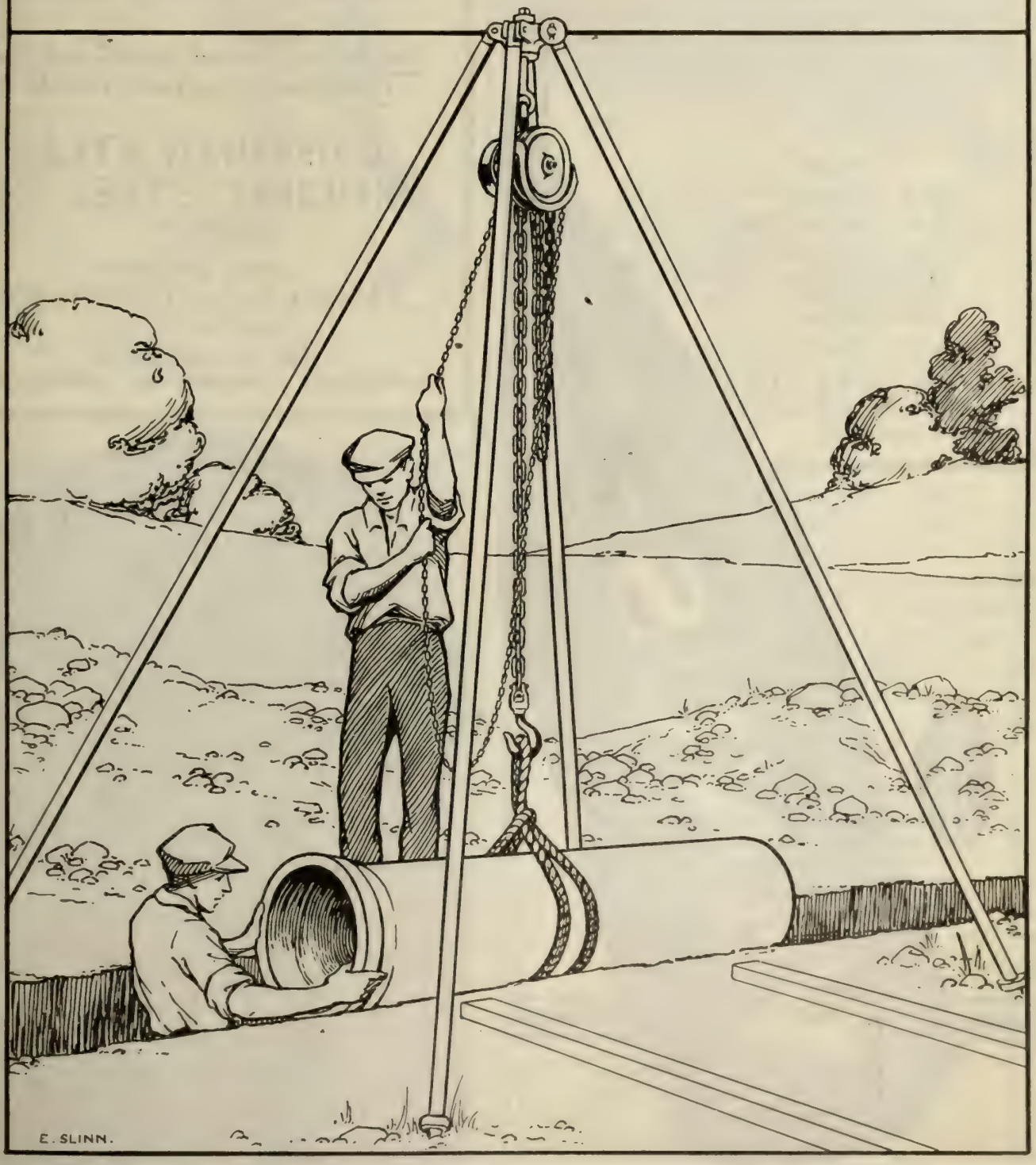
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# SPEED
# SAFETY
# ECONOMY

These are some of the good qualities built into the lifting machinery made in Canada by

**The HERBERT MORRIS CRANE & HOIST CO.**
Limited
**NIAGARA FALLS, CANADA**

*Write for Data Book 76*




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*The World's most famous Pencils*

FOR the clean, even lines of intricate mechanical drawings, or the graduation of tones that make the perfect illustration, there is a VENUS degree that exactly meets the engineer's requirements. VENUS Pencils have set a world standard for exactness and uniformity of grading.

Graphite, washed by a unique process; lead scientifically compressed; selected smooth-grained cedar; always uniform throughout.

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**Plain ends, per doz. $1.50**
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*At stationers and stores throughout the world*

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**Fifth Avenue, New York**
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*The largest selling quality pencil in the world*




# Made In Canada

## L-XX High-Speed
## ATLAS Tool Steels
## ATLAS Alloy Steels

**Hot Rolled, Forged Blocks and Discs**
**Cold Drawn Steel and Drill Rod**

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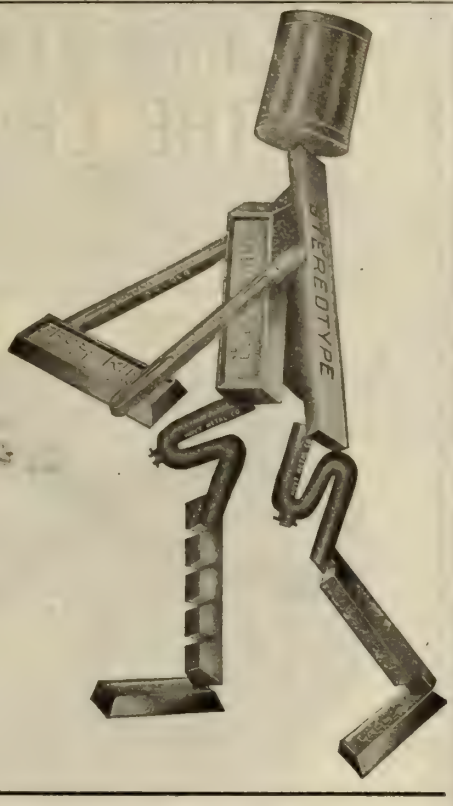


**FROST KING BABBITT**

will withstand heavy pressure without increasing its temperature.

For general machinery bearings it is without a peer.

If you are from Missouri try a sample lot and be convinced.

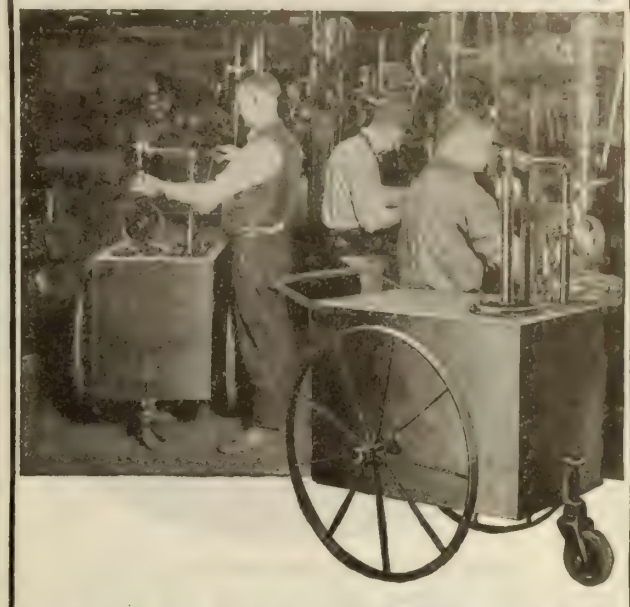



**HOYT METAL COMPANY**
MONTREAL TORONTO WINNIPEG

**DIAMOND TOOLS**
FOR TRUEING GRINDING WHEELS




**Tools For All Mechanical Purposes**
FURNISS CLARKE & COMPANY
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*Sole Canadian Agents for*
THE JOYCE-KOEBEL COMPANY, INC.
Formerly Geo. A. Joyce Co., Ltd.
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**Take the Oils To The Machines**

In a Bowser Portable Outfit and save Mechanics' time. Keep machines working and increase production.

Minutes spent by men in the oil room are wasted—lost. Your men don't want to lose those minutes. The old oil storage simply forces them to do it.

**BOWSER** ESTABLISHED 1885

**Oil Storage Systems**

prevents these losses, bring a day's supply of oil to the machines—no loss of time or oil. Workmen enjoy the convenience and safety of Bowser equipment—employers appreciate the actual money saving effected.

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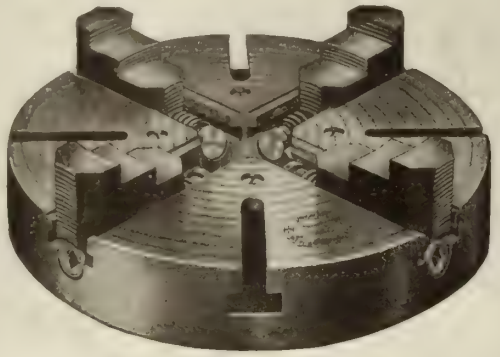
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ALL STEEL

# INDEPENDENT CHUCKS

are not an experiment—they have come to stay. They are a necessity with the modern machinery and high-speed steel cutting tools.



THE UNION STEEL BODY CHUCKS

are well designed and have all the elements of strength and durability for which they are designed. We make other types in steel also, including the Geared Scroll Chucks and the Geared Scroll Combination—all designed for heavy work and hard usage.

**UNION MANUFACTURING COMPANY**

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*New York Office:* 26 Cortlandt Street

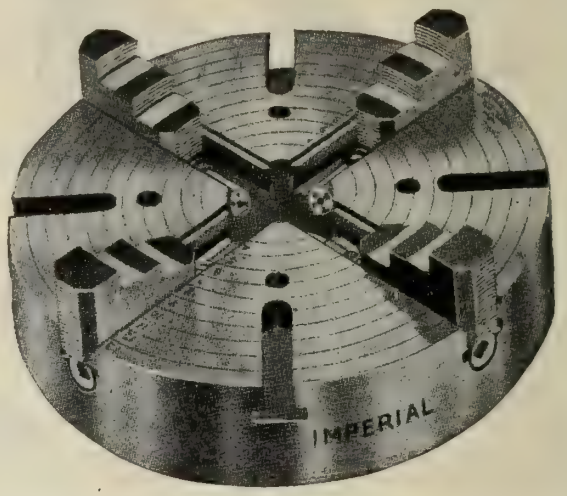
*Makers of a complete line of chucks*

# IMPERIAL LATHE CHUCKS

*Highly Endorsed by Canada's Best Manufacturers*

Sturdy long-wearing "Made-in-Canada" Chucks that are making good everywhere.

Specify them in your next order.



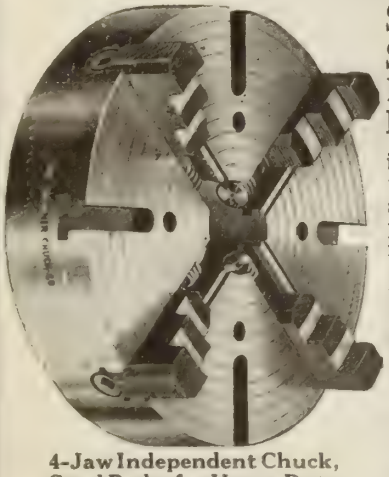

**Ker & Goodwin Machinery Co.**

BRANTFORD, Ont. LIMITED

SKINNER CHUCKS

# Strong Chucks—

That truly describes Skinner Steel Body Independent Lathe Chucks. They are not only strong and powerful, but wonderfully accurate. The



4-Jaw Independent Chuck, Steel Body, for Heavy Duty

## SKINNER Steel Body Independent Lathe Chuck

is a single steel casting of great strength, well proportioned and accurately finished. Face is graduated accurately in inches. Screws and bearings are made of the toughest steel to withstand abnormally hard wear.

The dependability of Skinner Steel Body Independent Lathe Chucks is conclusively proved by the fact that not one has ever been known to break in service—and we have been making them for many years.

*Write for catalogue and illustrated literature.*

THE SKINNER CHUCK COMPANY

NEW BRITAIN, CONN U S A

ESTABLISHED 1887

NEW YORK OFFICE: 94 READE ST.

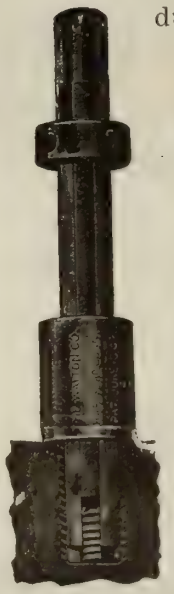
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# Buried in the Work and Broke!



Next time a tap breaks below the surface of a large casting, don't let some makeshift method of removing it injure the thread and waste half an hour of valuable production time. Instead—



# Walton it Out in a Jiffy

And save the casting.

Special analysis steel fingers of the Walton Extractor drop into the flutes of the broken tap—and grip. Then a few turns of a wrench applied to the squared end of the Extractor backs out the buried tap.

**Sixty-day trial offer** proves the Walton Extractor pays for itself.

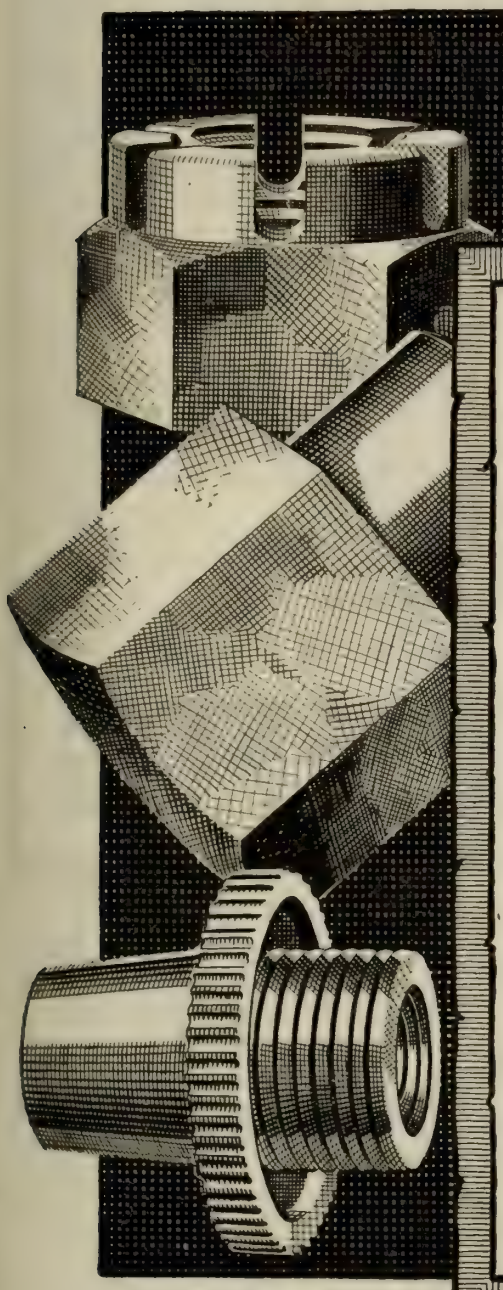
**Write.**

**The Walton Co.**

Hartford, Conn.

*If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.*

# SCREW MACHINE PRODUCTS



## SPECIAL

Screw machine product up to 2¼" diameter to customers' specifications. Hardened and ground product to specifications.

## STANDARD

V., U.S.S., and S.A.E. Cap Screws

V., and U.S.S. Set Screws

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**THE NATIONAL ACME COMPANY**

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DeCourcelles G.T.R.R.

*What are your requirements*

**?**

*If interested tear out this page and place with letters to be answered.*



# Oakite Cleans 2½ Times Faster

THE heat treating department of a large tool steel factory now removes heavy quenching oil from small steel blocks by using Oakite materials and methods.

Formerly parts were tumbled in sawdust for five hours with three changes of sawdust before all oil was satisfactorily removed.

Now boil parts for 5 minutes in Oakite solution and tumble for 2 hours in sawdust, using only 1/3 the quantity of sawdust formerly used for one of the three tumbling operations.

Work comes through 2½ times faster, with the use of much less sawdust—and every part is absolutely free from oil. Oakite *cleans*.

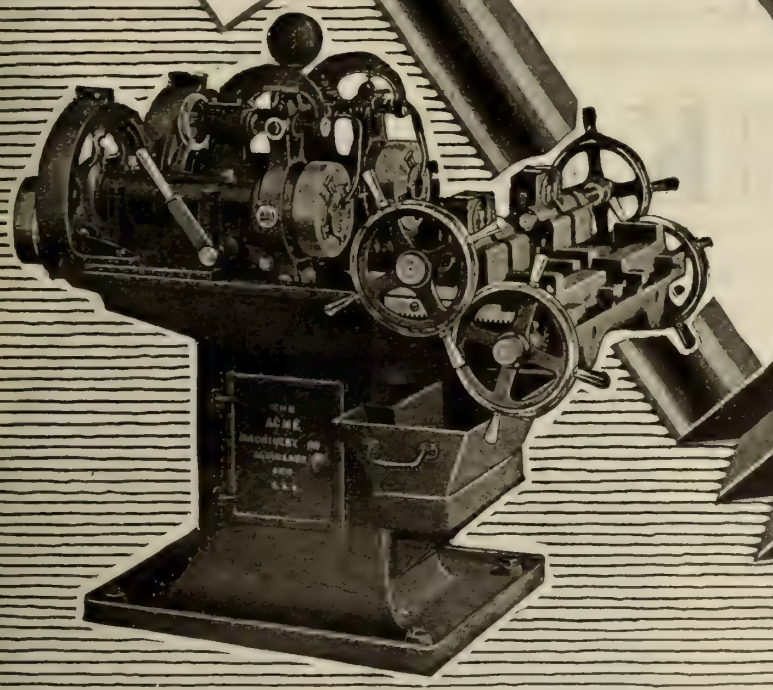
*May We Serve You Too?*

**OAKITE**

MANUFACTURED BY
OAKLEY CHEMICAL CO.
44 THAMES STREET · NEW YORK

# BOLTS

## SQUARE HEXAGON TEE-HEAD



### Cut Them In Your Own Plant

*and Save Money on Cost and Delay in Deliveries*

### ACME BOLT CUTTERS

are made in various sizes for cutting bolts from ¼ to 1 in. diameter. Their heads allow micrometer adjustments while they are in motion. The dies can be changed from one size to another in less than one minute and produce clean, accurate, highly-finished threads.

**May we send catalog?**

### The Acme Machinery Co.

**4530 St. Clair Ave. Cleveland, Ohio**

We make a complete line of Bolts, Rivet, Heading, Upsetting and Forging Machines, Bolt Cutters, Hot Pressed Nut Machines, Hammer Heads, Bolt Pointers, Nut Tappers.

**Representatives for Canada:**
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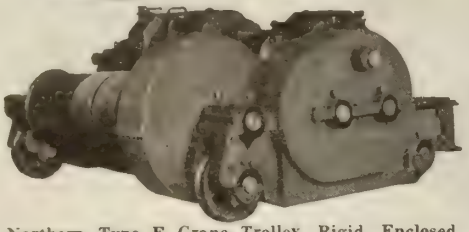

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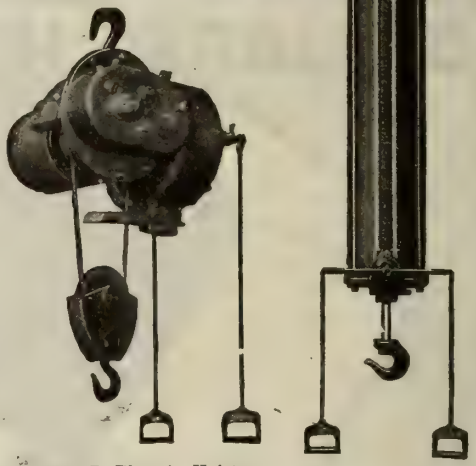


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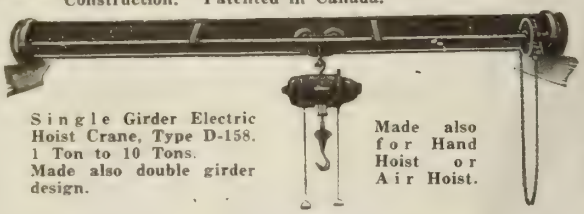
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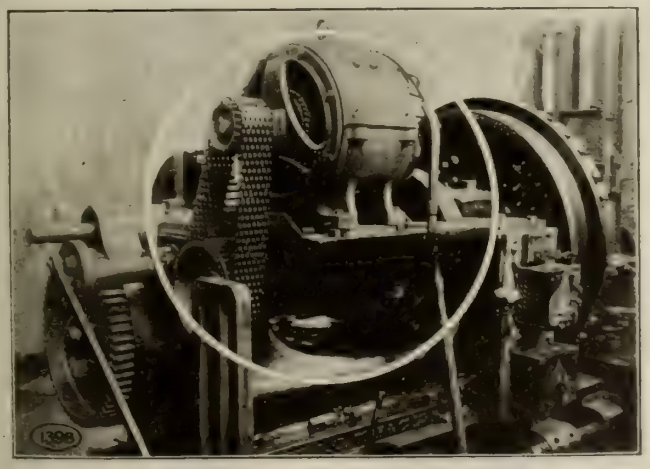


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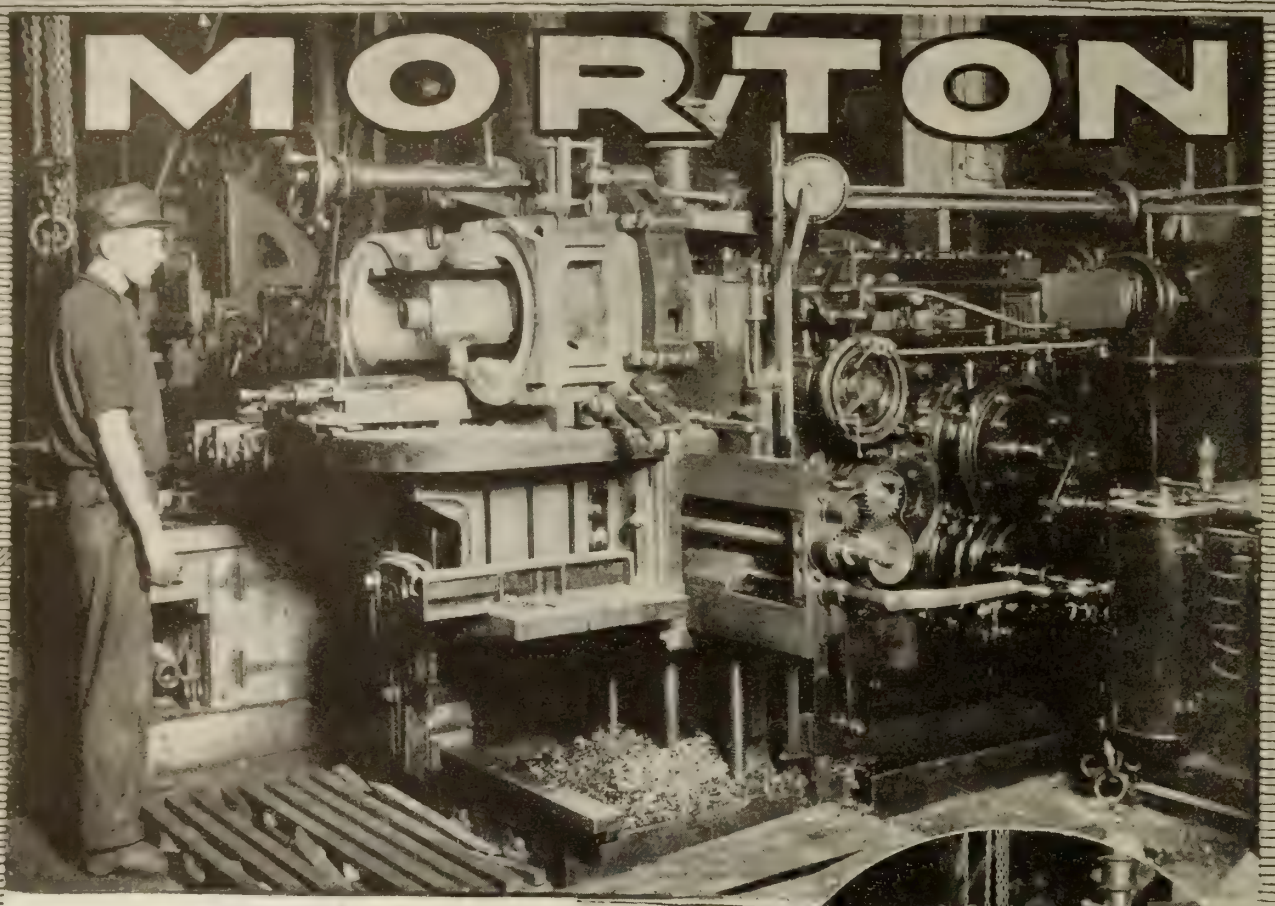
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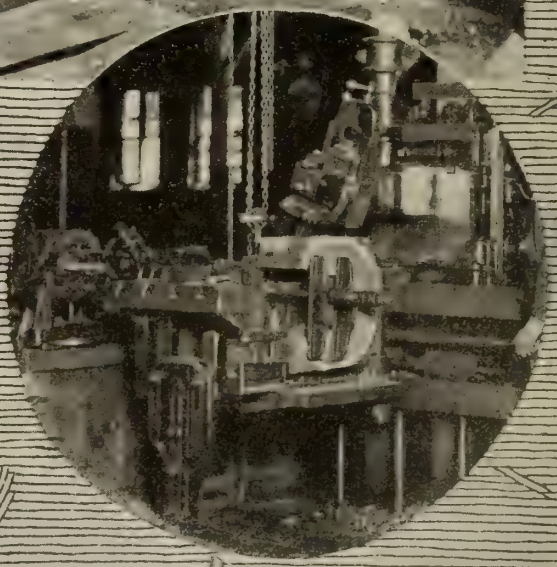
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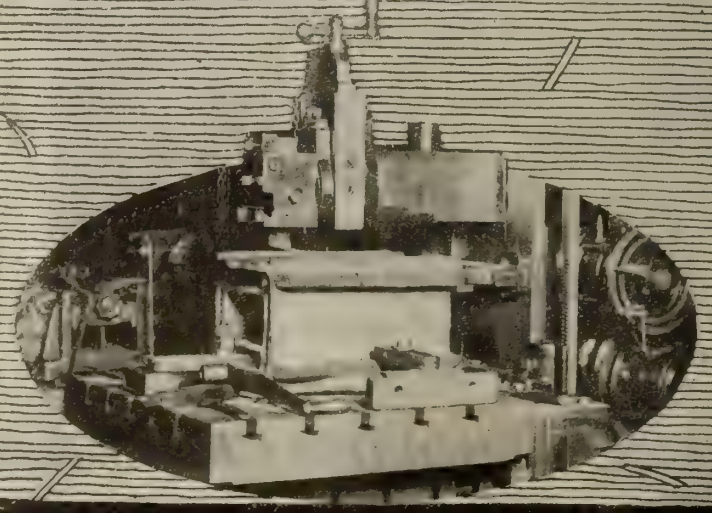
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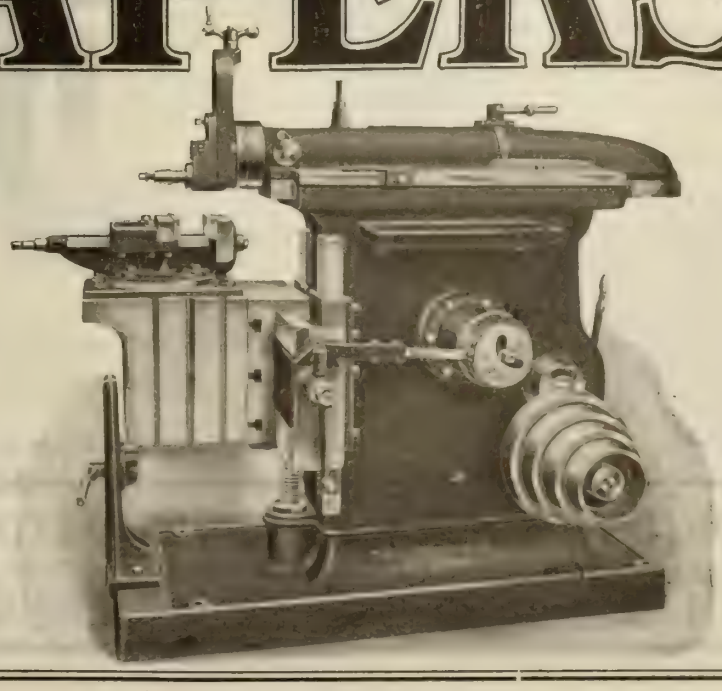



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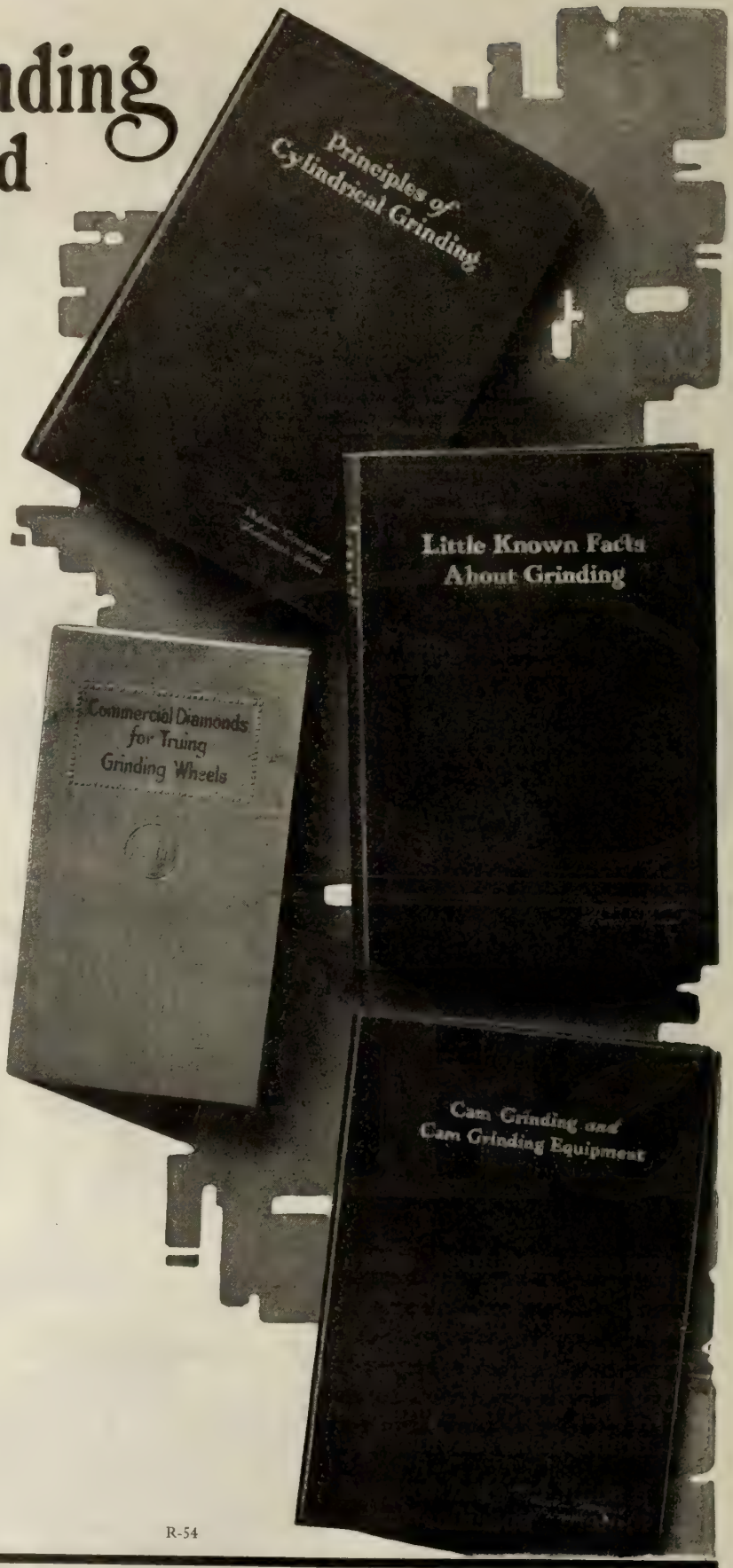
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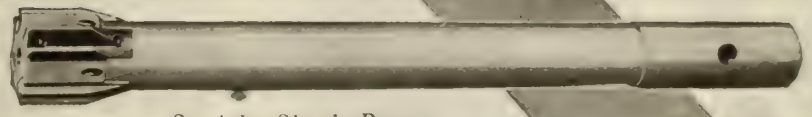
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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

VOL. XXV. No. 1 January 6, 1921

# Designing Fixtures for Holding Pistons

## Preferences of Designer—Thickness of Wall—Accuracy of Finish Desired—Material Used—All These Points Have a Varying Influence on the Design of the Holding Arrangement

By F. SCRIBER

AS a means of propulsion nothing to-day is more common or more fundamental to this end than pistons which are as most everyone knows one of the basic units in automobile engine design and aircraft engine design not to mention innumerable other forms of engines, etc. Therefore, it will no doubt be interesting to study some of the designs of holding-fixtures which are used for machining the same on chucking machines, engine lathes and various other forms of special rigid machines for turning these. Apart from the preferences of the individual designer which of course are more or less of an item in themselves the very nature of the piston such as thicknesses of walls, accuracy of finishes desired and material used have a varying influence on the design on the holding arrangement.

In Fig. 1 we have a piston 2 3-4 inches diameter made entirely of steel with thin walls of .060 inches thick at the open end of the piston. This piston was machined all over both inside and out except for a very small portion in back of the bosses which carry the connecting rod wrist pin. The fixture used for holding this after the piston had been machined inside and while the outside was turned and the piston ring grooves cut and end faced was mounted on a turret lathe, the body of this fixture being indicated at A; this was made of cast iron.

In this body was driven a steel portion B which was keyed in place; the piston was slipped over the diameter C against shoulder D, this bar being flatted off at E to clear the bosses of the piston. The square headed screw E is tightened by the operator and this coming against the beveled pin F forces pin G against a tapered end H, which in turn forces out four pins I, which equalize on the diameter J, thus securely holding the outer end of the piston against the strains of cutting. Three screws K, against which comes spring L, keep the four pins back against the beveled surfaces of the operating pin, while spring M forces the other pins back after the screw has been released, thereby permiting the piston to be removed upon completion of the cutting. At X in this illustration is shown the tool used for turning the outside of the piston, other tools used at this time being cutters held in front and rear cross-slide blocks on the machine for grooving and facing.

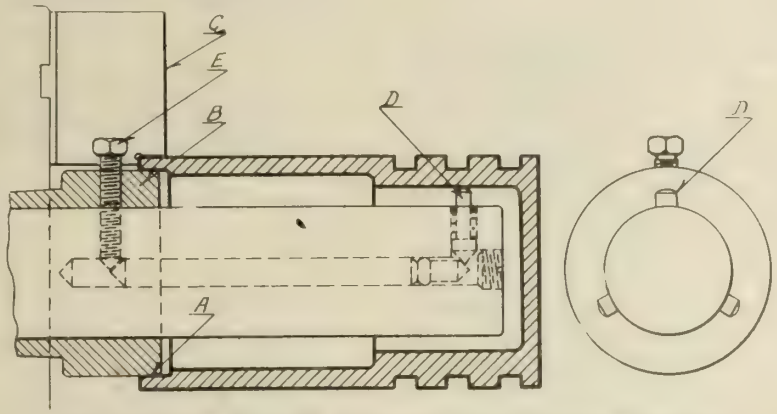



FIG. 2 PISTON HOLDER ARRANGED WITH CHUCK AS DRIVER.

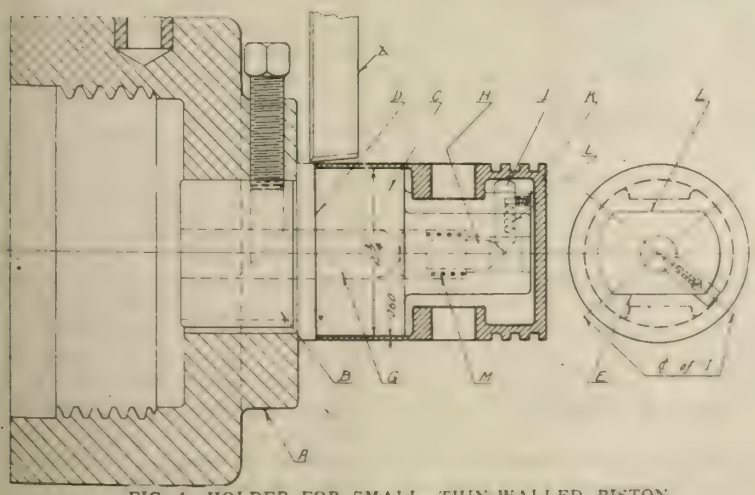



FIG. 1 - HOLDER FOR SMALL, THIN-WALLED PISTON.

In Fig. 2 we have an example of an arrangement, which although somewhat similar to the preceding, was used for machining the outside of a heavy cast iron piston. In this design of piston the diameter at A was first bored, also the chamber, while the outside of the open end was turned to the correct diameter for a length equal to the machined portion of the inside diameter. The piston was next pushed over a suitable holder B in the spindle of the machine and three soft jaws C in a chuck grip the piston at the open end over this holder. To hold the closed end steady and centralize it three pins D, which are expanded

by the screw E in the same manner as in the design previously described, are employed.

A holding device of different design is illustrated in Fig. 3. In this arrangement the piston is machined at X following which it is placed on the fixture shown, which consists of a cast iron body A screwed on the spindle nose of the turret lathe upon which is mounted a steel ring B over which the piston fits. Before this operation the hole for the connecting bar wrist pin has been bored out and through this hole is placed a pin C which also goes through a bar D. In the end of this bar D a draw rod E is threaded which goes through the spindle of the machine and at the outer end is attached a hand wheel F, in the end of the spindle is placed a bushing G and by turning the hand wheel the draw rod is caused to screw into the connection, thereby pulling the piston by means of the pin in the wrist pin holes securely back on the fixture.

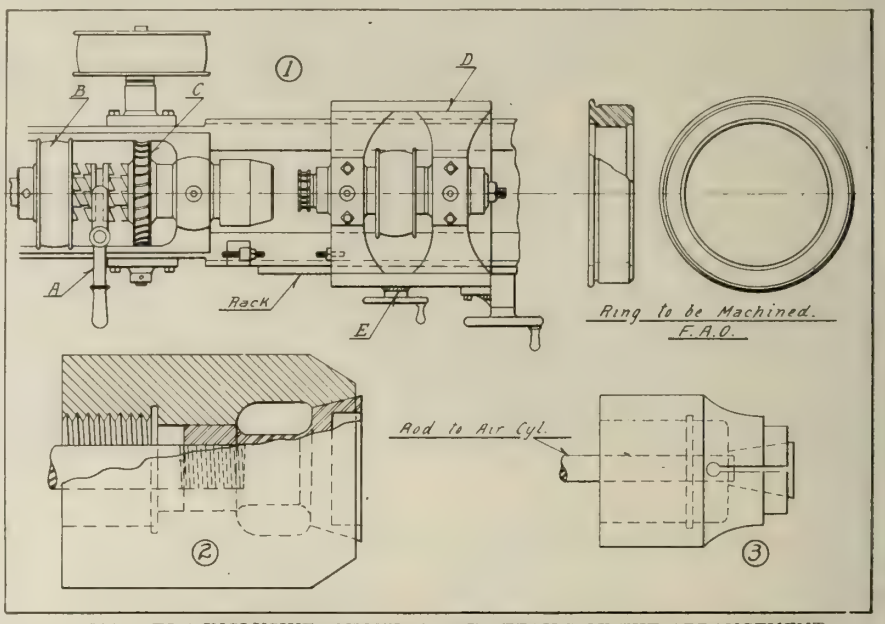
Fig. 5 shows an illustration of an arrangement having the same design except that as the wrist pin hole in the piston is not bored a double hooked bar is made to straddle the wrist pin hole bosses, therefore by tightening the hand wheel A at the end of the spindle through the medium of the drawback rod the hooked bar is caused to draw back into the spindle nose fixture thus pulling the piston securely against the seat C on the body of the fixture D. To compensate for the irregularities in the rough cast bosses of the piston this hooked bar E is made a floating fit in the holder. Small hand knob E is pinned to the end of the drawback rod, the advantage of this being to turn the hooked bar by means of the draw rod half way round so it will clear the bosses while the piston is put in position or removed. These four arrangements shown are all good designs which have proven satisfactory for making the parts shown. These particular holders were used for machining in quantities, they varying in diameter from the 2 3-4 size up to approximately 10 inches.

## MACHINE FOR MILLING SPECIAL WASHERS

By G. Barrett

The accompanying sketch illustrates a special machine designed for milling steel rings for ring spinning frames. The rough rings are made on the Ajax forging machine, from solid round bars, and are afterwards faced to the desired width on a vertical mill. They must have a very smooth finish to prevent the cotton yarn from sticking during the spinning process. The machine here shown accomplished this with very good results and gave quick and accurate production. After facing, the rings are held in the collet chuck shown enlarged in Fig. 2. When trueing up the ring the clutch lever A is thrown over so that the clutch engages with the pulley B, which revolves the work spindle at high speed.

When ready for machining the clutch is engaged with the worm wheel C, this worm wheel being driven by means of a worm underneath on which the driving pulley is secured, the latter being operated by a quarter turn belt. An adjustable stop is provided for locating the carriage in the proper position when milling. The cutter is first fed to the desired depth, using the graduation on the cross feed spindle. The work spindle is allowed to make about three revolutions before the work is completed. Machining the outside is done in the same manner, the periphery being milled while the ring is held from the inside in the chuck shown in Fig. 3. The work produced from this machine was entirely satisfactory.




FIGS. 1 TO 3 INCLUSIVE—SHOWING THE DETAILS OF THE ARRANGEMENT.

## PROTECTING POLISHED METALS

A process has been invented in Germany for protecting polished metals which have to undergo annealing. As a rule, tarnishing results, but in this case the trouble is overcome through the use of a solution of boric oxide.

The solution is only applied as a very thin film over the articles to be annealed, but it is claimed that it completely excludes atmospheric oxygen. The film melts at a temperature varying between 550 and 650 deg. Cen., according to its composition, and acts as a protection so long as it remains solid. Steel, for example, remains bright when heated to the melting point of the composition, and no coloration takes place when the steel is tempered. It is stated to be still more effective in the molten or semi-molten condition, as it then forms a perfectly gas-tight cover round the article, even when heated to the highest temperature used in practice. The coating is perfectly fireproof, does not evaporate, and dissolves any oxidised matter on the surface of the heated metal. The coating can be applied either as a powder, sprinkled or dusted over the surface of the objects to be annealed, or as a liquid. It is soluble in water and methylated spirit, and the work to be annealed is simply dipped in the solution and allowed to dry. The coating peels off on cooling, or it may be dissolved in warm water.

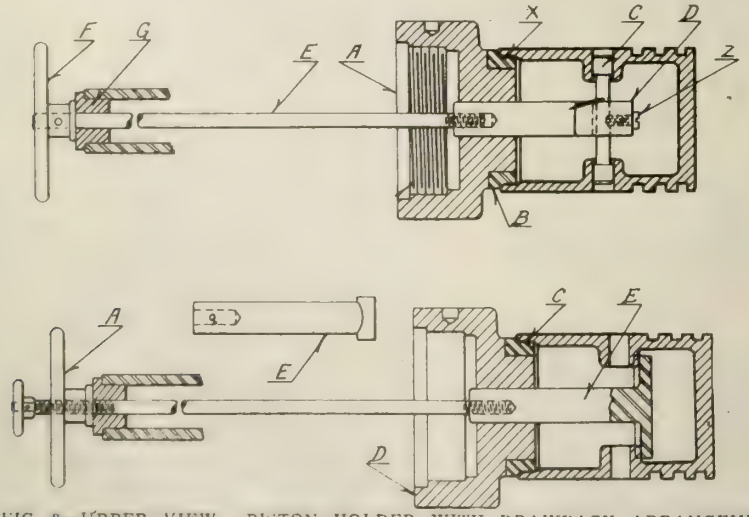



FIG. 3 UPPER VIEW. PISTON HOLDER WITH DRAWBACK ARRANGEMENT IN SPINDLE OF MACHINE.
FIG. 5—LOWER VIEW. HOOKED TYPE OF PISTON DRAWBACK ROD.

# Practical Pointers on Rolling Mill Operation

## Making Cold Rolled Strip Steel—Rolling of Tin Plate—How to Obtain Best Results When Rolling Thin Sheet, and What Happens When Unequally-heated Pack is Inserted in the Rolls

By W. S. STANDIFORD

IN our December 26th issue, we told of the English and American methods of rolling, how to obtain large output when rolling their plates, also how to avoid waste. We also described the plain and universal type of mills, and how to obtain the best results from each. In this, the concluding part of the article we will start at the making of cold rolled strip steel.

### Cold-Rolled Strip Steel

Another class of thin sheet steel for which there is a large demand is called "cold-rolled" strip steel and "ribbon-stock." The manufacture of this grade of metals differs radically from that of sheet steel; the red-hot steel billets first being reduced to a sufficiently thin gauge and width in a hoop or band mill, there being no cross rolling of the metal as is the case in sheet steel manufacture. It is made into coils in the hoop mill and goes to the cold-rolling department or is sold in the market in coil form. Hot rolling of steel in the hoop mill leaves the pores of the metal in an open or porous condition, no matter how smooth the bands look on their surfaces. On the other hand cold-rolling closes the pores and makes a denser product. The rolling of strip steel and ribbon stock is mostly done on rolls that generally have a body length of 8 or 12 inches, the roll diameter varying from 6 to 10 inches. Of course there are longer and thicker rolls used for the purpose of obtaining wider strips, but the average sized mill uses the small sizes of rolls listed above.

Strip mill rolls are turned or ground with a curve on their surfaces that is entirely opposite to those used for manufacturing hot rolled thin sheets; rolls for producing the latter require a concave surface, the deepest part being in the middle, while the ribbon stock and strip steel rolls must be slightly convex or crowned, the amount of crowning varying with their length and diameter. For small rolls of from 8 to 12 inches body length, the convexity varies from 0.001 to 0.015 inch high in their centres. This allows for spring or bending of the rolls which is necessarily heavy on cold rolling mills as contrasted with hot ones, the rule being that longer rolls require more crowning than do short body ones.

The degree of finish on hot mill rolls need not be nearly as smooth as that on the cold rolls. The surface on the former is sufficiently smooth as the roll lathe tool leaves it, but cold rolls require a shining body exterior and they also must be as free from surface scratches as possible, otherwise each scratch or mark will show on every strip or ribbon of steel that is run through the mill. The rolls should produce a bright shining finish on the strips and leave a surface that can be directly nickel-plated without the necessity of the metal having to be further buffed or polished.

By finishing the ribbon stock bright much time and expense are saved the consumer who regularly uses quantities of this steel. It is the usual practice of mills manufacturing cold-rolled ribbon or strip stock to anneal this metal between gauge reductions in cold rollings; and, contrary to the general opinion held among those uninitiated in rolling mill procedure, the temper is obtained not by annealing but by cold rolling after annealing, and it is at this stage of manufacture that the skill of the strip maker reaches its pinnacle of perfection.

**PRACTICAL KNOWLEDGE**

*The author, being a practical man himself, can tell his story in everyday rolling mill language. He touches no technicalities, but tells the tale simply, concisely, and briefly. An article of this nature should be filed away for future reference, as we do not know very much, as a general rule, about rolling mill practice.*

Five different degrees of hardness or tempers are produced by cold rolling. They are as follows: dead soft; soft; medium soft; half hard or bright rolled and full-hard. When the strip is thoroughly annealed the metal comes under the dead soft classification, and it is capable of being used for the most difficult of deep stampings or drawings. It is very much superior to the usual grades of sheet steel made for drawing purposes; its better quality being due to the fact that it has not been cross-rolled and also to the numerous cold rollings needed to reduce it to the desired thickness, the many cold rollings received making its texture very fibrous in character and increasing its tensile strength and ductility. The soft grade is for making ordinary kinds of bends and easy drawing operations in which a certain amount of stiffness is desired in the finished article. The medium soft quality is intended for use where a springy metal is desired, one capable of standing bending at right angles across its grain; it should also bend fairly well with the grain without breaking.

The hard, or full hard, as it is usually named, is the strips cold rolled to size and not annealed. This metal is intensely hard and it is only suitable for flat work such as for making washers, discs, and other flat work where no bending is needed. In purchasing strip steel always specify the gauge in thousandths of an inch or by Birmingham or Stubs gauge and not by the U. S. standard gauge. Mills making strip steel can furnish it in either wide sheets, which can be cut into strips of the desired width by the consumer or else it can be obtained in strips of the required width.

When stripper dies are used in certain kinds of stamping work it is best to use the sheared metal, as more accurate straight-edges are procured. The drawback to the strips that are rolled to proper width is that the middle parts of the sides of strips are bulged outward, it not being square and at a right angle to the top and bottom sides, so that for use in stripper die work it is not so good. The edges of the sheared strip will usually contain slight burrs on the edge of one side, which is made by the slitting knives. Strip steel is also used for making brake bands in the automobile trade, proving to give good service in that capacity. Strip steel is always oiled and boxed, or wrapped in burlap so as to prevent scratches and surface rust in shipping.

### Rolling of Tin Plate

In the rolling of tin plate, which is made mostly out of the semi-finished steel bars, there is a loss of metal in the heating and rolling from the semi-finished to the finished form of from 6 to 8 per cent. Rolls for making tin plate are generally shorter in length than those used to roll heavier plates, such as those used for ships and boilers. The curvature of surface in the latter rolls are not as deep as the tin plate rolls. On account of the thinness of the gauge of metal rolled and the fact that no water is used on tin plate rolls, the latter require a deeper concave surface to allow for expansion. When a mill first starts rolling tin plates on a Monday morning it is customary to roll narrow sheets until the roll centres have expanded and are level, when wide sheets can be rolled. The bars from which these plates are rolled are 8 inches wide, and vary in thickness from $\frac{3}{8}$ to $\frac{5}{8}$ of an inch; the length varying according to the widths of the finished plates desired.

### Turning of Tin Plate Rolls

In the turning of tin plate rolls, both rolls could be turned with a concave sur-

face, but it is found advisable in practice to turn one roll with a plane surface and put double the concavity in the other as the roll turning is done quicker by this method. After the plane surfaced roll is turned, the other one intended to have a concave surface is put into the lathe. The roll having a level surface is next put in the carriage on top, and the top roll is crossed so that their centres are out of line. This makes the middle part of each roll approach nearer to one another than their ends, the rolls being placed as close to each other as is practicable without the top roll revolving by friction. Narrow cuts are then taken from the centre of the roll, each cut being about 1½ inches wide. The top roll during the process of turning is let down so as to touch the roll in the lathe, from time to time, until the roll in the lathe has a curved surface and no light can be seen between the two rolls when they are touching.

The amount of crossing varies with the length and thickness of the rolls and also the time cycle of working. Where two 12-hour or three 8-hour shifts are worked, the usual amount of crossing is as follows: Rolls of 24-inches diameter by 32 inches long should be crossed 2¼ inches. Rolls 38 inches long and 24 inches diameter require a 2½ inch crossing; 24 inch diameter rolls having a length of 40 inches need a 2⅝ inch crossing. If rolls have a length of 48 inches it will only be necessary to cross them 2⅝ inches as this amount will be found by experience to be amply sufficient. This length of roll does not require so much crossing as some other sizes on account of the mill crew not being able to work wide sheets as fast as they can handle narrow ones, consequently the rolls do not attain such a high temperature as narrower rolls do. In regard to rolling 34 inch wide sheets on rolls having a body length of 48 inches, the rolls having been crossed in the lathe 2¾ inches, and rolling this width of sheets continuously it has been found that the necks of the rolls will heat too much and more than their centres, the result being that the pack of sheets will not lay flat and open easily.

### Getting the Best Results

To get the very best results in thin sheet rolling the top roll should be two inches smaller in diameter than the bottom one. The top roll, by reason of its having a smaller diameter, bites deeper into the pack of sheets, and as it has a slower rate of rotation its surface speed, differing from that of the bottom roll, produces the result that the pack of sheets lies flat and opens up easier. Sheet rolls should not be worked at too high a temperature as they are liable to crack, in fact, many sheet mill rollers crack such rolls by working them at too high a heat, the management not knowing any better, putting the cracking down to accidental causes instead of its being due to the roller's carelessness, as the former, by heating the rolls too suddenly and by having the ends of the rolls vary too much in temperature from their centres can cause the best rolls made to crack. Rolls once cracked soon break in two. When rolls have a deep blue color in their centres and the ends are purple, the centres being about 600 degs. Fahr., this is the highest temperature that they should be allowed to get, as they are almost certain to break or develop fire cracks and have pieces break out of the surface. They also have a burned or rough surface. Chilled rolls used on finishing sheet mills are made from cast iron and have their chilled surfaces ¾ inch deep, while the rest of the roll is soft cast iron. The combining of soft centre rolls having a chilled outside surface makes considerable trouble in the hot rolling process as the expansion of the chilled structure of cast iron is about double that of the soft gray iron centre. Should the roll be permitted to heat too rapidly the expansion will tear the roll in two, which is due to the different amounts of expansion between the chilled and soft iron.

Cast iron, when heated, has a certain amount of permanent expansion, and it never contracts back to the original size when it is cold, but always remains slightly larger than it was before heating. This causes the grain of the metal to become porous in consequence. The greater the depth of chill on a roll the greater the expansion will be. When a chilled roll has been reduced in diameter by frequent dressing it loses its power of expansion, the result being that the roll turner has to put less concavity in the roll.

### Two Important Points

There are two important points that a sheet steel roller has to contend with in the rolling of the above metal. The first is to make the pack of sheets open easily; the second is to make them lay flat when finished. The second is the more difficult, as to make a heat of sheets lay perfectly flat is not an easy thing to do. The roller may work the screws on housings exactly alike on each pack of sheets, yet each one will have a different shape when finished. You will have one sheet curved or dished like a saucer, another pack of sheets will buckle, and the sheets composing another pack will draw to one side, all of them being made in the same heat. Uneven heating in the furnace will cause the pack of sheets while they are in the rolls to run off to one side. The heater placed the packs in the furnace, and when they were partially heated they were turned up on their edges. The sides of the pack being upward and in the open part of the furnace they were more exposed to the heat and flames than the sides at bottom of furnace. Thus one side or edge of the pack soon acquired a greater temperature than the other, which may vary from 25 to 50 degrees.

### What Happens

When an unequally heated pack is inserted in the rolls, the hot side, or that side in which the temperature has been raised above the other, will pull faster and move ahead of the other sections. This causes the sheets to shift their positions on one another in the pack and to pinch, buckle and show stress marks. By getting the metal too hot in the furnace and the heat evenly distributed over the pack surface, the latter will be

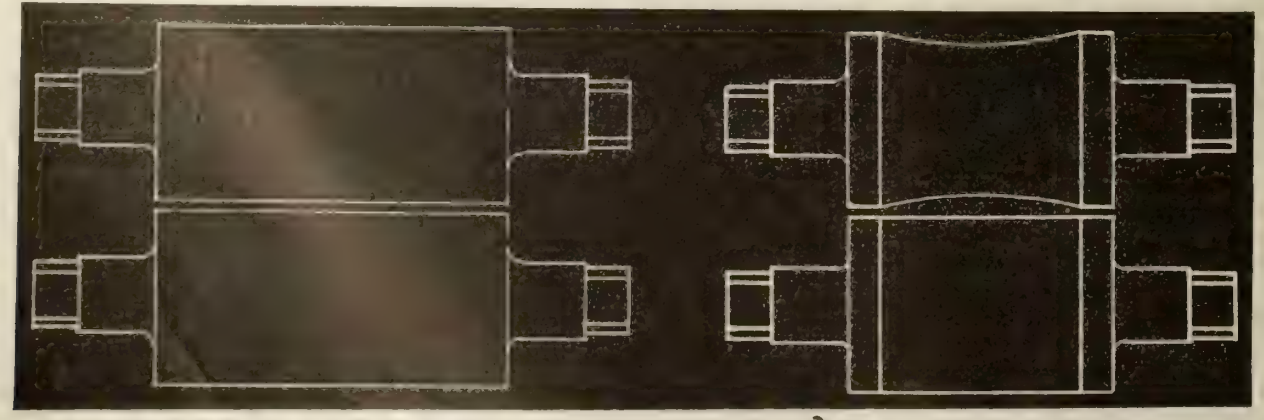


FIG. 3 ROLLS FOR MAKING HEAVY PLATES ON AMERICAN-STYLE MILLS. THE ROLLS ARE TURNED FLAT, AND RUNNING WATER IS USED TO PREVENT THE ROLLS' EXPANSION.

FIG. 4—HEAVY ENGLISH PLATE MILL ROLLS WHICH ARE WORKED DRY. THE ONE ROLL CARRIES ENOUGH CURVATURE TO SAVE TURNING. CONCAVE SURFACE IS EXAGGERATED TO SHOW THE IDEA CLEARLY.

full of scale, and if the rolls are worn slightly hollow in the middle (which is generally the case toward the end of a week's run) the scale will be pushed along towards the centres of the plates and become embedded in the metal, which soon causes trouble in the pickling department, as the pickling fluid will eat into and dissolve the metal on the smooth parts of the plates long before the scale is removed by the acid. This never occurs when the sheets contain very little scale upon their surfaces. From the foregoing it will readily be noted the importance of a correct heating temperature, especially when rolls are worn slightly hollow in their centres.

The turning of chilled iron rolls for manufacturing thin sheets such as are used for making cooking utensils, etc., is in general a very tedious operation, and attempts have been made to do this work by means of specially constructed grinding machines. This is a great success, both from an economical and quality standpoint. The grinding of rolls can be done in about half the time it takes a roll-turner to turn them on the lathe, while the rolls ground on the machine have a smoother finish than any lathe tool will make, they being more accurately level in every respect. Sometimes a jam in the rolls will cause what is technically known as a "burnt spot." Its shape varies, depending on the form of the material rolled. These burnt spots occur on hot mill rolls only. In sheet mill rolls these hard places take the form of a long streak of compressed chilled iron, extending parallel to the axis of the roll, their depths varying from 1-32 to ⅛ of an inch.

### Chilled Cast Iron Rolls

Chilled cast iron is the hardest metal a roll turner has to work. The tool used is very little harder than the chilled iron. In order to cut any metal at all and give the tool a chance to do the cutting, a roll has to revolve at a very slow speed in the lathe, its periphery moving at a rate of one-half a revolution per minute. When a burnt spot is encountered, owing to the metal getting compressed by the sudden stoppage of the rolls, the compressed metal is rendered as hard as the metal in the tool, if not harder, the result being that when the tool strikes the hard spot the edge of tool breaks out, sliding over the top and refusing to cut at all. To get over this trouble he must sharpen his tool, put it in a lathe, take a very light cut until the burnt spot nears, then sudednly take a very heavy cut so as to get under it and lift it out. When it is ⅛ inch deep it has to be broken down little by little, as a roll-turning tool will not take a deep cut in ⅛ inch chilled iron. Doing this work is tedious and dangerous as pieces of the spot and turning tool fly out into the air with very great force. The writer has seen a roll turner have an artery pierced in his arm from this source. It is hardly necessary to say that after pressing the lever down to make the tool take the "lifting-out" cut, that a roll turner doesn't stay in the vicinity of the lathe, but retires about eight feet to one side.

After the work is completed a roll is made 3-16 to ⅜ inch smaller in diameter, it also being out of round shape, and the large amount of metal required in the turning out of the hard spot being wasted. The turning tool is also ruined until it is dressed and put into shape by a blacksmith. There are cases in which the tool is rendered totally unfit by breaking into several pieces, so that it wouldn't pay a blacksmith to spend any time upon it. It will be seen from the above that it is absolutely necessary to cut the burnt spot entirely out of a roll in order to obtain a smooth surface. When an emery wheel roll grinder is used the emery wheel being very much harder than any burnt spot in a chilled iron roll, the compressed metal is very easily and quickly ground with the rest of the roll's surface, only enough metal requiring to be removed to smooth up the roll's periphery. The burnt spot having a smooth surface like the rest of the roll, it does not interfere with manufacturing good plates. Roll-grinding machines are money savers and their use is increasing every year.

The writer knows of mills where the rolls are necked in the usual manner in a lathe, the necks in such cases being left 1-32 inch oversize, then they are ground to their correct diameter in a roll grinder.

### Ground Roll Necks

Ground roll necks, owing to their perfection in finish and roundness, make the rolls operate very much better in the mill housings than when they are turned in a roll lathe, thus a roller is enabled in starting a new order to set his rolls much quicker and maintain the desired gauge thickness easily. The reasons controlling this factor are due to the fact that, no matter how sharp a necking tool is used in a roll lathe, the necks of all rolls are always, to a certain extent, out of true cylindrical shape, as the roll-turning tool in lathes of this character requires to be operated below the roll's centre and thus it exerts an upward thrust against centres and wears them slightly oval in shape. An emery wheel on a roll grinder on the other hand requires only a slight pressure against the work, the grains of emery in the wheel touching the roll's surface at a very narrow angle and being far harder than any tool and travelling at a fast speed, soon reduces the necks to a true cylindrical shape. On this account rolls having perfect journals revolve better in the mill housings, there being no high spots on them to grind the bearings to an uneven shape.

In the handling of rolls for making thin sheets, the roller has to use judgment if one set of rolls are smooth and the other rough. Thus, if the roughing rolls are freshly dressed and smooth, while the surfaces of the finishing ones are rough—by this it is meant that they have been in use for some time—the finished sheets will have a rough and spotty appearance. If the roughing rolls have a rough surface and the finishing rolls are smooth and the reductions of metal on the latter are sufficient to remove the roughing roll surface marks, the finished sheets will be smooth. Of course, in a case of this kind the finishing rolls will not keep smooth for as long a time as when both the roughing and finishing sets are freshly dressed and put into a mill at the same time. The foregoing shows that a roller on a sheet mill has no cinch while making sheet iron, steel, etc., and he has to be continually on his guard and use judgment as each lot of metal rolled behaves in a different manner while being rolled.

### Should Be Perfect As Possible

Where steel or iron sheets are to be coated with tin they require to be as perfect as possible from all buckles and blemishes, as every imperfection will show on the finished product when the tin plate dipper gets through with his work. The dipper also plays an important part in turning out smooth-appearing sheets, it being possible on his part —if the pickling and dipping into the molten tin is not done carefully—to produce a very rough and uneven-looking coating, which may be blamed upon the quality of sheets coming from the mill, when in reality the fault is with the tin dipper. To test whether a sheet of tin plate is evenly coated, lay it on a flat surface and place the eyes at a height of about two inches from its top and look diagonally over it from one corner to another. If it has a good level and even coating of tin, it will be free from waves and spots, if otherwise the defects will be easily seen. Should such a sheet be looked directly down upon from its top, nothing but its largest defects will show as the reflection from the bright surface will interfere with seeing the small waves of unequally deposited tin

### A FEW POINTS TO REMEMBER

*Strip mill rolls are turned, or ground, with a curve on their surfaces that is entirely opposite to those used for manufacturing hot rolled thin sheets.*

*The degree of finish on hot mill rolls need not be as great as that on cold rolls.*

*It is good practice to anneal cold-rolled ribbon stock, or strip stock, between gauge reductions in cold rollings.*

*Five different degrees of hardness are produced by cold rolling, dead soft, soft, medium soft, half hard or bright rolled, and full hard.*

and spots. By glancing over a sheet diagonally with the eyes occupying a low position, shadows will be cast by each ridge of tin, due to uneven flowing.

The part played by the roll designer in these days of efficiency methods is most important, as the rapid progress in mechanical arts is due, to a great extent, to the roll designer, who is often called upon by various inventors and mechanical engineers to design rolls for making difficult sections in iron, steel and also the non-ferrous metals. In those early days when the iron and steel industry was in its infancy there were no roll designers or foremen roll turners; the designing of rolls being usually done by the roller, a draftsman, mill superintendent, or foreman machinist, who generally made a rough sketch of the passes to be turned in a new set of rolls by the roll-turner. As the ironmasters' business gradually increased it was found necessary and more satisfactory in order to obtain greater efficiency to do away with such haphazard methods and to put the responsibility for the proper designing of the rolls into the hands of one man, who became in time a specialist, and was called a roll designer. Thus, very large mills employ a roll designer —who is also a roll turner of wide experience, and who does nothing else but design rolls for the orders of different shaped sections that are continually being received.

### To Test Ductility

In cases of this kind the actual turning of the rolls from the designs furnished is done by journeymen roll turners who are under the supervision of a foreman roll turner. In small mills employing 150 or more men it is customary for the management to employ one roll turner who is capable of both the designing and turning of rolls. Small mills, as a general rule, only receive an occasional order from outside sources that call for new shapes, so that the workman can easily keep up the supply of freshly-dressed rolls and also do any small amount of designing work that comes along.

In modern rolling mills the roll turner has a well-lighted shop of his own to do the work in. Small mills mostly place the roll lathe in their machine shop amongst the machinists' lathes, which proves to be very good practice, as the power requirements are grouped together; in addition, most machine shops are so designed as to be very well illuminated and also free from mill dust and smoke.

Those who use an occasional black or uncoated sheet of iron or steel for repair work are often at a loss to know whether the metal is composed of iron or steel. For the benefit of such readers who desire to make a test of any sheets which they may have on hand, the following method of testing will prove satisfactory, as wrought iron and steel sheets can be easily distinguished from each other. Proceed as follows: first polish with emery cloth or a file a spot on the metal until it is bright; then place a few drops of nitric acid on the place and leave it alone for a few minutes. The spot will then appear of an ash-grey color on wrought iron, brownish-black on mild steel, and a deep black on cast iron. It can be not only used for testing sheets and bars but also for cast iron, where any doubt exists in regard to the identity of the latter metal. In handling any acid care should be taken not to get any of it upon the hands or clothing as acids are very dangerous to handle.

### Actual Turning of Rolls

To test the ductility or quality of any sheet, bend it back and forth until it breaks in two. If it cracks on the back surface after one or two bends it is not annealed very well. Should the piece of sheet steel withstand many bendings it will be found to be a very tough, fibrous metal. The above is only a rough shop test but it will serve to give an idea of the quality of any sheet when anyone desires to select a tough sheet of metal to be used in emergency repair work or otherwise. The testing of tin and galvanized coatings by bendings is also a very useful kink, as it enables a person to find out if the pickling and cleaning operations have been properly done, which is necessary, as otherwise bending will make the coatings peel off when their adherence to their metal base is slight. In regard to the engine power required to drive sheet mills and plate rolls as contrasted with the power needed to operate rolls for making other sections, it has been found out by experience that engines and electric motors used to drive rolls for manufacturing heavy sheets and plates of all descriptions require to be far more powerful than those needed for making other shapes and sections. This is due to the position of the metal rolled being parallel to the rolls' axes, it exerting a force that is comparable to a powerful brake. For the latter reason large diameters of necks and roll bodies are used in mills of this kind. Large diameter necks in turn also create more friction on the bearings, which, coupled together with the pressure that is exerted by the metal being rolled thus makes more power necessary. To the uninitiated person who looks at any sheet mill crew working rolling either sheets for automobiles or for tin plate, etc., the manufacture of these sheets looks very simple and easy and they haven't the least idea of the trouble that can occur unless the heaters and mill crews work together in harmony and for the general good of all.

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**Moving Office.**—The J. A. M. Taylor Machine Tool Supplies has moved from the Stair building, at the corner of Bay and Adelaide streets, Toronto, to new quarters at 77 Adelaide street west.

## THE USE OF PEAT AS FUEL

In a lecture delivered by Professor P. F. Purcell before the Royal Dublin Society and published by the Fuel Research Board, it is stated that the total amount of peat used in Ireland lies between six and eight million tons per annum, as compared with 4¾ million tons of coal imported and 90,000 tons raised in the country. Irish peat has advantages in two respects, (1) the ash content is comparatively low, and (2) the nitrogen content is comparatively high. It is, therefore, a good peat for the recovery of sulphate of ammonia. Peat, generally speaking, contains from 90 to 95 per cent. of water, and part of this moisture cannot be pressed out owing to it being held by the colloidal matter in the peat. There are at present only two installations in Ireland where this fuel has been successfully employed for the generation of power. One is at Clifton, in Galway, where the Marconi Company uses 5,000 to 6,000 tons of air-dried peat to generate the power for the wireless station. The other is at Portadown, where the power for a linen factory is obtained from a producer gas plant using peat as the fuel.

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We understand that preparations for the British Industries Fair, Birmingham, 1921, which is to be held in the permanent buildings of the Castle Bromwich Aerodrome from February 21st to March 4th next, are now well under way. It will be run under the control of the Board of Trade and the Birmingham Municipality and Chamber of Commerce. None but British and British Empire manufacturing firms will be allowed to exhibit at the fair, and, and none but bona-fide British or foreign buyers may be visitors by invitation of the Board of Trade.

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In a paper dealing with the uses of aluminium for electric installations, Mr. E. O. Pannell, the author, states that aluminium can be drawn three times as far as copper without having to anneal it. The finished wire should indicate 58 to 62 per cent. of the conductance of copper wire of the same size, but it is usual to take 60 per cent. for this figure and a tensile strength of 24,000 pounds per square inch. Thus, if it is required to replace a copper wire on an overhead line with one of aluminium, the latter must have a 29 per cent. greater diameter and a 66 per cent. greater area. To increase the tensile strength and so permit a reduction in the sag of the conductor between the supports aluminium strands are laid around a core of steel wires. The steel wires are double galvanized and impregnated with fish oil to prevent corrosion. A cable of this type is about 35 per cent. heavier than aluminium, and costs, it is stated, 4 to 5 per cent. more; but it has a sag on long spans of 50 per cent. less, so that especially high towers are obviated.

# Special Two Spindle Semi-Automatic Miller

## A Machine Made for a Special Purpose, viz., to Mill Transmission Covers—Two Covers are Milled at One Setting—Special Locking Devices are Used

By J. H. MOORE

THE TWO Spindle Semi-Automatic Horizontal Miller described herein, is a new departure in shop equipment. Figs. 1 and 2 illustrate two different views of this machine, and the Ford-Smith Machine Co., Ltd., Hamilton, Canada, who are the designers and manufacturers of this Miller, have given us some interesting data regarding the same.

The machine was made for one of the large motor companies to mill their transmission covers on a new self-starter engine. Two of these covers are shown on the table of machine at Fig. 2. These covers are so designed that there are two parallel faces, one slightly ahead of the other, to be milled. In order to procure maximum production the special machine was designed. This machine is milling during a very large proportion of its running time, as the operator clamps one cover on the turntable while the other is being milled. An automatic rapid power traverse to the turntable is also provided, and it is largely by these features that such a large production is maintained.

The machine is of exceptional rugged design, and the location of both spindles can be clearly noted at Fig. 1. A feature of the design was the adoption of standard parts as far as possible, that is, the parts going to make up the regular type of Ford-Smith Miller.

The column is practically a duplicate of their heavy model standard type, but shortened to bring the turntable top to the most convenient height for the operator. Fig. 3 illustrates clearly some interesting features in the machine, and for reference purposes we will speak of the parts by symbol numbers as marked on the line drawing.

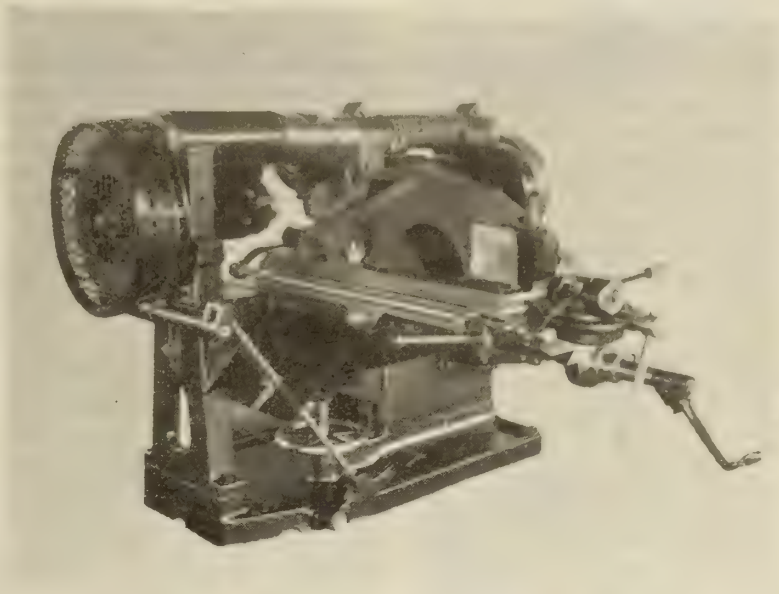


FIG. 2 THIS VIEW SHOWS BOTH COVERS IN POSITION, WITH TABLE BACK FROM THE SPINDLE.

The surfaces that are to be milled can be seen clearly on the outline drawing of the parts. Two castings are placed on the turntable at once, and held down by special bolts and clamps, see 19 AM 27. The turntable is pivoted in the center, and revolves on the stud 8 AM20. Wear on this swivel stud can be taken up by means of the conical sleeve No. 9 AM20, and split outer ring No. 10 AM20.

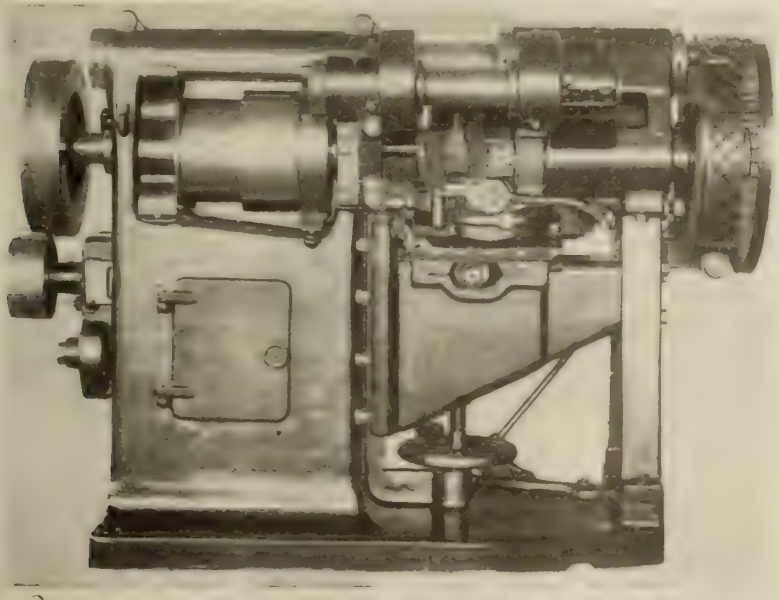


FIG. 1—GENERAL VIEW OF THE SPECIAL MACHINE.

The method of locking the table in position is well worthy of note. Two locating plugs for engaging the turntable edge are employed and these are not entirely dependent upon springs. The locating plugs No. 2 AM17 are made of tool steel hardened and tapered where they engage with the hardened tool steel blocks No. 33 AM27 set in the turntable. The plug nearest the cutter, and consequently the most important one is positively pulled into engagement with its notch by means of the side locking cam No. 37 AM27. This, of course, prevents any radial play.

To revolve the turntable a pull on the handle No. 2 AM13 releases both plugs, as the handle just referred to operates in turn the rod No. 11 AM17, and the lever No. 4 AM13. In this way both plugs are controlled from one handle.

The method of clamping turntable rigidly, after it has been located, is also worth mentioning. This is accomplished by means of two floating clamps, No. 1 AM21 and No. 2 AM21. Both these clamps are operated from one handle in front of machine. This handle is shown at No. 8 AM17. These clamps float and the holding down grip is equalized on all four corners. The tension rod No. 7 AM17 equalizes the pressure by connecting the front and rear clamps. A good powerful grip is obtained and no movement of the turntable is possible.

When it is desired to leave the turntable in an unlocked position, while swinging the same, the little latch is

turned a half turn and engages with the pin shown in lower view. Another feature in this machine is that the outer cutter head can be adjusted along the overarm in thousandths by means of a thread on the arm, together with suitable lock nuts. To take care of wear in the cutter a fine adjustment is provided on the cross table by screw No. 16 AM17. On making the necessary adjustment on the main spindle cutter the outer cutter head is likewise adjusted to suit the amount moved. The method of bracing the overarm and base is so self-apparent that no mention need be made except that slotted holes are placed in outer cutter head to allow for adjustment.

To prevent the workman getting hit by revolving handle of table a special safety handle No. 13 AM13 is provided. This handle is so constructed that when the hand is removed the handle itself is kicked out of position by the pin and spring No. 17 AM27. No danger can follow as the handle cannot revolve, but hangs down idle.

Fig. 2 shows the machine provided with a brake lever. A metal band goes around the enclosed flywheel, and the operator after shutting off his power can soon stop the machine by stepping on the treadle. Vertical adjustment to the knee is obtained by means of handwheel shown.

The object in having two flywheels on the machine was to eliminate as far as possible all vibrations at the cutters, and the installation of these wheels has proved worth while as they accomplish perfectly the duty alloted them. As the material milled in this case is dry, no pump system is required.

The feed box and rapid power box is driven from the countershaft and not from the main spindle, as is usually the case. In this way the rapid power can be engaged for returning the table with the spindle stopped. The inner side of the table is provided with three stops. The end stop trips the feed when the cut is finished. The middle stop automatically engages the feed at the right place when the table is moving in quickly under the rapid power. The outer end stop trips the rapid power when the table is returned after cut is completed. Push knobs are provided, making these various motions self selective, thus avoiding chances of damage to the mechanism.

The faces being milled on this work are approximately 4¾ x 4½″ and a surface is milled at bottom of boss as well as on the side. From 1-32″ to 5-32″ of cast iron is removed, depending upon the castings, and a feed of 4″ per minute is used. Roughly speaking, 160 of these covers are completed every eight hours. Results with this machine have proven that it pays, when necessary, to make special equipment for such duplicate type of work.

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There are various methods of preserving timber, and some of these were given recently in the Building Age. They comment as follows: The steeping process consists merely in soaking the timber in a water solution of a preservative. The wood must be thoroughly seasoned and left in the solution one day for each inch in thickness and one additional day. After treatment, the timber should be air-dried before using. Zinc chloride attacks lead paints, but is very desirable otherwise. Mercuric chloride is very effective, but is poisonous and has a decided corrosive action on steels. Sodium fluoride does not attack paint, is not corrosive, and in most other respects is very desirable. Timbers may be coated with coal tar creosote by a brush treatment, by dipping in hot oil for five to fifteen minutes, or by the hot and cold bath method. This method consists in submerging the lumber in hot oil for several hours and then either allowing the oil to cool down slowly with the wood in it or plunging the wood into cool oil and leaving it for several hours. Coal tar creosote is objected to by some insurance companies, but whether or not it really does add greatly to the inflammability of wood is a debatable question.

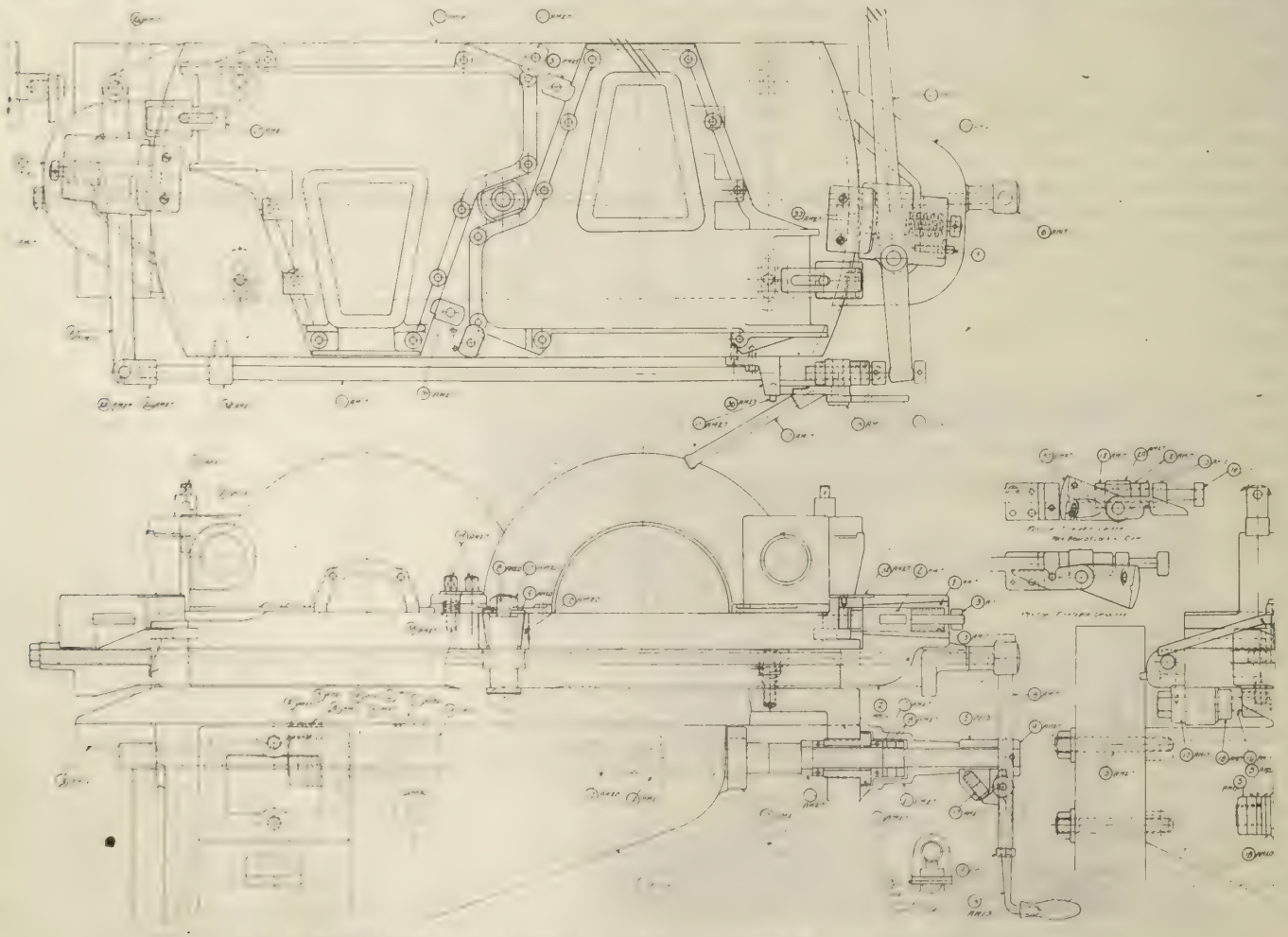


FIG. 3—THIS PARTIALLY SECTIONAL VIEW ILLUSTRATES VARIOUS FEATURES. REFER TO THE TEXT MATTER FOR DESCRIPTION.



# WHAT OUR READERS THINK AND DO



## DRILLING JIG WITH FLOATING CLAMP BAR

John S. Watts

The drilling operation on the link shown in Fig. 1 presents a rather interesting problem by reason of the location of the holes, having to be in correct relation to three surfaces. The link is a steel casting for a picking belt, which is virtually a steel plate conveyor. The plates are five feet wide and have each a pair of links riveted to them so as to form two complete chains, one at each side of the conveyor. There are two sprockets on the driving shaft, with teeth to take the links, these teeth meshing with the links at the point marked "a."

The plate is shown dotted in Fig. 1, and it will be noticed that it projects at one end to lap over the preceding plate, to prevent any leakage of coal.

The holes for the rivets connecting the plate to the link are cored, the only machine work being the drilling of the pin holes. From the above it will be seen that the requirements are as follows:

First, the centre lines of the holes must be square with a line drawn through the centres of the double eye and single eye.

Second, in order that the plates will mesh correctly, the pin holes must be drilled at the correct distances from the surfaces of the pad "b," to which the plate is to be riveted.

Third, to ensure that each of the two links on a plate will mesh with the two sprockets correctly, the two pin holes must be the correct distance from point "a."

In Fig. 2 is shown the jig, and we will show how each of the above requirements have been met.

In designing the jig to fulfill the first requirement we must remember that the link is not to be machined and that therefore the actual dimensions of the castings will be apt to vary slightly from the drawing sizes. For this reason the width of the space between the jaws of the double eye of the link is ⅛ of an inch greater than the width of the single eye.

The spaces in the jig into which the double eye and single eye fit, respectively, must be greater than the widths of these parts of the casting as given by the drawing. The clearances should be one-sixteenth to ensure that any casting that will go into the jig will also fit into its place in the chain. For instance, the maximum over-size the jig will admit on the single-eye is one-sixteenth and the maximum under-size on the space between the jaws of the double-eye is also one-sixteenth, and as the drawing gives one-eighth clearance, the maximum width of single eye will just go into the minimum width of space in the double eye.

When the link is placed in the jig it rests on one face of the single eye and an inside face of the double-eye, and as any over-size in the casting will probably be equal at both places, the centre line of the link will lie in a horizontal plane. In any case we are assured that any link that will enter the jig will fit the other links, and that at least two of the faces of the bosses are in their correct location and will be as good a job as can be gotten with rough castings.

The second and third requirements must be studied together and in the jig shown this is accomplished by having the casting clamped against two surfaces, one of which controls the location of the surface "a" and the other that of "b." When the casting is being entered into the jig, the clamp is swung out on its hinge and the casting pushed into place, the clamp swinging in as the casting enters the jig. Tightening up the thumb screw causes the clamp, first, to push against the end of the link and so press the point "a" against the stop in the jig provided to locate this point, and then, secondly, to force the link into the jig until the pad "b" is against the surface of the jig at the back, which locates the position of the pad in reference to the holes. As will be seen, we now have the casting clamped in the jig in the position desired to fulfill the three requirements enumerated above.

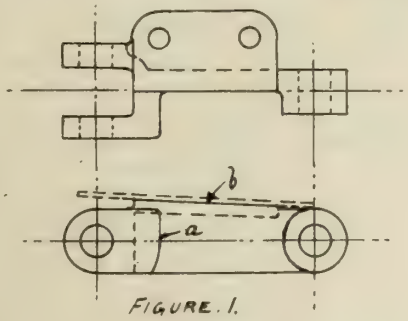



FIGURE 1.

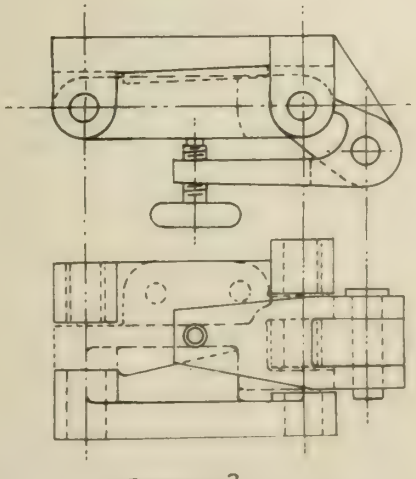


FIGURE 2

FIGS. 1 AND 2—ILLUSTRATING THE PART ITSELF, AND THE JIG.

This would not be possible of attainment by the use of a single clamp, as there would be no assurance that surface "a" would be correctly located. To depend upon the operator pressing the casting against the stop is to depend upon "a broken reed." And if two clamp screws were fitted, the casting would be easily placed wrong by tightening up the wrong clamp first. Then also the operation would consume more time than that required using the jig shown.

To remove the casting from the jig it is only necessary to slack up the thumb screw a few turns, when the link can be withdrawn, as the clamp swings out of the way as the link comes out.

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Creosoted wood cannot be painted over successfully, because the oil quickly comes through the paint and discolors it. Although pressure treatments are the most expensive they are the most effective because they result in the greatest absorption and penetration of preservative. Roof planking should receive 8 lb. to 12 lb. of creosote per cubic foot, or ½ lb. of the salt if zinc chloride be used. Such treatment should add at least twenty years to the life of roof plank. Lumber should be cut to final dimensions before treatment. Whenever it becomes necessary to cut into treated timber the untreated wood exposed by cutting should be given two brush coats of creosote or some other preservative.

# Safeguarding Operation of Industrial Cranes

## Crane Inspection, Safety Devices, Proper Slings, Duties of Operator, Proper Chains to Use for Different Purposes, the Endless Chain Sling, Identification of Chains

By JOHN A. HOPE

THE rules and regulations, herewith set forth, governing the shop maintenance of cranes and hoisting chains, and care of the same, is submitted by the writer, recognizing the importance and considerate attention that has been given to this subject by one of Canada's leading railroad companies, in safeguarding workmen from injury. It is doubtless true that many industrial firms have adopted ways and means for the protection of the workmen that may be similar to those here given, but a brief discussion of some details at this time may prove beneficial to many of the readers.

### Shop Cranes

The general construction of modern workshops provide ample overhead room for carrier cranes, and according to the length of the building and the nature of the work, two or more of these cranes may be operating on the one runway, with a minimum tracking height of about 330 feet from the floor. The duties of these cranes involve the rapid transit of shop material from one department to another, where floor conveyances are not convenient. The operators in charge of the cranes are constantly engaged in the different positions below them and seldom are required to watch the movement of the crane along the tracks, and therefore assume that there are no obstructions to the crane tracking when moving along the rails. This makes shop orders effective that no class of workmen, steam fitters, etc., working on maintenance of building, are allowed to work in the vicinity of cranes, except in the case of emergency repairs which must necessitate the stopping of the crane from operating in the section where the trouble may be.

### Crane Indication

It is most advisable that all cranes be painted with a light distinguishable color, to contrast sharply with the building interior and surroundings, so that they will be quite noticeable to all floor men in the works; also that the rated capacity of the crane be stenciled in large lettering on both sides or bridges. This capacity should always read in tons, as men do not grasp the significance of pounds capacity as well as they do tonnage.

### Crane Safety Devices

In order to facilitate repairs, all cranes should be equipped with suitable runways that will provide easy access to carrying transmission, propelling gears, bearings, motors, etc. These runways likewise permit of ready inspection at all times. All overhead crane equipment should be controlled by limit switches for extreme load height; also include the best features in drum clutch and brake devices, automatic gong ringer, etc.

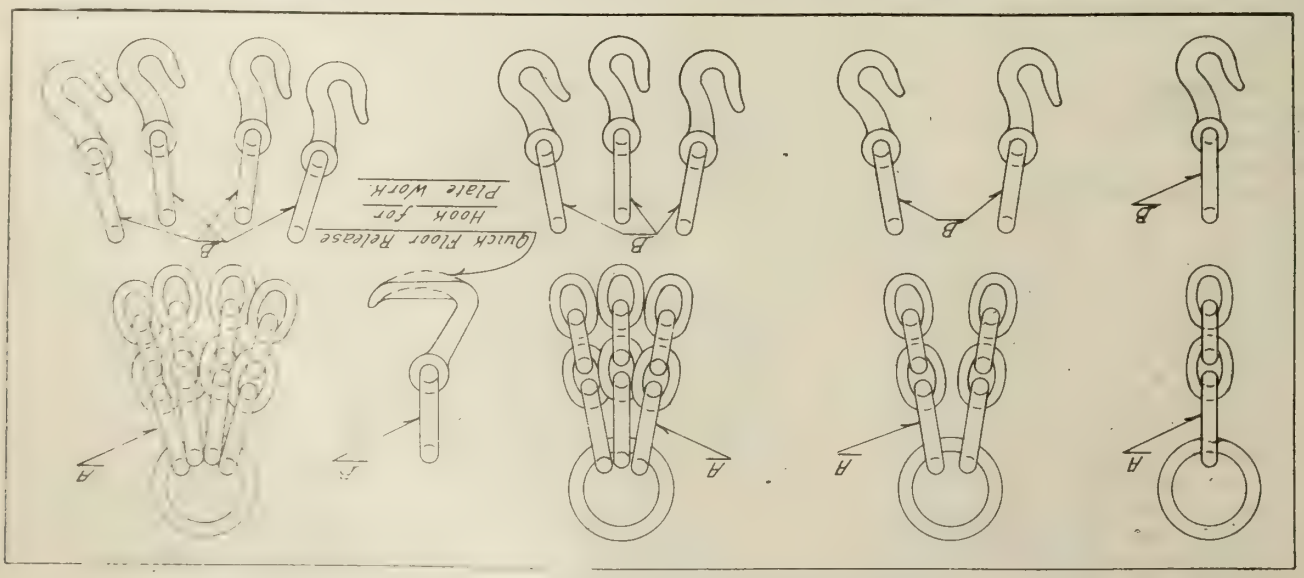
### Crane Inspection

Whether the number of cranes warrant an inspector on the job all of the time or only part of it, it is necessary that cranes receive a close inspection at least once a week. This inspection must include a very careful examination of the hoisting cables, to ascertain that there are no damaged or broken strands, and that cable sheaves are not worn to cause any cable defects. It is possible and expected that a good brand of cable, kept in good condition by frequent oiling and used for moderate lifting within crane capacity, should at least give a satisfactory twelve months' service, that is, for machine shop service; foundry cranes cannot be governed by this rule, on account of the extra usage and the continual dust. However, there is no other interpretation of the shop rule, which states, each or any cable inspected and discovered with broken wire in strand must be immediately discarded and new cable applied, irrespective of what length of service damaged cable has been in use.

As previously stated, cables on general service cranes (excepting founddries) should have a predetermined renewal date set, according to the number of days or hours crane is in use, always taking into consideration the nature of the material handled, for although cables may not show weakness in broken strand wires, the breaking strain may be very materially reduced, with too continued service.

### Crane Operators and Slings

The present practice, where one or more carrier cranes are in continuous use, is to provide a competent slinger, who takes the responsibility of slinging all material to be handled, and in seeing that all material is placed in the proper position. Rules applying to crane operators and slingers are for eliminating any misunderstanding. 1st.—Crane operator being responsible for material load when hoisted, that there is no undue swing to load, and that observance is made to clear projecting wall cranes, etc. 2nd.—That crane operator takes his signals from slinger with respect to hoisting, lowering, or carrying of ma-




A ONE, TWO, THREE AND FOUR-LEG SET OF CHAINS.

terial. 3rd.—That crane operator can refuse to make load lift, if in his estimation improper fastenings or under capacity slings or chains are used by slinger. 4th.—Slinger to be fully competent in the use and capacity selection of chains which are at his disposal and generally indicated for their special use. 5th.—That in handling or placing material in a predetermined position for mechanics involved, all signals must be transmitted through the slinger to the crane operator, for too many signal bosses will tend to create accidents and cause unnecessary confusion. Cordial co-operation is demanded from crane operator and slinger, and where repeated friction is apparent in the handling of material, a change is effected.

### Chains

In the accompanying sketch are shown a set of one, two, three and four leg chains, and these are considered as the most serviceable for all round use in foundry, machine and erecting shop service, not excepting the endless chain sling. These chain lengths are made up of No. 1 best tested, oval link, wrought iron, for hoisting purposes, covering a lifted range from 1-4 to 20 tons, as illustrated. This is in reference to general shop use, as there are a large variety of special chains for work of specific character. With reference to the head ring on these chains they are made a relative size for the different chains, to facilitate hooking on to the carrier crane main hook. Ring thickness is made to suit the chain capacity. Chain data is omitted in this article, as this information may be had from any of the hand-books now available. The safety factor used for hoisting chains approximates 5 to 7, that is, 1-5 to 1-7 the breaking strain of chain being the allowable carrying load.

It is freely conceded that the one and two leg hook chains, and also the endless sling chain, are the most expedient and desirable for handling material in erecting, foundry and structural work. The two, three and four leg chains, with different width hooks, are the best adapted for boiler and tank plate work. The three leg chain is recognized as the safest flat plate carrier on account of its three point suspension, thereby decreasing the possibility of plate slipping.

### Rope Slings

Manila or hemp rope slings are not included in the shop equipment for general sling work, on account of being subject to strand cutting when used on rough or sharp edged material, yet their field of usefulness is so extensive that it is almost essential to provide such slings for specific uses. The 1-inch and 1¼-inch rope slings (endless) are much preferred by erecting millwrights. Light material that is being installed down from large or heavily constructed machinery, necessarily requires a light sling, and where small parts are being handled in a confined space, with the probability of being jammed, the rope is more suitable, as it enables the operator to watch any crowding of the work against adjoining machinery. Light ¼-inch chain slings, where a heavy power crane is doing the work, will not stand up to this momentary strain, and frequently results in a bursted link and falling of material. Rope slings are very serviceable when placing light material inside of locomotive boilers, where view is obstructed.

Tube handling in large quantities give preference to the 2 and 2½-inch diameter endless rope sling, as it has a natural tendency to hug the tubes securely and preventing slipping, and in the case of thin tubes, avoiding damage to the same.

### The Endless Chain Sling

This chain, in ¼ and 5 16 inch open link sizes, ranging from 3 to 5 feet in length, is regarded by machine shop operators as one of the most necessary individual pieces of equipment of any they have got. These chains are used with wall cranes equipped with air hoists or quick-acting chain blocks as lifting mediums, the average weight of material handled being from 100 to 1,000 lbs. Mechanics making daily use of such chains carry their work out in routine manner, so that little thought is given to the possibility of chain breaking and causing injury. The need of regular inspection is therefore obvious. The following is a conversation the writer had recently with a workman using a chain as cited above.

"Where is your chain sling?" Machine operator produces the same. "How long have you been using this chain?" "Possibly five months." "Have you ever examined the individual links in the chain for possible defects?" "Well to be candid—No. I did not." "Don't you think that it would only be fair to yourself to give your chain a two-minute inspection once a week and thereby save yourself from possible injury?" "Well, I know you are right, as I have never given it a thought. I am going to take a squint at that chain right now, for now that I think about it I have made that little old chain do some work this while back." This is not to cast reflection on the ability or carelessness of these men, who just simply acquire a familiarity with their working surroundings and forget to be concerned in matters not dealing directly with the work. To make it a plainer statement, these men are more mindful to the material held in the sling than to the sling itself, which for the common needs of safety, in seeing that chains are kept in good condition.

### Chain Inspection

Inspection of chains requires that an inspector becomes acquainted with the following duties. To inspect daily the condition of chains in the different departments, checking up those that show wear or abuse. Single leg chains checked up for undue stretch by their known length. Two, three or four leg chains are checked up by taking notice, when suspended on crane hook, that no one leg exceeds others in length. Care should be taken in making these chains that all sections are of equal length from the ring head. Where hard usage has caused noticeable dents or bent links, it is necessary that the chain be discarded and a new one applied; the long links as shown in A and B constitute the only part of chain allowed for smith-shop welding. The welding of any other link in chain leg is prohibited as further assurance of safety, not that there should be distrust of the welded link renewal but the general insecurity of other parts of the broken chain which may be strained. By renewing the entire chain leg there is no doubtful action taken.

### Chain Identification

It is part of the chain inspector's duty to know exactly how many chains, and type, are in daily use. This requires that each chain have an identification number stamped on it, this to enable inspector to keep record of their use or abuse. Record of the same to be kept in card index or log book. This identification to read as follows: Number of chain, 50; kind of chain, double (plate hook); length and size, 6 ft. 0 in. x ⅝ link; where used, plate department; when made, 1—8—1918; last annealed, 3—6—1920; remarks, O.K.

### Annealing Chains

The advisable practice is to anneal all chains semi-annually, especially those that are being used in continual and heavy service, as these develop a tendency to become crystallized. The method for this annealing is to put chains in a series of rows on the bed of the annealing furnace, one that is oil fired being preferred. With furnace closed up, gradually apply heat until chains attain a cherry red. Shut off the heat and allow furnace to cool until chains can be removed by hand. The inspector is then called upon to examine chains carefully, link by link, as this annealing invariably shows up seam fractures, that are indiscernible when chains are in use and oil coated. Chains inspected and found O.K. are then oiled. Large chains are brush painted, and the smaller chains dipped in oil tank and then allowed to drain off. They are then returned to their various departments for service.

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A locomotive turn table, 92 feet long, was recently lifted and moved horizontally 1,600 ft. at Kansas in ten hours by means of a 100-ton wrecking crane and two railway flat trucks. The crane first lifted one end of the turn table and a cribbing was built underneath at about two-thirds of its length from the crane. The crane was then lowered away. This action raised the far end and a cribwork was built there. The crane gave another hoist and the first crib was heightened. By repeating this process the turn table was raised high enough to admit the trucks below far more quickly than could have been done with jacks. Once on the trucks the table was easily hauled by a locomotive to its new site.



# DEVELOPMENTS IN SHOP EQUIPMENT



## UTILITY SCREW PRESS

Carl Pletz & Sons, 717 Sycamore St., Cincinnati, Ohio, have placed on the market what is known as their No. 3 and No. 3½ utility screw presses. The illustration depicts the press, and, as stated, it is made in two sizes. This type machine is used to straighten shafts, bars, rails, beams, etc. It is also arranged to press in or out bushing, press gears or wheels on and off shafts and can form or bend metal in many shapes.

The bed is 4 ft. long, deep and heavily ribbed with a hole cored under the screw to permit work to drop through to the floor when pressed out. These cored holes permit the pressing of pieces in or off of long shafts. The two upright posts are strong enough to withstand ten times the load that can ever be applied.

The screw is made of high grade steel accurately chased. The steel screw pad fits on the end of the screw and the thrust is taken on a hardened steel and bronze washer, which is set in oil.

The hand wheel on the end of the screw is fitted with a handle so that the screw can be returned quickly. By using a four-foot bar in the hand wheel a pressure of about 20 tons can be secured. Following are the principal specifications:

| | No. 3 | No. 3½ |
|---|---|---|
| Size of screw | 2″ | 2″ |
| Pitch of screw | ¼″ | ¼″ |
| Distance between posts | 12¾″ | 17¼″ |
| Distance under screw pad | 14″ | 20″ |
| Length over all | 4′ | 4′ |
| Height with screw down | 42″ | 42″ |
| Weight | 500 lbs. | 600 lbs. |

## SHAPER MILLING ATTACHMENT

The Tri-State Milling Machine Co., 172-174 South Front Street, Memphis, Tenn., have placed on the market a milling machine attachment for use on shapers. This attachment is shown on the photograph, and the makers claim that this fixture is good for the following uses.

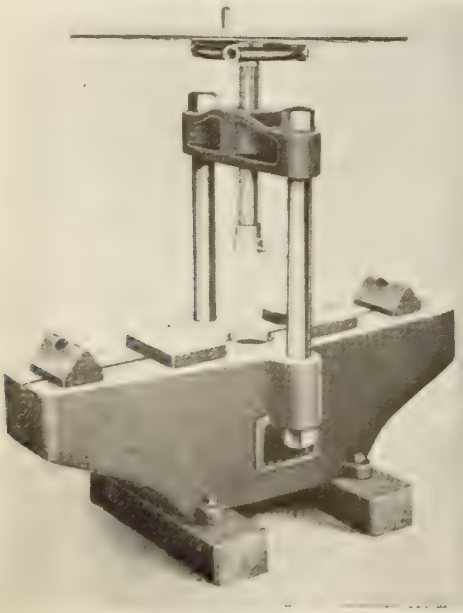
The attachments are made to fit any size or make of shaper, and in very short order the shaper is transformed into a miller by use of this fixture. The attachment is used to cut spur gears up to 18 inches diameter, also bevel and mitre gears, worm gears, keyseating shafts almost any size with one cut, woodruff keyseating, plain slab milling and form milling such as forming and shaping up dies and punches, profile work such as milling out circular slots, fluting reamers, taps, or similar work. This is said to be a powerful attachment because it is worm driven by a triple cut worm and gear, running in a closed gear box filled with heavy oil, which lubricates every bearing from the inside of the gear box; all bearings are taper and provided with a lock nut, one on the inside and one on the outside for taking up the wear.

Following are the principal specifications: Milling head—Cast iron, heavily constructed, fitted for ram slide and fastened with gib key. Pulley—four step cone, 4, 6, 8 and 10 inch, 2½ inch face. Bearings—bronze, taper adjustable for wear. Drive—worm and gear, hardened steel, runs in oil. Drive shaft—nickel steel, hardened steel thrust bearings on each side of worm. Runs either right or left. Spindle—Hollow high carbon steel; 1⅞ inch diameter. No. 4 standard Morse taper. Nose threaded for chuck. Arbor—Nickel steel, 1 inch diameter. Only one furnished. Table—3 feet long, 3 T-slots, round base permitting turn at any angle, cross feed 7 inches. Table fits on shaper base, giving quick adjustment.

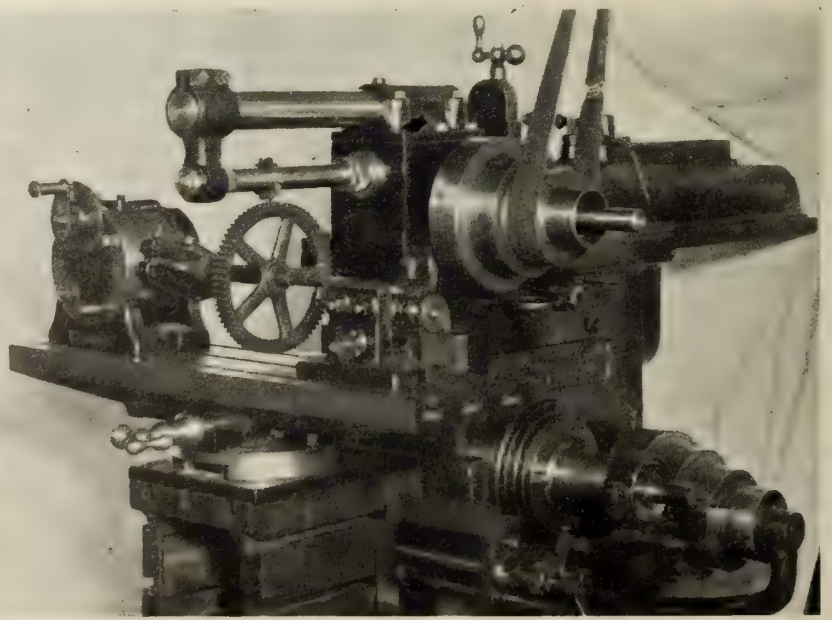
## FRICTIONLESS CENTRE

The Snellex Manufacturing Co., Rochester, N.Y., have placed on the market what they claim is a frictionless centre.

This centre is designed to eliminate friction between the work and the centre, to make it unnecessary to regrind centres, to increase production at a



UTILITY SCREW PRESS.

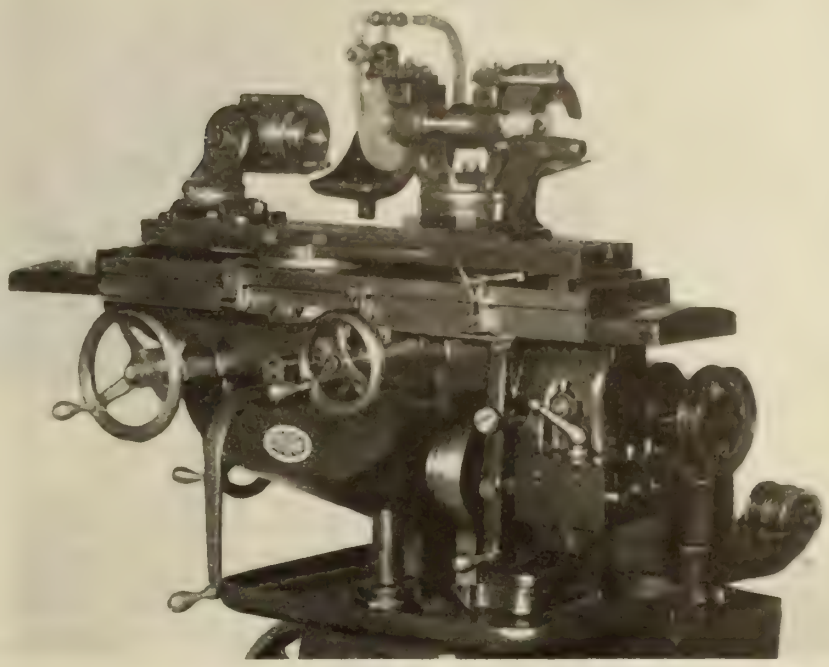


SHAPER MILLING ATTACHMENT

higher speed, and to prevent worn or burnt centre holes in the work. It is also said to do away with the unsatisfactory lubrication between centre and work. The arrangement of the ball-bearings and the general construction is plainly seen in the accompanying sectional view.

The live centre is mounted in special ball bearings, at the rear end of the centre is an adjustable cone, together with a lock washer and check nut, and the end is sealed with an oil cap. The principal point of novelty lies in the construction of the ball races, which are the peculiar movement of the balls, formed at an angle of forty-five degrees.

This arrangement has the following advantages. It insures the greatest sensibility of the live centre without end or side play, and a permanent trueness of the balls to one ten-thousandth of an inch. This last feature has its secret in which are travelling in a spiral motion caused by the forty-five degree angle of the races. This insures a perfect and uniform wear of the balls which keeps them round and true in size. These centres are made in four sizes, varying from No. 1 to No. 4 Morse taper.



GENERAL VIEW OF THE GRINDER.

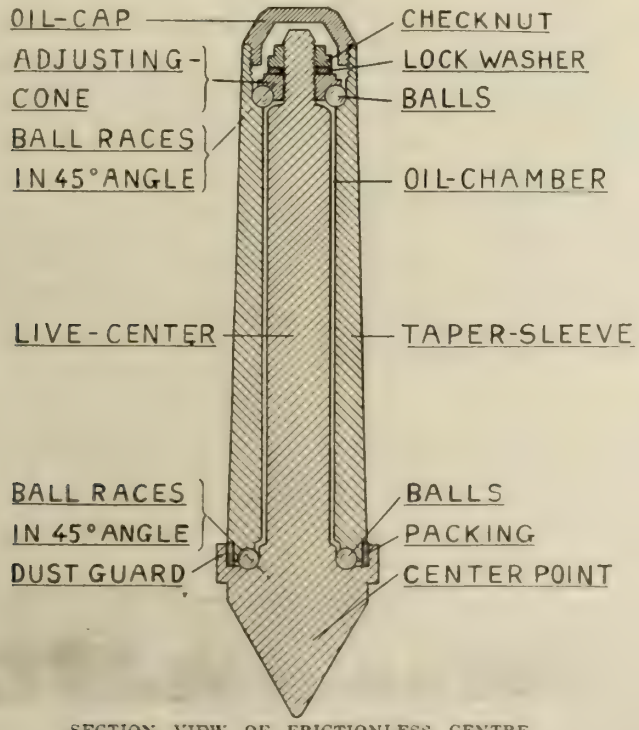
## UNIVERSAL TOOL ROOM GRINDER

The Oakley Machine Tool Co., Cincinnati, Ohio, have placed on the market their No. 3 universal tool room grinder. This machine has incorporated in it certain features intended to insure, during the life of the machine and under all working conditions, accuracy, rigidity, and convenience of control. The longitudinal feed may either be hand-operated or driven by power. The fast hand feed is operated through a rack and pinion, either from the front or rear of the machine by a long hand-lever. A small handwheel in front of the saddle controls the slow hand-feeding movement. The power feed is driven by a single belt from a countershaft, and constant belt tension is maintained irrespective of the position of the knee. There are three feed changes obtained through a cone pulley.

The operating and reverse levers are directly under the operator's hand. Hardened chrome-nickel steel is used for all reverse mechanism clutches. The cross-feed is operated by a large diameter handwheel, either from the front or rear of the machine, and there are micrometer dials at both ends of the cross-feed screw. Another large handwheel is used for the vertical feed, which has a micrometer dial on the elevating shaft. The thrust is taken by ball bearings.

The slide of the machine is aligned to the saddle by vee and flat bearings of liberal dimensions. This slide is designed to maintain true alignment during the life of the machine, and it is easily removed from the saddle for cleaning. The saddle and knee have V-bearings; and in the case of the slide, saddle, and knee there are no gibs or adjustments for the operator to tamper with. The entire slide bearings are oiled through one centralized oil-cup. The wheel-head swivels on the column 180 degrees either side of the central position. The wheel-spindle runs in dustproof, taper, bronze bearings. The work-head has a No. 12 B. & S. taper for receiving the shanks of large end-mills. This work-head swivels in horizontal and vertical planes.

The range of the machine is as follows: Longitudinal movement, 17 inches; vertical movement, 10½ inches; cross movement, 9 inches; maximum swing, 10 inches; maximum distance between centers, 20 inches. The table surface is 5¾ inches wide, and 33¾ inches long. The automatic feeds are 6½ inches, 11⅜ inches, and 19½ inches per minute.




SECTION VIEW OF FRICTIONLESS CENTRE.

## CONTINUOUS FEED DISK GRINDER

The Gardiner Machine Co., Beloit, Wis., have recently placed on the market what is known as their continuous feed disk grinder. This machine is semi-automatic in operation and is designed to eliminate the usual amount of

labor expended in operating hand disk grinders. An important feature of this machine is the constant production obtained. With any hand operated machine, the human element has to be considered and naturally a uniform output cannot be obtained.

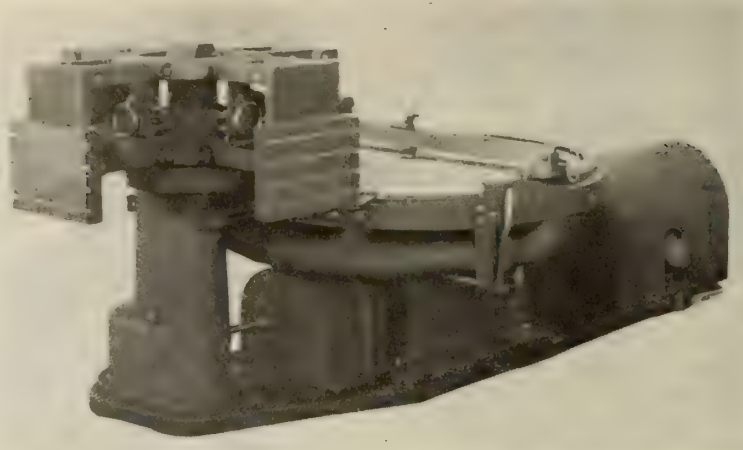
The machine carries a horizontal disk wheel 53" in diameter, and is provided with a revolving reel, which carries four work tables, as shown in illustration.

The work to be ground is attached to these tables by means of suitable fixtures mounted on them, and the revolving reel brings it over the surface of the grinding wheel. The tables are automatically lowered on the wheel. Pressure to insure quick removal of stock is secured through gravity, but by means of a compression spring this pressure may be adjusted. The weight of the table insures application of uniform pressure, which can be increased by adding extra weight if the character of the work necessitates it. A micrometer stop screw makes it possible to remove stock to definite dimensions.

Due to the construction just described, the operator simply places the work in the fixture and removes it when finished. The revolving reel is mounted on a vertical shaft 3½ inches in diameter, and is driven through worm, spur, and bevel gears from the gear driving the main spindle of the machine. By means of change-gears, the reel may be made to revolve ¼, ½ or 1 revolution per minute, thereby producing 1, 2, or 4 finished pieces per minute. Other speeds may be obtained by substituting special gears.

The driving shaft is provided with a friction clutch which is operated by a lever placed in a convenient position, which makes it possible to start or stop the feeding mechanism independently of the grinding wheel. The reel and the shaft which drives it are mounted in bronze bearings; all other shafts are carried in ball bearings. The gears are totally enclosed, which protects them from dust and dirt and allows them to be amply lubricated. The feeding stand is bolted directly to the baseplate upon which the machine is mounted, and to accommodate various sizes of work, has an adjustment of 6 inches along this baseplate. Because the work-tables are at right angles to the grinding heel, accuracy of the work being grouped is assured.

Rigidity and strength are important features of this machine. It weighs about 7,600 pounds when crated for domestic shipment. The disk wheel is mounted on an extra large and heavy cast-iron flange. The driving spindle is of large diameter and runs in two self-aligning radial ball bearings. All down or end thrust is taken on a self-aligning ball thrust bearing which contains ten 1¼-inch diameter balls. Power is transmitted to the disk wheel by hardened special steel bevel gears. The ratio between the driving shaft gear and the spindle pinion is 2.4 to 1. These gears are also fully enclosed within the base of the machine, and provision is made for ample lubrication. They are completely protected from any grit or dust.



GENERAL VIEW OF THE CONTINUOUS FEED DISC GRINDER.

An extra pulley is mounted on the driving shaft for belting to an exhaust fan, which is set on the floor in back of machine. There is a dust channel cast into the base of the machine extending entirely around and underneath the outer edge of the disk wheel. When the guard ring is removed this channel is uncovered all the way around so that the grindings which might interfere with effective exhausting may be removed readily. A dust exhaust manifold is fastened into the bottom of this dust channel in four places and connected to an extra large exhauster, reducing the dust problem to a minimum. The cast-iron guard ring is fastened to the top of the base with collar head screws. Any portion of the guard ring is removable, permitting the grinding of work carrying a lug projecting above the plane of the ground surface.

# NEW THINGS IN MACHINE TOOLS

## PORTABLE AIR COMPRESSOR

The Black and Decker Manufacturing Company of Baltimore, Md., are now making a portable electric air compressor outfit mounted on a three-wheel carriage fitted with a pushing handle and brake. Automatic control of the supply is provided for as the machine starts to operate when the pressure falls to 160 lbs. and stops when the pressure has been raised to 200 lbs. per sq. in. A reducing valve is fitted to the reservoir to give a working pressure of from 40 to 80 lbs. The regular equipment includes valves, gages, electric cord, 25 feet of air hose and blow gun. Additional equipment may be supplied if desired.

## MOTOR-DRIVEN TOOL GRINDER

The United States Tool Company of Cincinnati are now making a self-contained tool grinding machine operated by a 5 h.p. shunt-wound, adjustable speed Westinghouse motor running at from 1120 to 1600 r.p.m. The motor is fitted direct to the drive shaft and may be started or stopped by pushing a button, the starter being located in the base of the machine. The control buttons are located on the top of the machine so as to eliminate the possibility of the workmen striking it while operating on the work.

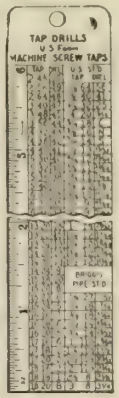
## MULTIPLE-SPINDLE DRILL HEAD

A new design of adjustable-center multiple-spindle drill head has recently been placed on the market by the United States Drill Head Company of Cincinnati. When using six spindles or less, the full adjustability of the head may be obtained, although more than six spindles may be applied but with a lesser range of adjustment. Each spindle is carried on a separate auxiliary arm that may be swung in a complete circle about an intermediate pinion that meshes with the main gear in the central drive spindle. The intermediate pinions are made with a wide face to permit of vertical adjustment to the separate spindles when it is desired to use drills of different lengths. One locking nut is used for holding the spindles in position and any of the spindles may be readily attached or removed. The auxiliary spindles are fitted with ball thrust bearings and are provided with means for adjustment for wear. Five standard sizes are made with a range for drilling on circles from 2 inches to 18 inches in diameter. Special sizes may be had if required.

# Have You Tried This Contest Yet? If not--- Do so Now

Do you want to win one of these scales?

It's very easy, and at the same time you add to your store of knowledge. The details are given below.




The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

## What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

The Prize Winner for Dec. 9th Issue is GEORGE LAND, 567 Patterson St., Peterboro, Ont. Another chap from Welland had his answers correct, but was 7 days later than the winner in sending them in.

**CONTEST FOR JAN. 6TH ISSUE**

**Contestants are required to write us, stating to which advertisements we refer in this number.**

1—Something you can't afford to take chances on.
2—How to prevent a certain article from freezing.
3—Something that is solid—yet adjustable.
4—How to eliminate the danger of error.
5—Something that you can accomplish in three minutes.
6—How to reduce non-productive time.
7—How to save money.
8—How to obtain dependable production.
9—Something said to be very popular.
10—How to get away from experimenting.
11—How to get more speed.
12—How to make one pound of one material equal ten pounds of another.

**These are Correct Answers for List from Dec. 9th Issue:**

1—John Bertram & Sons, Ltd.
2—The Wallace Barnes Co.
3—The Galt Machine Screw Co.
4—The City of St. Johns.
5—Dominion Forge & Stamping Co., Ltd.
6—The Bristol Co.
7—Gooley & Edlund, Inc.
8—Nova Scotia Steel & Coal Co., Ltd.
9—Puro Sanitary Drinking Fountain Co.
10—Hoyt Metal Co.
11—A. R. Williams Machinery Co.
12—Norton Company of Canada.

## Closing Date for This Contest is January 27th

# A.W.
## Their Reputation Encircles the Entire Globe

# ENGINEERS'
# SMALL
# Gear Cutters
# Reamers

The **High Speed Steel and Carbon Steels** used in our tools are the result of many years of **actual manufacture and careful research in our own mills.** Therefore the quality is assured.

*Our Name*

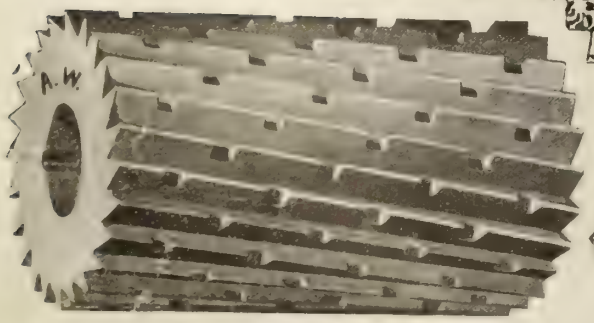
## ARMSTRONG

**Works:—**
**Longueuil, Que.**

**CANADIAN**

**Messrs. Sir W. G Armstrong Whitworth & Co Ltd. England**

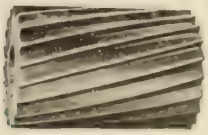
**Messrs. Armstrong & Main Ltd.**
**Constructional Engineers, Glasgow**




WHIT

# ARMSTRONG WORTH

TRADE MARK



## TOOLS

## Milling Cutters
## Drills, etc., etc.

We combine **scientific methods** with an **intimate knowledge of working conditions. Result—Accuracy and Endurance,** which have led machinists to insist on **"A.W." Tools.**

***on Every Tool***

## WHITWORTH *of* Canada Limited

**Head Office:**
**298 St. James St., Montreal**

**Branches:**
**Toronto, Hamilton Winnipeg**

**REPRESENTATIVES FOR**

Messrs. Cromptons Ltd.
Electrical Engineers, London

Messrs. Partington Iron & Steel Works
Manchester

Messrs. Armstrong Siddeley
Motor Cars, Coventry

Messrs. Pearson & Knowles Ltd.
Steel & Iron Manufacturers, Warrington

Messrs. Rylands Ltd.
Wire Rope Manufacturers
Warrington



*If interested tear out this page and place with letters to be answered.*

# Machine Tool Designers Were Busy in 1920

## Automatic Turning Machine, Boring Mill, Pneumatic Motor Hoists, Electric Riveting Machine, Blasting Machine, Keyseating Machine, Twist Drill Grinder, and Other Tools Are Included

**The Oliver Machinery Company, Grand Rapids, Mich.**—An improved patternmakers' and general woodworker's vise. The vise is patented and is very versatile in its adaptation to the general line of work found in woodworking departments.

**Manning Maxwell & Moore, Inc., New York.**—A special vise in which three jaws can be swivelled independently, and can be locked in any desired position.

**Alfred Herbert, Ltd., Coventry, Eng.**—This concern has brought out various new developments, but perhaps the three most distinctive are as follows: An automatic turning machine in which there is no overhead gear. The range of speed is obtained automatically, and a new method is used to move the turret. A patent cold sawing machine. This machine has a patent chip remover which greatly reduces the risk of saw breakage and permits of higher speeds and feeds. A radial drilling machine. This machine is just entering on the market and was recently shewn at the Olympia Exhibition in London.

**A. T. Brush Tool Co., Erie, Pa.**—A micrometer that can be used for measuring from zero to two inches without any attachment. The spindle has a screw of 220 threads per inch, while a separate screw with forty threads per inch is used for traversing the spindle.

**National Acme Co., Cleveland, Ohio.**—An automatic machine constructed on the multiple spindle principle. This machine has a capacity of from 3 to 4 inches.

**The Wetmore Reamer Co., Milwaukee, Wis.**—A special set of reamer tools designed for the production of round, straight, and thoroughly smooth holes in small cylinders.

**The Storm Manufacturing Co., Minneapolis, Minn.**—A boring mill that is especially adapted for the boring or reboring of motor cylinders and other parts such as large gears, heavy bushings, tractor wheels, etc.

**Independent Pneumatic Tool Co., Chicago, Ill.**—Various developments have been brought out, these including pneumatic motor hoists, a moisture separator, a power screw driver attachment, a pistol grip electric drill, a hose coupling and a drill repair vise.

**The Kent Machine Co., Kent, Ohio.**—A compound mixture for mixing bone meal and various compounds for pack hardening and carburizing steel.

**The Cincinnati Electrical Tool Co., Cincinnati, Ohio.**—A combination bench drilling stand that has a portable electric hand drill attached.

**Mada Engineering Co., Liverpool, Eng.**—An electric riveting machine which is portable in nature and can be used on outside jobs.

**H. B. Underwood Corporation Philadelphia, Pa.** — A small engine that may be operated either by steam or air for driving portable mechanism such as boring bars and drilling machines. These engines are made in two sizes, two or three horse-power.

**Long & Allstatter, Hamilton, Ohio.**—An improved design of helve hammer of the rubber cushioned type.

**The Victor Tool Comp., Waynesboro, Pa.**—A collapsible taper cutting pipe tap. Sizes of these taps range from 2 to 12 inches.

**The Gray Machine Tool Co., Buffalo.**—A blasting machine that is adapted for the cleaning of the insides of pistons.

**The Bear Pneumatic Tool Co., Kansas City, Mo.** — A pneumatic riveter that is supported on a stand, and is intended for use in riveting traction plates on the rims of pneumatic tires. With slight modification, it can be adopted on a great variety of work.

**Grimscom-Russell Co., New York.**—A multiwhirl oil cooler that is used for the cooling of oil in turbine bearings, reduction gears, or quenching oil used in heat treatment.

**Ackland Specialty Co., Springfield, Mass.**—A screw driver which it is claimed will remove any rusted screw which could not be budged by an ordinary driver.

**The Baird Pneumatic Tool Co., Kansas City.**—An arch flue and pipe bender that is adapted for bending into difficult shapes, locomotive or marine arch flues, also airtight connections used under regular freight or passenger cars.

**The Mattison Machine Works, Rockford, Ill.** — An automatic stroke belt sander. This machine automatically moves the sand belt across the surface.

**Hercules Manufacturing Co., Portland, Oregon.** — A horizontal key seating machine in which the work holding face plate is secured to one end of the machine, and may be tilted to accommodate pieces with tapered keyways.

**The R. S. Whitney Co., Lewiston, Maine.** — A safety repair jack which is designed to meet all classes of car, truck, and tractor repair work.

**Carl Pletz & Sons, Cincinnati, Ohio.** — A screw press that is adapted for the straightening of shafts, bending bars or shapes, pressing in bushings, etc.

**Universal Boring Machine Co., Hudson, Mass.** — A special lubrication system has been arranged for on all machines turned out by this company.

**The National Engineering Co., Sarnia, Ont.** — A line of tool stands, racks, and stools especially adapted for all types of manufacturing plants.

**The Aetna Foundry and Machine Co., Warren, Ohio.**—A machine designed for use in tinning heavy sheets used in the manufacture of milk can bodies.

**The Logansport Machine Co., Logansport.**—A new line of air chucks with duplex control mechanism.

**The Superior Collett Chuck Company, Grand Rapids.**—A new type of collett chuck for drilling machines.

**The Eastern Tube & Tool Co., Brooklyn, N.Y.** — A new line of machine centre points made of high speed steel for insertion in any mild steel shank.

**The Ryerson-Conradson Co., Chicago, Ill.** — A vertical attachment of the semi-universal type. This attachment can be fitted to the ways of the millers. A universal dividing head is also part of their new developments.

**Square D. Co., Detroit.**—A lever safety attachment for side presses. This device is arranged to protect the hands of the operator. The press throws a clutch which brings down a shield, thus protecting the operator.

**Canadian Desmond Stephan Mfg. Co., Hamilton.** — This concern produces a full line of emery wheel dressing tools. They also handle industrial diamonds.

**Bellevue Industrial Furnace Co., Detroit, Mich.** — A semi-automatic twist drill grinder which is arranged for two, three, and four-lip right and left hand drills.

**The Standard Meter Co., Ltd., Toronto, Can.** — Two different types of coal oil lamps that are used for brazing and other kindred jobs. These lamps are said to be both wind and rain proof.

**Augustine-Bacon Manufacturing Co., Kansas City, Mo.**—A reversible driving chuck that is said to grip the stock when running in either direction.

**D. F. Dunham, Los Angeles, Cal.**—A valve grinder is so arranged that a valve face can be ground accurately, even should the valve centre be mutilated.

**J. H. Williams & Co., Brooklyn, N. Y.**—A new line of

Falcon wrench that has a wide range of applications and is particularly adapted for piping installation.

**S. P. Rockwell, Syracuse, N.Y.**— Hardness tester. Machine consists of cast frame and plunger. A vertical, movable chuck holds the piece to be tested. Piece to be tested is raised until coming in contact with testing point.

**The Ingersoll-Rand Co., Sherbrooke, Que.** — Several new tools have been added to their pneumatic lines, these to be known as "Little David" tools.

**The Lovejoy Tool Co., Inc., Springfield, Vt.**—A new line of turret tool holders.

**The Graphoscope Development Co., New York.** — A moving picture apparatus especially designed for the use of salesmen.

**The U. S. Tool Co., Newark, N.J.**—A line of subpresses for various classes of stamped work.

**The Westinghouse Electric and Mfg. Co., Philadelphia, Pa.**—An electric welding outfit which is mounted on a portable truck.

**The Automatic Transportation Co., Buffalo, N.Y.**—A lifting and tiering truck. This truck will pick up and elevate loads to any desired height up to 6 ft.

**The Hamilton Tool Co., Hamilton, Canada.**—A combination chuck and collet. A patented tool that is designed for use in the rapid interchange of drills, reamers, counterbores, etc., on any machine without stopping the machine. The chuck is fitted with Morse taper shank to fit the machine spindle.

**The James Buckley Co., Montreal, Que.**—A new type of tool holder, known as the both way tool holder. This holder is said to be especially for planers or shapers.

**The Climax Company, Montreal, Que.** — A line of belt fasteners, belt lacing machines, and packing. The fasteners are of wire construction and can be laced into the belt either by machine or with a simple hammering tool. The packing is used in extremes of temperatures or pressure such as are sometimes experienced in refrigeration work or rods of pumps of every description. It is claimed that this packing never burns, and does not harden or crystallize.

**Daniel C. Reid, Philadelphia, Pa.** — An ellipsograph. This instrument is claimed to draw all kinds of ellipses and ovals, from 1½ inches up to 12 inches major axis.

**The Joseph T. Ryerson & Son, Chicago, Ill.** — A line of wire nail machines.

**The Sutherland Machine Shops, Omaha.**—A cylinder and boring machine. This small machine will fit on the bed of any lathe, from 14-inch to 24-inch swing, and can be used on either open head or closed cylinder blocks.

**M. H. Derringer, Philadelphia, Pa.**—A special tool holder for lathe use.

**The Link Belt Co., Chicago, Ill.**—A safety mechanical overload release which is especially adaptable for elevating, conveying, and power transmission machinery.

**The D. & M. Guard Co., Rochester, N.Y.**—A safety guard used on any type of punch press.

**The Wahlstrom Tool Co., Brooklyn, N.Y.**—An automatic tapping attachment which is claimed to speed hand tapping. Steel gears provide an oscillating movement, the backward movement clearing the chips. No springs are used, the movement being absolutely mechanical.

**The Berg Burner Co., Brooklyn, N.Y.**—A new design of burner for the burning of oxo-hydrogen gas, automatically produced from oil and water. The burner will operate in any position, and is designed to consume cheap distillates or refined oils.

**The Kent Machine Co., Kent, Ohio.**—A semi-automatic two-spindle pointer. This machine is used for pointing bolts and rods up to three-quarter in. diameter.

**The Cincinnati Ball Crank Co., Cincinnati, Ohio.**—A compression coupling for use on shafts between 15 16ths, and 3 inches.

**J. Merey, Chicago, Ill.**—A marking machine known as a stampograph. This is a rotary machine for lettering and numbering and can be used on any soft metal.

**Guldager and Jantch Co., Detroit, Mich.** A device for the holding of indicators when used on large square with a blade from 2 to 3 inch in width.

**The W. S. Rockwell Co., New York.**—A new line of ship yard angle and plate heating furnaces. Angle heating furnaces are of double end construction, permitting the charging and heating of the material from both ends. Plate heating furnaces have doors of exceptional weight and capacity, and to facilitate opening and closing, are mechanically operated. These furnaces are generally built for oil or gas fuel, although coal may be used if desired.

**The Canadian Hauck Burner Co., Port Hope, Canada.**—A combination lead melting furnace and portable oil burner. When used as a melting furnace 200 lbs of lead or babbit can be melted in 15 min. When not used for melting lead in the pot, the burner may be detached from the furnace, and used for melting babbit out of bearings, re-babbitting, bending pipes, etc.

**The National Acme Co., Cleveland, Ohio.**—A bar pointing machine which meets the requirements of manufacturers in general. Any shaped bars can be handled in this machine and in some cases where quantities of stock are handled, two machines operating end to end are used. A one-horse power motor drives this machine and may be connected to any convenient electrical circuit.

**The Kremer Cummins Machine Co., Cleveland, Ohio.**—A mechanical belt shifter for machine cone pulleys. No part of the shifter is applied directly to the machine or to countershaft. In operating the device, the operator first shifts belt to the next smallest step of cone pulley by operating handles.

**The Dominion Welding Mfg. Co., Montreal.**—An instantaneous water heater combining various features. The burner of this heater is of special type. Those heaters are made for both the trade and domestic use.

**The Gammons-Holman Co., Manchester, Conn.** — A spiral fluted taper reamer that may be used in drilling machines. These reamers are made in all standard sizes.

**The Peerless Machine Co., Rachine, Wis.**—A drill rack that provides for the placing of drills with their points downward, the holes in this stand being drilled cleared through, each having two diameters.

**The H. H. Moore Co., Rochester, N.Y.**—A slotting attachment that can be used on planer or shaper. Will make internal shaping of any description, such as dies, jigs, gauges, keyways, etc. The attachment is made in three sizes.

**The Hunter Saw and Machine Co., Pittsburgh, Pa.**—A special tooth adjustment for inserted tooth saw blades. The arrangement permits the adjustment of one or more teeth independent of the others.

**The Manhattan Machine and Tool Works, Grand Rapids, Mich.** — A four-point screw press that is operated by a special rachet action. The capacity of this press is 80 tons.

**The Wallace Supplies Mfg. Co., Chicago, Ill.**—A machine for the bending of cold bars to any desired shape. The machine will also bend various sizes of pipes.

**The Beard Pneumatic Tool Co., Kansas City.** — A Staybolt cutter that is said to have a strength capable of clipping off staybolts up to 1⅛ diameter at the rate of 1 200 per hour.

**The Eclipse Counter-Bore Co., Ltd., Walkerville, Ont.**—A full line of holders, pilots, core drills, countersinks, counter bores, cutters, and special tools.

**The Roberts Mfg. Co., New Haven, Conn.**—A line of unit jacks and bolt couplers. A surface gauge connection is arranged to work in conjunction with these jacks.

**The Brown Instrument Co., Philadelphia, Pa.**—A new compensated heatmeter. This instrument embodies various new features.

**Edward A. Robinson Co., Montreal.**—An automatic grease cup which when once filled and pressure is applied, the feeding process is constantly maintained until all grease has been delivered to the bearing.

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## Selling and Cutting Prices

THE Montreal Daily "Star," in a recent edition, makes use of the words: "It must be remembered, too, that lower prices will stimulate buying." It may be that this referred only to certain lines of merchandise that pass over the counter. It could not refer to selling in general, because the facts are against any such theory having a chance to prove correct.

Start back with the automobile business, the first to put up the price reduction sign. Ford started the business, and in a few weeks car makers, all over the country, irrespective of what their cost sheets told them, were quoting new selling prices. Some orders came in as a result, but it was dealer business, and the ultimate buyer has not come into the market yet as a result of the price reduction. The dealer is loaded up with cars, but the cutting of the price of automobiles did nothing at all toward promoting real, genuine sales to car users. If it had any influence at all, Ford's own big plant would not now be standing idle in Detroit with the workers clamoring for the use of that plant in order that they might make cars for their own use.

Neither could the "Star's" statement be applied with truth to the great field of machine tools, where investments run into very large amounts. When a man goes out to buy machinery he does so because he is going to make something with that machinery. He does not buy because it is cut in price. The "Star" would not put in a new press to-day or a new battery of linotypes because there was a cut rate on. They would put these things in only on one condition, viz., that they had need of them.

The steel market is another case. Prices have been reduced, and yet buying is less. Non-ferrous metals have been riddled as far as their high war marks are concerned and yet to-day they are a drug on the market. Low prices will not sell them.

The "Star's" claim that lower prices stimulate buying should be interpreted in very narrow confines. In some lines of foodstuffs and wearing apparel this may be true, but in the great field of iron, steel, machine tools and equipment in general, it has very little significance.

## Making Income Reports

ACCORDING to reliable information, a number of small shops, some of them in the machinery business, have neglected to make out their reports for the purpose of the income department assessment.

The general excuse is that they do not consider they have a business large enough to make them liable for purposes of the income tax, and therefore they send in no report.

The safest way is to make out the report in full and let the department do the thinking as to whether or not the proprietor is liable to taxation.

Write off a fair amount for depreciation, not more than you are entitled to and not more than you can substantiate in fact if you are called upon to do so.

This paper discussed the matter with the proprietor of a small machine shop, who stated that making out the income tax report was the best piece of business he had ever undertaken: "It gave me an idea of my own affairs that I never secured in any other way. Before I was taking too much for granted, and it was a surprise to learn that some departments that I thought were my best money-makers were not far removed from being cripples. It made me a great deal more keen on collections and on making every department toe the mark. It was a good day for me when I started making out my reports."

This advice is intended, of course, for the smaller plants, for as a rule, the larger concerns have a system that takes care of all these matters.

Remember, the onus for making the returns is placed upon the individual. Do not imagine that you can sit back and wait for the Government authorities to come around and dig you out.

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In December 30 issue we published three pages of brief items regarding machine tool developments. The two pages to follow are a few more that Canadian Machinery has covered during the past year. The tools included are of the miscellaneous type.

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Canadian Machinery takes this opportunity of thanking its many friends who forwarded Christmas and New Year's messages during the holiday season. Never before has there been such rare taste in the selection of suitable cards and designs for the sending of holiday greetings. The work, from a technical point, was splendid, and the friends of Machinery are to be congratulated upon patronizing the best print shops in the country, for in no other place could such work be turned out. We thank all heartily who have so remembered our publication.

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Right at the start of the New Year would be a good time to start some serious study—get headed in one direction. Get on one set of rails and go ahead. The man who does things well will be employed while the tinker is around waiting for something to turn up.

---

The cost of living in Canada was 163 per cent. above 1913 in May of 1920. At December first this had come down 15 per cent. And every decline means that our dollar is getting to look more like a real, respectable, honest-to-goodness dollar should look.

# *Take Advantage of This Situation*

MR. MANUFACTURER: Just a word or so with you.

You are not particularly busy at the plant this month. It may be that part of the works are closed down, and you are not sure when they will reopen.

It may be that you are running part time and trying to make the availbale work spread over as far as possible in the interests of your employees.

However, all that does not make much difference. Here is the point:

Was everything all right in the shop when it was running full blast a few months ago? Were there any operations that you had in mind to make inquiries about?

Were there some pieces where the cost sheets showed that it was taking more time and more money to produce in your plant than in others?

Were there not some old machines on the line that had served their day and generation? They had been written off in depreciation some years ago, and still you hammered away with those old plugs, always saying that just as soon as things let up a bit you intended to replace them with something more in keeping with the rest of your outfit. Yes, that's all true. Well now—

Why not take all these matters up with your machine tool dealer now when he has a chance to talk seriously with you, and to give you the service that he could never do were he busy with orders and shipments. The truth is he has time now to give some real attention to your case.

By real attention we do not mean a hurried visit with a grip under his arm and some blue prints, circulars and order forms chucked in his pocket.

We mean this: Ask the engineering department of any good machine tool firm to show you where improvements could be made in your method of production.

Don't let the dealers get away from you too easy. They have often told you that they had machines that would pay you to put in your plant. You were making money then, perhaps, and you were not interested. Most men, when they see the returns coming along all right, are not inclined to worry much about some little old machine that is kind of run down at the heels. It is working, and the results are coming, so there it ends.

But these dealers have told you they could show results that would save money for you?

They have taken blue prints of your work, perhaps, and submitted figures showing just what could be done. But you were busy then and the thing didn't have a chance to get across.

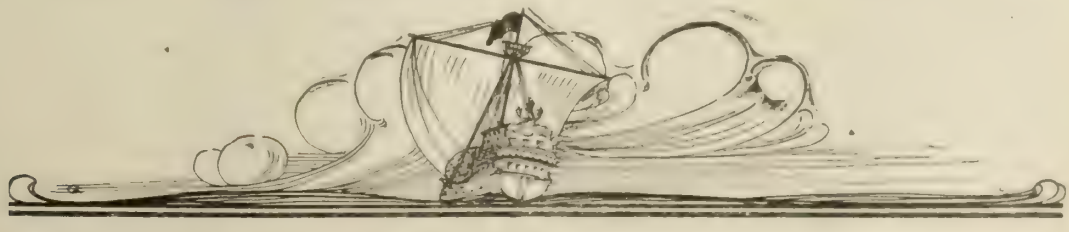
Your plant is not going to be idle long. It is going to start and run again soon, perhaps overtime as well as regular days. You are going to meet stiff competition—harder in many lines than you have ever met in the past.

Your big chance is going to be in having equipment just as good—perhaps a little better—than any other firm in your line of business. Certainly you cannot afford to take a chance in entering into competition with the world with a second-rate equipment. Don't depend on tariffs and adverse exchange rates to keep out foreign-made goods. Get your plant in such shape that your costs will be on a competitive basis with the best of them.

Now remember—machine tool firms have the time to attend to you now, and, what's more, they are in the mood to do it. Get them to show you where they can save money for you with their equipment. If they can put up a good money-saving proposition to you, you are going to be interested. If you are not, then your place is not in the manufacturing business in this day and generation.

Take advantage of the fact that it is a buyers' market. Make use of the service the machine-tool builders have at their disposal for a technical analysis of your manufacturing problems.

Right now is a remarkably good time to take a look over your whole equipment and weed out the weak spots.





# MARKET DEVELOPMENTS



# Believe The Worst Has Happened in Market

## Any Change Now Should be for the Better—Change is Being Made in Pig Iron—Other Prices Stay Much the Same—Buyers Not Coming Into the Markets at Any of the Centres

THE year 1921 starts off quiet in the machine tool, iron and steel markets. Dealers are not expecting a renewal of buying at once, but a number of them will go as far as saying that conditions are not getting any worse, and from this they reason that the peak of the trouble has been reached. Cancellations have been asked for in a number of instances, but the majority of these have not been granted.

One Canadian mill has started one of its bar mills in operation this week. This will roll largely for stock. Buffalo mills are in here making a strong bid for bar iron material just now, and the Canadian mill is called upon to meet this competition. Sheets are selling in fairly large quantities, but the best business just now is being done in tubes.

The Corporation mills continue to roll steel at about 92 per cent. of their capacity, while many of the independents are idle. Pittsburgh reports have many guesses regarding the matter of wages, the one carrying most weight being that wages might be cut right now by some of the independents were they not afraid that a reduction in wages would lead to a demand on the part of the buyers for cheaper steel.

New York reports that machine tool makers are not bulging yet in regard to their selling schedule for 1921. Makers probably realize that in the present temper of the market a reduction in price would not bring in any new business. Dealers in this district agree that this is the case, holding that when machine tools are wanted, they are bought almost regardless of any reduction in price.

The scrap metal trade continues in the slump. It has been there for many weeks now and little trade is being done. The larger yards persist in their attitude not to buy anything except enough to cover their contracts.

# QUIET OF HOLIDAY SEASON IS STILL IN MONTREAL MARKET

Special to CANADIAN MACHINERY.

MONTREAL, Que., Jan. 6.—Industrial adjustment in the nature of wages and working conditions, promises to be a feature throughout the coming weeks. It is not that industry has had a bad year financially, but rather that high wages must be diluted in some degree to conform to the new analysis required to maintain well balanced trading throughout the coming and succeeding years. In establishing this new industrial formula it is essential that the component ingredients be carefully selected and arranged before doses in large volume can be administered, but when in a condition for regular and advanced treatment, the convalescent period of invalid industry will be ushered in to the tune of greater activity in every line of manufacture.

### Looking for Summer Activity

The coming of the new year has not opened up any new channels of interest in steel circles, apart from the fact that dealers are far from being cast down by the existing quiet character of general business. The great bulk of steel demand, just now, is for urgent need only. so that consumers are not overstocked with supplies of any kind. Most of the mills are operating light so that surplus stocks are not over-abundant. This condition promises well for an early return to normal activity when the trade and the public generally feel that the hour has arrived for geting back into working harness. "The past year has been filled with many interesting features, and while the latter months have caused us some anxiety, we have never been discouraged, realizing that some such depression must come sooner or later before trading could be returned to a sound working basis, a condition that has not existed since the middle of 1914." "The intervening years," continued the dealer," have passed by with conditions more or less of an artificial nature, intermixed with excessive demand and abnormal price fluctuations, but never with the assurance of permanency, either in the way of production or in the cost of materials. It is necessary, therefore that the irregularities of industry, liquidation or mutual adjustment of high priced goods, better regulation of wage scales and working conditions, should be arranged to suit the changing circumstances. We are now carrying sufficient supplies in warehouse to meet all requirements of the trade, but are not overloading ourselves, for the reason that the present lull is prevalent throughout the country, and that all activity is more or less in repose." It would appear that dealers are not expecting any heavy buying before March at the earliest, but many are anticipating a fairly active period before the summer months are far advanced. All price quotations are of a nominal character and unchanged. Further revision downward is not unlikely.

### Tool Trade Very Quiet

The machinery trade seems to be facing a period of comparatively light buying, as a result of the unsettled state of trade, and the tendency on the part of many manufacturers to curtail operations while industry is adjusting itself to its changing surroundings. Purchasing agents, in many cases, are instructed to buy conservatively during this period of transition, and in consequence it is often difficult to secure their business interest, let alone an order for equipment. Many, however, intimate that their normal needs are under-supplied, and a renewal of general activity would mean additional or renewed equipment.

More than ordinary attention has been given recently to the clearing out of existing stock, which, in many instances, was acquired at higher figures than could be obtained for similar tools at the present time. Some dealers are fortunate in having small stocks on hand, while others are carrying considerable equipment purchased during the past year or two, much of which, however, was secured in bulk, so that a lot of it could be sacrificed and still leave the dealer with a small profit. The holiday weeks provided a quiet period for many dealers and the volume of business was comparatively low for most houses, some of which had their men off the road for the entire week.

**Active Period May Follow Lull**

"We may as well be out of business for all we are doing just now. However, we must take the rough with the smooth, and as the past several years have enabled us to weather a short period of depression, we are content to carry on at a slight loss, in the expectation that the year will not be far advanced before things begin to right themselves. For the present prices may as well remain where they are, although a revision would result in lower quotations." This statement from a dealer here indicates the extent of trade in old materials, but the passiveness is counteracted by the belief that business will show a gradual picking up after a few more weeks of slow trading.

## POINTS IN WEEK'S MARKETING NOTES

**There is no change in the scrap metal situation, yards still reporting little being done in any line. Many of them are still out of the market for any non-ferrous lines.**

—

**A new price on pig iron is being brought out, which will show a reduction.**

—

**Buffalo firms are making a bid for the bar iron trade in this district. Another bar iron mill was put in operation by the Steel Co. of Canada this week.**

—

**Tubes continue in good demand, but the price remains unchanged.**

—

**The Steel Corporation mills continue to operate at 92 per cent. of capacity, while most of the independents are down.**

—

**Machine tool dealers in the district have no intimation of new prices by the makers.**

—

**Pittsburg claims that some of the steel mills would cut wages, but fear such a move would lead to a demand on the part of consumers for cheaper steel.**

## QUIET WEEK IN TORONTO TRADE

**No Intimation Given of Intention to Make Reductions in the Selling Schedules**

TORONTO.—Although it is generally anticipated that trade will improve soon, it is hardly to be expected that a change would be felt in the first few business days of the year. Trade is quiet in nearly all lines, and buying for the most part is confined to actual wants. If a firm can do without a machine tool or an order of steel, it is being done without, and it might also be added that in some cases if they can do without paying promptly for anything or everything they secure they are following the same policy.

Dealers say they have no intimation of any change in selling schedules on which to work this year. It might have been expected that new prices would have come out around the first of the year. It is reported that some of the makers have still on hand fairly large stocks of raw materials, and they feel that until they have worked these out they should not make any material reduction in prices. It is also doubtful whether there would be any advantage from a reduction in price at this time. As a general thing, when a man buys a machine tool he does so because he has some definite purpose in view—he is going to make something, and the matter of a few hundred in price would neither drive him from the market nor bring him into it.

There are some inquiries in the market now. They are, for the most part, rather small, and consist of replacements or minor additions to existing plants.

Small tools are selling also on the hand-to-mouth policy, and the whole territory is being worked for all available business. There are few firms carrying any very large supplies of small tools, and the low rate of operations in many cases justifies this position, and offers no good reason why a firm should change its attitude.

**The Steel Market**

Bar Iron.—There is a fairly heavy stock of bar iron in the warehouses of this district. Buying is not very brisk yet, but mills are working putting in stock for the buying they expect to come later on. Steel Co. of Canada started a bar mill running this week, which has been down for some time past. The mills at Buffalo are making a strong bid to get into this district, and they are offering prices at times that make it very plain they are out to secure business. The Canadian firms, therefore, are under the necessity of meeting this competition. Bars are quoted for prompt delivery from stocks at 4.75c per pound.

Sheets.—The demand for sheets has continued fairly strong this season, and the weather has helped in this to some extent. The open season has the effect of allowing outside work to go ahead. Stocks held at present are fair, but were a buying movement of any size to start, the merchants would soon have to come into the market in order to secure supplies. The one sheet mill in this district is fairly well supplied with orders, which should keep it in operation for a couple of months yet.

Plate.—Demand very light at present, and has been for some weeks owing largely to falling off in shipbuilding in this district. Warehouses are quoting 5.50 to 6c, and delivery can be made on short order.

Tubes.—There is a good trade being done in tubes. The price is still holding the same, and remains well above the pre-war list. It is about the last item to show real strength, and so far is the hold-out of the market in the matter of reduction.

## AS A WHOLE 1920 WAS A GOOD YEAR FOR U.S. MACHINE TOOL TRADE

Special to CANADIAN MACHINERY.

NEW YORK, Jan. 6, 1921.—The year just closed has been a very profitable one for the machine-tool industry of the United States notwithstanding the unsettled conditions of the past few months. In the first half of the year business was exceptionally good. The period of activity in buying started about the middle of 1919 and continued almost without interruption until May or June, 1920. In April the railroad strike occurred and later there was the coal strike, both of which created a shortage of steel and coal and made it impossible for some plants to work at full capacity. Coincident with these factors was the tightness of money. As a result, the period of cancellations began about the middle of 1920, though there was also a good share of new business at the same time. Some manufacturers and dealers had a satisfactory trade almost to the end of September, taking into account both orders and shipments.

At the beginning of 1921 some machine-tool manufacturers find themselves in a rather unsatisfactory position. Many of them have been left with large stocks of high-priced pig iron, steel, castings and other machine-tool parts. If they were to take too large a loss on this inventory it would seriously [illegible]

financial condition, despite the large profits which they have made in the last few years. One plant is said to have $1,000,000 in capital tied up in such raw or partly finished material. It becomes a serious problem just how to meet the evident expectations of buyers of lower prices on tools. With few exceptions, machine-tool manufacturers have not made reductions, but fear that they will be obliged to do so within the next 30 or 60 days. One engine lathe manufacturer announced a 12½ per cent. cut, effective January 1, but, generally, the builders are still holding out for the same prices as have prevailed throughout the greater part of 1920. An occasional concession is heard of, particularly when dealers are competing for business. Such concessions usually come out of the dealer's commissions.

Some business is expected to develop during the first two or three months of the new year, but it is not likely that there will be any rapid recovery in buying. In some quarters it is thought that most all of 1921 will be quiet as compared with the business that was done in 1919 and 1920. There is a considerable amount of dormant business—that is, the inquiries have been sent out in recent weeks, but buying has been postponed. Whether a goodly share of this prospective buying will materialize remains to be seen.

# MAY HAVE TO MAKE MORE PRICE CHANGES TO CONVINCE BUYERS

Special to CANADIAN MACHINERY.

PITTSBURGH, January 6.—Mills that closed in the latter part of December are not resuming this week to any great extent. Resumption hinges upon the accumulation of orders, whether strictly new business, specifications against old contracts or releases from suspensions, and the accumulation has been very slow. A change in conditions is requisite to enable the independents to operate at any considerable rate, and while such change has been predicted in most quarters as likely to occur after January 1, the change can hardly be expected in the first few days of the new year.

As to the United States Steel Corporation, it continues to operate up to the physical limit, and with a few additional blast furnaces blown in during the past two months, on account of supplies of coal and coke being improved, the corporation's operations are somewhat heavier than for many months, at about 92 per cent. of capacity, measured in steel making units in operation.

With the corporation operating at 92 per cent., there is an ingot production at the rate of fully 21,000,000 tons a year, and at an estimate of 20 per cent. for the independents, counting, of course, those that are closed entirely, there is 6,000,000 tons more, making 27,000,000 tons altogether, there is production at about 65 per cent. of the 42,000,000 ton average rate obtaining during the first nine months of 1920, when the demand for steel was regarded as remarkably heavy. Considering the stagnation prevailing almost everywhere, one would suppose that consumption of steel had decreased by more than one-third. If so, the prospect for the immediate future is not heavier production, but lighter production. It would be necessary to account for the present production, and it seems quite possible that some of the steel being shipped by the Steel Corporation is going to replenish stocks.

### Prospects for Consumption

Obviously it is a question of when the ultimate consumer will take hold. It is not a question directly of when the fabricating shops, car shops, machinery manufacturers, bolt, rivet and nut makers, spike manufacturers, agricultural implement makers, producers of cold finished steel bars, and the various other "manufacturing consumers" will decide to buy steel from the mills, but a question when the customers of these steel consumers will themselves be disposed to buy. The manufacturing consumers will buy only as they see a market for their various finished products.

The readjustment the country is now undergoing is of course chiefly a readjustment in prices for materials and services. Consequently it is not enough for mill prices of rolled steel products to be readjusted. There must be readjustment in prices all along the line down to the ultimate consumer. Assuming for the sake of argument that mill prices have been readjusted adequately, it is a fact that prices of manufactured goods have not in all cases been readjusted in keeping. The manufacturing consumer cannot stand between the steel mill and the public and put in his own pocket the reduction the steel mill makes. To illustrate, at the top of the last price movement before the war, culminating late in 1912, steel bars reached 1.40c, while standard railroad spikes reached 1.85c. Merchant bars, as now equalized between the Steel Corporation and independents, are 2.35c, which is 67 per cent. advance. Assuming for argument that this extra price is justifiable, there is the condition that when, recently, spikes declined to 3.65c, they were regarded as readjusted, but they are 97 per cent. above the 1.85c price. If the spike makers cannot "afford" to sell at less than 3.65c, then there is something wrong with their costs and the country will wait until they have readjusted those costs.

### Pipe Gets in Line

The year 1920 in the finished steel market ended nicely by the independent market on steel pipe coming down on the last day, for under date of December 31, 1920, the Republic Iron & Steel Company issued a new card showing the same discounts as in the Industrial Board schedule of March 21, 1919, the card to which the United States Steel Corporation has uniformly adhered all this time. The other independents will necessarily have to do likewise and it is an unimportant detail what dates their revised cards may carry. The reduction is from a basing discount, on ¾ to 3-inch, of 54 per cent. to a basing discount of 57½ per cent., making $7 a net ton change.

Pipe was the remaining item in the regular steel mill products to be adjusted. The independent price on tin plate came down to the Steel Corporation price of $7 per base box, 100-pound, about the middle of November. On November 26 bars, shapes and plates came down to the Steel Corporation or Industrial Board prices of 2.35c, 2.45c, and 2.65c, respectively. November 29 wire and nails came down to 3.25c for wire and $3.25 for nails, and a few days later sheets came down to 3.55c for blue annealed, 4.35c for black and 5.70c for galvanized.

Thus the whole round trip of independent steel prices was made just within the limits of the calendar year 1920. It is true that late in 1919 the independents in certain lines were quite generally securing prices above the Steel Corporation or Industrial Board prices, but those prices could be regarded simply as containing delivery premiums, the mills not being willing to sell and the buyers not being willing to buy for any distance ahead. It was after Chairman Gary of the Steel Corporation made his statement, December 30, 1919, that the corporation would not advance its prices, that the independents saw that they would really have to "go it alone" and then they regarded their advance prices as regular prices, not as premium or temporary prices.

### Prospective Steel Prices

In view of the fact that there is not likely to be any general buying movement in steel products in the near future, say not earlier than three months hence, steel manufacturers would prefer it to be assumed that present prices represent the prospective bottom, but the fact may as well be stated plainly that this is not the more likely prospect. The balance of probabilities is that the low point in steel prices, on which the market will eventually turn and from which it will stiffen, will be lower than the present level, say from 2.00c to 2.20c for bars, shapes and plates. If such prices come, they will not be developed soon. There is no incentive for a mill to name such close prices unless, or until, it sees an opportunity to fill up fairly well and thus obtain an economical operation.

As to wages, reductions by independents' mills have not been proceeding nearly as fast as seemed likely two or

three weeks ago. The majority of independents are holding off, awaiting a further reduction in the cost of living and also being desirous that the present plant idleness may have its full moral effect both upon workmen and the retail stores they patronize. Some mills, too, attach much importance to the theory that immediately upon wage reductions being made steel buyers would expect lower prices for steel.

At the opening of business this week a large valley pig iron producer announced its willingness to sell basic iron at $30 and Bessemer iron at $32, valley, thus recording declines of $3 in each grade from the previous nominal quotations. Foundry iron, formerly quotable at $35, valley, is not plainly marked at any price, but will have to readjust itself to no more than a moderate spread above basic.

# EDMONTON STANDS AT GATE OF NEW COUNTRY AWAY TO NORTH

A. M. FRITH, secretary of the Edmonton Board of Trade, writing to this paper of conditions in that centre during 1920, says:—

Commercial development in Edmonton during 1920 has been very pronounced. In addition to a considerable number of new firms, which have been established in the city, both manufacturing and distributing, many important additions have been made to plants and warehouses already established.

One of these is the erection of a nine storey warehouse for Marshall Wells, Alberta, Ltd., this building being the largest warehouse devoted to one line in western Canada, outside of Winnipeg. It is expected that the building will be ready for occupancy about December 1st. It will be one of the most complete and best equipped buildings of its kind in the country.

Work has also been started on an addition to the already large warehouse of Revillon Wholesale, Ltd. The plans for this building will make it, when completed, the largest commercial warehouse in the Dominion, with 11 acres of floor space, a frontage of 350 feet by 150 feet in depth, nine storeys high. Another important development is the erection of a new factory for the North West Biscuit Company at a cost of $500,000. This company is already the second largest exclusive biscuit factory in Canada and the new building will have double the capacity of that at present occupied.

Perhaps the most important development in the commercial life of Edmonton during the year has been the acquisition by lease of the Edmonton, Dunvegan and British Columbia Railway by the C.P.R. The inevitable result of this will be a very greatly improved service to the Peace River and Grande Prairie countries, followed by a great influx of settlers and business men to that fertile region of which Edmonton is the natural distributing centre. A great number of new settlers have gone into the Peace River country this year, and from present prospects this number will be very materially increased in 1921. Enquiries regarding Peace River are coming from all parts of the United States and the Old Country and no less than 2,000 soldier settlers have been located on farms in that district during the last few months. It is a fact that by far the greatest number of soldier settlers have taken up land in Alberta, this Province leading by a big margin all the other Provinces in Canada. Over $13,000,000 has been authorized by the local office of the Soldiers' Settlement Board for advances to soldiers, for the purchase of land, livestock or farm machinery.

Another important factor in the commercial development of Edmonton is the extensive work being conducted by many strong companies in the oil fields of Northern Alberta. Chief among these is the Imperial Oil Company, the Union Oil Company and some syndicates financed by British capital. The operations of the former have resulted in the discovery of oil at Fort Norman on the Mackenzie River. Oil was discovered at a depth of about 600 feet and further drilling will be done in that vicinity next spring, those in charge of the work being convinced that oil will, within a short time, be found in large quantities. In view of the urgent need of petroleum and its vital place in industry at the present time, the particular significance of this discovery and the operations leading to the development of further oil deposits will be apparent.

Edmonton, however, will depend in the future, as it has in the past, very largely upon the development of the rich agricultural land in Central and Northern Alberta. Greater attention is being given all the time to the possibilities for wealth in mixed farming in this district. This is seen in the steadily increasing value of farm lands and the growing demand, particularly on the part of Americans from the bordering States, for improved farms in this territory. During the year a large number of American farmers, most of them with an ample supply of capital, have purchased improved farms and from the enquiries which are being received it is evident that this number will be very greatly increased.

With the timber resources of this Province practically untouched, with one-seventh of the total known coal deposits of the world within its borders and the consequent possibility of an unlimited suppy of cheap power, it seems inevitable that an extensive industrial community will be established by which the markets of the western Provinces will be supplied from this city or district.

In view of all these developments, therefore, it must be stated that the future prospects for Edmonton have never been better than they are at the present time, and business men with one accord are extremely optimistic in respect to prospects for greatly increased business during 1921.

# CANADA NINE DAYS AWAY FROM JAPAN

**Believes Trade Could Be Developed That Would Be to the Interest of Dominion**

A summary of an article in a recent edition of the Trade Bulletin from Ottawa, gives the following:

Canada's place in the future development of Japan should be studied. Many things are in our favor. We are the nearest of all western nations to Japan. Vancouver is to-day nine days from Yokohama and San Francisco is 20. This is due largely to the excellence of Canadian ocean service. Canada must put herself more firmly on the business map. A better cable service and a national news service is necessary.

Japan is developing very rapidly and her needs are many. In Japan it is the age of building. Many of the roads of Japan are execrable, but the growth of interprovincial transportation has brought forward the subject of state developed trunk roads, and it is even now under consideration. Herein lie openings for Canadian road-making machinery, and timbers, and later for the increased importation of bicycles, automobiles and accessories. In the renewing of the Japanese cities, there is market for Canadian steel and iron, for nails and bolts, iron pipes and wire, and all wood and iron working machinery. Agricultural implements will be in demand, for the wages in the cities will inevitably drain the cheap labor from the rural districts.

**Hopeful for 1921.**—The annual travelers' convention of the Ontario Wind Engine & Pump Company, Toronto, manufacturers of Toronto farm equipment, was held at the head office of the company. Every traveller felt optimistic concerning business in 1921. Many thought that the volume of sales would exceed 1920, which in itself was a record year. In support of their contention they stated that farmers were swinging over from the buying of luxuries to the buying of necessities, and it was predicted that spring would bring some healthy buying; also the farmers were figuring on planting a large acreage in 1921.

# SELECTED MARKET QUOTATIONS

**Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.**

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $39 96 |
| Lake Superior, charcoal, Chicago | 53 50 |
| Standard low phos., Philadelphia | 44 79 |
| Bessemer, Pittsburgh | 41 96 |
| Basic, Valley furnace | 37 50 |
| Toronto price:— | |
| Silicon, 2.25% to 2.75% | 51 50 |
| No. 2 Foundry, 1.75 to 2.25% | 50 00 |

## IRON AND STEEL

| Per lb. to Large Buyers | Cents |
|---|---|
| Iron bars, base, Toronto | $ 4 75 |
| Steel bars, base, Toronto | 4 75 |
| Iron bars, base, Montreal | 4 50 |
| Steel bars, base, Montreal | 4 50 |
| Reinforcing bars, base | 5 50 |
| Steel hoops | 6 00 |
| Tire steel | 5 00 |
| Spring steel | 8 00 |
| Band steel, No. 10 gauge and 3-16 in. base | 5 50 |
| Chequered floor plate, 3-16 in. | 8 50 |
| Chequered floor plate, ¼ in. | 8 00 |
| Bessemer rails, heavy, at mill | .... |
| Steel bars, Pittsburgh | 3 00-4 00 |
| Tank plates, Pittsburgh | 3 50 |
| Structural shapes, Pittsburgh | 3 00 |
| Steel hoops, Pittsburgh | 3 50-3 75 |
| F.O.B., Toronto Warehouse | |
| Small shapes | 5 50 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 3 62 |
| Structural shapes | 3 72 |
| Plates | 3 67 to 5 50 |
| Small shapes under 3" | 3 62 |

## FREIGHT RATES

Per 100 Pounds.

| Pittsburgh to Following Points | C.L. | L.C.L. |
|---|---|---|
| Montreal | 58½ | 73 |
| St. John, N.B. | 84½ | 106½ |
| Halifax | 86 | 108 |
| Toronto | 38 | 54 |
| Guelph | 38 | 54 |
| London | 38 | 54 |
| Windsor | 35 | 50½ |

## METALS

| | Gross. Montreal | Toronto |
|---|---|---|
| Lake copper | $19 00 | $19 50 |
| Electric copper | 18 50 | 19 00 |
| Castings, copper | 18 00 | 19 00 |
| Tin | 44 00 | 46 00 |
| Spelter | 8 50 | 9 00 |
| Lead | 7 50 | 8 00 |
| Antimony | 8 00 | 9 00 |
| Aluminum | 34 00 | 35 00 |

Prices per 100 lbs.

## PLATES

| | | |
|---|---|---|
| Plates, 3-16 in. | $ 5 50 | $ 5 50 |
| Plates, ¼ up | 5 00 | 5 50 |

### PIPE—WROUGHT

**Standard Buttweld Pipe**

Per 100 Ft.

| | Steel Blk. | Steel Galv. | Gen. Wrought Iron Blk. | Gen. Wrought Iron Galv. |
|---|---|---|---|---|
| ⅛ | $ 6 50 | $ 8 50 | $..... | $..... |
| ¼ | 5 31 | 7 41 | 5 91 | 8 01 |
| ⅜ | 5 31 | 7 41 | 5 91 | 8 01 |
| ½ | 7 10 | 8 63 | 7 95 | 9 42 |
| ¾ | 8 80 | 10 87 | 9 95 | 12 02 |
| 1 | 13 01 | 16 07 | 14 71 | 17 77 |
| 1¼ | 17 60 | 21 74 | 19 90 | 24 04 |
| 1½ | 21 04 | 25 99 | 23 79 | 28 74 |
| 2 | 28 31 | 34 97 | 32 01 | 38 67 |
| 2½ | 44 75 | 55 28 | .... | .... |
| 3 | 58 52 | 72 29 | .... | .... |
| 3½ | 74 06 | 90 62 | .... | .... |
| 4 | 87 75 | 107 37 | .... | .... |

**Standard Lapweld Pipe**

Per 100 Ft.

| | Steel Blk. | Steel Galv. | Gen. Wrought Iron Blk. | Gen. Wrought Iron Galv. |
|---|---|---|---|---|
| 2 | $32 01 | $ 38 67 | $35 71 | $42 37 |
| 2½ | 48 26 | 58 79 | 54 11 | 64 64 |
| 3 | 63 11 | 76 88 | 70 76 | 84 53 |
| 3½ | 75 90 | 92 46 | 85 10 | 101 66 |
| 4 | 89 93 | 107 55 | 100 83 | 120 45 |
| 4½ | 1 05 | 1 29 | 1 30 | 1 54 |
| 5 | 1 22 | 1 50 | 1 52 | 1 80 |
| 6 | 1 58 | 1 95 | 1 97 | 2 33 |
| 7 | 2 06 | 2 53 | 2 53 | 3 01 |
| 8L | 2 16 | 2 66 | 2 66 | 3 16 |
| 8 | 2 49 | 3 07 | 3 07 | 3 64 |
| 9 | 2 98 | 3 67 | 3 67 | 4 36 |
| 10L | 2 77 | 3 41 | 3 41 | 4 05 |
| 10 | 3 56 | 4 39 | 4 39 | 5 21 |

**Prices—Ontario, Quebec and Maritime Provinces**

## WROUGHT NIPPLES

4" and under, 60%.
4½" and larger, 50%.
4" and under, running thread, 30%.
Standard couplings, 4-in. and under, 30%.
Do., 4½-in. and larger, 10%.

## OLD MATERIAL

Dealers' Average Buying Prices.

Per 100 Pounds.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $10 50 | $10 50 |
| Copper, crucible | 13 00 | 12 00 |
| Copper, heavy | 12 50 | 12 00 |
| Copper wire | 12 50 | 12 00 |
| No. 1 machine composition | 13 00 | 12 00 |
| New brass cuttings | 7 00 | 9 00 |
| Red brass turnings | 10 00 | 10 00 |
| Yellow brass turnings | 7 00 | 7 50 |
| Light brass | 5 00 | 5 00 |
| Medium brass | 6 50 | 6 00 |
| Scrap zinc | 5 00 | 5 50 |
| Heavy lead | 5 25 | 5 60 |
| Tea lead | 2 50 | 3 00 |
| Aluminum | 16 00 | 16 00 |

| | Per Ton | Gross |
|---|---|---|
| Boiler plate | $11 00 | $12 00 |
| Heavy melting steel | 18 00 | 23 00 |
| Axles (wrought iron) | 25 00 | 20 00 |
| Rails (scrap) | 18 00 | 18 00 |
| Malleable scrap | 20 00 | 25 00 |
| No. 1 machine cast iron | 32 00 | 33 00 |
| Pipe, wrought | 8 50 | 10 00 |
| Car wheel | 30 00 | 33 00 |
| Steel axles | 20 00 | 20 00 |
| Mach. shop turnings | 8 00 | 9 00 |
| Stove plate | 23 00 | 25 00 |
| Cast boring | 8 00 | 12 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, 7-16 and up | +10 |
| Carriage bolts, ⅜-in. and less | Net |
| Coach and lag screws | —15 |
| Stove bolts | 55 |
| Wrought washers | —25 |
| Elevator bolts | +10 |
| Machine bolts, 7-16 and over | +10 |
| Machine bolts, ⅜-in. and less | +10 |
| Blank bolts | Net |
| Bolt ends | Net |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | +25 |
| Machine screws, fl. and rd. hd., brass | net |
| Machine screws, o. and fil. hd., brass | net |
| Nuts, square, blank | +25 add $2 00 |
| Nuts, square, tapped | add 2 25 |
| Nuts, hex., blank | add 2 50 |
| Nuts, hex., tapped | add 3 00 |
| Copper rivets and burrs, list less | 15 |
| Burrs only, list plus | 25 |
| Iron rivets and burrs | 40 and 5 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, O. & R., bright | 75 |
| Wood screws, flat, bright | 77½ |
| Wood screws, flat, brass | 55 |
| Wood screws, O. & R., brass | 55½ |
| Wood screws, flat, bronze | 50 |
| Wood screws, O. & R., bronze | 47½ |

## MILLED PRODUCTS

(Prices on unbroken packages)

| | Per Cent |
|---|---|
| Set screws | —20% 25 and 5 |
| Sq. and hex. hd. cap screws | 12½ |
| Rd. and fil. hd. cap screws | plus 25 |
| Flat but. hd. cap screws | plus 50 |
| Fin. and semi-fin. nuts up to 1-in. | 12½ |
| Fin. and Semi-fin. nuts, over 1 in., up to 1½-in. | —5 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2-in. | +12½ |
| Studs | +5 |
| Taper pins | —12½ |
| Coupling bolts | +40 |
| Planer head bolts, without fillet, list | +45 |
| Planer head bolts, with fillet, list plus 10 and | +55 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | +60 |
| Collar screws | list plus 20, 30 |
| Thumb screws | 40 |
| Thumb nuts | 75 |
| Patch bolts | add +85 |
| Cold pressed nuts to 1½ in. | add $1 00 |
| Cold pressed nuts over 1½ in. | add 2 00 |

## BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $60 00 |
| Open-hearth billets | 60 00 |
| O.H. sheet bars | 76 00 |
| Forging billets | 56 00-75 00 |
| Wire rods | 52 00-70 00 |

Government prices.

F.O.B. Pittsburgh.

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails, base | $5 75 |
| Cut nails, vase | 6 70 |
| Miscellaneous wire nails | 50% |

## ROPE AND PACKINGS

| | |
|---|---|
| Plumbers' oakum, per lb. | 0 10¼ |
| Packing, square braided | 0 38 |
| Packing, No. 1 Italian | 0 44 |
| Packing, No. 2 Italian | 0 36 |
| Pure Manila rope | 0 29 |
| British Manila rope | 0 28 |
| New Zealand hemp | 0 23 |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | net |

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | $ 0 27½ |
| Solder, guaranteed | 0 29½ |
| Soldering coppers, lb. | 0 62½ |
| White lead, pure, cwt. | 20 35 |
| Red dry lead, 100-lb. kegs, per cwt. | 15 00 |
| Gasoline, per gal., bulk | 0 42 |
| Pure turp., single bbls., gal. | 3 15 |
| Linseed oil, raw, single bbls. | 2 37 |
| Linseed oil, boiled, single bbls. | 2 40 |
| Wood alcohol, per gal. | 4 00 |
| Whiting, plain, per 100 lbs. | 3 00 |

### CARBON DRILLS AND REAMERS

| | |
|---|---|
| S.S. drills, wire size | 40 and 5 |
| Can. carbon cutters, plus | 10 |
| Standard drills, all sizes | 40 and 5 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 and 5 |
| Bit stock | 50 |
| Ratchet drills | 10 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 50 |
| Sleeves | 50 |
| Taper pin reamers | 25 off |
| Drills and countersinks | net |
| Bridge reamers, carbon | 50 |
| Centre reamers | 5 |
| Chucking reamers | net |
| Hand reamers | 10 |
| High speed drills, list net to plus | 20 |
| Can. high speed cutters, net to plus | 10 |
| American | plus 40 |

### COLD ROLLED STEEL

[At warehouse]

| | |
|---|---|
| Rounds and squares | $7.50 base |
| Hexagons and flats | 7.50 base |

### IRON PIPE FITTINGS

| | Black | Galv. |
|---|---|---|
| Class A | 70 | 85 |
| Class B | 30 | 40 |
| Class C | 20 | 30 |

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 8 50 | $ 9 00 |
| Sheets, blue ann., No. 10 | 7 00 | 7 50 |
| Canada plates, dull, 52 sheets | 13 00 | 13 00 |
| Can. plates, all bright | 14 00 | ..... |
| Apollo brand, 10¾ oz. galvanized | .... | .... |
| Queen's Head, 28 B.W.G. | 13 00 | ..... |
| Fleur-de-Lis, 28 B.W.G. | 12 50 | ..... |
| Gorbal's Best, No. 28 | .... | .... |
| Colborne Crown, No. 28. | .... | .... |
| Premier, No. 28, U.S. | 10 00 | 11 00 |
| Premier, 10¾-oz. | 10 50 | 11 40 |
| Zinc sheets | 16 50 | 20 00 |

### PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

### ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

**Prices per 100 lbs.**

### FILES AND RASPS

| | Per Cent. |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 32½ |
| Black Diamond | 27½ |
| J. Barton Smith, Eagle | 50 |
| McClelland, Globe | 50 |
| Delta Files | 20 |
| Disston | 40 |
| Whitman & Barnes | 50 |
| Great Western-American | 50 |
| Kearney & Foot, Arcade | 50 |

### BOILER TUBES.

| Size. | Seamless | Lapwelded |
|---|---|---|
| 1 in. | $27 00 | $..... |
| 1¼ in. | 29 50 | ..... |
| 1½ in. | 31 50 | 29 50 |
| 1¾ in. | 31 50 | 30 00 |
| 2 in. | 35 00 | 30 00 |
| 2¼ in. | 35 00 | 29 00 |
| 2½ in. | 42 00 | 37 00 |
| 3 in. | 50 00 | 48 00 |
| 3¼ in. | .. .. | 48 50 |
| 3½ in. | 63 00 | 51 50 |
| 4 in. | 85 00 | 65 50 |

Prices per 100 ft., Montreal and Toronto

### OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | ..... |
| Royalite, per gal., bulk | 28 |
| Palacine | 31 |
| Machine oil, per gal. | 58 |
| Black oil, per gal. | 27 |
| Cylinder oil, Capital | 1.01 |
| Petroleum fuel oil, bbls., net | 19 |

### BELTING—No 1 OAK TANNED

| | |
|---|---|
| Extra heavy, single and double | 6½ |
| Standard | 6½ |
| Cut leather lacing, No. 1 | 2 00 |
| Leather in side | 2 40 3 00 |

### TAPES

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES

| | |
|---|---|
| Polishing wheels, felt | $4 50 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, Turkish | 8¾ |
| Pumice, ground | 06 |
| Emery glue | 30 |
| Tripoli composition | 9½ |
| Crocus composition | 12 |
| Emery composition | 11 |
| Rouge, silver | 64 |
| Rouge, powder, nickel | 38 |

Prices per lb.

### ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | .08½ |
| Grits, 80 and finer | .6 |

### BRASS—Warehouse Price

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 30 |
| Brass sheets, 24 gauge and heavier, base | 0 38 |
| Brass tubing, seamless | 0 42 |
| Copper tubing, seamless | 0 44 |

### WASTE

| | | | |
|---|---|---|---|
| XXX Extra | .23 | Atlas | .19 |
| Peerless | .22 | X Empire | .18½ |
| Grand | .21½ | Ideal | .18 |
| Superior | .21½ | X Press | .17 |
| X L C R | .20 | | |

**Colored**

| | | | |
|---|---|---|---|
| Lion | .16 | Popular | .12 |
| Standard | .14 | Keen | .10 |
| No. 1 | .14 | | |

**Wool Packing**

| | | | |
|---|---|---|---|
| Arrow | .35 | Anvil | .22 |
| Axle | .28 | Anchor | .17 |

**Washed Wipers**

| | |
|---|---|
| Select White | .20 |
| Dark colored | .09 |
| Mixed colored | .10 |

**This list subject to trade discount for quantity.**

### RUBBER BELTING

Standard ... 10% Best grades... 15%

### ANODES

| | |
|---|---|
| Nickel | .55 to .60 |
| Copper | .38 to .40 |
| Tin | .70 to .70 |
| Zinc | .16 to .17 |

**Prices per lb.**

### COPPER PRODUCTS

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | $35 00 | $37 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 40 00 | 44 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 43 00 | 46 00 |
| Copper sheet, planished, 16 oz. base | 47 00 | 50 00 |
| Braziers', in sheets, 6 x 4 base | 39 00 | 42 00 |

### LEAD SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $10 50 | $14 50 |
| Sheets, 3½ lbs. sq. ft. | 10 25 | 14 00 |
| Sheets, 4 to 6 lbs. sq. ft. | 10 00 | 13 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS

| | |
|---|---|
| Acid, boracic | $ .23 |
| Acid, hydrochloric | .04¾ |
| Acid, nitric | .11 |
| Acid, sulphuric | .04½ |
| Ammonia, aqua | .15¾ |
| Ammonium, carbonate | .23 |
| Ammonium, chloride | .22 |
| Ammonium hydrosulphuret | .75 |
| Ammonium sulphate | .30 |
| Arsenic, white | .16 |
| Copper, carbonate, annhy | .41 |
| Copper, sulphate | .13 |
| Cobalt, sulphate | .20 |
| Iron perchloride | .62 |
| Lead acetate | .30 |
| Nickel ammonium sulphate | .20 |
| Nickel carbonate | .32 |
| Nickel sulphate | .20 |
| Potassium sulphide (substitute) | .40 |
| Silver Chloride (per oz.) | 1.15 |
| Silver nitrate (per oz.) | 1.10 |
| Sodium bisulphate | .13 |
| Sodium carbonate crystals | .04 |
| Sodium cyanide, 127-130% | .39 |
| Sodium hyposulphite per 100 lbs | 9.00 |
| Sodium phosphate | .15 |
| Tin chloride | .30 |
| Zinc chloride, C.P. | .30 |
| Zinc sulphate | .08 |

**Prices per lb. unless otherwise stated**



# INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES



## ENGINEERING

The High School Board, Burlington, Ont., is planning the erection of a school costing $75,000.

The Electro-Foundries, whose building was destroyed by fire recently, will be rebuilt at once.

Phillips Steel & Wire Co., St. Patrick street, Montreal, are erecting a warehouse costing $7,500.

The Royal Bank of Canada are erecting a bank in the spring at Dodsland, Sask., at a cost of $10,000.

The erection of an oil-distributing warehouse is being planned by the McColl Bros., Regina, Sask.

Tenders will be called in a short time for the erection of a high school to cost $200,000 for Board of Education, London, Ont.

The Cecil Investment Co. are contemplating at an early date the erection of a $1,000,000 hotel at 22 Sparks street, Ottawa, Ont.

Plans are being prepared for a tourist hotel costing $300,000 at Kelowna, B. C. Tenders will probably be called in the spring.

A factory building will be erected on Dawes Road, Toronto, at a cost of $38,000, by Andrew Buchanan and Sons, Glasgow, Scotland.

The Farmers' Co-operative Packing Co., St. Boniface, Man., plans to erect a cold storage addition to their plant there. The estimated cost is $200,000.

A by-law will be submitted to the ratepayers early in January, authorizing construction of a memorial hospital to cost $37,000 for Perth Memorial Hospital Board.

The American firm of Steel Sash, Ltd., have established a Canadian branch at London, Ont. Machinery is being installed and manufacture will commence early next month.

The Prov. Govt. Dept. Pub. Works, Toronto, are planning the erection of a new administration and office building, costing $1,500,000. Estimates will probably be presented at next sitting of Legislature.

Application will be made to the Parliament of Canada at the next session for an act to incorporate a company under the name of the Mackenzie River Petroleum Co., Ltd., with the powers incident to the production of oil and natural gas and the marketing and transportation, except by rail.

## SEVERAL CHANGES MADE IN THE SELLING FORCE OF JOHN MORROW CO.

THE management of John Morrow Screw & Nut Co., Limited, Ingersoll, Canada, has taken advantage of the holiday season to reorganize the company's selling force.

The company has established at 489 St. Paul street west, Montreal, an office and warehouse. This branch will be in charge of F. J. McCarty. Mr. McCarty is an experienced tool maker, and has had, in addition, a large business experience, having been intimately and favorably known to the trade of the Montreal territory for several years past. The services of Mr. McCarty and his staff will be exclusively devoted to the interests of the customers of John Morrow Screw & Nut Company, Limited, and the Ingersoll File Company, Limited, for which the Morrow Company are the sole distributors.

In Central Ontario a change has also been made. J. C. Adams, Toronto, now represents the Morrow Company in this territory. He, too, has the advantage of having had actual shop training. After leaving the bench he was for several years connected with the Vokes Hardware Co., Toronto, and since being demobilized from the Royal Air Force has been in the service of one of Canada's largest manufacturing concerns. He will devote his time exclusively to the work of the John Morrow Screw & Nut Company, Limited, and Ingersoll File Company, Limited.



J. C. ADAMS

H. P. Stoneman, assistant general manager, is at present in western Canada completing arrangements whereby the Morrow Company will be adequately represented on the Prairies and the Pacific Coast.

In an interview with a representative of this publication the other day, J. F. MacKay, who assumed the duties of vice-president and general manager of the company on November 1st last, stated that the Morrow Company has been running at capacity practically throughout the entire year, sales showing substantial increases over the corresponding months of the previous year.

Mr. MacKay further stated that from orders already on the company's books, and from inquiries being received daily, he was of the opinion it would be a matter of but a few weeks when the full equipment and force of the company would again be required to keep up with the demand.

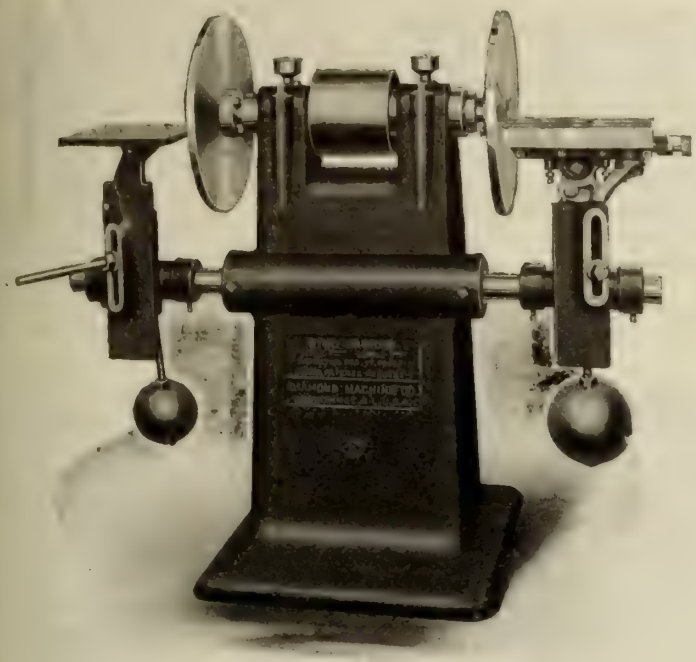
In an interesting letter addressed by the company to each employee at the close of the year, the announcement is made that by means of a bonus system inaugurated one year ago the wages of every employee—excepting the executive officers—has been increased by 22½ per cent. during the year, and that the total amount so distributed was over $77,000. The same system will be continued for some time to come.

---

A large uptown restaurant is being planned in the vicinity of Avenue Road and Bloor St., Toronto, by Col. McLean, proprietor of the Venetian Gardens in Montreal.

Plans for the construction of a power plant on Green River next spring for the development of from 2,000 to 2,500 h.p. are being made by the Madawaska Light and Power Co., St. John, N.B.

The Billings and Spencer foundry at Welland has been closed for a readjustment of business. The notices which were posted up stated that all employees were free to seek employment elsewhere.



# DIAMOND
## DISC GRINDERS

Good grinding in fast time has made the Diamond popular in a host of shops. The right design and build eliminate vibration and give the operator a perfect surface every time. There is a suitable size and equipment for every surface grinding job you have. Workmanship and material of "Diamond" quality throughout.

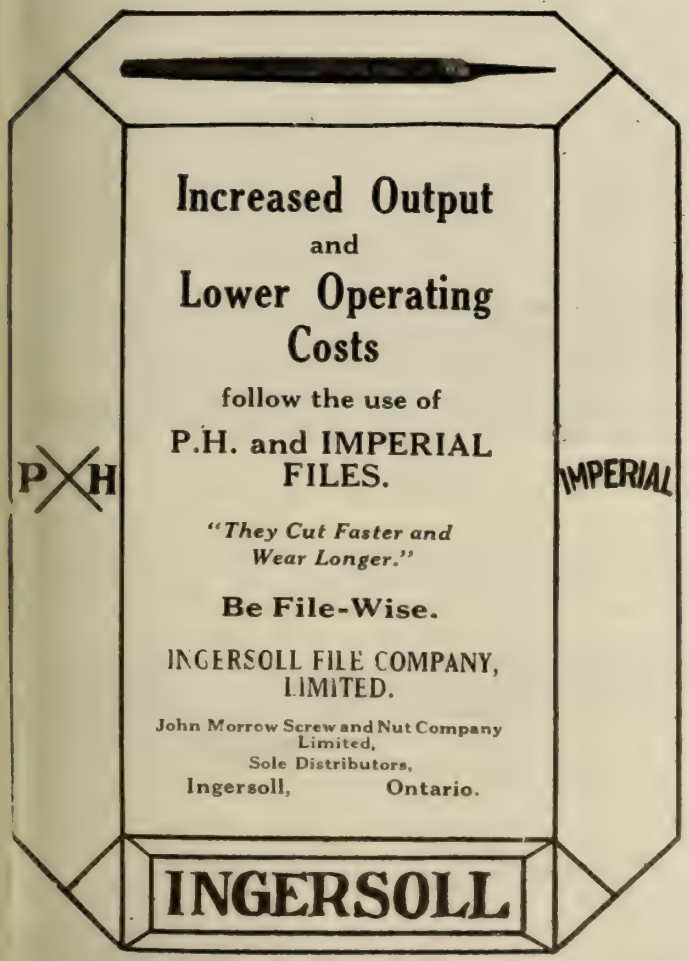
May we send you catalogue?

**The A. R. Williams Machinery Company, Limited**

ST. JOHN, N.B.
WINNIPEG, VANCOUVER

*If It's Machinery, Write "Williams"*

64 Front Street West
TORONTO







HIGH SPEED STEEL
INTRA STEEL GIBRALTAR STEEL
Tool Steel for Every Purpose
Swedish Lancashire Iron

Twist Drills, Taps, Hack Saw Blades. Milling Cutters, Files, Etc., Music Wire for Springs, Steel Balls. Cold Rolled Tool Steel in Strips and Sheets, Circular Saws, Machine Knives.

**PILOT STEEL & TOOL COMPANY,**
LIMITED
332 St. James Street, Montreal

*Sole Agents for*

JONAS & COLVER, LIMITED
Nove and Continental Steel Works, Sheffield, Eng.

H. BOKER & CO., Inc.
New York, N.Y.

*If interested tear out this page and place with letters to be answered.*

# FINDS GERMAN GOODS NOW SELLING IN BRITISH MARKET

MR GEORGE A. MARSHALL, of Marshall Son & Bunney, and also connected with the Canadian Association of British Manufacturers, has returned from an extended trip to England, making a survey of the steel and cutlery districts. Mr. Marshall found a good many instances where German-made goods were being sold in London in direct competition with British made.

"It is surprising the way in which German goods are coming back into the markets," said Mr. Marshall, in discussing the matter with Canadian Machinery. "Dealers tell me that when it comes to a sale and the difference of price is in favor of the German article, the sale will follow the price. Germany, according to all reports I could gather, is recovering very rapidly, and it is largely due to the efforts of the working people, whereas in England the labor market is still indifferent, to say the least. The attitude of the workers is greatly changed from the time when I was last over in 1914, and it seems impossible to get anything like the production returns of the former days, while the rate of wages is still very high. There is of course considerable unemployment, but even that does not seem to have made much difference in the rate of wages."

Living is still high in England, no matter what lines are purchased. Merchants in many cases are making much higher profits than they ever did in days before the war, and thy are fighting to retain the margin of profit.

"The war effort of the Old Country was too great for the people there to stand in many cases," is Mr. Marshall's belief. He recalled several families that had been shattered by the inroads of the war, and the remaining members, fathers and mothers in several instances, were nervous and physical wrecks, the strain having been more than they were able to bear.

Some lines of industry have found it difficult to get under way because there were such enormous stocks piled up from the days of the war, especially in lines of tool steel.

Mr. Marshall called on a number of firms whose goods he handles in Canada, and was also a visitor at the headquarters of the Association of British Manufacturers and their agents, finding that body in a very prosperous state, and developing a large amount of world-wide trade.

"But Toronto looks good to me," concluded Mr. Marshall. This paper was the least bit surprised to hear such an admission from such a staunch Britisher, and such a lover of England. "I was really very glad to get back to Canada, and I tell you Toronto is a lovely city and a fine place to live."

### Firms Want to Establish Trade Relations With Canada

Information regarding the following lines can be obtained by communicating with this paper and mentioning key numbers:

2594, Bright Nuts and Bolts.—A Manchester firm inquires for manufacturers of bright nuts and bolts who are in a position to export. Samples and prices are requested.

2595, Colliery Rails and Tubs.—A Manchester firm are open to consider offers of colliery rails and tubs.

2596, Castings.—A Manchester firm are in the market for malleable iron and steel castings.

2597.—Gasolene Farm Engines.—A Japanese firm of agricultural implement importers in the Hokkaide are anxious to hear from Canadian manufacturers of gasolene engines. The firm is at pres ent importing from the United State but would be glad to give preferenc to Canadian manufacturers. The siz most is demand is 1¾ horsepower mod with magneto ignition, adaptable eithe to gasolene or kerosene, but all sizes u to 8 or 10 horsepower are importe Catalogues and c. i. f. prices are re quested immediately.

2600, Asbestos.—A Nottingham fir are open to consider offers of fibre an sheet asbestos, washers and packings.

2601, Graphite.—A Nottingham fir would like to receive prices and sample of any Canadian graphite that may b on offer.

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A memorial arch is being contemplate by the pupils and graduates of the Roy al Military College, Kingston, Ont., t the memory of the many cadets and ex cadets that fell during the war. Est mated cost, $60,000.

# FIRST QUARTER BUSINESS IN 1921 WILL BE ABOUT AT PRESENT LEVELS

THE prediction which we ventured to make a year ago has been largely verified by the course of the market itself. Owing to the disorganized condition of the American railroads, even after their return to the management of their respective companies, deliveries of material were for a long time uncertain. This has now been practically overcome and conditions more or less normal can now be said to prevail.

The coal situation, which was almost in the nature of a famine, resulted in high prices prevailing for iron and steel products during the greater part of the year. While it was evident that prices would eventually come down, it was not until the month of October that the prevailing wave of deflation made its influence felt in iron and steel. Since then premium prices have almost disappeared, and the year closes with quotations on the majority of iron and steel commodities at the level of prices instituted by the Industrial Board of the United States in 1919. The United States Steel Corporation is now rapidly overtaking its old contracts, and is starting to ship freely to this market.

There has been a marked absence of buying both in the States and Canada during the past month and as a result some of the mills in the States are only in partial operation, while others are closing down until sufficient orders accumulate to warrant their starting up again. In the meantime buyers are refraining from placing contracts and are purchasing only what their absolute needs demand.

Under prevailing circumstances it is very improbable that there will be any advance in present price levels during the first quarter of 1921. On the other hand, when the time arrives that the United States Steel Corporation is in a position to handle prompt shipment business, it may be decided that a reduction in wage costs is necessary, with the view of reducing prices in an orderly fashion and so preventing any individual price cutting. Reduction in wages must necessarily be gradual, as the cost of living goes down, and it will, therefore, be a long time before the pre-war standard of prices on iron and steel commodities will be reached. Our view is that for the first quarter of 1921 prices will remain at about their present level.

Business generally in Canada has been good throughout the year. There is no reason to doubt that this will be reflected in the balance sheets of all the large producing companies. Most of them have wisely laid up sufficient reserves to tide them over a period of deflation and they are thus in a position to meet the present quietness without anxiety. There has been no speculation and no undue inflation and consequently nothing in the nature of a collapse is possible.

J. T. McCALL,
President and General Manager,
Drummond, McCall & Company, Limited.

Dec. 30, 1920.

# OUR FRIENDS

## THE GREAT POPULARITY OF GEOMETRIC SCREW CUTTING TOOLS HAS BROUGHT THEM TO US

Thousands of Screw Machine users have come to know The Geometric Tool Company through the perfect work performed by the Geometric Automatic Adjustable Die Heads and Collapsing Taps.



**Connecticut Section of the A.S.M.E., Guests at the Works of The Geometric Tool Company**

A demonstration of the efficiency of Geometric Tools was made. You can make a like demonstration right in your own shop. Let screw thread cutting be the most satisfactory operation there.

## THE GEOMETRIC TOOL COMPANY

**NEW HAVEN . CONNECTICUT**

*Canadian Agents :*

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B., Halifax, N.S.
Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

*If interested tear out this page and place with letters to be answered*

# NUMBER OF NEW FIRMS GOT A START IN BRANTFORD IN 1920

REVIEWING the progress made in Brantford during the year 1920, W. H. Wood, managing secretary of the Chamber of Commerce states:—

During the year 1920 the following large concerns commenced production in the Brantford plants:—

Robbins and Myers, of Springfield, Ohio., manufacturers of fractional horsepower motors, fans and other small electrical appliances.

J. & J. Cash, Inc., with plants in Norwalk, Conn., and Coventry, England, manufacturers of woven names.

S. C. Johnson & Sons of Racine, Wis., manufacturers of floorwax, stains, wood finishes and freeze-proof, carbon remover, cleaner, polish, etc., for automobiles.

The Wm. Sparling Co., of Toronto, Ontario, and the H. K. Ferguson Co., of Cleveland, Ohio., construction engineers, opened offices in the telephone city to care for their contracts in this part of the province.

The McClary Stove Company, of London, Ont., purchased the Wm. Buck Stove Company, and have greatly increased production in their Brantford plant.

The Williams Tool Corporation of Canada, Limited, manufacturers of pipe threading machinery, amalgamated with the J. H. Hall & Sons plant. The Williams people are from Erie, Pa., and are caring for their Canadian trade as well as that formerly held by the Hall Co., from their Brantford plant.

The Brantford Emery Wheel Co., Ltd., is now the Canadian plant of the Waltham Grinding Wheel Co., of Waltham, Mass.

The Brantford Computing Scale Co., Ltd., are now a million dollar concern, and are completing their excellent new factory, which will soon be occupied and make it possible for them to meet the demands of their business as well as to care for their new lines.

The Dominion Flour Mills, Limited, are now occupying an excellent new red pressed brick mill which was erected in the fall of 1920.

The Cockshutt Plow Co. again increased their immense plant by the addition of a large smithy.

The A. C. Spark Plug plant is completed, which, with over sixteen acres of land, has been purchased outright by the General Motors Corporation.

The Brantford Brass Foundry Company has commenced production.

The Brantford Machine & Tool Co. has been taken over by a new textile company.

Ham Brothers, manufacturers of refrigerators, bee keeper's supplies, screen doors, kitchen cabinets, have made another large addition to their plant.

The Blue Bird Co., manufacturers of electric washing machines, and household electrical appliances, are also securing production.

The Ontario Portland Cement Co., headquarters at Brantford, are now constructing their plant at Beachville, Ontario.

Several other industries from the United States are looking quite favorably upon the telephone city as being the centre which meets the requirements considered when seeking a location. There are now a score of United States concerns who have their Canadian plants in Brantford.

## PERSONAL

George Wedlake, general manager of the Cockshutt Plow Co., Brantford, was elected mayor in the civic elections this week, having a majority and a plurality as well. The result was a remarkable tribute to the esteem in which Mr. Wedlake is held in the community. He has been on the Hydro Commission of that city for some years. Mr. Wedlake has been with the Cockshutt Plow Co. for many years, starting there as a molder, and working his way on up to the position of general manager. Mr. Wedlake has a plain and direct method of talking to men, and when he gives his word on a point it is accepted as as good as finished already. Mayor-elect Wedlake should be able to serve his city well.

A permit has been granted to the Imperial Oil, Ltd., for the erection of a steel warehouse, storage tanks and stables on the corner of Market and Water Sts., Gananoque, Ont.

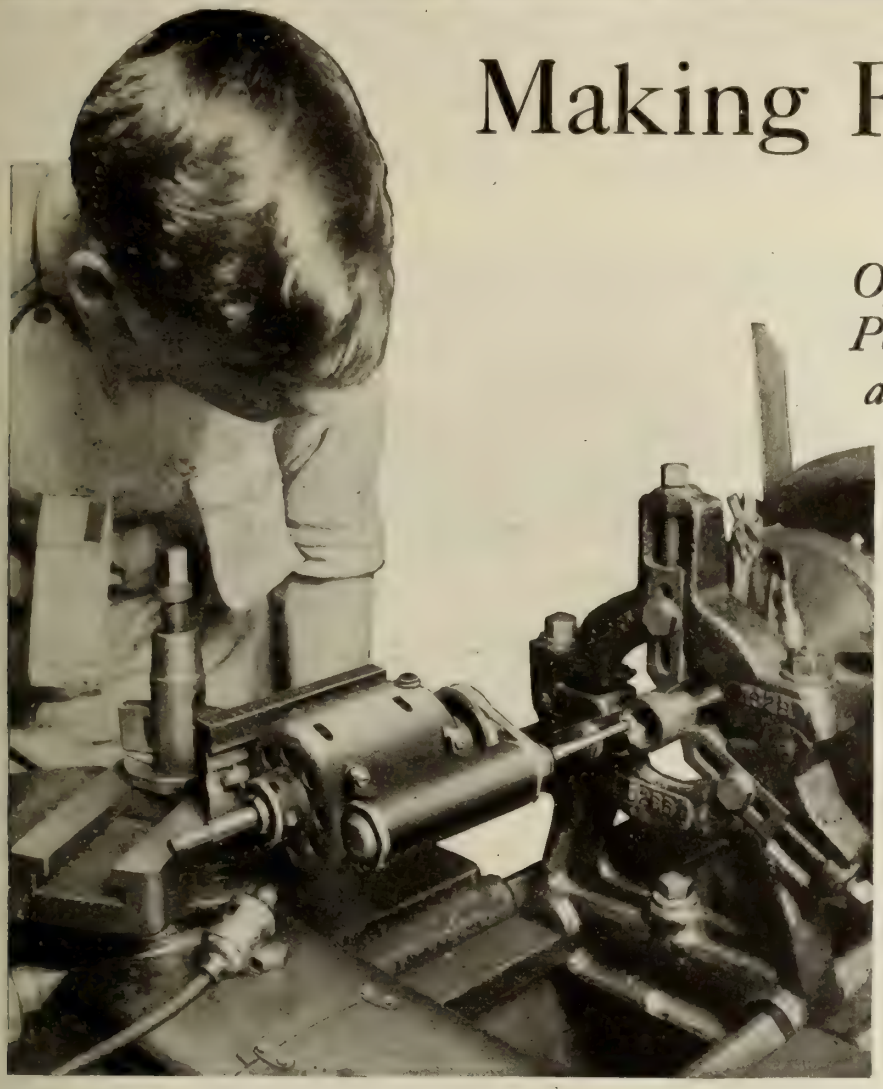
**Tenders Called.**— Tenders are called up to January 11, for building a bridge over the Burlington Channel, Ont. The structure is to be single leaf Strauss trunnion bascule. Address R. C. Desrochers, Ottawa, from whom blue prints can be secured.

A company has been formed under the name of the British Columbia Steel Works, Ltd., by the amalgamation of the Port Moody, Eburne and Tudhope Electrical plants. Each of these plants will continue to operate on its present location, pending concentration of all of them at Port Moody.




—Darling, in Des Moines "Register."

**Surely There Must be a Better Way to Gather Apples**



# Making Fine Tools

## *An Interesting Operation, Economically Performed by Means of a DUMORE Grinder*

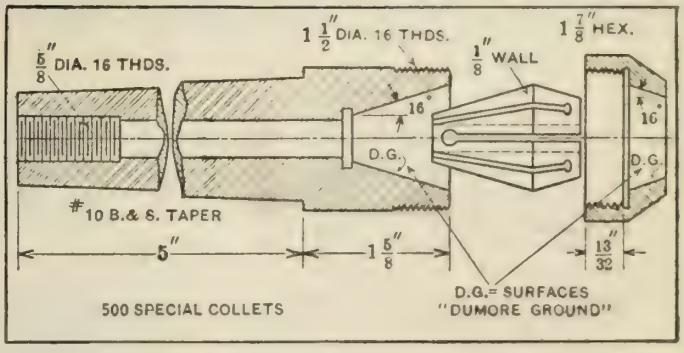
This photograph — taken at the City Engineering Company's (Dayton, Ohio) plant shows a Dumore Grinder finishing the main shank and head of a special draw-in collet. There were 500 put through in this special lot and the time for the operation shown averaged 8 minutes per piece.

The second operation; grinding the internal face of the collet nut, was also performed by this convenient precision tool.

Dumore Grinders are popular here as in every plant where fine tools are made. Their accuracy makes them useful for the finest finishing work; their simplicity and convenience make them practical for many difficult, almost inaccessible jobs.

Dumore Grinders transform any lathe into a precision grinder; they make fine finishing possible in every machine shop.

***May we tell you more about them?***




## WISCONSIN ELECTRIC COMPANY

2931 SIXTEENTH STREET - - RACINE, WISCONSIN

# DUMORE HIGH SPEED GRINDERS

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## TRADE GOSSIP

BIG EXPENDITURE.—The Toronto Harbor Commission, at its weekly meeting had the estimates for the next year under consideration. It is proposed to spend upwards of $4,000,000 on the completion of the Sunnyside-Humber development, including the top dressings of the boulevard and bridle paths, further extension of the industrial area in Ashbridge's Marsh and the central harbor. This will provide a great deal of work for mechanics and laborers. It is intended to have a conference with the Board of Control and City Council concerning the program early in the new year. Another suggestion is that a forward movement be inaugurated for securing new industries, as there will be abundance of electrical power available if the citizens, as they probably will do, pass the bylaw for the acquisition of the Mackenzie power interests.

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An ingenious plan was adopted for the removal of a waterworks standpipe about twenty feet in diameter and over a hundred feet high. It was surrounded so closely by buildings that it could not be felled like a tree and to build scaffolding would have been too costly. A circular platform was built slightly smaller than the inside of the pipe with empty barrels under it to give it sufficient buoyancy to float upon the water. The pipe was pumped full to begin with and as the work proceeded the water was drawn off. A gang of men upon the floating platform had an easy job of cutting off the pipe section by section by oxy-acetylene apparatus.—Compressed Air.

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A device has been invented by M. Lequex for regulating the temperature of electric furnaces. Briefly the device consists of a glass tube inclined at 30 deg. and connected at its upper end with a vessel containing a fluid which undergoes considerable dilatation under the influence of heat. The lower end of the tube connects with a vertical cylinder containing mercury in which is an adjustable piston. In the sloping tube, where the mercury enters up to a certain height, are spaced platinum contacts connected with points on the coil of a rheostat. The device is placed in the furnace, and when the latter is cold the platinum points are short-circuited by the mercury. The furnace therefore receives the full current. With a rise in temperature the liquid in the upper vessel expands and forces down the mercury, thus putting into circuit a succession of the various sections of the rheostat connected with the platinum points and diminishing the current.

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It is estimated that the proposed new nurses' home at Calgary will cost $185,000. The building will be three storeys in height and of fireproof construction.

# Explosion of an Oxygen Tank

THE accompanying engravings show some of the damage done recently by the explosion of an oxygen tank. One man was killed, a considerable number of persons were more or less seriously injured, and the property loss was large.

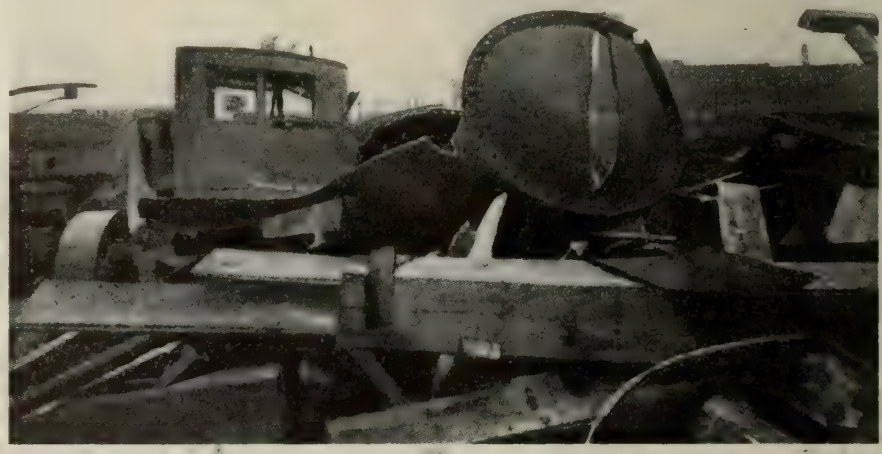


FIG. 1—EXPLODED TANK AND RUPTURED HEAD.

The tank, which was used for storing electrolytic oxygen, was about ten feet long and four feet in diameter. The shell was made of 7/16-inch plate, laid in two courses, each five feet long, and the longitudinal (or "fore-and-aft") joints were of the triple-riveted lap type, having a calculated efficiency of about 75 per cent. The upper head of the tank was convex, and the lower head was originally concave. (This method of construction is not altogether ideal, but it is reasonably safe for ordinary purposes, when a factor of safety of at least five is used by the designer.) A safety-valve was provided and adjusted to blow off at 100 pounds pressure.

The initial rupture apparently occurred in the solid plate, the line of fracture running parallel to the length of the tank, but keeping well away from the riveted joint. The shell tore away from the head at one end, and the line of rupture also followed the girth joint at the middle of the tank, so that a considerable part of one of the sheets opened out like a leaf in a book or magazine. (See Fig. 1.) In addition to this, the lower head, which was originally concave, was ruptured along one of its diameters, and its curvature was reversed so that it was convex after the accident.

The cause of the explosion is not definitely known. In connection with the



FIG. 2- GENERAL VIEW OF THE RUINS.

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Interior View of Garlock-Walker Warehouse

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There are many used machine tools included in our exhibit, a number of them just as serviceable as new tools. It will pay you to look them over, for if they suit your purpose a considerable saving will result.

Remember this: Whether you are to personally inspect our stock or not you can place confidence in our desire and ability to furnish you with tools that will give absolutely good service. We aim to always supply our customers with machines best suited for their requirements. Success in this respect accounts for our continued and ever-growing patronage.

## Garlock-Walker Machinery, Limited

334 St. James St. MONTREAL | 32 Front St. W. TORONTO | 567 Banning St. WINNIPEG

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FIG. 3—GENERAL VIEW OF RUINS.

production of electrolytic oxygen there is always a possibility of reversal of polarity occurring in the electric generator, and a consequent mixing of oxygen and hydrogen; but it is believed that this did not occur in the present case. It is far more probable, in our opinion, that the accident was due to the presence of lubricating oil in the tank. Pumps used for compressing oxygen are supposed to be lubricated with soap, or merely with water; but it is said that distinct traces of lubricating oil were found on the lower head of this tank after the explosion. The use of any true oil for lubricating purposes in connection with the compression of oxygen is always dangerous, and it appears to be highly probable (as we have already said) that this accident was due to the presence of such oil, and to its spontaneous explosive combustion. It also appears to be more than doubtful if the gas was properly tested for purity.

The exploded tank was supposed to be strong enough to require a pressure of 1,000 pounds per square inch to produce rupture,—assuming that the pressure was applied steadily and with gradually increasing intensity. In accordance with well-known mechanical principles, however, a suddenly-applied pressure of materially less magnitude might produce failure. We have no way of knowing what the actual maximum pressure may have been.

This accident, whatever its cause may have been, illustrates the reality and seriousness of the danger associated with the handling of compressed gases, and demonstrates the need of exercising great care to keep every kind of combustible matter away from compressed oxygen,—whether the combustible material be gaseous, liquid or solid.—Travellers' Standard.

## WATER POWER AND LOCATION OF PLANT

The presence of coal has been one of the most important factors determining the industrial expansion of various countries during the past hundred years or so.

This condition is gradually changing through the exhaustion of coal supplies. A recent article by G. H. Ashley, State Geologist of Pennsylvania, emphasizing the necessity of replacing coal by water-power, is particularly significant, coming from one who is well able to judge the situation in this great coal state. His statements are of special interest to Canada in view of the prediction that industrial supremacy will, eventually, pass from coal-depleted regions to areas where large water-powers are available. It is even pointed out that one way of keeping the industries where they are in the United States would be by the importation from Canada of enormous quantities of hydro-electric energy available on the St. Lawrence and at Niagara.

Mr. Ashley holds that: "The industrial East has maintained its supremacy because of cheap fuel and nearness to markets. Because of cheap fuel Pittsburgh can afford to haul iron ore from Minnesota. It does not take a seer nor even a scientist to point out that, if our present increased use of power continues, a generation will see the exhaustion of cheap fuel in the East."

"A review of the field today shows that, in several of the districts, practically all of the thick coal has been mined out, while in others it is possible to count the years to the time when the supply will be gone. It may be argued that, as the cost of coal increases, the manufacturing interests of the East will turn to water power. That argument leads to the question of the adequacy of the water-power of that region to take over the burden now carried by coal."

"In addition to the powers within the boundaries of the northeastern United States, there are large powers to the north in Canada. The St. Lawrence below the international boundary is estimated to have a potential horse-power of nearly 1,500,000, and the provinces of Quebec and Ontario have been estimated to have a maximum of 6,000,000 h.p. each, including that from Niagara and the St. Lawrence. Already 125,000 h.p. is imported into New York from Ontario, and a small amount is imported into New England. If all of the Canadian water powers were developed and Canada would allow the exportation of, say, one-half the power, or 6,000,000 h.p., it is probable that the northeastern corner of the United States could look forward to an ultimate utilization of not less than 10,000,000 to 12,000,000 water horse-power."

It need hardly be pointed out that the benefits accruing to Canada from the exportation of 6,000,000 horsepower would be relatively negligible. One large manufacturing plant using, say, 1,200 h.p., would employ more men than the water-power plants generating 6,000,000 h.p.

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A Hobart correspondent in the "Times Trade Supplement," says that the National Portland Cement Company, Maria Island, Tasmania, are sending their own engineer to the United Kingdom and America to select the most modern machinery. The whole of the plant for the first unit is expected to be delivered on the works within the next 12 months. It is stated by the secretary of the company that it is proposed to produce from 30,000 to 50,000 tons of cement per year with the first unit, the ultimate objective being 150,000 tons a year, which would be far in advance of the production of any other company in Australia at the present time.

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According to a recent statement on the position of the electrical industry in Germany, the output of the German heavy cable makers for the first half of the current year is only 30 per cent. of that of the corresponding period in 1913, while estimates comparing the second halves of these two years point to a proportion of 25 per cent. only. The output in the lamp industry last year was 70 millions of which 25 per cent. were exported, though before the war the production was much greater, and the export about one-half the total output.

---

2221. Mining Machinery.—A reliable Johannesburg firm of engineering agents are prepared to consider the South African representation of Canadian engineering plants for machinery of all kinds, engineering specialties, mining machinery and material.

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# OBITUARY

The death occurred in Montreal on December 31st of Paul Fitzgerald Brophy, mechanical and electrical engineer, at the Canadian Explosives Ltd.

D. J. Dickson, Sec.-Treas. of the James Wilson & Co., railway and steamship supplies, Montreal, died on New Year's day. Mr. Dickson had been with the company since coming to Montreal forty-five years ago.

Wilfred C. Sly, president, and George K. Fanner, vice-president of the W. W. Sly Foundry Co., Cleveland, were killed by bandits who after the hold-up escaped with the company's pay envelopes containing $4,200. The two men died instantly.

The death took place in Wellesley Hospital, Toronto, suddenly on Sunday of Sir Frank Baillie. He underwent an operation some weeks ago, and apparently was progressing favorably, when complications developed and the end came quickly. The late Sir Frank Baillie was president of Canadian Aeroplanes, a firm that turned out very good machines on short order. He was likewise president of Canadian Cartridge Co., Limited, Hamilton, and president of the Burlington Steel Company, Limited, Hamilton. The Canadian Cartridge Company was organized by him shortly after the commencement of the European war for the purpose of manufacturing cartridge cases for the British Government and, it will be remembered, that in June, 1916, he turned over to the government the sum of $758,248 profits from the manufacture of munitions. He was largely responsible for the organization of the Dominion Steel Foundry Company, Hamilton.

The Dominion Transportation Bldg., Welland, has been purchased by the Fulton Motors, H. O., 59 Yonge street, Toronto. No new building will be done until spring.

The contract for the construction of the drydock at Esquimalt, B.C., has been awarded to P. Lyall & Son. The tender was $4,300,000, which is about two millions less than the government estimate.

## FIRMS WANT TO ESTABLISH TRADE RELATIONS WITH CANADA

Information regarding the following lines can be obtained by communicating with this paper and mentioning key numbers.

2462. **Industrial Machinery.**—A British firm in Constantinople with extensive connections desires to receive particulars from Canadian suppliers of industrial machinery with a view to future developments of this trade.

2472. **Iron and Steel. Hardware, Tools, Handles and Canned Goods.**—Two African firms, one in Port Elizabeth and the other in East London, make requests for catalogue of any of the above or kindred lines from Canadian manufacturers prepared for regular deliveries.

2466. **Provisions and Foodstuffs, Machinery, Automobiles, Lumber.**—A firm in Cairo, Egypt, the head of which is a British subject and who claim long experience, are desirous of securing the agency of Canadian manufacturers and shippers, and articles suggested are: Provisions, condensed milk, meats, horses and cattle, salted and smoked fish, canned fruits, tobacco, and flax fibre, also agricultural and labour saving machinery, oil engines, automobiles, and lumber. Full list of articles and proposals on file at the Commercial Intelligence Branch, Dept. of Trade and Commerce, Ottawa.

2458. **Fencing material.**—A Johannesburg firm of importers making a specialty of iron and steel fencing material request correspondence from Canadian manufacturers prepared for regular export.

2459. **Baling Wire.**—A Liverpool firm ask for quotations on baling wire, 9 foot lengths, 14 gauge and looped one end.

2460. **Industrial machinery.**—A British firm in Constantinople desires to get in touch with Canadian exporters of industrial machinery of all kinds.

2461. **Industrial machinery.** — Three large British firms in Constantinople with extensive connections are desirous of receiving particulars from Canadian suppliers of industrial machinery of all kinds with a view to the resumption of normal trade with that centre.

2454. **Gasoline and farm engines.** — A Japanese firm of agricultural implement importers in the Hokkaide is anxious to hear from Canadian manufacturers of gasoline engines. The firm is at present importing from the United States, but would be glad to give preference to Canadian manufacturers. The size most in demand is the 1 3-4 h.p. model with magneto ignition, adaptable either to gasoline or kerosene, but all sizes up to 8 or 10 h.p. are imported. Catalogues and c.i.f. prices are requested immediately.

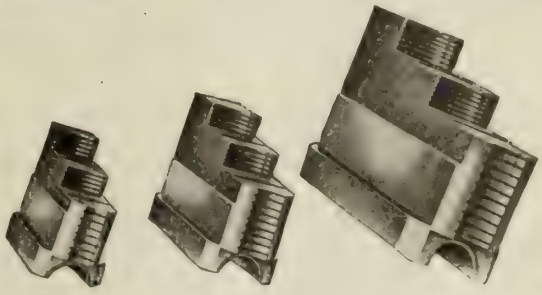
2455. **Iron, steel and engineering specialties.**—A Canadian business man, who is representing an important Canadian manufacturing enterprise in the United Kingdom, would be glad to undertake a few additional Canadian agencies, more especially anything relating to iron, steel or engineering specialties.





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## ARTICLES WANTED

WANTED — RESPONSIBLE ENGINEERING firm wants Blue Prints and use of patterns or Blue Prints and one set of Castings each, of Planer about 46″ x 46″, Horizontal Boring Mill and Pipe Bending Machines, various sizes. Above wanted for advertiser's own shop and not for selling purposes. State what you can offer and terms to M. T. L., Ltd., P.O. Box 1185, Montreal. (c2m)

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12″ Pollard Bench Drills.
14″ Alfred Herbert Ball Bearing Drills.
20″, 22″, 24″, 27″ Pollard Upright Drills.
36″ Pollard Sensitive Radial Auto Feed.

SHAPERS

16″ Milwaukee, cone pulley drive.
24″ Milwaukee, cone pulley drive.

PLANERS

36 x 36″ x 10′ Stirk Planing Machine.
60 x 60″ x 16′ Stirk Planing Machine.

BORING MILLS

20″ Webster & Bennett Duplex Boring Mill.
30″ Webster & Bennett Standard Boring Mill.
48″ Stirk Standard Boring Mill.

## ALFRED HERBERT LTD.

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The GEO. F. FOSS MACHINERY & SUPPLY CO., LTD.
MONTREAL AND NEW YORK


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*Beatty Bros., Limited, Fergus, Ontario, with branches throughout Canada in a recent issue of their weekly sales bulletin, "Facts," give a very clear idea of the value of Hardware and Metal to the Canadian trade. This is what "Facts" has to say:—*

# "Do You Read Hardware & Metal?"

"We do not often take space in FACTS to boost any particular paper, but we are making an exception in the case of Hardware and Metal.

"If we did not know that so many of our hardware salesmen subscribed to it, we should be tempted to republish in FACTS some of their recent articles on the price situation.

"Some ten or fifteen trade papers—as distinct from farm papers—come into the FACTS editorial sanctum. There is none with half the weight and breadth of information that is possessed by Hardware and Metal.

"During the easier days of the past few months,—when the main question was not what the Sales Force could sell but what the Factory could supply—we may have been tempted to let Hardware and Metal go by the board.

"You can't afford to neglect it in these days. It is just full of authoritative information on the price situation in particular and hardware merchandising in general.

"So read it carefully. It gives you just the dope you need. When you tell the merchant that prices are not going to slump—well, he may not quite believe you. He feels you may have some axe to grind.

"But when you can quote or indicate some article in Hardware and Metal to prove your point,—it convinces.

"Remember, Hardware and Metal carries a lot of weight. It is known to be thoroughly unprejudiced and reliable. There are very few stronger trade papers in America so far as their own particular fields are concerned.

"So don't neglect your weekly reading of Hardware and Metal. Clip out any specially good points and paste them in your notebook for easy reference.

"The first two or three items on page 40 of the October 23 issue are dandies—probably you noticed them. If not, turn up your copy and read them.

"We all have to be well posted in these days or we go under. This is no time for the half-informed salesman to be on the road."

## HARDWARE AND METAL

*"Canada's National Hardware Weekly"*

**143 University Avenue, Toronto, Canada**

**Montreal Branch, Southam Building** **Winnipeg Branch, Union Trust Building**

Published every Saturday since 1888. The only weekly hardware paper in Canada and the only hardware paper in Canada that gives you a circulation statement audited by the Audit Bureau of Circulations.

# OILGAS
INDUSTRIAL FURNACES

# Lower Fuel Bills *for* The New Year

THAT'S the **Oilgas** New Year's Greeting—one of vital importance to you.

Resolve now to put your heating system on a more profitable basis. Industrial Furnaces burning **Oilgas** will cut your fuel bills in half. They are more economical than coal, producer gas, or powdered fuel.

***Furnaces for***

Continuous Forging
Continuous Reheating
Annealing, Hardening
Billet Heating
Enamelling
Heat Treating
Malleable Melting
Rivet Heating
Plate and Angle Heating

***Typical Users***

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Steel Co. of Canada Ltd.,
Dominion Copper Products Co.

**Oilgas Industrial Furnaces are the most modern, efficient and economical heating method—full details on request.**

## General Combustion Co. of Canada Limited

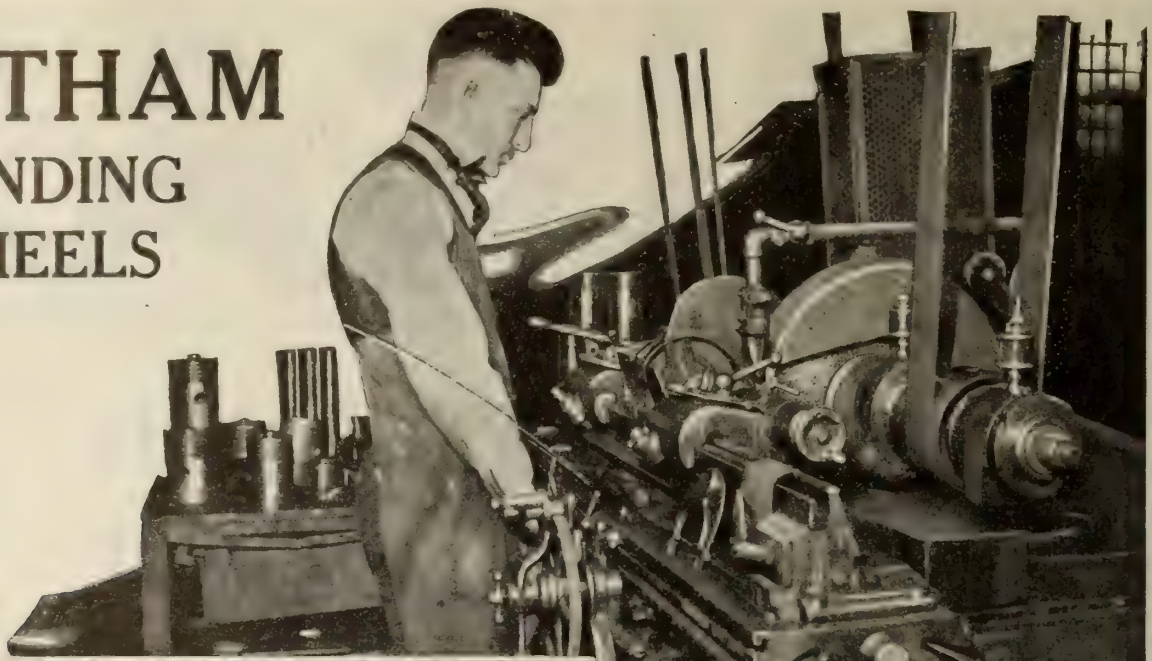
**619-623 New Birks Building, MONTREAL**

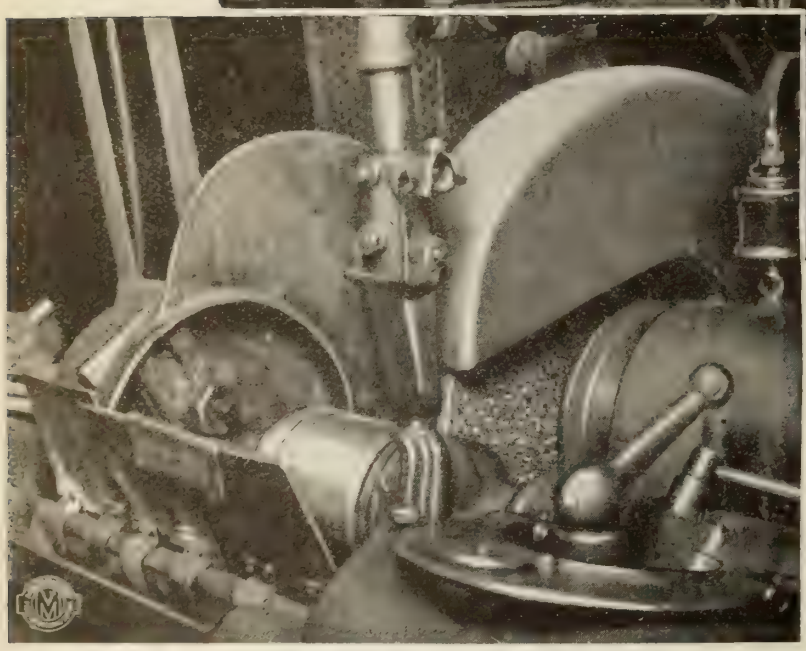
***"Experts in the Economical Combustion of Liquid Fuels"***

**Oilgas Furnaces Are Made in Canada**

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# WALTHAM
## GRINDING WHEELS





ALOWALT

CARBOWALT

## Some Interesting Facts for the Man who Grinds Cast-iron Pistons

The photograph taken at the International Motors Company (Plainfield, N.J.) shows the grinding of cast-iron pistons 4 inches diameter, 6 inches long. The total tolerance on the diameter is .001 inch. About .020" is removed in the operation. The actual grinding time is four minutes for each piston. Can you better it?

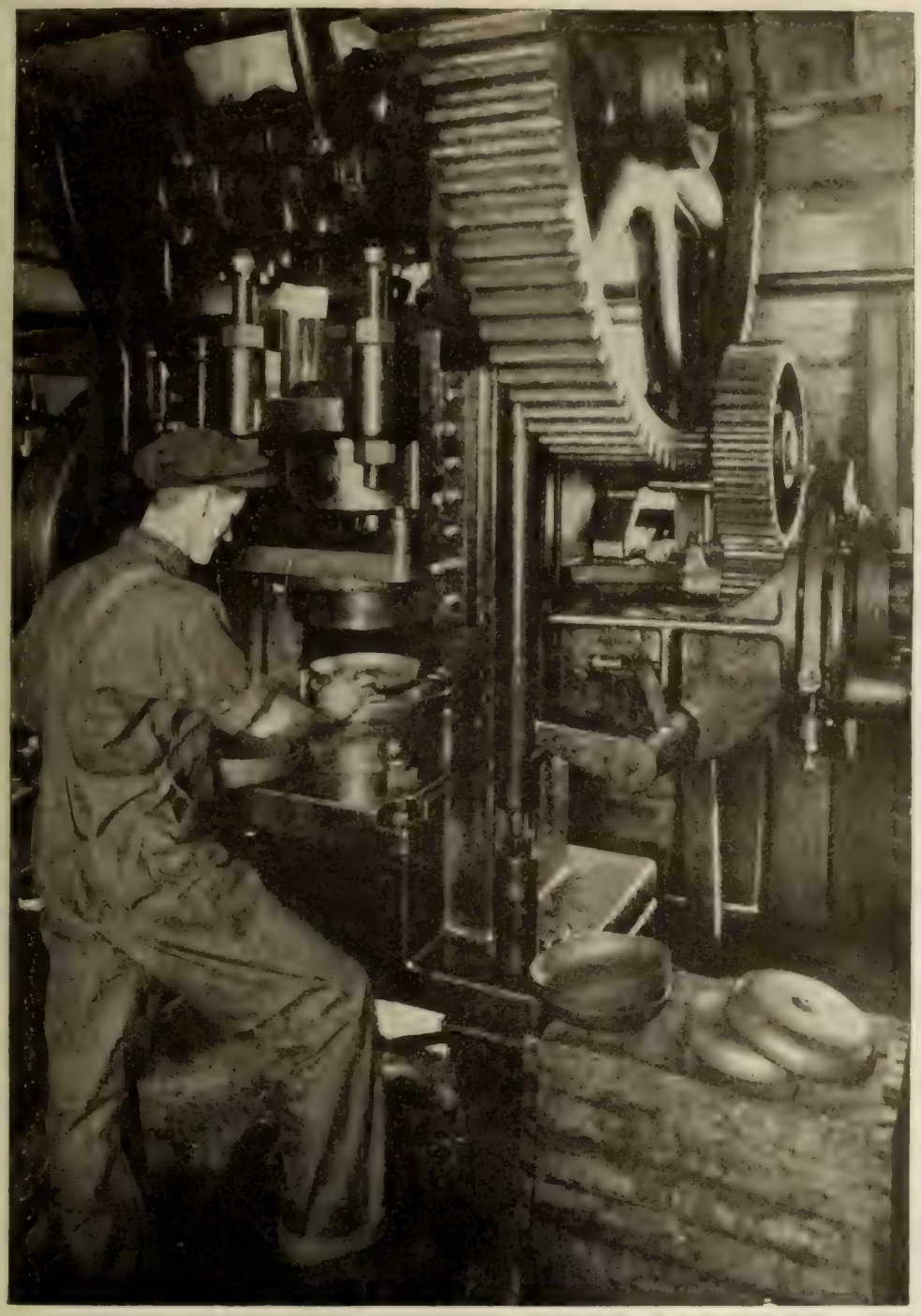
Waltham Wheels, chosen by a process of elimination during competitive tests, have been in use in this department for over eight months. The wheel used on this operation is a Waltham Carbowalt Grinding Wheel, 36 grain, Grade K, 18 inches in diameter, by 3-inch face.

What is your grinding problem? (There's one in every plant). State it—we'll guarantee to find the answer for you.

Waltham Grinding Wheels are made for all purposes. Efficient service is merely a question of finding the *right Waltham for the job*—as here.

# WALTHAM GRINDING WHEEL COMPANY, Waltham, Mass.

*Canadian Representative:* STANDARD MACHINERY & SUPPLIES, LTD., MONTREAL



# 1300 10-Inch Brass Gongs

is the steady day by day production rate obtained by Bevin Bros. Mfg. Co., of East Hampton, Conn., on this "BLISS" 3½-B Toggle Drawing Press.

The press was installed in 1907 and has averaged four days per week operation since that time. No parts have had to be replaced since installation, and it is in first-class condition to-day.

Besides the 10-inch gong, this same press is used, also, for drawing 6, 7, 8, and 12-inch gongs, all from ⅛-inch brass.

Bevin Bros. have over twenty "BLISS" presses in operation at present. These were installed at various times over a period of nearly twenty years.

BLISS 1857

## E. W. Bliss Company

*Main Offices:* BROOKLYN, N.Y., U.S.A.
*American Factories:* BROOKLYN, N.Y., *and* HASTINGS, MICH.

BLISS 1921

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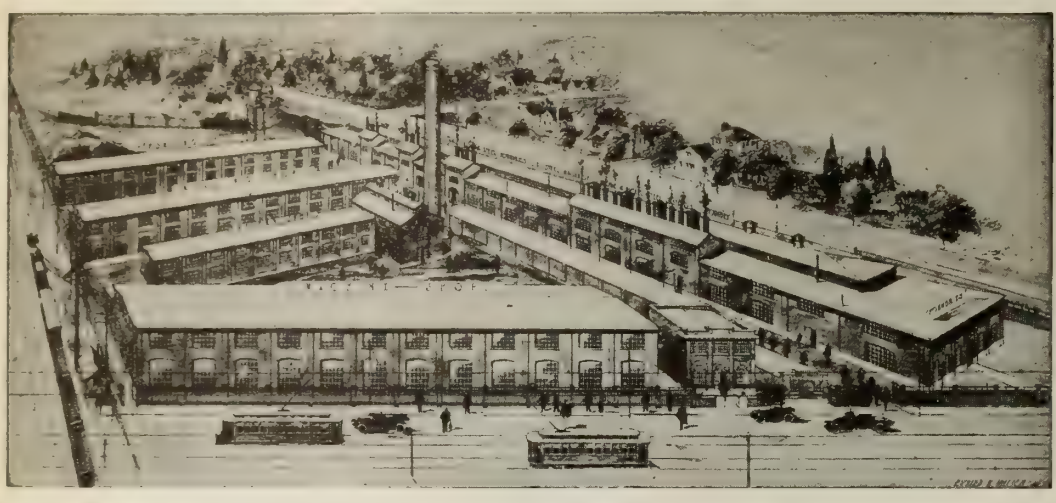
# Hull Iron and Steel

## Foundries, Limited *Hull, Quebec*

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***Annealed and Unannealed***

Cement Mill and Mining Machinery Castings, Stamp Mills, Crushing Plants, Excavating Outfits, Steel Car Wheels, Locomotive Driving Wheels and Frames, etc.



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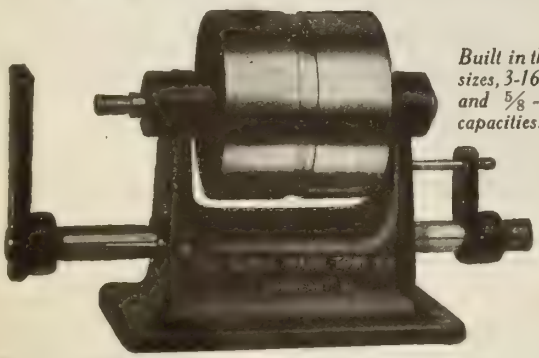
"H I S C O" machine-moulded gears, while requiring no pattern, insure accuracy, dependability, quality, and the price is minus the cost of patterns—which in these days of high prices of lumber is something to be considered.

**Specify "HISCO" Products**

*It pays to use high grade machine tools*

# BURKE

## Tapping Machine



*Built in three sizes, 3-16, 3/8 and 5/8 - in. capacities.*

Friction Driven, All Shock to Tap Eliminated

This strong, light weight Tapping Machine is an investment you can't afford to overlook. Install it in your shop and you can produce the maximum of well-tapped holes with inexperienced labor. It is simple to operate, never breaks taps and taps either right or left hand Threads.

Write for description circular. Or send samples or blue print for production estimate.

**BURKE MACHINE TOOL CO.**

300 15th St., Conneaut, Ohio, U.S.A.

# AGENTS WANTED

For a high grade Piston Packing amongst mill and steamer supply houses in all the principal centres. Sold at a reasonable price, allowing for a good margin of profit to the dealer.




***Write for our agent's proposition***

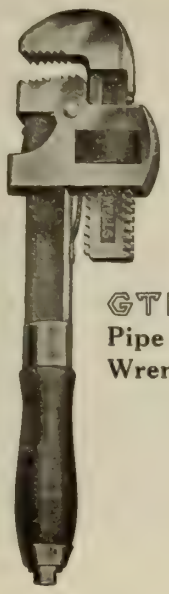
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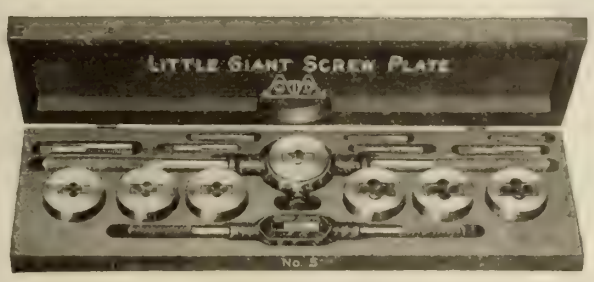
Factory, June St.
HALIFAX, N.S.

*If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.*

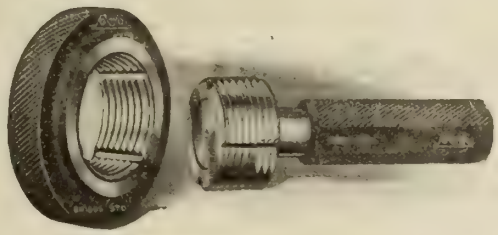
# Screw-Threading GTD Excellence



GTD Pipe Wrench




No. 5 "Little Giant" Screw Plate



GTD Gages

GTD Hand Reamer



## Taps and Dies

For hand and machine use, including the shear-cutting "Gun" Tap and the "Acorn" Die.

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The famous "Little Giant" and "OK" brands. An assortment for every screw-threading need.



"Gun" Tap

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For every purpose. Accurate and hard-wearing.

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Thread Limit, Snap-Lead Limit, Plug and Templet, both Screw-Thread and Cylindrical.

## Pipe Tools

Pipe Wrenches, Vises, Cutters, Taps, Stocks and Dies.

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**Wells Bros. Co. of Canada, Limited**

**London Office: 139 Queen Victoria St., E.C. 4.**

**Clip the coupon and send it in.**

GTD Corp. of Canada, Ltd. Galt, Ontario

Please send me catalogs descriptive of the following:

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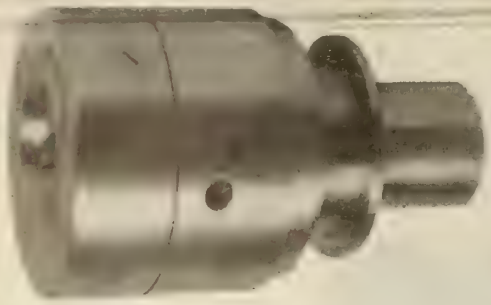
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# No. 2 TYPE "R"
# Hartness Automatic Die

***WITH SHANK FOR REVOLVING SPINDLES***

These dies are designed for use on either vertical or horizontal spindles. Die is re-locked by forward motion of sleeve, which may be actuated by a yoke working in the groove or by a fixed stop making contact with rear edge of sleeve at the return stroke. Die is unlocked in the usual manner by retarding its forward motion or by a fixed stop, making contact with the external tripping button shown on the face of the die. External tripping button is especially desirable in cutting very short threads as it relieves the thread of the strain incidental to unlocking by the pull-off device.

**The diameter of the No. 2, Type R die is 3 3-16 in., and its length as shown is 3½ in.**

**The Die cuts both right and left-hand threads ½ in. to 1 in. in diameter, and from 10 to 40 threads per inch.**

**Shanks are varied to meet individual requirements.**

**A set of standard chasers in carbon steel is supplied gratis with each Die.**

**No tools of any kind need be used in changing chasers.**

**A chaser grinding jig is supplied gratis on Die orders if desired.**

## Jones & Lamson Machine Company
DIE DIVISION)

9-10 Water Lane, Queen Victoria St., LONDON, ENGLAND.

SPRINGFIELD, VERMONT, U.S.A.

503 Market St., SAN FRANCISCO, California, U.S.A.

**American Agents for Dies and Chasers:**

P. H. Biggs, 1235-1237 West 9th Street, Cleveland, Ohio.

Coghlin-Kirkley Machinery & Supply Co., Toledo, Ohio.

E. L. Essley Machy. Co., Chicago, Milwaukee and Moline.

Robinson, Cary & Sands Co., St. Paul and Duluth.

**Foreign Agents:**

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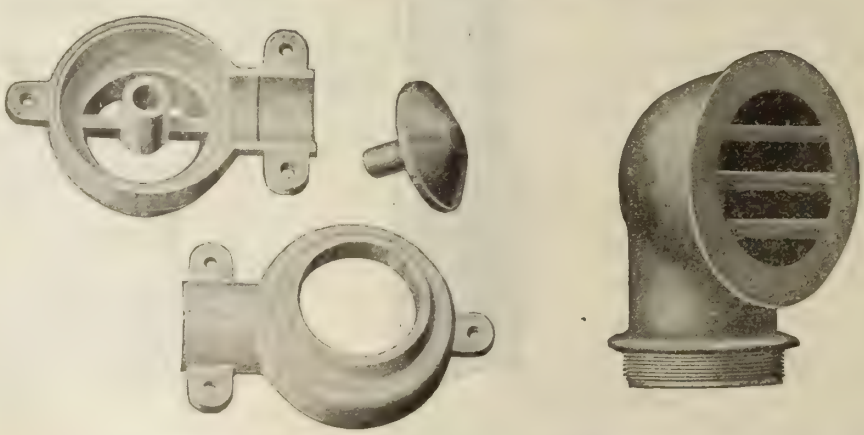
Holland—Spliethoff, Beewukes & Company, Rotterdam, Holland.

Australia—McPherson's Pty., Ltd., Melbourne, Australia.

Japan, Manchuria, Korea, Formosa—Mitsui Bussan Kaisha, Ltd., Tokyo, Japan.

Sweden—A. Bol Oscar Lindbom, Postbox 420, Stockholm.

# DIE-CASTINGS
## DOEHLER PROCESS



Note the smooth appearance of the Die-Castings in the illustration. No burrs—no rough spots. Cored holes are perfectly round and centred. Require practically no machining

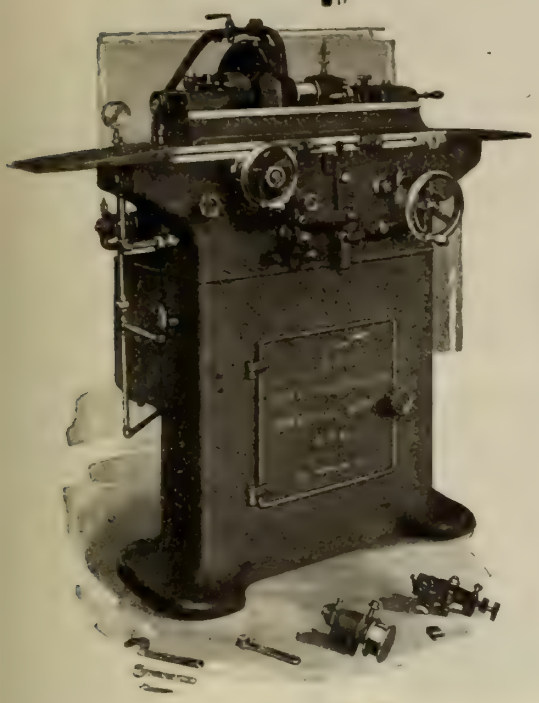
**SEND BLUE PRINTS TO US FOR ESTIMATES**

***Manufactured by***



**Tallman Brass & Metal Limited**
**HAMILTON, ONT.**





Greenfield

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# Plain Grinders

will greatly cut the cost of your small cylindrical work within the limits of 4 x 12 inches. Equipped with small grinding wheels for taking light cuts with great rapidity, they require only a minimum amount of power.

Greenfield Plain Grinders are strong, accurate, medium-weight machines capable of giving any degree of speed without shifting belt or changing gears. They grind small standardized parts with efficiency and dispatch.

It will prove worth your while to investigate their many other money-saving features. Write to-day for particulars of this money-saving grinder.

**Greenfield Machine Co.**
**Greenfield, Mass., U.S.A.**

# DIE-CASTINGS

**They Save Time and Expense!**



**They Require No Machining!**

Your small metal parts can be die-cast at low cost. Gear teeth, threads and other intricate parts can be cast so accurately that machining is unnecessary. No matter how complicated your small pieces may be put them up to our engineers. We can save you time and expense.

***Largest Manufacturers of Die-Castings in Canada.***

## THE FISHER MOTOR CO., LIMITED

**ORILLIA, ONTARIO**

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# *Boyers balk the chalker*

THE trail of perfectly-driven rivets in the wake of Boyer-equipped riveters makes rivet inspection a "light occupation" indeed! And cutting out improperly driven rivets is an expense worth avoiding.

Sustained driving power and day-in-and-day-out *dependability* is the only straight-through road to 100% steam or air-tight rivets.

Long after other hammers have been "stepped down," Boyers are still hard-hitters. Backed by the durable Boyer valve–the valve case with five lives – their giant driving power is as everlasting as the hammer itself.

The hardest-hitting, longest-lasting hammer you can buy is the *Boyer.* Ask for Bulletin 600.

*Sales Representatives*

The Holden Company, Limited

354-356 St. James Street, Montreal, Canada

*Sales and Service Branches:* TORONTO, 342 Adelaide Street, West WINNIPEG, 150 Princess Street VANCOUVER, 81 Pender Street

*Canadian Factory:* Canadian Pneumatic Tool Company, Montreal

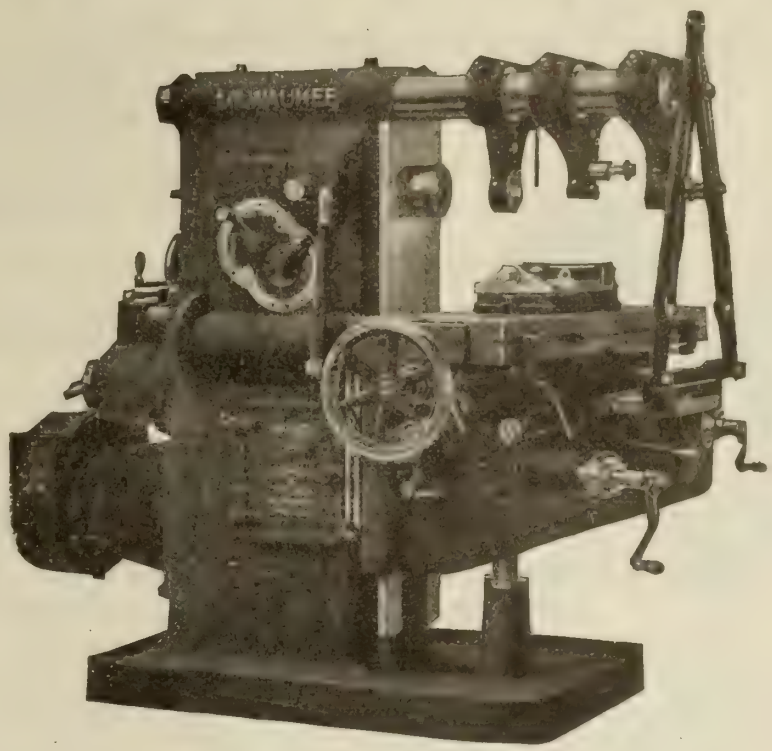
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# BOYER HAMMERS

*The world's standard* *wherever rivets are driven*

# MILWAUKEE MILLING MACHINES



**Efficient on all Classes of Milling—Light and Heavy.**

MILWAUKEE Milling Machines are scientifically designed and constructed, embodying only the best obtainable materials and workmanship. Better materials give longer life and superior service. Finer workmanship means greater accuracy, and, through the mechanic's knowledge of the capabilities of his machine, time saved, and thus, larger outputs.

IN every branch of manufacturing you'll find Milwaukee Milling Machines and you'll also find that every "Milwaukee" has built an individual reputation for its ability to withstand long, hard, high-speed service. Milwaukee Milling Machines are noted for their power and ruggedness, and their accuracy and ability to handle delicate work, as well as heavy operations, is just as highly esteemed.

FIRMS that seek the certainty of milling satisfaction find their hopes realized in the "Milwaukee."

*Write for Catalogue—NOW.*



## KEARNEY & TRECKER CO.
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Canadian Representatives: Williams & Wilson, Ltd., Montreal; F. E. Barber Machy. Co., Toronto; A. R. Williams Machy. Co., Vancouver and Winnipeg.

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# Premier Meighen Discusses National Issues in MACLEAN'S

**The Rt. Hon. Arthur Meighen, Prime Minister of Canada, has written for January 1st MACLEAN'S a forceful exposition of his platform and policy.**

HE discusses the bi-lingual issue, the tariff, reconstruction, the growing unrest and unemployment — but he avers that the tariff is the "one great issue of our domestic politics."

"Why is it the issue?" queries Mr. Meighen. "It is the issue, I think, because the enemies of the Government cannot oppose us on any other."

Regarding the tariff, the Premier tells readers of MACLEAN'S: "We do not propose going any higher *on any single line of articles.*"

"Is Mr. Crerar hedging?" the Premier inquires.

Of Mr. Mackenzie King he says: "He can be quoted on almost every conceivable side of the tariff issue."

*Articles by Mr. W. L. Mackenzie King and Mr. T. A. Crerar will follow in succeeding issues.*

## "The Drama of Our Great Forests"

***A BIG INSTALMENT IN JANUARY 1st MACLEAN'S***

This stirring story by Arthur Heming is continued in January 1st MacLean's, chock-full of wood-lore, fascinating yarns of the luring, frozen North, and amazing tales of actual adventure. The life history of the Canadian beaver, our national animal, is unfolded in a manner that surpasses fiction, as fact so often does if truly told by a masterful writer—"the beavers—those wonderful amphibious animals of the Northland that display more intelligence, perseverance, prudence and morality than many a highly civilized human being."

## Other Big Features

**"The Big Time Man."**
By C. W. Stephens.
A romantic story of the unromantic business of making bottles.

**"Money and Motion Pictures."**
By John W. McKay.
A Canadian who filmed "The Miracle Man."

**"The Diamond Pickers."**
By Madge MacBeth.
The girl detective finds how diamonds disappear by extra-human agency.

**"Margot and Peter Flower."**
By Mrs. "Margot" Asquith.
The commencement and course of an amazing eight years' flirtation.

**"Foiling the 'Free Trader'."**
By Kathrene and Robert Pinkerton.
A Hudson's Bay story, where the Indian outwits his white foe.

**"The City of Peril."**
By Arthur Stringer.
A big slice of this serial of Bolshevistic peril.

**"When Toronto Grew Up"**
By Col. Geo. H. Ham.
Anecdote after anecdote of the past fifty years in Toronto.

## Review of Reviews

Selections culled and clipped from the cream of the world's periodical literature.

**"How France is Recovering"** Lovat Fraser.
**"Germany Still Unrepentant"**—J. Ellis Barker.
**"Winston's Opinion"**—Rt. Hon. Winston Churchill.
**"Women Rule Films"**—W. Stephens Bush.
**"Wells on Mankind"**—H. G. Wells.
**"Bethmann-Hollweg Explains"**—A. J. Toynbee.
**"Jailing the Journalists"**—Freeman's Journal.
**"Forced Into Slang"**—George Ade.
**"A Simple Solution of Labor Problems"**—E. S. Howe.

***Secure Your Copy Early—The Supply Is Limited***

# MACLEAN'S

"CANADA'S NATIONAL MAGAZINE"

***JANUARY 1st ISSUE*** ***On All News-stands*** ***20c***

**Or Send $3.00 for a Year's Subscription to MACLEAN'S MAGAZINE, 143-153 University Avenue, Toronto, Canada**

# New Method Saves Valuable Hours



### To Duplicate Blueprints

Tracing them in the drafting room takes hours — sometimes days — of a highly paid man's time, always with a chance of errors.

The PHOTOSTAT accomplishes the same result in a few minutes at a cost of a few cents and without errors.



### To Make Drawings of Small Machine Parts

in the drafting room, costs many dollars and takes hours or days of time.

A PHOTOSTAT copy of a small machine part accomplishes the same result and is made in a few minutes at a cost of a few cents.



### To Make Advertising Layouts

by hand for six or a dozen publications requires hours of work by an expensive man.

The PHOTOSTAT quickly duplicates the original layout at the required size and as many times as desired at a cost of a few cents apiece.



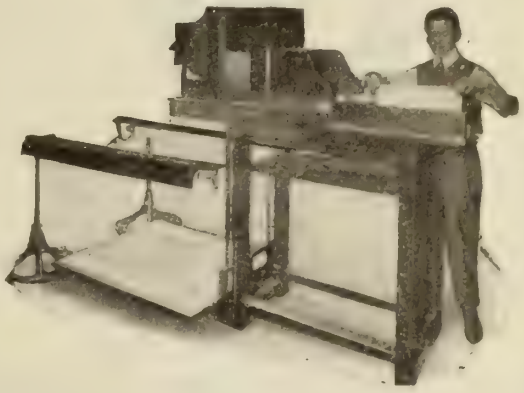
### To Copy Catalog Pages

letters, reports, charts, etc., takes hours of a stenographer's time. The results cannot be exact duplicates and there are frequent errors.

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## The PHOTOSTAT

(Trade Mark Registered)



## is the Up-to-Date Method for Doing All This Work

**Photographic Copying Machine**

Cuts Hours to Minutes
Cuts Dollars to Cents
Makes No Mistakes

"The machine pays for itself in 8 or 9 months, because of its man power savings."

*Manufactured by the Eastman Kodak Company Exclusively for*

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# BERNARD
## Wood Split Pulleys

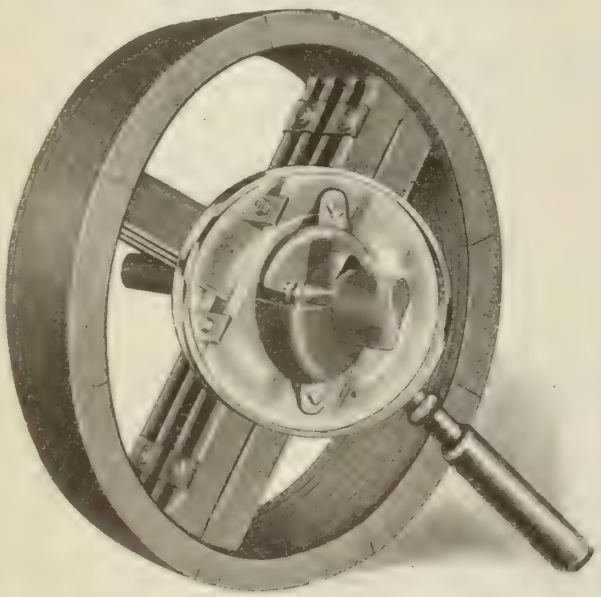


## Save Power

*Wood Split Pulleys are lighter and they have an efficient Belt Gripping Surface*

With the installation of Bernard Wood Split Pulleys you start on the road to lower overhead. Their cost is low.

**Safety** **Satisfaction**



BERNARD SAFETY COLLAR

*Put them to the test.*

**The A. Bernard Industrial Co.**

*Manufacturers of High-Grade Power Transmission Appliance*

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## Locomotive Cylinder or Dome Facing Machine

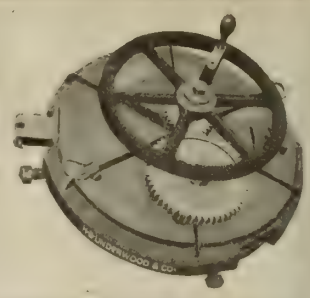


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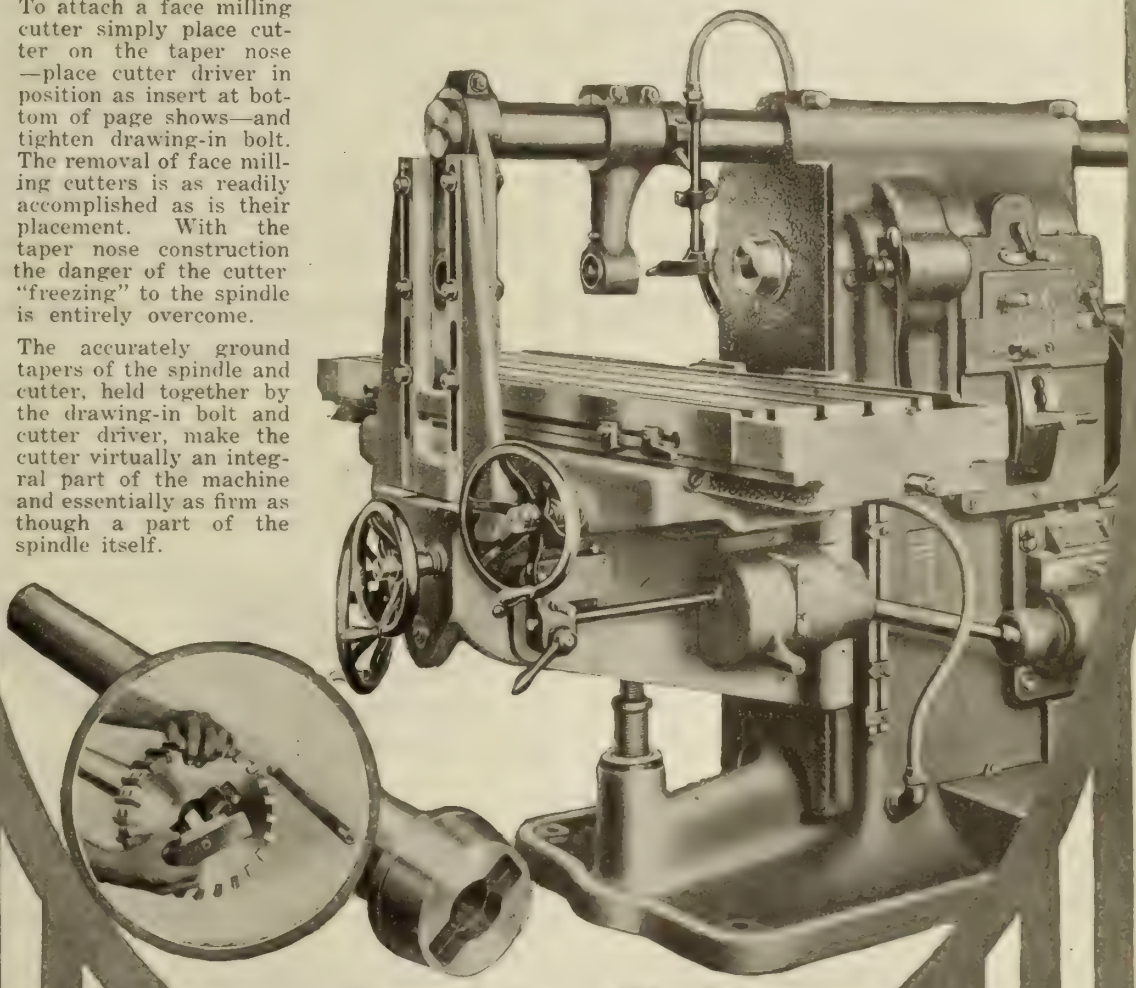
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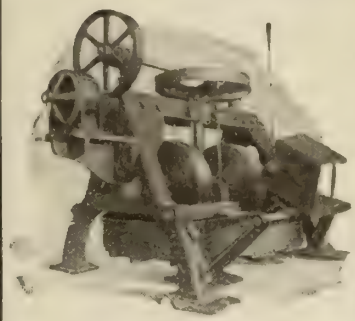
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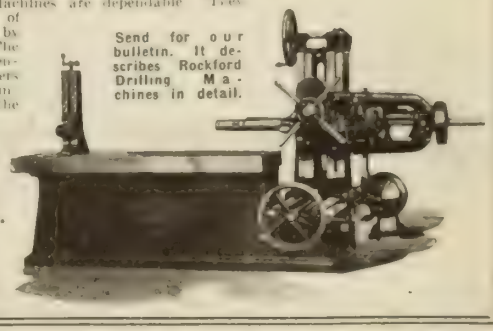
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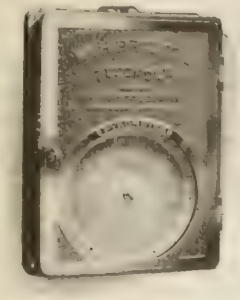
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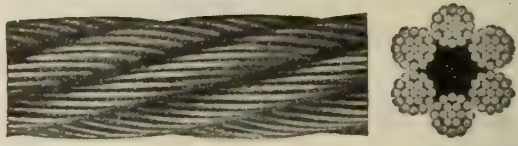
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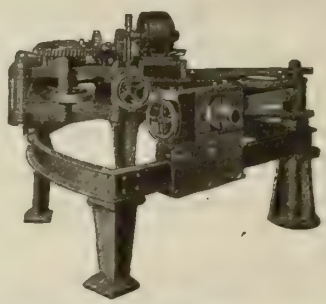


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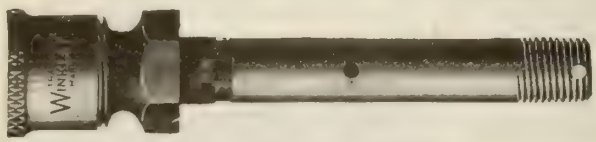


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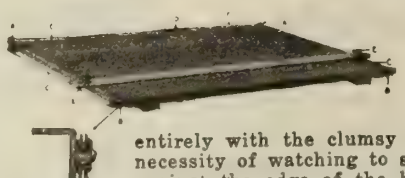
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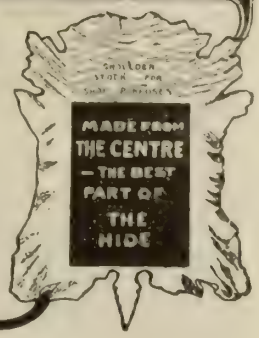
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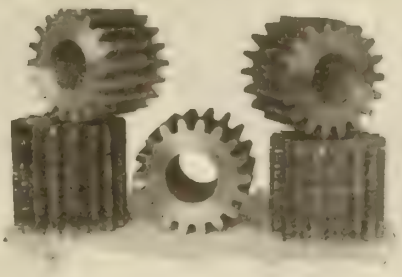
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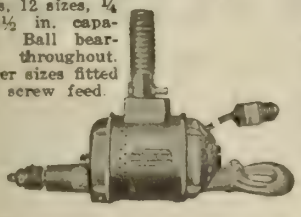
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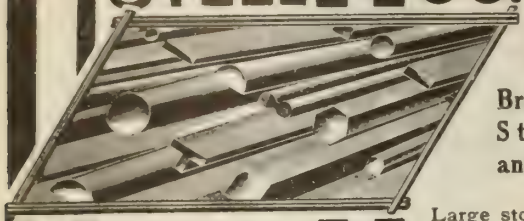
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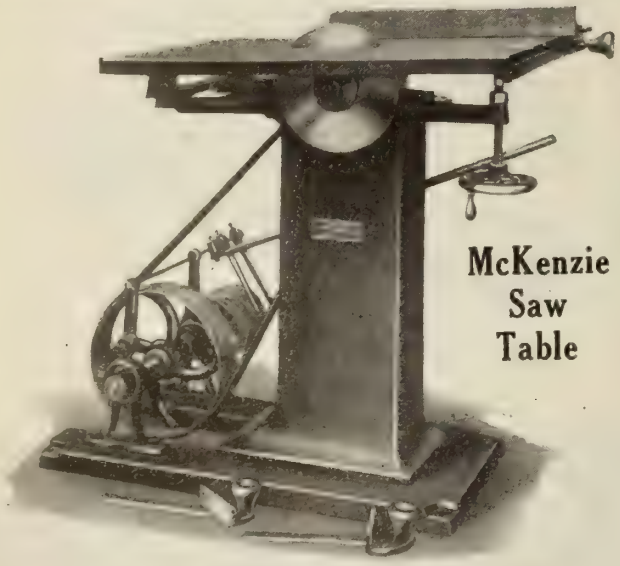
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Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Belt Lacing**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

**Belt Lacing Machines**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
McLaren Belting Co., J. C., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Belt Tools**
Graton & Knight Mfg. Co., Worcester, Mass.

**Belting, Chain**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Belting, Fabric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
McLaren Belting Co., J. C., Montreal, Que.
Sumner & Co., New York City.

**Belting, Leather**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Ltd., Montreal Q.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Goodhue J. L. & Co., Danville, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Scheiren Co., Chas. A., New York City
Smith Belting Co., Toronto, Ont.
Sumner & Co., New York City.
Tullis & Son, Ltd., John, Glasgow, Scot.

**Belting, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.
Quaker City Rubber Co., Philadelphia, Pa.

**Belts, Abrasive**
Carborundum Co., Niagara Falls, N.Y.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.

**Bench Countershaft Standards**
Ford-Smith Machine Co., Hamilton, Ont.

**Benches, Work**
Aikenhead Hardware Ltd., Toronto, Ont.

**Bending Machines, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bertrams Ltd., Edinburgh, Scotland.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

**Bins, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Blocks**
Ford Chain Block Co., Philadelphia, Pa.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Chain (See Hoists, Hand)**
Aikenhead Hardware Ltd., Toronto, Ont.
Ford Chain Block Co., Philadelphia, Pa.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Die**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co. Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Illingsworth Steel Co., John, New York City, N.Y.

**Blocks, Pillow**
Can. Link-Belt Co., Toronto, Ont.

**Blowers**
Can. Blower & Forge Co., Ltd., Kitchener.
General Combustion Co. of Can., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sturtevant Co., B. F., Boston, Mass.

**Bolt and Nut Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Bolt and Nut Machinery, Automatic**
National Acme Co., Cleveland, Ohio.

**Bolts and Nuts**
London Bolt & Hinge Works, London, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Petrie, Ltd., H. W., Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.

**Bolt Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa.

**Boosters**
Sturtevant Co., B. F., Boston, Mass.

**Boring and Turning Mills, Vertical**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.

**Boring, Drilling and Milling Machines, Horizontal**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa.
Lucas Machine Tool Co., Cleveland, Ohio
Universal Boring Machine Co., Hudson Mass.

**Boring, Drilling and Milling Mach. Vertical**
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Herbert Ltd., Alfred, Toronto, Ont.
Lucas Machine Tool Co., Cleveland, Ohio
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich
Petrie, Ltd., H. W., Toronto, Ont.
Universal Boring Machine Co., Hudson Mass.

**Boring Heads**
Aikenhead Hardware Ltd., Toronto, Ont.

**Boring Tools**
Armstrong Bros. Tool Co., Chicago, Ill
Gisholt Machine Co., Madison, Wis.

**Box Strapping (Signal System)**
Transportation Service Ltd., Toronto, Ont

**Brackets, Lamp Adjustable**
McCroskey Tool Corp., Meadville, Pa.

**Brakes, Magnetic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Brass**
Brown's Copper & Brass Rolling Mills Ltd., Toronto, Ont.

**Bricks, Fire**
Elk Firebrick Co. of Can., Ltd., Hamilton, Ont.

**Bridges**
Hamilton Bridge Works Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que

**Broaching Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont

**Bronze**
Brown's Copper & Brass Rolling Mills Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Walker & Sons Metal Products, Ltd. Hiram, Walkerville, Ont.

**Bronze, Phosphor**
British Smelting & Refining Co., Ltd Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton Ont.

**Bucket Carriers, Pivoted**
Can. Link-Belt Co., Toronto, Ont.

**Buffing or Polishing Machines (See Polishing and Buffing Machines**
Can. Hanson & Van Winkle Co., Ltd. Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Petrie, Ltd., H. W., Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O

**Bulldozers**
Bertram & Son Co., Ltd., The John Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Ryerson & Son, Jos. T., Chicago, Ill.

**Burners, Oil and Gas**
Can. Hauck Burner Co., Port Hope, Ont
General Combustion Co. of Can., Ltd. Montreal, Que.
Rockwell Co., W. S., New York City.

**Bushings**
Fisher Motor Co., Ltd., Orillia, Ont.
Morrow Screw & Nut Co., Ltd., John Ingersoll, Ont.

**Calipers**
Brown & Sharpe Mfg. Co., Providence, R.I
Goodell & Pratt Co., Greenfield, Mass.
Starrett Co., L. S., Athol, Mass.

**Cams**
Canada Foundries & Forgings Co., Welland, Ont.

**Can-Making Machinery (See Shee Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont
MacKinnon Steel Co., Sherbrooke, Que

**Cars, Ore**
MacKinnon Steel Co., Sherbrooke, Que

# BUYERS' DIRECTORY

**Castings, Aluminum**
Canada Electric Castings Co., Ltd., Orillia.
Canada Metal Co., Ltd., Toronto, Ont
Electric Steel & Engineering Co., Welland, Ont.
Taliman Brass & Metal Co., Hamilton, Ont.

**Castings, Brass and Bronze**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
International Machinery & Supply Co., Montreal, Que.
Taliman Brass & Metal Co., Hamilton, Ont.

**Castings, Marine**
Can. Steel Foundries, Montreal, Que.

**Castings, Die Molded**
Electric Steel & Engineering Co., Welland, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Kaine Foundry Co., Galt, Ont.

**Castings, Ferro-Alloy**
Can. Steel Foundries, Montreal, Que.

**Castings, Iron**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Electric Steel & Engineering Co., Welland, Ont.
Fleck Ltd., Alexander, Ottawa, Ont.
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Hyd. Press**
Can. Steel Foundries, Montreal, Que.

**Castings, Nichrome**
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Semi-Steel**
Davidson Mfg. Co., Thos., Montreal, Que.
Electric Steel & Engineering Co., Welland, Ont.
Halcomb Steel Co., Syracuse, N.Y.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

**Castings, Steel**
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

**Cements, Iron**
Smooth Mfg. Co., Jersey City, N.J.

**Centering Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Chains (See Sprockets and Chains)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que
Wright Mfg. Co., Lisbon, Ohio.

**Chains, Driving**
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Reading Chain & Block Co., Reading, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chasers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chemists**
Toronto Testing Laboratory, Toronto, Ont.

**Chucking Machines**
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Chucks, Drill**
Jacobs Mfg. Co., Hartford, Conn.

**Chucks, Drill and Tap**
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Goodell & Pratt Co., Greenfield, Mass.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Lathe**
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Magnetic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**
Columbia Hdwe. Division, Cleveland, O
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

**Cleaners, Metal, Waste, General**
Oakley Chemical Co., New York, N.Y.
Levis, The, Toronto, Canada.
Scythes & Company, Ltd., Toronto, Ont

**Clocks, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Clutches, Friction**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**
Can. Link-Belt Co., Toronto, Ont.

**Collars, Shaft or Set**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

**Collets**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compressors, Air**
Curtis Pneumatic Machinery Co., St. Louis, Mo.

**Compressors, Air and Gas**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**
Ford-Smith Machine Co., Hamilton, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**
Jones & Glassco, Montreal, Que
Main Belting Co. of Can., Montreal, Que
Mathews Gravity Carrier Co., Port Hope, Ont.

**Copper**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Cotter Pins**
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Counterbores**
Cleveland Twist Drill Co., Cleveland, O
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**
Aikenhead Hardware Ltd., Toronto, Ont
Starrett Co., L. S., Athol, Mass

**Countershafts**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Couplers, Car and Locomotive**
Can. Steel Foundries, Montreal, Que.

**Couplings, Flexible**
Holden Co., Ltd., Montreal, Que.

**Couplings, Rigid**
Bernard-Industrial Co., A., Fortierville, Que.

**Couplings, Shaft**
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

**Cranes, Electric**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepherd Electric Crane & Hoist Co., Montour Falls, N. Y.

**Cranes, Hand (See Hoists, Hand)**
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

**Cranes, Locomotive**
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Cranes, Traveling**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Reading Chain & Block Co., Reading, Pa
Shepherd Electric Crane & Hoist Co., Montour Falls, N. Y.

**Crank Pin Turning Machines**
Garlock-Walker Mchy. Co., Toronto, Ont
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia Pa.

**Cutters, Flue**
Holden Co., Ltd., Montreal, Que.

**Cutters, Gear**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I
Butterfield & Co., Inc., Rock Island, Que
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**
Atkins & Co., Inc., E. C., Indianapolis, I
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc. Rock Island Que
Eclipse Counterbore Co., Ltd., Walkerville, Ont
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Madison Mfg. Co., Muskegon, Mich
Pilot Steel & Tool Co., Montreal, Que
Pratt & Whitney Co., of Canada Ltd Dundas, Ont.

**Cutters, Milling**
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Milling Machine Co., Cleveland
Ewart & Whitehall Ltd., Galt, Ont
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont
Kearney & Trecker Co., Milwaukee, Wis
Morse Twist Drill & Machine Co., New Bedford, Mass
Pilot Steel & Tool Co., Montreal, Que
Witt Twist Drill Co. of Canada, Ltd., Walkerville, Ont

**Cutters, Stay Bolt**
Acme Machinery Co., Cleveland, Ohio
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont

**Cutters, Thread**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt
Landis Machine Co., Inc., Waynesboro, Pa

**Cutting-Off Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garlock Walker Mchy. Co., Toronto, Ont
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Cutting-Off Machines, Pipe (See Pipe Cutting and Threading Machines)**
Landis Machine Co., Inc., Waynesboro, Pa
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Cutting-Off Tools**
Armstrong Bros. Tool Co., Chicago, Ill.
Pilot Steel & Tool Co., Montreal, Que.

**Cutting Oil Filters (See Oil Filtering Systems)**
Bowser & Co., Inc., S. F., Fort Wayne, I.
Cataract Refining Co., Toronto, Ont.

**Cutting, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

**Dealers, Machinery (See Searchlight Section)**
Ford Smith Machine Co., Hamilton, Ont
Petrie, Ltd., H. W., Toronto, Ont

**Deckle Straps**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Diamonds, Black and Rough**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond, Carbon and Bortz**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Desmond-Stephan Co., Hamilton, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Wheel Trueing Tool Co., Detroit, Mich.

**Diamond Crossings**
Can. Steel Foundries, Montreal, Que

**Die Sinking Machines, Automatic**
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

**Dies, Screw and Thread Cutting**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Dyrab Steel (Consolidated) Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford Smith Machine Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

**Dies, Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kumber & Hilliker Mfg. Co., St. Catharines, Ont.

**Dies, Self-Opening, Adjustable**
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Dies, Threading-Opening**
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt
Landis Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.

# BUYERS' DIRECTORY

**Disc Cement**
Ritchey Supply Co., Toronto, Ont.
Watson Abrasives Co., Chicago, Ill.

**Dividing Heads**
Ackworthie, Ltd., John, Birmingham, Eng.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Reid Tool & Machine Co., La Salle, Que.

**Dogs, Lathe and Milling Machine**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drafting Boards and Tables**
Darling Bros., Ltd., Montreal, Que.
Dominion Drawing Table & Mfg. Co., Adrian, Mich.
Hughes-Owens Co., Ltd., Montreal, Que.

**Drafting Materials**
Dietzgen, Eugene, Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Dominion Drawing Table & Mfg. Co., Adrian, Mich.
Hughes-Owens Co., Ltd., Montreal, Que.

**Dressers, Grinding Wheel**
Carborundum Co., Niagara Falls, N.Y.
Dom. Abrasive Wheel Co., Ltd., Montreal, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Jones & Lamson Mach. Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Drill Holders**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drill Rods**
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Drill Speeders**
Canada Machinery Corp., Galt, Ont.

**Drilling Machine Heads**
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

**Drilling Machines, Automatic**
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

**Drilling Machines, Bench**
Beacon Engineering Co., Tipton, England
Can. Blower & Forge Co., Ltd., Kitchener.
Goodell & Pratt Co., Greenfield, Mass.
Henry & Wright Mfg. Co., Hartford, Conn.
High Speed Hammer Co., Rochester, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Electric and Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Foss Machinery & Supply Co., Geo F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Gang**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drilling Machines, Heavy Duty**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**
Avery Drilling Machine Co., Cincinnati, Ohio.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Holly, R. S., Toronto, Ont.
Lucas Machine Tool Co., Cleveland, Ohio.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Multiple Spindle**
Beacon Engineering Co., Tipton, England
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
Niles-Bement-Pond Co., Cincinnati, Ohio.
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

**Drilling Machines, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Drilling Machines, Portable**
Haskins Co., R. G., Chicago, Ill.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Radial**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo F., Montreal, Que.
Garlock Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Mueller Machine & Tool Co., Cincinnati, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Riverson & Son, Jos. T., Chicago, Ill.
Toomey Inc., Frank, Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Drilling Machines, Sensitive**
Avery Drilling Machine Co., Cincinnati, Ohio.
Beacon Engineering Co., Tipton, England
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
High Speed Hammer Co., Rochester, N.Y.
Hoosier Drilling Mach. Co., Goshen, Ind.
Jones & Shipman, of Leicester, England, Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Turret**
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

**Drilling Machines, Vertical**
Aurora Tool Works, Aurora, Ind.
Avery Drilling Machine Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng.
Steelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Drills, Center**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Jones & Shipman, of Leicester, England, Toronto, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Drills, High Speed Twist**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co., Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.
Taylor Tool Co., J. A. M., Toronto, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Drills, Twist and Flat**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Dust Handling Equipment**
Can. Blower & Forge Co., Ltd., Kitchener.
Sturtevant Co., B. F., Boston, Mass.

**Electrical Instruments**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Electrical Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O.

**Elevating Trucks (See Trucks)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Elevators and Conveyors**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Emery Cloth**
Wausau Abrasives Co., Chicago, Ill.

**Emery Wheels (See Grinding Wheels)**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Carborundum Co., Niagara Falls, N.Y.
Dom. Abrasive Wheel Co., Ltd., Montreal, Que.
Ford-Smith Machine Co., Hamilton, Ont.
International Machinery & Supply Co., Montreal, Que.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Engines, Capstan**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Engineers, Mechanical**
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.

**Expanders, Tube**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Eyeglasses, Safety (See Goggles, Safety)**
Prest-O-Lite Co. of Can., Toronto, Ont.
Willson Goggles, Inc., Reading, Pa.

**Fans, Electric**
Can. Blower & Forge Co., Ltd., Kitchener.
Northern Electric Co., Montreal, Que.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Exhaust**
Can. Blower & Forge Co., Ltd., Kitchener.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Ventilating**
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Fibre**
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**File Handles**
Ingersoll File Co., Ltd., Ingersoll, Ont.

**Files and Rasps**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Filing Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Filler, Iron (See Cements, Iron)**
Smooth Mfg. Co., Jersey City, N.J.

**Fire Extinguishers**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Fittings, Pipe**
International Malleable Iron Co., Guelph, Ont.

**Flexible Shafts**
Aikenhead Hardware Ltd., Toronto, Ont.
Haskins Co., R. G., Chicago, Ill.

**Flux, Galvanizing**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Fluxes, Welding**
L'Air Liquide Society, Toronto, Ont.

**Forging Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.

**Forgings, Drop**
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd., Toronto, Ont.

**Forgings, Hammer**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.

**Foundry Equipment**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Foundry Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Frogs, Spring or Rigid**
Can. Steel Foundries, Montreal, Que.

**Fuel Oil Burning System**
Cole Ltd., George W., Toronto, Ont.
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Heat Treating Coal**
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Oil and Gas**
Bellevue Industrial Furnace Co., Detroit.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces and Ovens, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces, Tempering and Annealing**
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furniture, Machine Shop**
Garlock-Walker Mchy. Co., Toronto, Ont.
Ministry of Munitions, London, Eng.
National Engineering Co., Sarnia, Ont.

**Gages, Dial**
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont.
Perdue, W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass.

**Gages, Measuring (See Tool Work)**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Q.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Gages, Recording**
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.
Republic Flow Meters Co., Toronto, Ont.

**Gages, Snap, Thread and Cylindrical**
Ackworthie, Ltd., John, Birmingham, Eng.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Standard**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis, I.
Elliott & Whitehall Tool Co., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.

# BUYERS' DIRECTORY

**Gages, Thread**
Ackworthle, Ltd., John, Birmingham, Eng
Greenfield Tap & Die Corp., Galt, Ont
Johansson Inc., C. E., Windsor, Ont
Starrett Co., L. S., Athol, Mass

**Garnet, Emery and Flint Paper and Cloth**
Ritchey Supply Co., Toronto, Ont
Wausau Abrasives Co., Chicago, Ill

**Gas, Coal Compressed**
L Air Liquide Society, Toronto, Ont

**Gas, Compressed**
Prest-O-Lite Co. of Can., Toronto, Ont

**Gaskets**
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont
Garlock Manufacturing Co., New York.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont
Hendrie Co., Ltd., Montreal, Que
Smooth Mfg. Co., Jersey City, N.J
Woolsten Rubber Co., Jersey City, N.J

**Gear Blanks**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont
Philadelphia Gear Works, Philadelphia, Pa.

**Gear-Cutting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilgo Machine Co., Bridgeport, Conn
Brown & Sharpe Mfg. Co., Providence, R.I
Fellows Gear Shaper Co., Springfield, Vt.
Pratt, Ltd., H. W., Toronto, Ont
Wicket Machine Co., D. E., New London, Conn.

**Gear Testing Machines**
Brown & Sharpe Mfg. Co., Providence, R.I

**Gears, Cast**
Can. Link Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que
Dom. Foundries & Steel, Hamilton, Ont.
Foster Motor Co., Ltd., Orillia, Ont
Head Iron & Steel Foundries, Hull, Que.

**Gears, Cut**
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont
Crescent Machine Co., Ltd., Montreal, Q.
Dominion Fibre Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que
Lyman Tube & Supply Co., Montreal, Que
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa
Reid (Hans) of Canada, Ltd., Montreal, Que.

**Gears, Dressed**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Gears, Forged**
Canada Foundries & Forgings Co., Welland, Ont
Lyman Tube & Supply Co., Montreal, Que.

**Gears, Herringbone**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont
Philadelphia Gear Works, Philadelphia, Pa

**Gears, Machine Moulded**
Can. Steel Foundries, Montreal, Que.

**Gears, Rawhide (See Gears, Cut)**
Philadelphia Gear Works, Philadelphia, Pa

**Gear, Silent Chain**
Gardner & Son, Robt., Montreal, Que
Morse Chain Co., Ithaca, N.Y.

**Gears, Worm**
Dom. Steel Products Co., Brantford, Ont

**Generators, Acetylene**
L'Air Liquide Society, Toronto, Ont

**Generators, Electric**
Hendrie Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal, Que
Pratt, Ltd., H. W., Toronto, Ont
Sherwant Co., B. F., Boston, Mass.

**Goggles, Safety**
Bausch, W. B., San Francisco, Calif
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y
Willson Goggles, Inc., Reading, Pa.

**Grab Buckets**
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que
Can. Link Belt Co., Toronto, Ont
Dominion Bridge Co., Ltd., Lachine, Que
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Grease Cups, Pressed Steel and Brass**
Can. Winkley Co., Ltd., Windsor, Ont

**Greases, Lubricating**
Canadian SKF Co., Toronto, Ont
Canada Refining Co., Toronto, Ont.

**Grinding Discs**
Ritchey Supply Co., Toronto, Ont
Wausau Abrasives Co., Chicago, Ill.

**Grinding Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Grinding Machines, Abrasive Belt**
Beacon Engineering Co., Tipton, England.
Norton Co of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Automatic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont
St. Louis Machine Co., St. Louis, Mo

**Grinding Machines, Bench**
Aikenhead Hardware Ltd., Toronto, Ont
Cowan & Company, of Galt, Ltd., Galt, Ont.
Ford Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. E., Montreal, Que
Geometric Tool Co., New Haven, Conn
Goodell & Pratt Co., Greenfield, Mass
Holly, R. S., Toronto, Ont
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co of Can., Ltd., Hamilton, Ont.
Pettie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rodefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co., Waltham, Mass.
Terry & Co., John C., Birmingham, Eng
St. Louis Machine Co., St. Louis, Mo
Strelinger Co of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont
Williams Machinery & Supply Co., A. R., Montreal, Que

**Grinding Machines, Center**
U.S. Electrical Tool Co., Cincinnati O
Wisconsin Electric Co., Racine, Wis

**Grinding Machines, Cutter and Reamer**
Cincinnati Milling Machine Co., Cincinnati Ohio
Garlock-Walker Mchy. Co., Toronto, Ont
Greenfield Machine Co., Greenfield, Mass
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Cylindrical**
Garlock-Walker Mchy. Co., Toronto, Ont
Greenfield Machine Co., Greenfield, Mass
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Die**
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio
National Machinery Co., Tiffin, Ont

**Grinding Machines, Disc**
Pearson Engineering Co., Tipton, England
Ford-Smith Machine Co., Hamilton, Ont

**Grinding Machines, Drill**
Beacon Engineering Co., Tipton, England
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que

**Grinding Machines, Face**
Ford-Smith Machine Co., Hamilton, Ont

**Grinding Machines, Floor and Tool**
Beacon Engineering Co., Tipton, England
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis
Modern Tool Co., Erie, Pa
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont
Terry & Co., John C., Birmingham, Eng
Wilkinson & Kompass, Hamilton, Ont

**Grinding Machines, Internal**
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que
Manhattan Machine & Tool Works, Grand Rapids, Mich

**Grinding Machines, Portable**
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que.
Carborundum Co., Niagara Falls, N.Y
Cincinnati Electrical Tool Co., Cincinnati Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Haskins Co., R. G., Chicago, Ill
Holden Co., Ltd., Montreal, Que
Independent Pneumatic Tool, Chicago, Ill
Wilkinson & Kompass, Hamilton, Ont.
Wisconsin Electric Co., Racine, Wis

**Grinding Machines, Power Oscillating Tool**
Herbert Ltd., Alfred, Toronto, Ont

**Grinding Machines, Ring Wheel**
Ford-Smith Machine Co., Hamilton, Ont

**Grinding Machines, Snagging**
Norton Co. of Can., Ltd., Hamilton, Ont

**Grinding Machines, Surface**
Garlock-Walker Mchy. Co., Toronto, Ont
La Salle Tool Co., Ltd., La Salle, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont

**Grinding Machinery, Tool Post**
Foss Machinery & Supply Co., Geo. E., Montreal, Que.
Gisholt Machine Co., Madison, Wis
Wilkinson & Kompass, Hamilton, Ont
Wisconsin Electric Co., Racine, Wis

**Grinding Machines, Universal**
Foss Machinery & Supply Co., Geo. E., Montreal, Que
Garlock-Walker Mchy. Co., Toronto, Ont
Gisholt Machine Co., Madison, Wis
Greenfield Machine Co., Greenfield, Mass
Jones & Shipman, of Leicester, England Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill
Landis Tool Co., Waynesboro, Pa
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Modern Tool Co., Erie, Pa
Morse Twist Drill & Machine Co., New Bedford, Mass
Pettie, Ltd., H. W., Toronto, Ont
Rodefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co., Waltham, Mass.

**Grinding Wheels**
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I
Carborundum Co., Niagara Falls, N.Y
Dom. Abrasive Wheel Co., Ltd., Munro, Ont.
Ford-Smith Machine Co., Hamilton, Ont
International Machinery & Supply Co., Montreal, Que.
Norton Co of Can., Ltd., Hamilton, Ont

**Guards, Machinery and Window**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Gun-Barrel Machinery**
Steinle Turret Machine Co., Madison, Wis

**Hack Saws, Power**
Ackworthlne, Ltd., John, Birmingham, Eng
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I
Garlock-Walker Mchy. Co., Toronto, Ont
Goodell & Pratt Co., Greenfield, Mass
Lyman Tube & Supply Co., Montreal, Que
McKenzie Machinery Co., Guelph, Ont
Pettie, Ltd., H. W., Toronto, Ont
Simonds Canada Saw Co., Montreal, Que
Starrett Co., L. S., Athol, Mass
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hammers, Chipping**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hammers, Drop**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y
Brown, Boggs & Co., Ltd., Hamilton, Ont
Canada Foundries & Forgings Co., Welland, Ont
Canada Machinery Corp., Galt, Ont

**Hammers, Electric**
Aikenhead Hardware Ltd., Toronto, Ont
Brown, Boggs & Co., Ltd., Hamilton, Ont
Holden Co., Ltd., Montreal, Que

**Hammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que
Independent Pneumatic Tool, Chicago, Ill
Keller Pneumatic Tool Co., Grand Haven, Mich
Ryerson & Son, Jos. T., Chicago, Ill

**Hammers, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont
Bradley & Son, Inc., C. O., Syracuse, N.Y
Brown, Boggs & Co., Ltd., Hamilton, Ont
High Speed Hammer Co., Rochester, N.Y
Lufkin & Co., A. B., Hespeler, Ont
Petrie, Ltd., H. W., Toronto, Ont
Ryerson & Son, Jos. T., Chicago, Ill

**Hammers, Riveting**
Cleveland Pneumatic Tool Co., Toronto, Ont
Ryerson & Son, Jos. T., Chicago, Ill

**Hangers, Shafting**
Can. Link Belt Co., Toronto, Ont
Canadian SKF Co., Toronto, Ont
Canadian Dodge Bros., Ltd., Toronto, Ont
Ford Sales Manager Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. E., Montreal, Que
Terry & Co., Ltd., John C., Birmingham, Eng
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hardening, Case-Hardening and Tempering**
Hamilton Case & Machine Co., Toronto, Ont

**Hardness Testing Apparatus**
Scott Instrument Co., Jamaica, N.Y

**Hobbing Machines**
Barber Colman Company, Rockford, Ill
Herbert Ltd., Alfred, Toronto, Ont
Pettie, Ltd., H. W., Toronto, Ont

**Hobs**
Barber Colman Company, Rockford, Ill
Brown & Sharpe Mfg. Co., Providence, R.I
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Hoists, Electric**
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que
Can. Link Belt Co., Toronto, Ont
Gartlock Wonder Mchy. Co., Toronto, Ont
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Montreal, Que
Shepherd Electric Crane & Hoist Co., Montreal, Que
Stephens-Adamson Mfg. Co., Aurora, Ill
Watson Electric Crane & Hoist Co., Paterson, N.J
Wright Mfg. Co., Toronto, Ont

**Hoists, Hand**
Lyman Tube & Supply Co., Montreal, Que
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Montreal, Que
Yale & Towne Mfg. Co., Stamford, Conn.

**Hoists, Pneumatic**
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que
Canada Pneumatic Tool Co., Toronto, Ont.
Gartlock Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago, Ill.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Montreal, Que.

**Holders-On, Pneumatic**
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que.
Canada Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool Co., Chicago, Ill.

**Hose, All Kinds**
Quebec Can. Rubber Co., Montreal, Que.

**Hose, Flexible**
Gutta Percha & Rubber Mfg. Co., Toronto, Ont.

**Hose, Industrial**
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont

**Hose, Rubber**
Can. Consolidated Rubber Co., Montreal, Que
Can. Rubber Co. of Can., Ltd., Montreal, Que
Dominion Rubber Co., Ltd., Montreal, Que
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont

**Hose, Steam, Suction, Water**
Quebec Can. Rubber Co., Montreal, Que.

**Hose, Steel**
International Machinery & Supply Co., Montreal, Que.
Quebec Metal Hose Co., Ltd., Montreal, Que.

**Hospital Supplies**
Hentz & Co., Toronto, Ont.
Lyman & Bros. Ltd., Toronto, Ont.

**Hydraulic Leather**
Graton & Knight Mfg. Co., Worcester, Mass

**Hydraulic Machinery**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que.
Can. Westinghouse Co., Hamilton, Ont.
Gartlock, Wonder Mchy. Co., Toronto, Ont.
Smart & Brown, Montreal, Que.

**Igniters, Gas Engine**
Canada Foundries & Forgings Co., Welland, Ont.

**Indicators, Speed and Test**
Ashcroft Manufacturing Co., Toronto, Ont.
Ashcroft & Co., John, Montreal, Que.
Bristol's Instruments, Ltd., Toronto, Ont.

**Jacks, Hydraulic**
Independent Machine & Foundry Co., Montreal, Que.
Watson & Co., R., Belleville, Ont.

**Jacks, Planer**
Ashcroft, Hope, Ltd., Manchester, Eng
Smart & Brown, Montreal, Que.

**Jigs and Fixtures (See Tool Work)**
Dominion Machine Co., Hespeler, Ont.
Bertram & Machine Tool Co., Montreal, Que.
Canada Machinery Corp., Galt, Ont.
Dom. Machine Co., Hespeler, Ont.
Dom. Steel Products Co., Brantford, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Machine Co., Hamilton, Ont.
Pratt, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Toronto Tool Co., Toronto, Ont.
Waterous, Ltd., Brantford, Ont.
Wickett Machine Co., D. E., New London, Conn.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Keyseating Machines**
Bertram Machine Co., Bridgeport, Conn.
Lees & Wainwright, Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Pratt, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.
Toronto Tool Co., Toronto, Ont.

**Keys, Machine**
Can. Fairbanks Standard Co., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Manhattan Machine & Tool Works, Grand Rapids, Mich.

**Knives, Machine**
Ashcroft & Co., John, Montreal, Que.
Canada Machinery Corp., Galt, Ont.
Standard Tool Co., Montreal, Que.

**Knurl Holders**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lacing Leather**
Clipper Belt Lacer Co., Grand Rapids, Mich
Main Belting Co. of Can., Montreal, Que

# BUYERS' DIRECTORY

**Ladders, Permanent**
Can. Foamite Firefoam Co., Hamilton, Ont.

**Lamps, Electric**
Federal Electric Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**Lathe Attachments**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.

**Lathe Pans, Portable**
Canada Machinery Corp., Galt, Ont.

**Lathe Tools**
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

**Lathes, Automatic and Semi-Automatic**
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Bench**
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co. of Canada, Ltd., Dundas, Ont.

**Lathes, Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
McKenzie Machinery Co., Guelph, Ont.
Porter-Cable Machine Co., Syracuse, N.Y.
Ryerson & Son, Jos. T., Chicago, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Engine**
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Cowan & Company, of Galt, Ltd., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Ministry of Munitions, London, Eng.
Mueller Machine & Tool Co., Cincinnati, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Perfect Machine Co., Ltd., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Porter-Cable Machine Co., Syracuse, N.Y.
Rockford Lathe & Drill Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Sidney Machine Tool Co., Sidney, Ohio.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Extension and Gap**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Lathes, Heavy Duty Projectile Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blashill Wire Machy. Co., Ltd., Montreal.
Sidney Machine Tool Co., Sidney, Ohio.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio.
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Polishing (See Polishing and Buffing Machines)**
Ford-Smith Machine Co., Hamilton, Ont.

**Lathes, Relieving**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Lathe, Universal Hand**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Lathe, Speed and Hand**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.

**Lathes, Spinning**
Terry & Co., John C., Birmingham, Eng.

**Lathes, Threading**
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

**Lathes, Vertical Turret**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Roelefson Machine & Tool Co., Toronto, Ont.

**Lathes, Wood Turning**
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Lighting Fixtures**
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

**Linoleum Mill Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Liquid Air Plants**
L'Air Liquide Society, Toronto, Ont.

**Lockers, Clothes**
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

**Lubricants**
Cateract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Lubricating Systems**
Bowser & Co., Inc., S. F., Fort Wayne, I.

**Machinists' Small Tools**
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Goodell & Pratt Co., Greenfield, Mass.
Jones & Shipman, of Leicester, England, Toronto, Ont.
Ker & Goodwin Machine Co., Brantford, Ont.
Ministry of Munitions, London, Eng.
National Machine Tool Co., Racine, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Ryerson & Son, Jos. T., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Mandrels, Expanding**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Mandrels, Solid**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Measuring Machines**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Metals, Alloy**
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Ministry of Munitions, London, Eng.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Metalite Cloth**
Ritchey Supply Co., Toronto, Ont.

**Meters, Steam Flow**
Republic Flow Meters Co., Toronto, Ont.

**Micrometer Calipers**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Milling Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Milling Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Milling Machines, Automatic**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Bench**
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Die**
Thurston Mfg. Co., Providence, R. I.

**Milling Machines, Hand**
Burke Machine Tool Co., Conneaut, Ohio
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

**Milling Machines, Horizontal and Planer Type**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Lucas Machine Tool Co., Cleveland, Ohio.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Milling Machines, Plain**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Lucas Machine Tool Co., Cleveland, Ohio.
McCroskey Tool Corp., Meadville, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
Toomey Inc., Frank, Philadelphia, Pa.

**Milling Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Milling Machines, Universal**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Lucas Machine Tool Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Thurston Mfg. Co., Providence, R. I.
Toomey Inc., Frank, Philadelphia, Pa.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Milling Machines, Vertical**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Lucas Machine Tool Co., Cleveland, Ohio.
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

**Monel Metal**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Motors, Electric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Moulded Rubber Goods**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Nickel, Bars, Sheets, Wire, Etc.**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Nickel Plating Outfits**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Nickel Silver**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Nitrogen**
L'Air Liquide Society, Toronto, Ont.

**Nut Tappers (See Bolt and Nut Machinery)**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

**Nuts, Finished and Semi-finished**
Galt Machine Screw Co., Galt, Ont.

**Nuts, S.A.E., Plain and Castellated**
Galt Machine Screw Co., Galt, Ont.

**Oil Filtering and Storage Systems**
Bowser & Co., Inc., S. F., Fort Wayne, I.

**Oil Storage Engineers**
Bowser & Co., Inc., S. F., Fort Wayne, I.

**Oils**
Canadian Oil Companies, Ltd., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Hole Covers**
Can. Winkley Co., Ltd., Windsor, Ont.

**Oils, Soluble**
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Stones**
Carborundum Co., Niagara Falls, N.Y.

**Oxygen**
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

**Oxy-Acetylene Apparatus**
L'Air Liquide Society, Toronto, Ont.

**Packing, Hydraulic**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Durabla Manufacturing Co., New York.
Graton & Knight Mfg. Co., Worcester, Mass.
Greene, Tweed & Co., New York City.
Guildford & Sons, Ltd., Halifax, N.S.
Gutta Percha & Rubber, Toronto, Ont.
International Machinery & Supply Co., Montreal, Que.

**Packing, Rod and Steam**
Durabla Manufacturing Co., New York.
Quaker City Rubber Co., Philadelphia, Pa.

**Packing, Steam**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Durabla Manufacturing Co., New York.
Graton & Knight Mfg. Co., Worcester, Mass.
Greene, Tweed & Co., New York City.
Guildford & Sons, Ltd., Halifax, N.S.
Gutta Percha & Rubber, Toronto, Ont.
International Machinery & Supply Co., Montreal, Que.

**Paper (Safepack)**
Transportation Service Ltd., Toronto, Ont.

**Paper Mill Conveyors**
Bertrams Ltd., Edinburgh, Scotland.

**Patents**
Fetherstonhaugh & Co., Ottawa, Ont.
Marion & Marion, Montreal, Que.

**Pans, Wet and Dry**
Frost Mfg. Co., Chicago, Ill.

**Pattern-Shop Machinery (See Woodworking Machinery)**
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Patterns, Wood and Metal**
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Penstocks, Steel**
MacKinnon Steel Co., Sherbrooke, Que.

**Phosphor Tin**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Photographic Duplicating Machines**
Commercial Camera Co., Providence, R.I.

**Pipe Bending Machines**
American Pipe Bending Machine Co., Boston, Mass
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

# BUYERS' DIRECTORY

**Pipe Cutting and Threading Machines**
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**
Landis Machine Co., Inc., Waynesboro, Pa

**Pipe Fitters' Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa.

**Piston-Ring Machines**
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Planers, Parallels**
L. & P. Mfg. Co., Niagara Falls, Ont.

**Planing Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Cowan & Company, of Galt, Ltd., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Toomey Inc., Frank, Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

**Planing Machines, Rotary**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Pneumatic Tools**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
International Machinery & Supply Co., Montreal, Que.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Pressed Steel Parts**
Ackworthie, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich.
Lucas Machine Tool Co., Cleveland, Ohio.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Presses, Banding**

**Presses, Broaching**

**Presses, Drop and Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Foot and Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

**Presses, Forcing**
Atlas Press Co., Kalamazoo, Mich.
Lucas Machine Tool Co., Cleveland, Ohio.
Niagara Machine & Tool Works, Buffalo, N.Y.
Stewart & Co., Duncan, Glasgow, Scot.

**Presses, Hydraulic**
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Niagara Machine & Tool Works, Buffalo, N.Y.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

**Presses, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Lucas Machine Tool Co., Cleveland, Ohio.
Niagara Machine & Tool Works, Buffalo, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**
Brown, Boggs & Co., Ltd., Hamilton, Ont
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Protractors**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Propellers**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Pulleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal**
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Canadian SKF Co., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Pulp and Paper Mill Equipment**
MacKinnon Steel Co., Sherbrooke, Que.

**Pumps, Barrel and Boiler-feed**
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coolant**
Trahern Pump Co., Rockford, Ill.

**Pumps, Geared and Hand**
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

**Pumps, Lubricant and Oil**
Bowser & Co., Inc., S. F., Fort Wayne, I.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**
Bowser & Co., Inc., S. F., Fort Wayne, I.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Jardine & Co., A. B., Hespeler, Ont,
Whitney Mfg. Co., W. A., Rockford, Ill.

**Punches, Power**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Toledo Machine & Tool Co., Toledo, Ohio.

**Punching Machines, Horizontal**
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Racks, Cut**
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**
Holden Co., Ltd., Montreal, Que.

**Reamer Holders**
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

**Reamers, Expanding**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Reamers, Solid**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co., Montreal, Que.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Reamers, Taper**
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Taylor Tool Co., J. A. M., Toronto, Ont
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Recorders, Temperature**
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Recorders, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Rheostats**
Northern Electric Co., Montreal, Que.

**Resistance Materials**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Respirators**
Willson Goggles, Inc., Reading, Pa.

**Rivets**
Parmenter & Bulloch Co., Gananoque, Ont.

**Rivet Heaters**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.
Ryerson & Son, Jos. T., Chicago, Ill.

**Riveting Machines**
Bilton Machine Co., Bridgeport, Conn.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**
Stewart & Co., Duncan, Glasgow, Scot.

**Rolls (Rubber Covered)**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rudder Frames, Steel**
Can. Steel Foundries, Montreal, Que.

**Rubber Goods, Mechanical**
Quaker City Rubber Co., Philadelphia, Pa.

**Rules, Steel**
Chesterman & Co., Ltd., J., Sheffield, Eng.

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Rust Preventatives**
Oakley Chemical Co., New York, N.Y.

**Sand Paper**
Wausau Abrasives Co., Chicago, Ill.

**Sand Equipment**
Can. Link-Belt Co., Toronto, Ont.

**Sand Mills**
Frost Mfg. Co., Chicago, Ill.

**Sand Rammers, Pneumatic**
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill
Keller Pneumatic Tool Co., Grand Haven, Mich

**Saw Frames and Blades, Hack**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Sawing Machines, Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Ryerson & Son, Jos. T., Chicago, Ill.

**Sawing Machines, Power Hack**
Ackworthie, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I.
Lewis, The, Toronto, Canada.
Perfect Machine Co., Ltd., Galt, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Saw Sharpening Machines**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saw Tables, Universal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Cowan & Company, of Galt, Ltd., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
McKenzie Machinery Co., Guelph, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cowan & Company, of Galt, Ltd., Galt, Ont.
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Hot and Cold**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Saws, High Speed Steel**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Metal Band**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cowan & Company, of Galt, Ltd., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Saws, Metal, Power**
Clemson Bros., Inc., Hamilton, Ont.

**Saws, Metal Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass

**Saws, Milling**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Saws, Screw Slotting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Swing Cut-off**
Oliver Machinery Co., Grand Rapids, Mich.

**Scales**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks Morse Ltd., Montreal, Q.

**Screens**
Can. Wire & Iron Goods Co., Hamilton, Ont

**Screw Driving Machine**
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Screw Extractors**
Cleveland Twist Drill Co., Cleveland, O.

**Screw Machine Work**
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio
Tallman Brass & Metal Co., Hamilton, Ont.

# BUYERS' DIRECTORY

**Screw Machinery, Wood and Lag**
[illegible] Harrison, Ont.

**Screw Machines**
[illegible] R.I.

**Screw Machines, Automatic**
[illegible]

**Screw Machines, Plain or Hand**
[illegible]

**Screw Plates**
[illegible]

**Screws, Cap and Set**
[illegible]
Acme Screw Co., Cleveland, Ohio.

**Screws, Machine**
[illegible] Bristol, Conn.

**Screws, Safety Set**
[illegible]

**Seamless Tubing. (See Tubing. Seamless Steel**
[illegible]

**Second-Hand Machinery**
(See Searchlight Section)
[illegible]

**Separators, Moisture and Oil**
[illegible]

**Separators, Oil and Waste**
[illegible]

**Shafting**
[illegible]
Can. Hoist & Derrick Co., Hamilton, Ont.
[illegible]
Can. Power Specialties Co., Hamilton, Ont.
[illegible]
Wilson Machine Co., A. R., Toronto, Ont.
[illegible]

**Shapes, Cold-Drawn Special Steel**
[illegible] Steel Co., Hamilton, Ont.

**Shaping Machines**
[illegible]

**Shapers, Wood**
[illegible] Grand Rapids, Mich.

**Shears, Hand**
[illegible]

**Shears, Power**
[illegible]

**Sheet Metal Working Machinery**
[illegible]

**Sheets, Nickel, Resist, Alloy**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Side Frames, Locomotive**
Can. Steel Foundries, Montreal, Que.

**Slotting Attachments**
[illegible]

**Slotting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford Smith Machine Co., Hamilton, Ont.
[illegible]
Moore H. A. Co., Rochester, N.Y.

**Solders**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Special Machinery and Tools**
Brown Engineering Corp., Ltd., Toronto.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Spectacles, Industrial**
Willson Goggles, Inc., Reading, Pa.

**Springs**
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Dyrab Steel (Consolidated) Ltd., Toronto, Ont.
Steele Ltd., James, Guelph, Ont.

**Sprockets and Chains**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Squares**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Stamping, Metal**
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Elliott & Whitehall Tool Co., Galt, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bullock Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Stamps, Steel**
Diamond Saw & Stamping Works, Buffalo, N.Y.

**Stairways, Wrought Iron**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Steam Specialties**
Crane Ltd., Montreal, Que.
Republic Flow Meters Co., Toronto, Ont.

**Steel Plate**
Hamilton Bridge Works Co., Ltd., Hamilton, Ont.
Dom. Foundries & Steel, Hamilton, Ont.

**Steels, Tool**
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel, Cold-Rolled Strip**
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Steel Castings**
Dom. Foundries & Steel, Hamilton, Ont.

**Steel Hardness Measuring Instruments**
Halcomb Steel Co., Syracuse, N.Y.

**Steel, Shafting and Free Cutting Screw**
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

**Steel, Sheet**
Andrews Steel Co., Newport, Ky.
Firth & Sons, Ltd., Thos., Montreal, Q.
Hlingsworth Steel Co., John, New York City, N.Y.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

**Steel, Tanks**
Can. John Wood Mfg. Co., Toronto, Ont.

**Steel, Stainless**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steels, Alloy, Open Hearth and Electric**
United Alloy Steel Corp., Canton, Ohio.

**Steels, Alloy and Carbon**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Halcomb Steel Co., Syracuse, N.Y.
Hlingsworth Steel Co., John, New York City, N.Y.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steels, High-Speed**
Andrews Steel Co., Newport, Ky.
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Hlingsworth Steel Co., John, New York City, N.Y.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel, Magnet**
Vanadium Alloys Steel, Latrobe, Pa.

**Steel, Structural**
MacKinnon Steel Co., Sherbrooke, Que.

**Steel Tubing, Close Joint and Welded**
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

**Stencil Machines**
Diagraph Stencil Machine Corp'n, St. Louis, Mo.

**Stencil Cutting Machines**
Diagraph Stencil Machine Corp'n, St. Louis, Mo.

**Stern Frames, Cast Steel**
Can. Steel Foundries, Montreal, Que.

**Stools, Shop**
Ministry of Munitions, London, Eng.

**Straightening Machinery**
Bertrams Ltd., Edinburgh, Scotland.
Ryerson & Son, Jos. T., Chicago, Ill.

**Studs**
Galt Machine Screw Co., Galt, Ont.

**Surface Plates**
Bilton Machine Co., Bridgeport, Conn.

**Swaging Machines**
Atkins & Co., Inc., E. C., Indianapolis, I.

**Switches, Railway**
Can. Steel Foundries, Montreal, Que.

**Switches and Switchboards**
Northern Electric Co., Montreal, Que.

**Tachometers**
Aikenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

**Tanks, Steel**
MacKinnon Steel Co., Sherbrooke, Que.
Can. John Wood Mfg. Co., Ltd., Toronto, Ont.

**Tanks and Pumps, Oil**
Bowser & Co., Inc., S. F., Fort Wayne, I.
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

**Tap Holders**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taper Pins**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Tapes, Measuring**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass.

**Tapping Machines and Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.
St. Louis Machine Co., St. Louis, Mo.

**Taps and Dies**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
International Machinery & Supply Co., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rickert Shafer Co., Erie, Pa.
Taylor Tool Co., J. A. M., Toronto, Ont.

**Taps, Collapsing**
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Rickert Shafer Co., Erie, Pa.
Victor Tool Co., Waynesboro, Pa.

**Teeth, Dredge Bucket**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Testing Metals and Materials**
Toronto Testing Laboratory, Toronto, Ont.

**Thermometers**
Bristol Co., Waterbury, Conn.

**Thread-Cutting Tools**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Thread Cutting Machines**
Landis Machine Co., Inc., Waynesboro, Pa.

**Threading Machines**
Acme Machinery Co., Cleveland, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Thread Lead Testing Machines**
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Thread-Rolling Machines**
Bliss Co., E. W., Brooklyn, N.Y.

**Tongs**
Hepburn Ltd., John T., Toronto, Ont.

**Tool Cases**
Rice Lewis & Son, Ltd., Toronto, Ont.

**Tool Holders**
Armstrong Bros. Tool Co., Chicago, Ill.
Bilton Machine Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Markers, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Tool Posts, Lathe**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Steels for all Purposes**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Tools, Small (See Machinists' Small Tools)**
Armstrong Bros. Tool Co., Chicago, Ill.
Bertrams Ltd., Edinburgh, Scotland.
Burgess & Marchand, Montreal, Que.
Chesterman & Co., Ltd., J., Sheffield, Eng.
Dyrab Steel (Consolidated) Ltd., Toronto, Ont.
Elliott & Whitehall Tool Co., Galt, Ont.
Foss Machinery & Supply Co., Geo F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Jones & Shipman, of Leicester, England, Toronto, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.
Ministry of Munitions, London, Eng.
National Machine Tool Co., Racine, Wis.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Tool Work**
Brown Engineering Corp., Ltd., Toronto.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.

**Torches, Blow**
Can. Hauck Burner Co., Port Hope, Ont.
International Machinery & Supply Co., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Trackwork, Railway**
Can. Steel Foundries, Montreal, Que.

**Trackwork, Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Transformers**
Northern Electric Co., Montreal, Que.

**Transmission Machinery**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Toronto, Ont.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Transportation Systems (See Trucks)**
Mathews Gravity Carrier Co., Port Hope, Ont.

# BUYERS' DIRECTORY

**Treated Bits**
Canadian Vulcan Steel, Latrobe, Pa

**Trolleys and Tramways**
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Reading Crane & Block Co., Reading, Pa.
Wright Mfg. Co., Lisbon, Ohio

**Trucks**
Can. Fairbanks-Morse Ltd., Montreal, Q.
Canada Tinplate Co. (R. B. Smiley), Toronto, Ont.
Dominion Steel Truck Co., Toronto, Ont.
Hepburn, Ltd., John T., Toronto, Ont.
Maple Leaf Mfg. Co., Montreal, Que.
Ministry of Munitions, London, Eng.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Trucks, Industrial Motor**
Maple Leaf Mfg. Co., Montreal, Que.
Ministry of Munitions, London, Eng.
National Steel Car Corp., Ltd., Hamilton, Ont.

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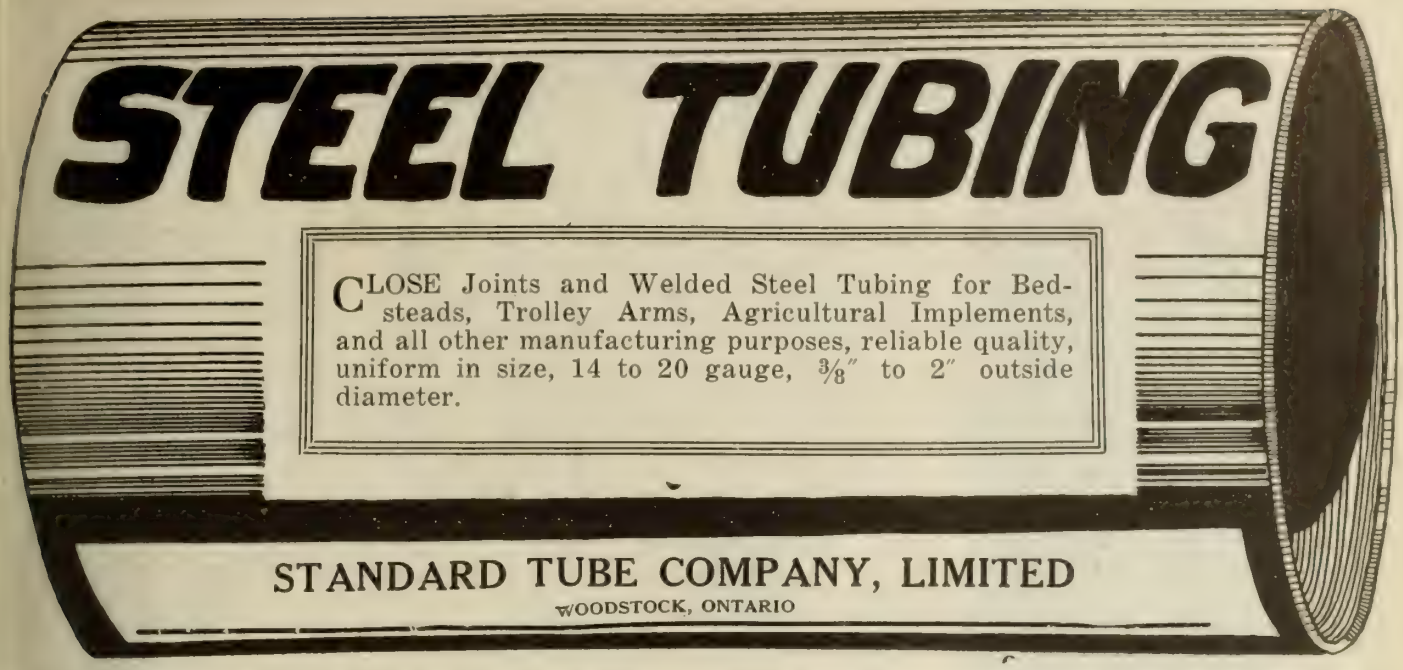
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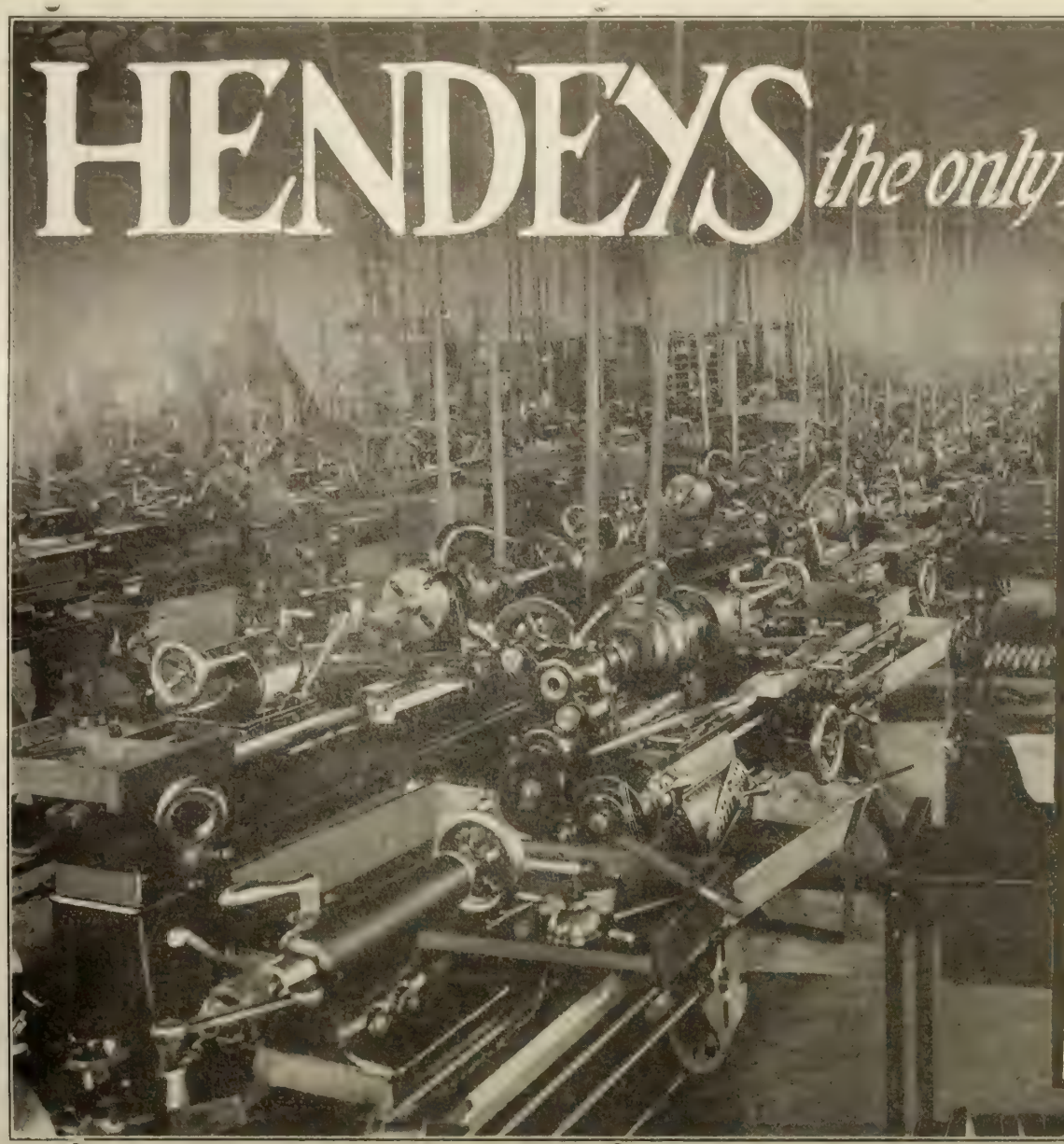
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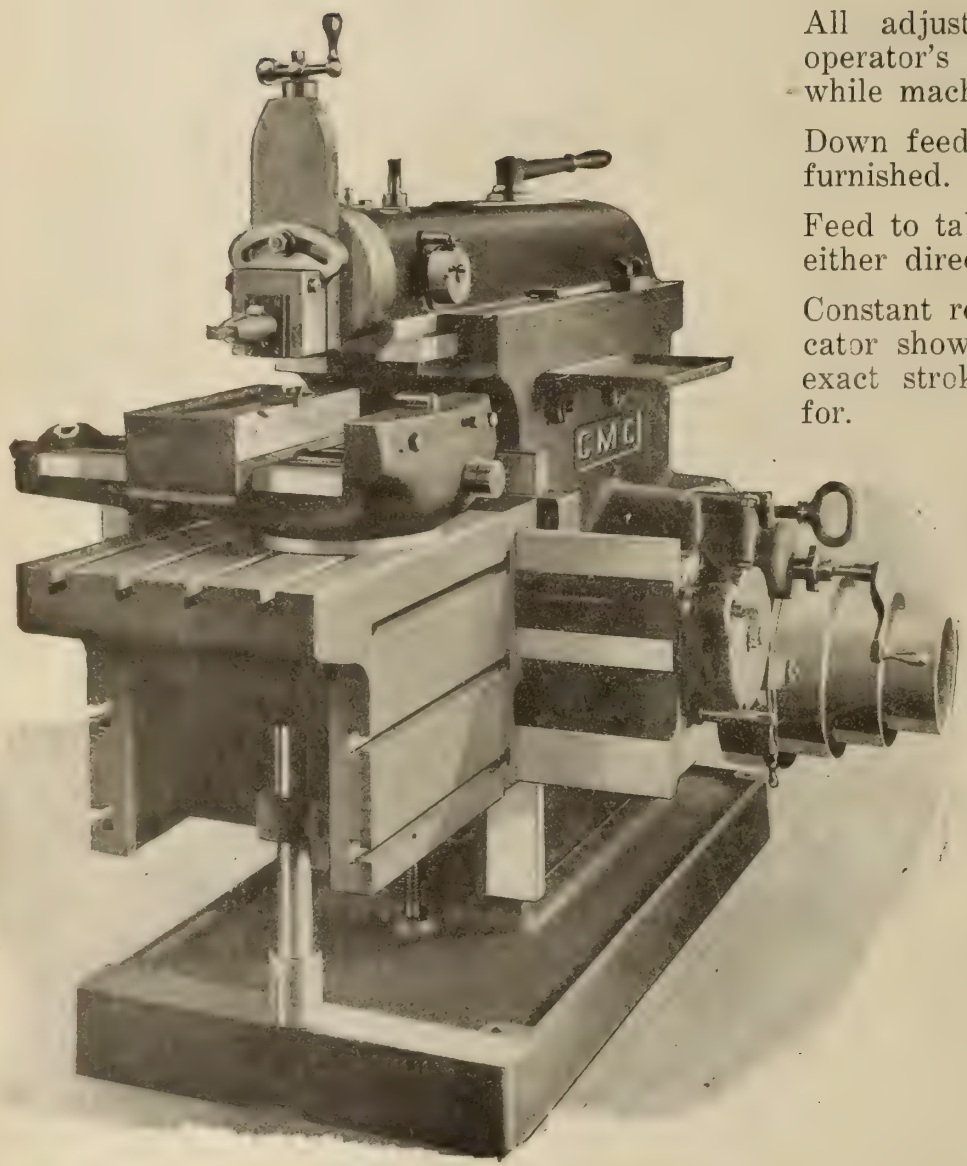
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# CANADIAN MACHINERY AND MANUFACTURING NEWS

Vol. XXV., No. 2 Published by the MacLean Publishing Company, Limited, Toronto January 13, 1921 $4.00 a Year Subscription Price

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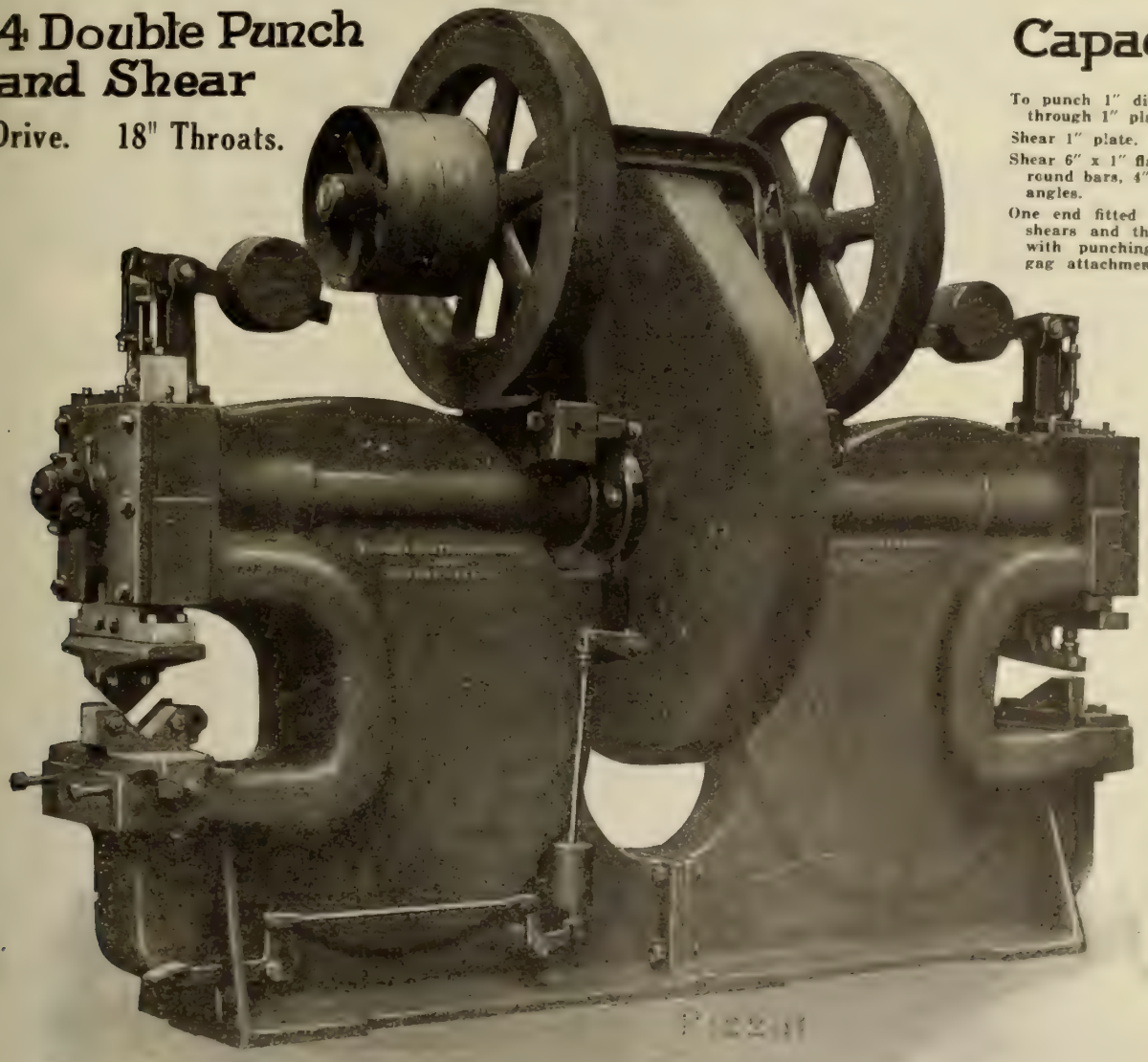
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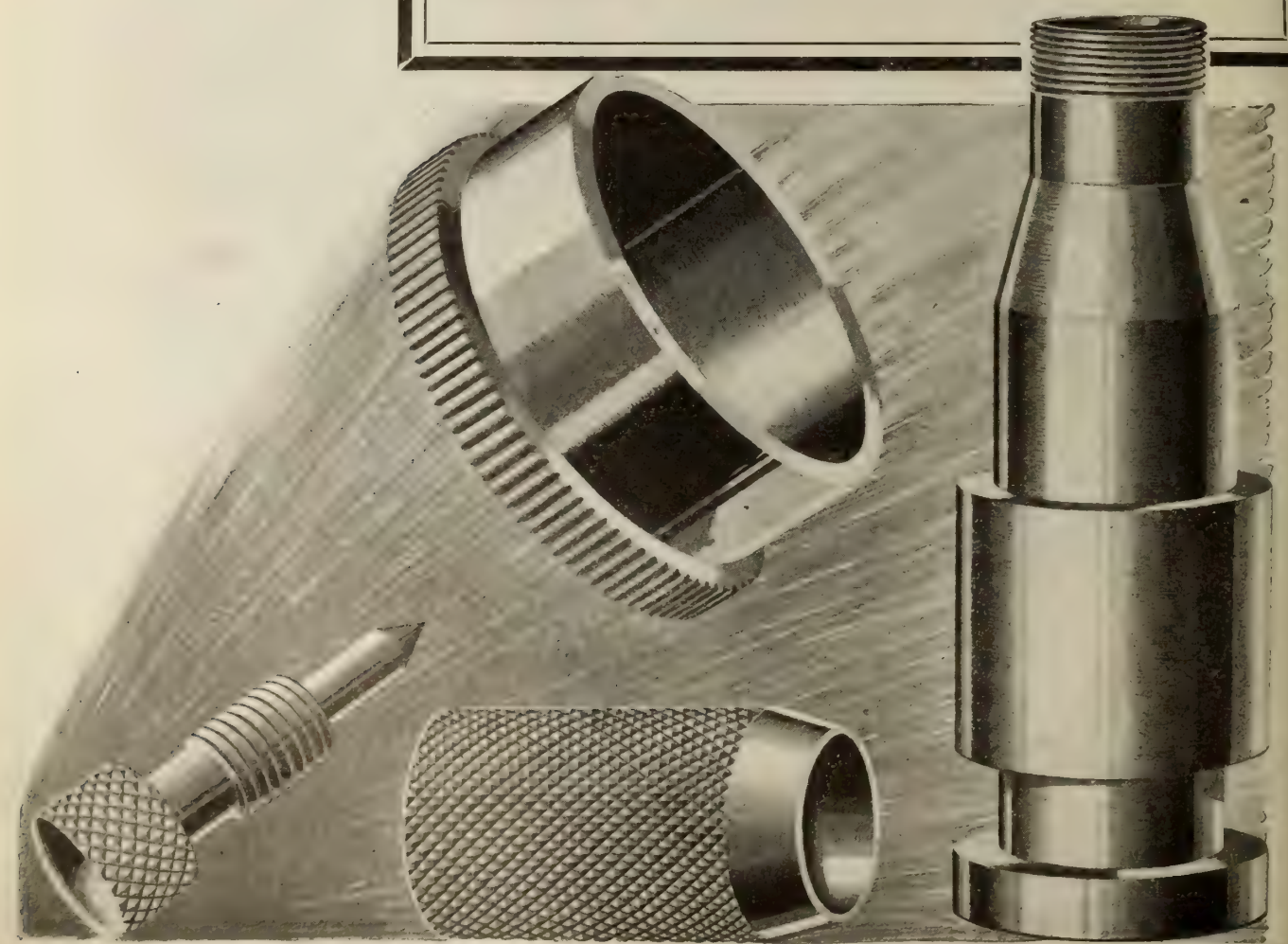
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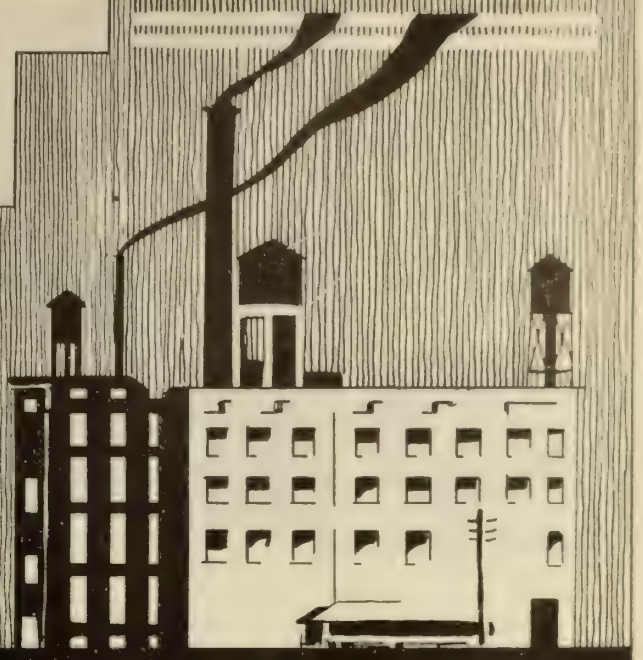
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## HIGH SPEED AND CARBON TWIST DRILLS, REAMERS AND MILLING CUTTERS



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## Satisfaction Creates Confidence

Wilt Tools are made from selected and scientifically tested raw materials, and skilled workmen in a modern factory equipped with up-to-date machinery. Wilt quality creates satisfaction, satisfaction creates confidence. Confidence creates sales, and sales build your business. Think it over.

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Ask your dealer or write direct for our Catalog "C."

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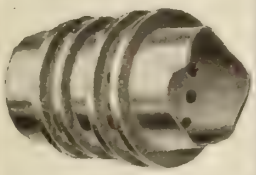
## Wilt Twist Drill Company of Canada, Limited

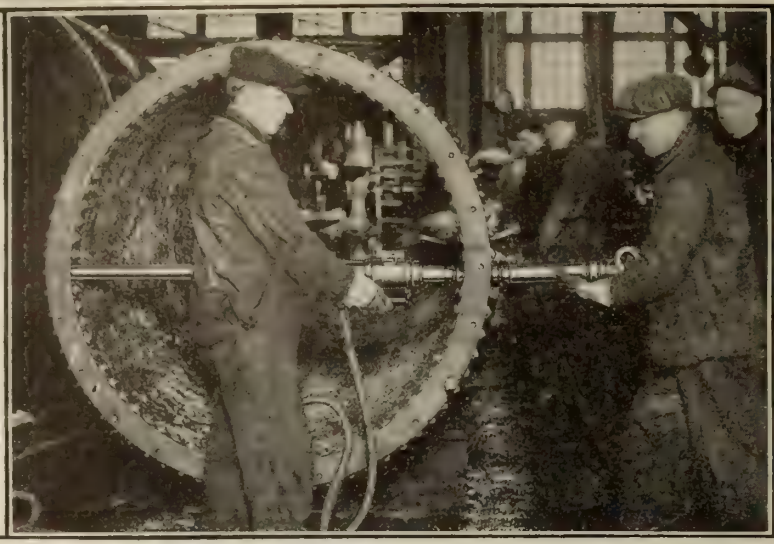
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Low upkeep costs prove the Boyer three-unit-part design logical, simple, dependable. Each part is *separately* renewable and interchangeable, with hammers of a like type. Result—sustained working life, maximum service from each unit part,



# *Back-up your production with Boyers*

"BACKING-UP" your operators and riveting operations with Boyer Pneumatic Tools is a dependable step towards securing air and steam-tight jobs at lowest cost per rivet driven.

Slightly cooled rivets work no hardship on the operator or great driving power of Boyer Riveting Hammers.

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P100-H

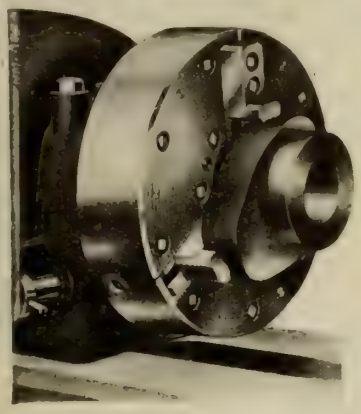
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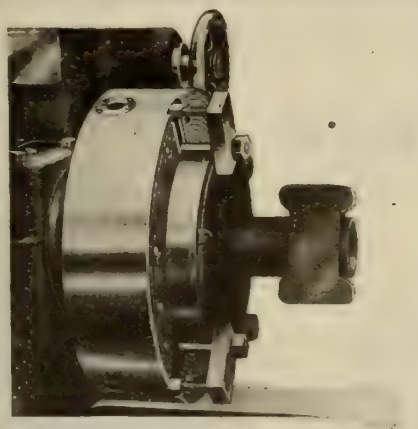
*The world's standard* *wherever rivets are driven*

# The "Coventry" Chuck

*Below are shown one Standard and one Special application of the "Coventry Chuck"*



Standard reversible jaws set for gripping irregular or eccentric work. The gas engine cam is made from a mild steel stamping with 3-inch hole drilled into solid metal. The chuck is our 15-inch size. After the jaws have been properly set, work like this is gripped and chucked as easily as any circular object and much quicker than if a four-jaw chuck were used.



The Coventry Chuck used as a face plate fixture, the object in this instance being clamped back on a locating ring, and a stem fitting into the bore of the chuck. The clamps are held from the T slots in the jaw slides. The chuck here is used for a second operation on the part shown at the left. Use of the chuck in this way saves the trouble and time of taking it off and putting on a special face plate fixture.

## Adaptability

In addition to being exceptionally strong, the "Coventry" Concentric Chuck is also adaptable to a large variety of special work which is outside the scope of standard self-centering chuck. The exceptionally long bearing surfaces of the jaw slides permit the use of a wide range of special jaws.

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**Let the "Coventry" Chuck solve your chucking problems.**

***Write for Bulletin No. 308.***

**Made in 6 Sizes: 9 in., 12 in., 15 in., 18 in., 21 in. and 25 in. diameter**

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Tell us the purpose for which the spring is intended, and experts will gladly co-operate to see that you get the design best suited to the purpose.

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## BEST BECAUSE
## ALL STEEL HARDENED

Spindle, Nut and Screw made of Bar Steel. Body drop-forged. Long lasting under hardest use.
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**"The Tool Holder People"**
**335 N. Francisco Ave., Chicago, U. S. A.**

# Heat Under Accurate Control

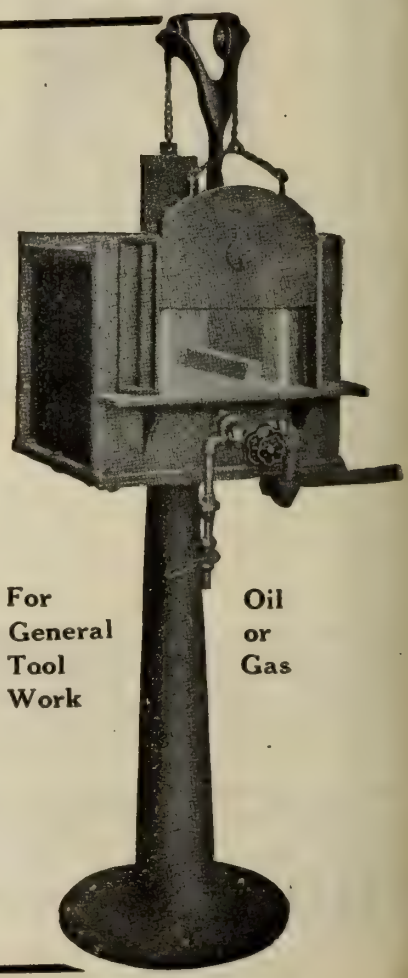
Here is an important factor in the heat treatment of metals. An intense heat, rapidly developed, and always under accurate control of the operator, are features that distinguish

# BELLEVUE FURNACES

These tool forges are particularly adapted for the requirements of the small machine shop for annealing and tempering dies, cutters, reamers, etc.

Combustion is perfect and no flames come in contact with material. Built to stand the highest temperature. Doors are properly counterbalanced. In every way BELLEVUE FURNACES meet with the demand for durability, efficiency and convenience.

**Let us advise you about your heat-treating problems**



**For General Tool Work** — **Oil or Gas**

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**Julius C. Hinz, President**

**703 Bellevue Ave. - Detroit, Mich.**

***Representative in Canada: H. W. PETRIE, LIMITED, Toronto, Canada***

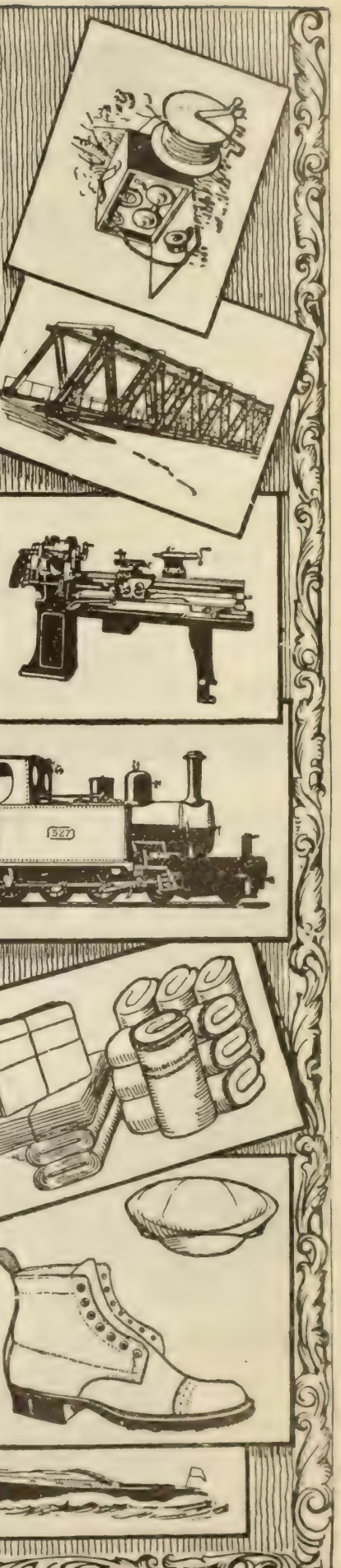
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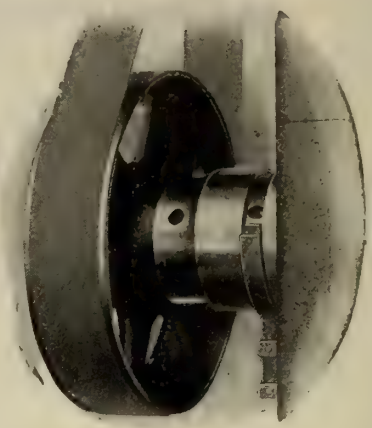
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The tight and loose pulley is passing from favor. With all its disadvantages, it long survived because a reliable friction clutch was not in evidence.

But in the Johnson Clutch, builders of high grade machinery have found a real clutch service. It has been thoroughly tested and adopted on the finest machines made.

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*Single Clutch with Pulley Mounted*

**Write for our Yellow Catalog and Booklet, "Clutches As Applied To Machine Building."**

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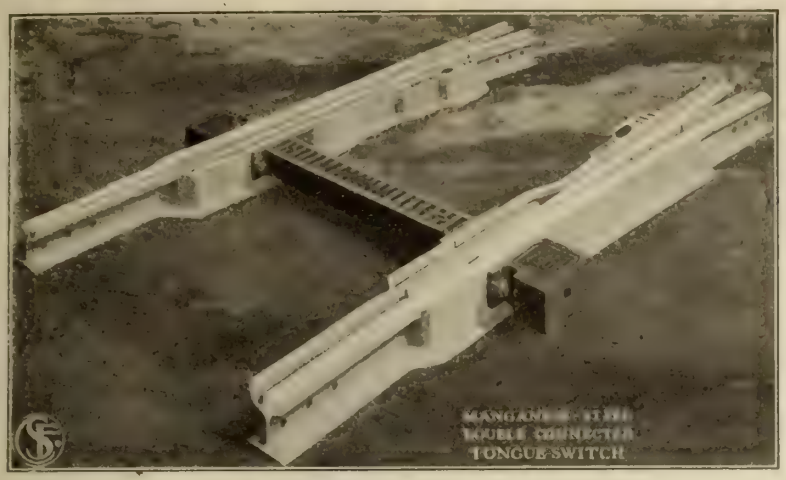
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2



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## HARTNESS AUTOMATIC DIES

### FOR REVOLVING SPINDLES

The No. 4 Type R Hartness Automatic Die has been designed for use on revolving spindles, either Vertical or Horizontal.

### THREE TYPES OF CONTROLS

Outside button coming into contact with some set stop on the machine.

Regular knock-off by carriage coming to a stop while chasers, which are carried along by the revolving thread, pull the body away from the latch pin.

Sleeve control enable chasers to be released or locked at any time.

**The Hartness Automatic Dies are the only automatic dies made that will, without the aid of lead screws, cut threads rivaling in lead accuracy those cut by the best engine lathes.**

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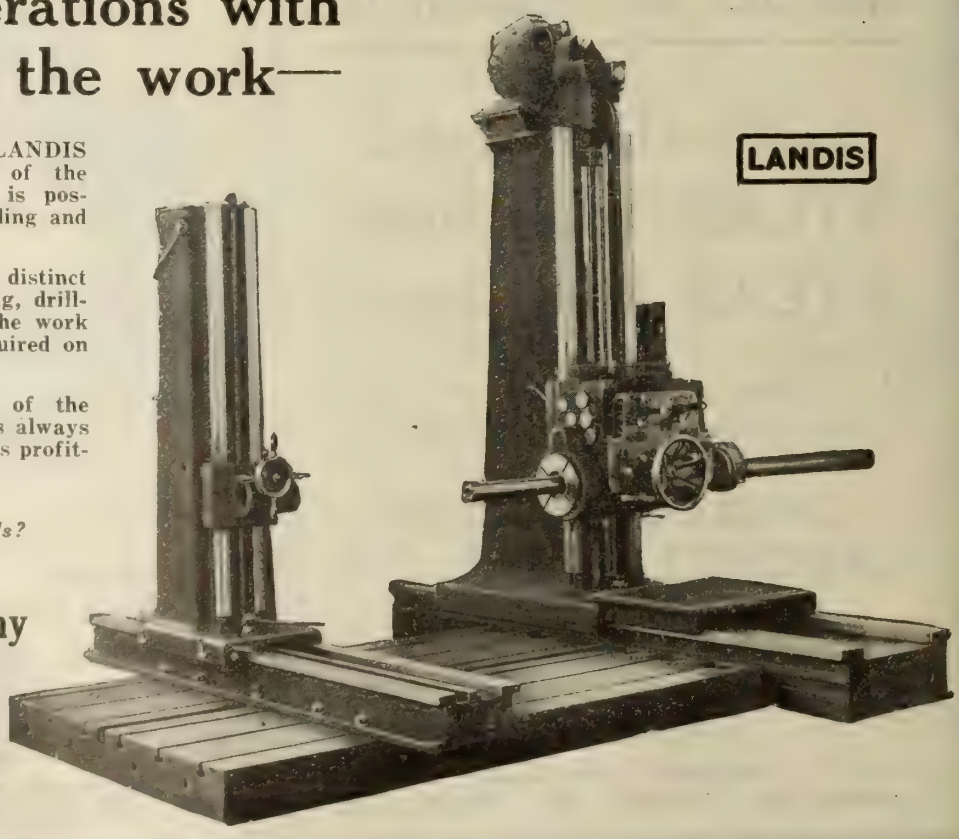
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The job requires in all sixty-four distinct operations, including boring, milling, drilling and tapping. One set-up of the work—a heavy piece—is all that is required on the LANDIS.

Versatility is a strong feature of the LANDIS. Wherever installed, it is always busy. Ask us for full details on this profitable machine.

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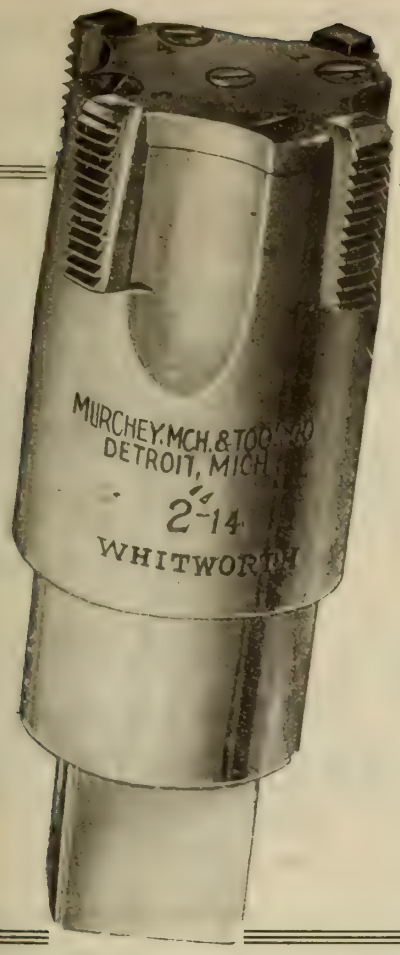



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# MURCHEY SOLID ADJUSTABLE TAPS

## Solid Adjustable Taps Cost Less

Unlike the solid trap, the Murchey Adjustable does not have to be scrapped when the cutting edge is worn.

**It is much less expensive to buy a new set of chasers than to buy a new solid tap.** And the difference in price is saved with every set of chasers you purchase! This is why Murchey Solid Adjustable Taps cost less money.

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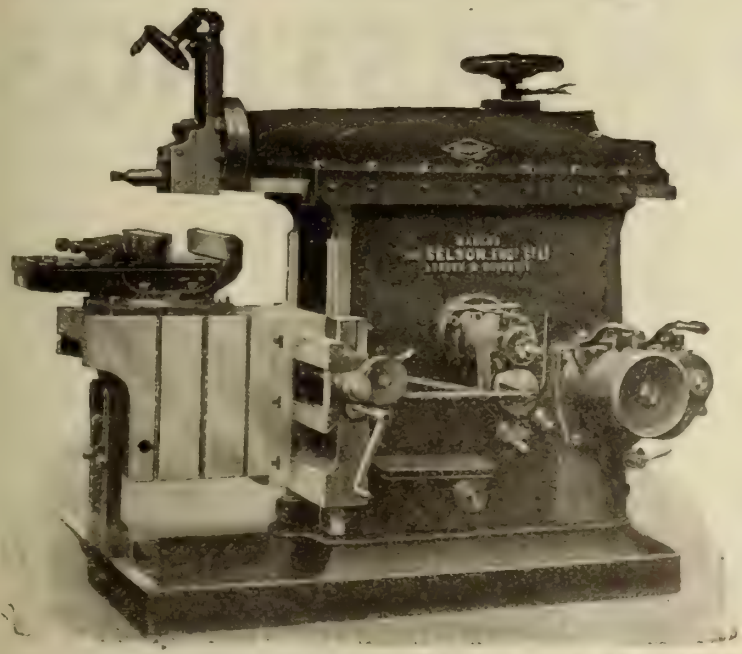
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*High Speed and Heavy Cut*

**Sizes**
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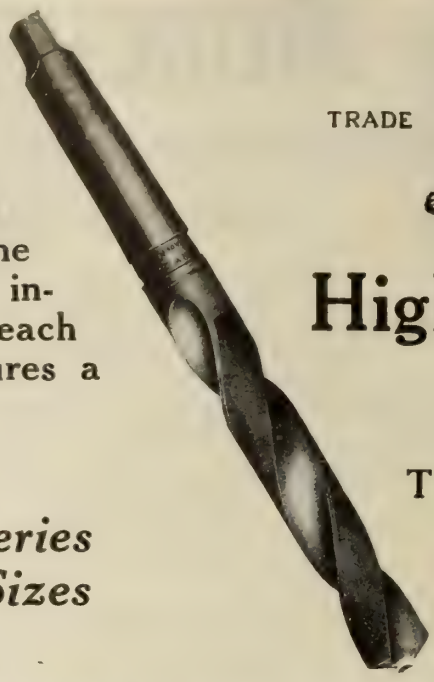
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MILLED OR TWISTED

From the raw materials entering the steel to the finished drill a rigid inspection is given after each operation, which assures a superior product.



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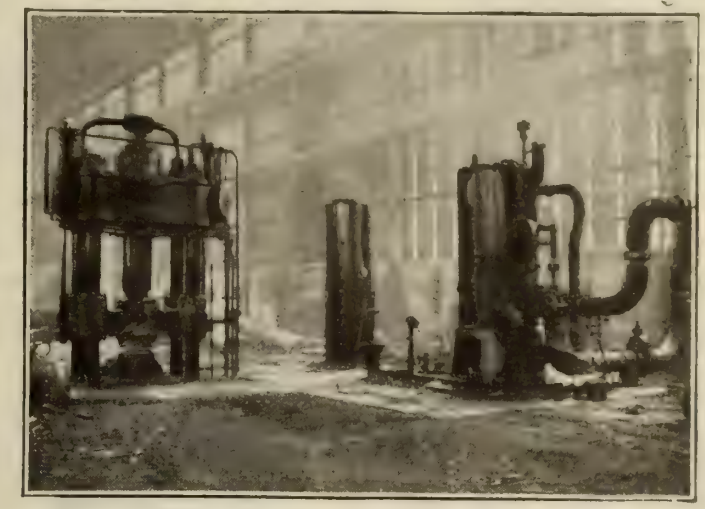
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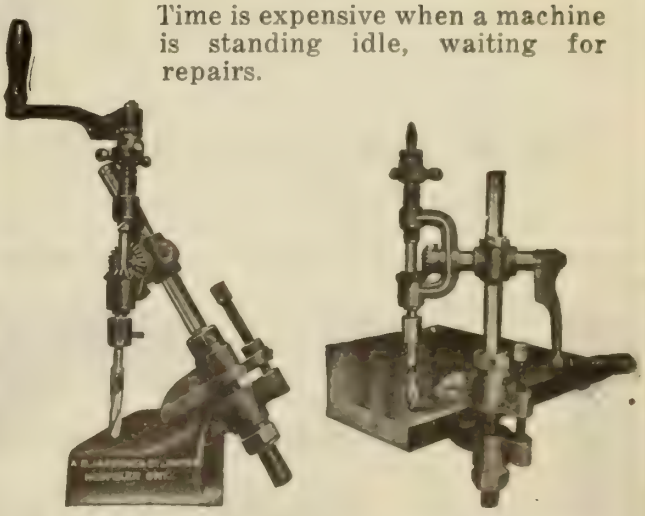
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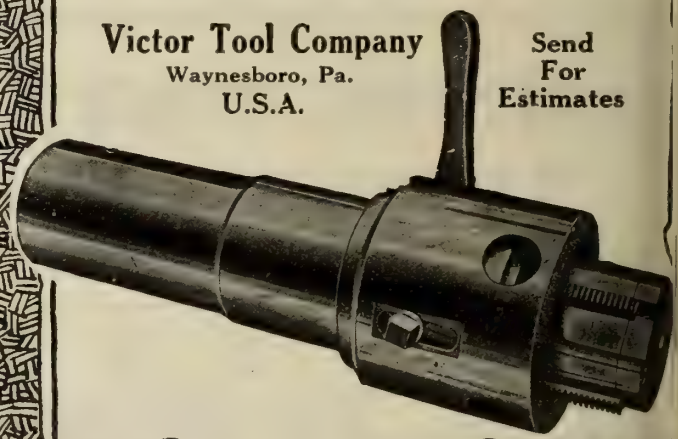
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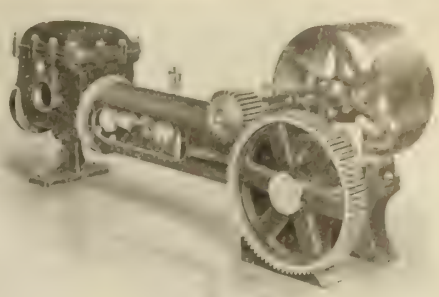


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We also make Standard, Simplex and Duplex Pumps for Boiler Feed, Air Circulation, Fire, Mine and General Service; high and low pressure Pumps for Hydraulic Presses, Lifts and Accumulators.

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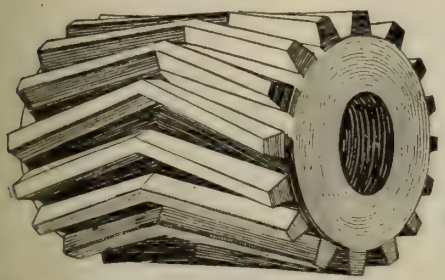
Castings supplied for shipbuilding, cars, locomotives, all classes of machinery, etc

*The Thos. Davidson Mfg. Co. Limited*

Head Office: Montreal.

Branches: Toronto and Winnipeg

Steel Foundry Division: Lachine Canal, Turcot



DAVIDSON STEEL CASTINGS MADE IN CANADA THE SEAL OF DURABILITY

# DAVIDSON




*Manufacturers:*

## The Sheffield Twist Drill & Steel Co., Ltd.

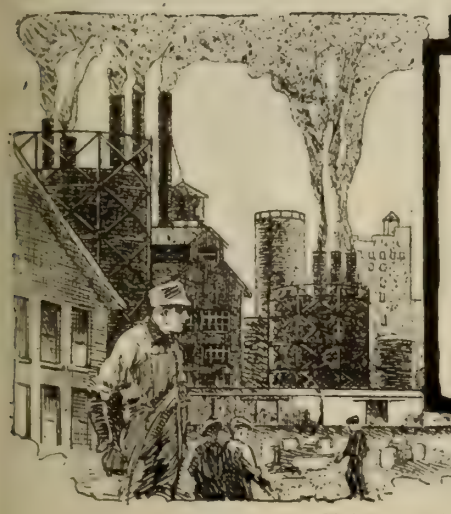
Works: Summerfield Street, Sheffield.

To **PROMOTE TRADE** within the **EMPIRE, CANADIAN MANUFACTURERS** will find that **"DORMER BRAND DRILLS"** meet all requirements. **QUALITY DRILLS** for quick drilling—USE **"DORMER."**

Sheffield Engineering Supplies, Limited,
230, Craig Street West,
Montreal, Canada.

*High Speed Twist Drills*

DORMER BRAND



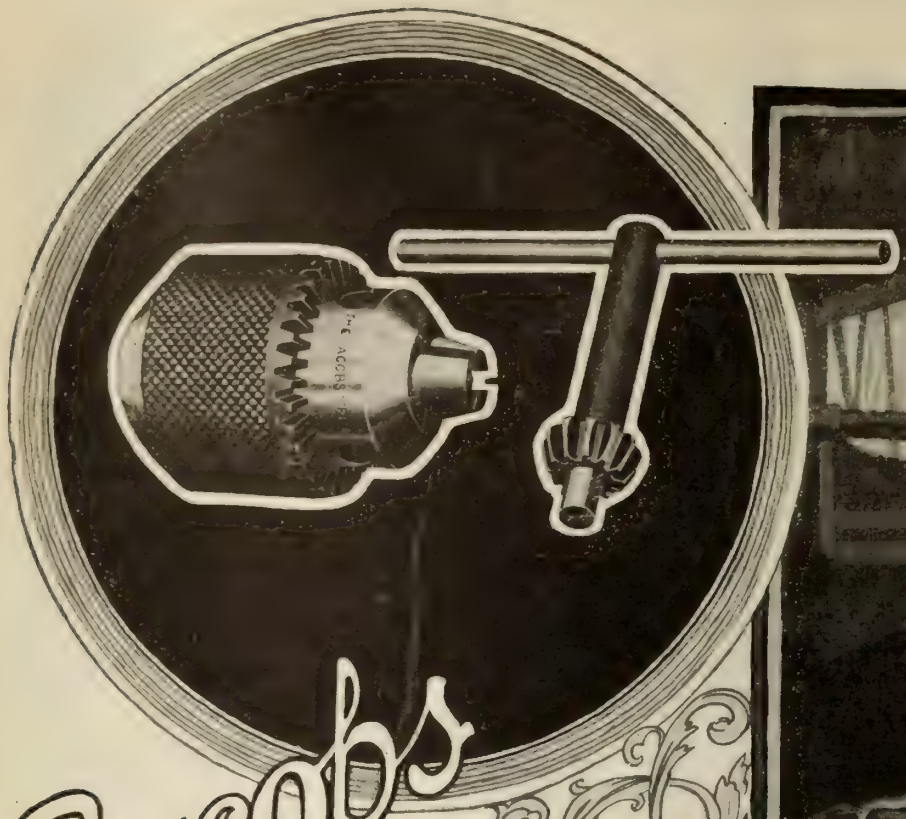
# STEEL PLATE CONSTRUCTION

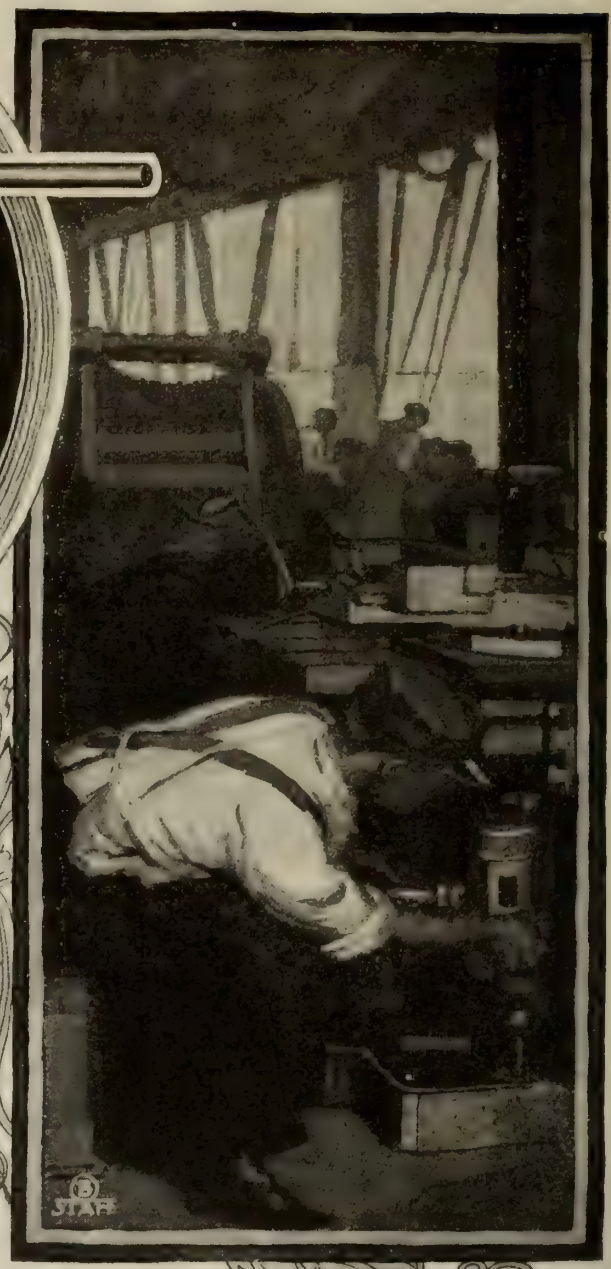
Oil Storage, Gasoline Tanks, Air Receivers, Pneumatic Water Supply Tanks, Smoke Stacks, Boiler Breeching, Riveted Steel Pipe, Bins and Hoppers.

## THE TORONTO IRON WORKS LIMITED

HEAD OFFICE: ROYAL BANK BLDG. TORONTO WORKS: CHERRY STREET


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# Jacobs Quality Chucks

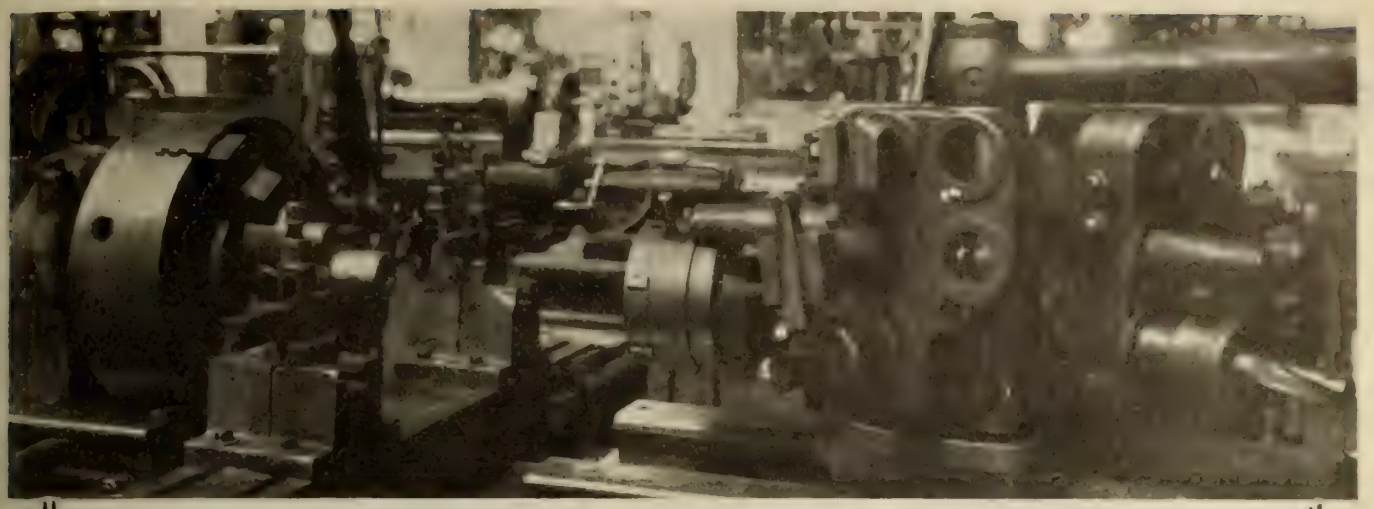
YOU know the value of true holes and you probably know also that a Jacobs Quality Chuck will drive a drill — any drill — straighter, truer, and more swiftly than any other chuck on the market.

But — do you know that over 75 per cent. of the drill machine builders have standardized on this chuck as a necessary adjunct to their product.

## The Jacobs Manufacturing Co.

**Hartford, Conn., U.S.A.**





# The Production of Pump Bodies

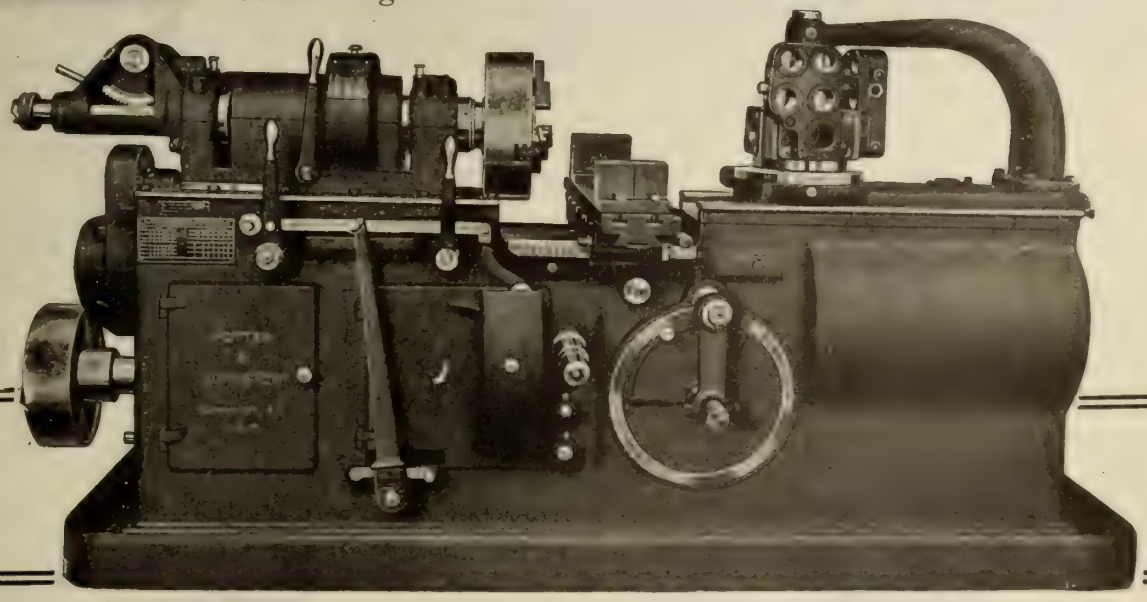
The production of Pump Bodies on the Potter & Johnston 6-A Automatic is an example of work worth while comparing with some of your parts.



Tools are set for Drilling, Counterboring, Turning, Facing and Threading.

The operator is attending to four machines, all of them engaged on work of this class.

No doubt you have work in your factory and it will pay you to send blueprints or samples along for production figures.



*Canadian Offices :* POTTER & JOHNSTON MACHINE CO.

## ROELOFSON MACHINE & TOOL CO., LIMITED

*Head Office and Showrooms :*

*11 Wellington Street East : Toronto, Canada*

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# WHY THE "SNAP" *in a* SNAP GAGE



THE meaning of the word "snap" as applied to limit gages of this type refers primarily to the way in which the gage is used when inspecting cylindrical work. Owing to the extra large tool steel gaging plugs with their beveled edges, this snap is especially evident when the inspector is using a Johansson Adjustable Limit Snap Gage. An operator only has to operate a Johansson Gage for a short time in order to appreciate how nicely it snaps over the work.

"SNAP" Number two is a most valuable one and applies to the breaking of the cast-iron gage frame. Johansson Snap Gages will not bend, warp, or spring if they are dropped. Instead, the cast iron will snap—the operator thus being prevented from using a gage which is inaccurate and passing spoiled work which would cause untold damage later on.

THE "snap" which perhaps appeals the most to the user of a Johansson Limit Gage of this type is represented by the slang meaning of the word. It is undeniably a "snap" to set, to maintain the accuracy and to use a Johansson Snap Gage. When it becomes necessary to reset the size on the Go and No Go plugs, this can be easily done by means of the adjusting screws which are securely held in their correct position by the action of the clamping screws which force the plugs to seat securely against the adjusting screws. The accuracy is then insured permanent by the sealing wax placed over the adjusting screws.

NOT only does the insulated grip protect the gage from change in size owing to temperature, but it also makes the use of the gage, hour after hour a "snap," for its location is such that the gage is always nicely balanced when so properly held.

IN short, it is a "snap" to manufacture by the limit system when Johansson Gages are used. Why not let them prove it in your own shop?



**Aikenhead Hardware Limited**
**Toronto, Ont.**

**Williams & Wilson, Ltd.**
**Montreal, Que.**

**Chas. A. Strelinger of Canada, Ltd.**
**Windsor, Ont.**

Johansson ACCURACY

**C·E·Johansson·Inc**
**POUGHKEEPSIE·N·Y**






The three impervious coatings, illustrated above, over specially annealed steel afford protection against the corrosive effects of salt sea air, severe gases, strong acid and alkaline fumes and extreme weather conditions.

Agents:—Canadian Asbestos Co., Montreal and Toronto; Jamieson Engineering Co., Ltd., London Building, Vancouver, R. Y. Kilvert & Co., Builders Exchange Building, Winnipeg; Gandy & Allison, No. 3 North Wharf, St. John, N. B.; General Sales & Engineering Co., Metropole Building, Halifax, N. S.

# Robertson Process Metal

## *For Economical Replacement*

Corrugated iron roofing and siding require frequent painting and repairs. The result is excessive maintenance costs. Robertson Process Metal, however, does NOT need frequent painting and repairs. Used for roofing, siding and other building purposes *in the first place*, it keeps *down* the cost of up-keep. Used for replacement, it provides insurance against future loss through premature depreciation, owing to its resistance to rust and corrosion.

Unusually strong and permanent, Robertson Process Metal is also light in weight. It insures lower transportation costs. It can be erected with speed and economy. It is the most economical permanent building material because it saves in FIRST COST and MAINTENANCE COST.

You can see and feel an actual sample of Robertson Process Metal. A piece of the metal, as illustrated, together with interesting literature, will be sent upon request.

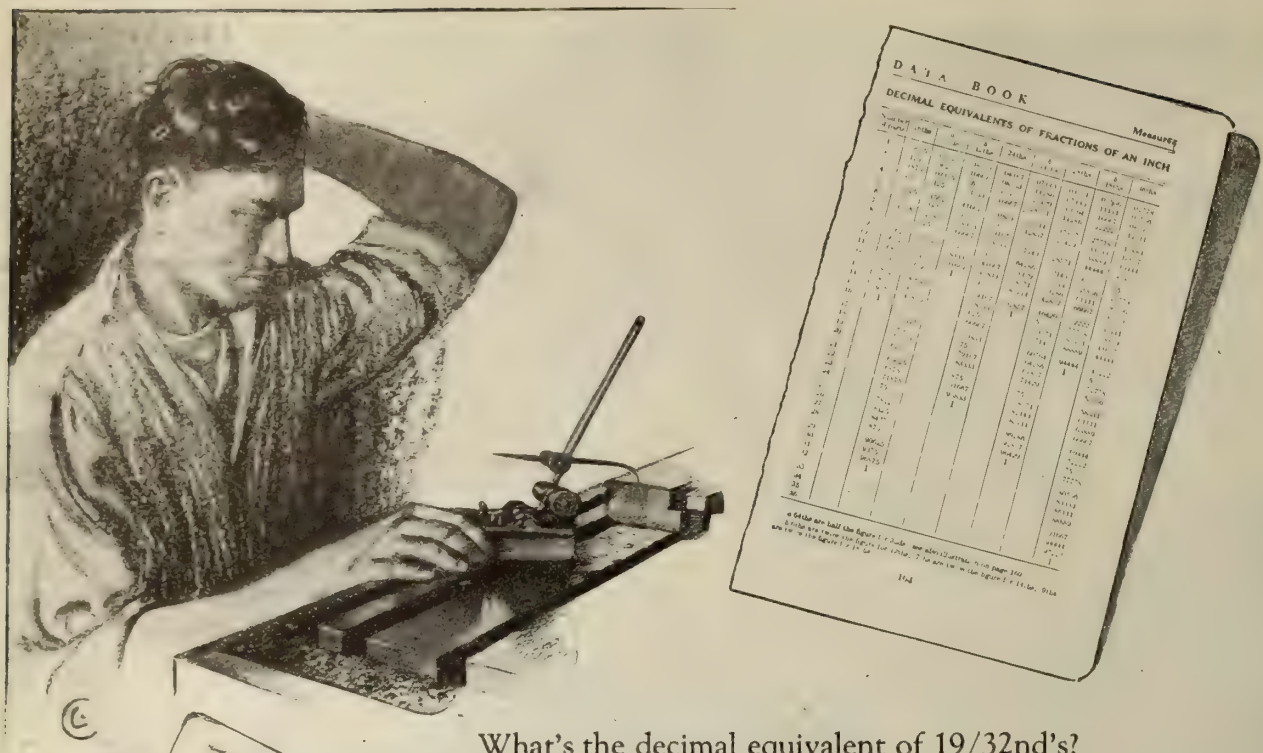
H. H. ROBERTSON COMPANY, Limited, Sarnia, Ontario

*General Sales Office:* Drummond Building, Montreal
*Branch Office:* Kent Building, Toronto

# ROBERTSON PROCESS

TRADE MARK REG. U. S. PAT. OFF.

## METAL FOR ROOFING AND SIDING




What's the decimal equivalent of 19/32nd's?

What is the breaking stress of No. 11 Roebling Wire?

How shall I select a bevel gear cutter for this work?

What clearance should I allow in grinding a milling cutter?

Answers to such common problems are found in the Starrett Data Book for Machinists.

Tables of decimal equivalents, machine screw dimensions, tapers and angles, wire gage standards — and hundreds of other facts in every-day use, are included in its 180 pages.

You'll find that it fits your job as it fits your tool kit. Its pocket size lets you keep it handy for ready reference. And there are mighty few problems that aren't answered in the Starrett Data Book.

At your hardware dealers. Also ask for Catalog No. 22 "3."

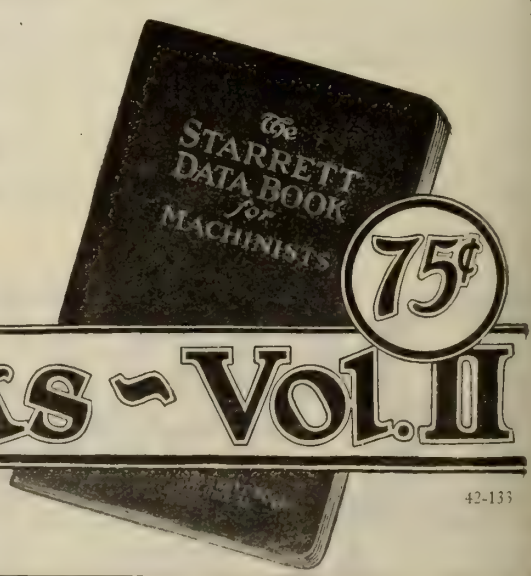
**THE L. S. STARRETT COMPANY**

*The World's Greatest Toolmakers*
*Manufacturers of Hack Saws Unexcelled*

**ATHOL, MASS.**



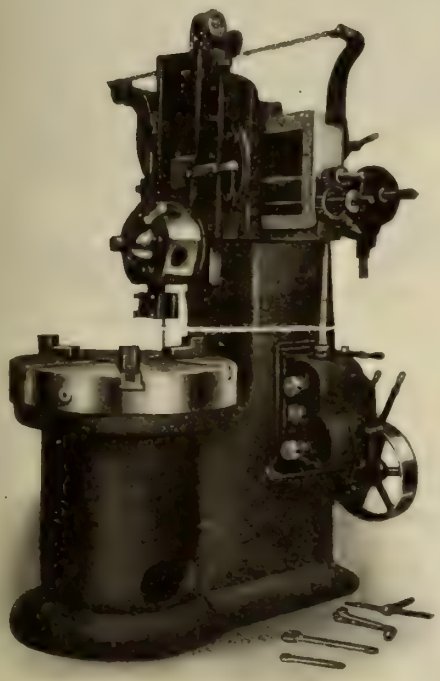



# Starrett Books - Vol. II

42-133

# MACHINERY
## AND SUPPLIES
### *Order Them from the House of Good Service*



WHEN about to purchase machinery or supplies here are three facts to remember:

1—The House of Petrie carries a gigantic stock of the best known machine tools and machine shop supplies; and you are assured of getting the kind of equipment you require—not something that will do just as well.

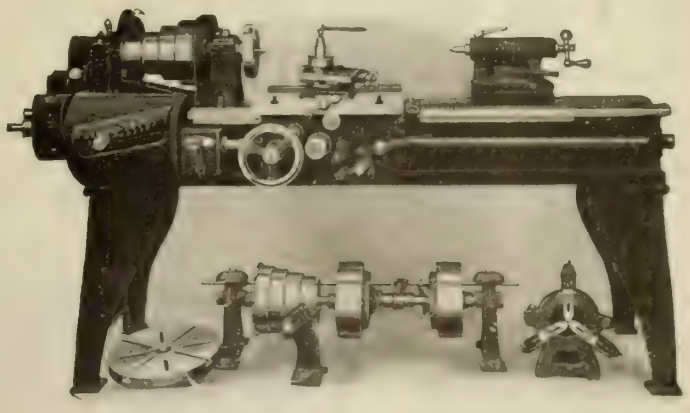
2—Every order receives the prompt attention of a competent staff and when possible is shipped the day received.

3—Half a century's experience in handling machinery of all classes enables us to successfully treat your problems.



***How Can We Serve You?***

***Enquiries Gladly Answered.***

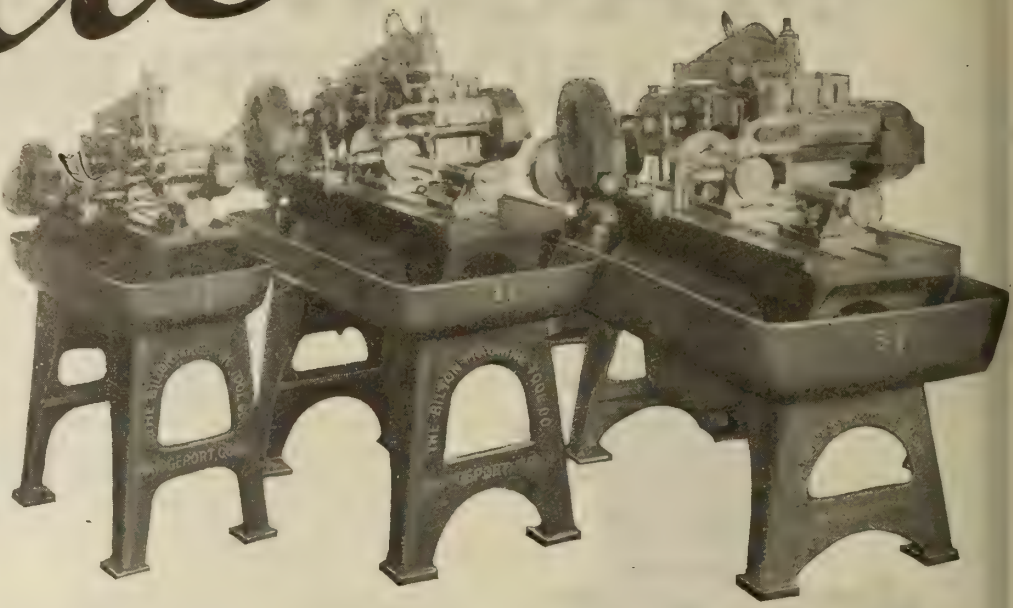


H.W. PETRIE LIMITED TORONTO

# H.W. PETRIE
## Toronto LIMITED Hamilton

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# Bilton GEAR MILLERS



## Fully Automatic

Their adaptability is almost unlimited on small work—such as cutting spur, bevel, miter, angle gears, saws, ratchets, sprockets, cutters, knurls, taps, cylinders, form cutting, manufacturing, milling, etc.

A big time saver, as indexing takes place during return stroke of cutter — which is removing metal 90% of the time.

*Write us for Catalog* 30-6

*Over 500 leading manufacturers now use the Bilton for high production on accurate work*

**Bilton Machine Tool Co.** Housatonic Avenue **Bridgeport, Conn., U.S.A.**

Foreign Agents: Alfred Herbert, Ltd. Chas. Churchill & Co., Ltd.

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# STEEL *for*

## Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

**We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.**



**Steel Ingots**
*by the*
**HARMET**
**Liquid Process**

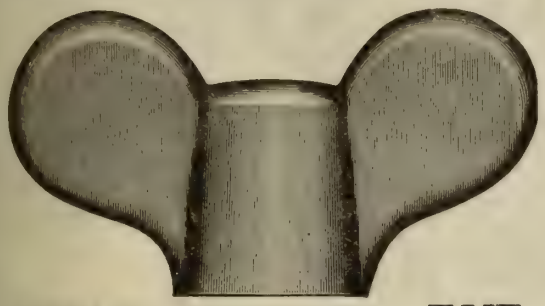
## Nova Scotia Steel and Coal Co., Limited

*Head Offices:*
New Glasgow, N.S.

Sales Offices:
Western Room 14 Windsor Hotel
MONTREAL

CANADA
FOUNDRIES & FORGINGS
LIMITED

DROP FORGED STEEL



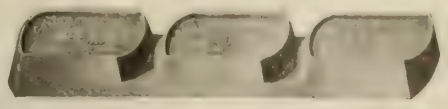
WING NUTS

EYE NUTS

*All Sizes*

Canadian Billings & Spencer Plant
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BABBITT METALS



Imperial Genuine

Made for extra heavy duty, such as Main Bearings on Turbine Generators, Calender Rolls in Pulp Mills, is specially adapted for Marine Engines.




HARRIS HEAVY PRESSURE

THE BABBITT METAL WITHOUT A FAULT

For Donkey Engines, Saw Carriages, Small Motors, Transmission Line Shafting and all steady heavy pressure duty.



Matchless

Suitable For Slow-Moving Bearings

THE CANADA METAL CO., LIMITED
TORONTO HAMILTON MONTREAL
WINNIPEG VANCOUVER

WE CAN SUPPLY

STEEL PLATE

—IN—

Universal Edge - up to 40 in. wide

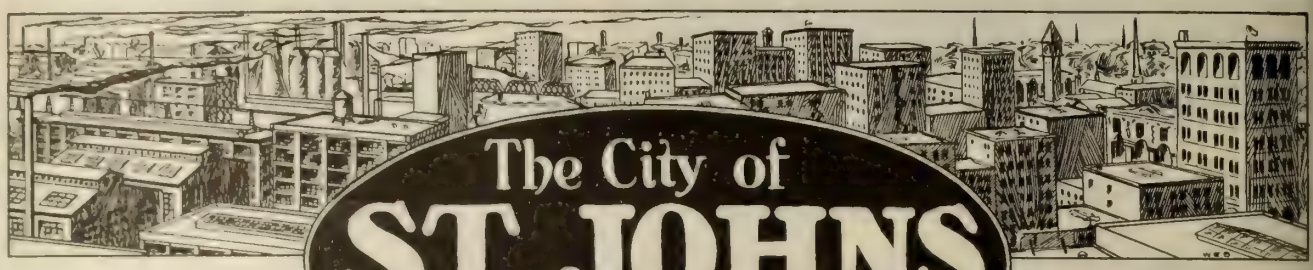
Sheared Edge - up to 60 in. wide

Any Thickness Any Lengths

*Send Us Your Enquiries.*

Dominion Foundries & Steel, Limited
HAMILTON, ONTARIO

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The City of
# ST. JOHNS
QUEBEC

## Locate in this Real Transportation Centre

St. Johns is a nerve centre of the network of railways connecting Central and Western Canada with the Maritime Provinces and with the Eastern States. Seven railways, including the C.P.R. and G.T.R., run through the city and are interconnected in the St. Johns yards by a terminal switching company. The manufacturer locating in St. Johns enjoys the advantages of competitive freight rates and dispatch in the assembling of raw materials and distribution of the finished product. The city in fact commands lower freight rates and a cheaper coal supply than any other centrally located manufacturing city on the North American continent.

St. Johns is directly connected by rail with the Montreal docks, 27 miles distant, affording first-class facilities for foreign trade. The city is an ideal location for the American manufacturer opening a branch plant in Canada; having direct connections by water with New York, the St. Lawrence and Great Lakes and the Eastern Seaboard of the United States.

Unlimited electric power is developed at Chambly, eleven miles north-east of the city, and distributed at prices that will compete with any city or town in the Dominion.

Cheap living conditions and low rents and taxes have resulted in cheap labor and an abundant supply of both skilled and unskilled workers is always available. Labor troubles are quite unknown.

In addition to the natural advantages of St. Johns as an industrial site the city also offers extraordinary inducements, such as: Tax exemptions; street extensions; bonus of five per cent. on your payroll for five years, making it an unusual industrial opportunity.

*Without a knowledge of your business or the conditions affecting it, we do not claim that St. Johns is rationally your location; but we know that St. Johns possesses extraordinary advantages, that in all probability it is the best site for your plant from every point of view, that you will be running the risk of serious mistake if you do not include this city in your investigations.*

*Seven railroads, includ... Canada's great transc... tinental lines.*
*Finest ocean shipping ... cilities.*
*Canal connections w... New York, the East... States, and the Gr... Lakes.*
*Cheapest labor market ... Canada.*
*Plentiful supply of sk... ed and unskilled labor*
*Cheap and abundant el... tric power.*
*Cheap coal and lo... freight rates.*
*Desirable factory s... with all public conve... ences immediately av... able.*
*Extraordinary i n d u... ments to new industr...*

**For more specific information write**

## The Secretary, City Council
## ST. JOHNS, QUE., CAN.




Canadian Distribution:

The A. R. Williams Machinery Co.,
St. John,
Halifax,
Toronto,
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Vancouver,
Montreal.

# So Far and No Farther

There is a point beyond which it is folly to keep a file in use.

Watch for the first hint of dullness, and throw your file away then.

Only thus can you ensure clean work and get full value from your workmen's time and energy.

Specify one of these brands and you will get full service from every file:

**Kearney & Foot**
**Great Western**
**American**
**Arcade**
**Globe**

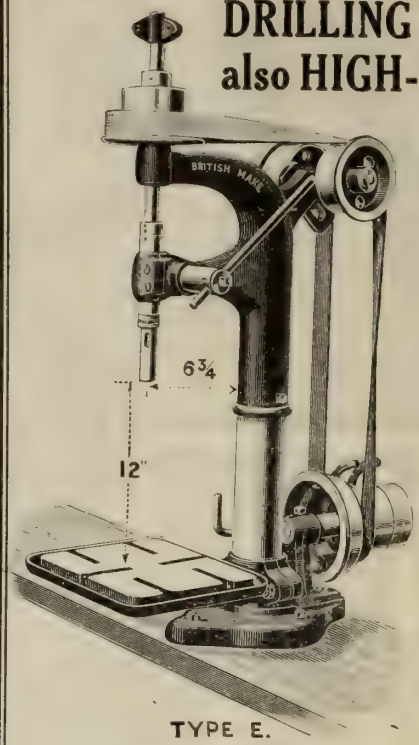
# FILES

*Made in Canada by*

## Nicholson File Company

Port Hope Ontario

## SENSITIVE BENCH and PILLAR DRILLING MACHINES also HIGH-CLASS BALL BEARING DISC and TOOL GRINDERS



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TEN DIFFERENT TYPES, ALL FROM STOCK

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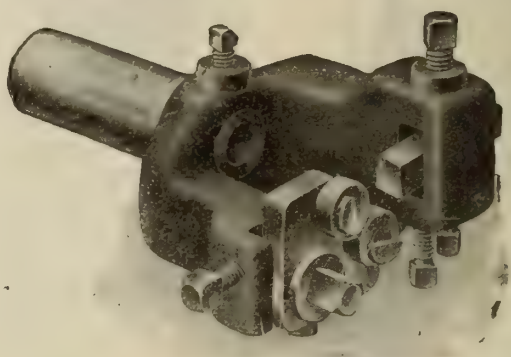
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*AGENTS WANTED*

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TIPTON, ENGLAND

# TURRET-LATHE TOOLS & HOLDERS



COMPLETE EQUIPMENT FOR CAPSTAN LATHES FULLY ILLUSTRATED IN OUR TOOL LIST E.

## J. ACKWORTHIE LTD.

COLESHILL STREET,
BIRMINGHAM
ENGLAND

# LA SALLE

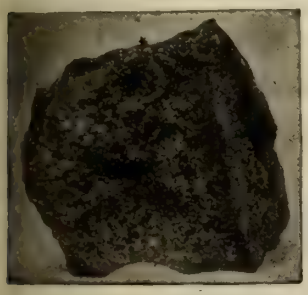
## Has an Advantage Over Other Grinders

There is some outstanding feature of all La Salle Grinding Machines that lends it exceptional productive ability.
The American Drill Grinder is especially adaptable for grinding twist, flat and three-lipped drills, because it has automatic lip rest and caliper jaw device, which assures proper clearance on all sizes of drills automatically. Send for descriptive matter covering our entire line of grinding machinery.



American Drill Grinder
For Wet or Dry Drill Grinding 1/8" to 2¼". Also 1/8" to 3½" dia.

**LA SALLE TOOL CO.**
La Salle, Illinois, U.S.A.
Represented in Canada by
**A. R. Williams Machinery Co., Ltd.**
64-66 Front Street W., Toronto
Halifax St. John, N.B. Montreal Winnipeg Vancouver



# DOMINION GRINDING WHEELS

***Test These Wheels on YOUR Work!***

Made in Canada, in our own factories, from the raw product to the finished wheel.

Canadians are beginning to realize the importance of buying at home so long as they can secure quality. We don't want to sell you Dominion Wheels merely because they are made in Canada. All we ask is that you test them against any wheels you are now using their merit will speak for itself.

The standard quality of Dominion Wheels is secured by manufacturing our own abrasive material. Thus we know the grade and grain of every wheel.




**Dominion Abrasive Wheel Company**
Limited
Mimico, Ontario

# Speedicut

## High Speed Steel

is the product of Sheffield's Modern Steel Mill. Made of selected materials by steel makers skilled in their craft. A unique and superior steel among high speed steels.

*"FIRTH QUALITY*



*FIRST QUALITY"*

**SPEEDICUT** is unexcelled for the manufacture of Drills, Taps, Reamers, Milling Cutters, Threading Dies, Forming Tools, etc. As well as Lathe Slotter, Planer, Shaper, Boring Mill and all Machine Shop Tools.

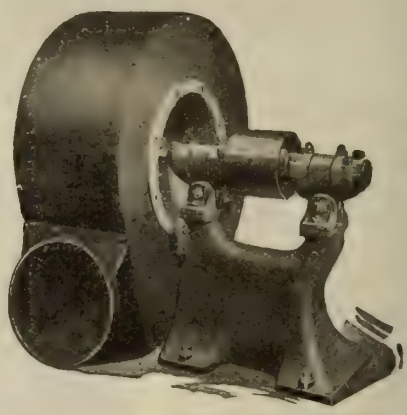
**THOS. FIRTH & SONS**
LIMITED
**SHEFFIELD ENGLAND**

*CANADIAN WAREHOUSES:*
MONTREAL
449 St. Paul St. W.
TORONTO
79 Adelaide St. W.
JOHN J. COLEMAN, Can. Manager


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# "CANADIAN" MILL EXHAUSTERS

## *Handle Any Material*



The Canadian Standard Mill Exhauster will handle any kind of material efficiently—sawdust, shavings, cotton lint, or stringy material, gases, fumes, smoke, etc.



They are adjustable to any angle of discharge instantly —have universal type of wheel and carefully constructed, self-aligning oil-ring bearings.

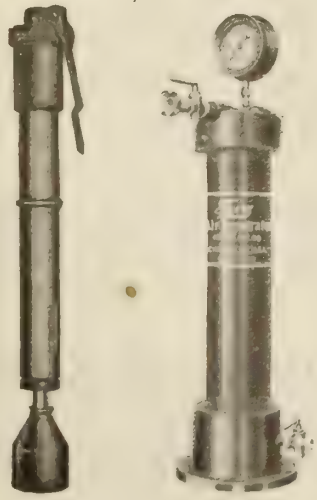
Catalog 410-77—gives technical data and prices. Write for a copy.

**Canadian Blower & Forge Co. Ltd.**
**KITCHENER, ONT.**

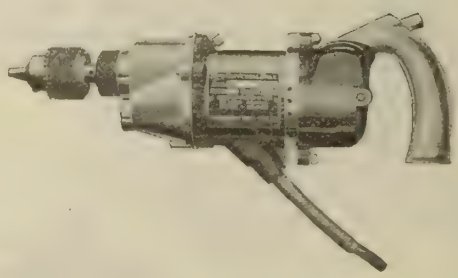
*Thor*

## PORTABLE PNEUMATIC and ELECTRIC TOOLS

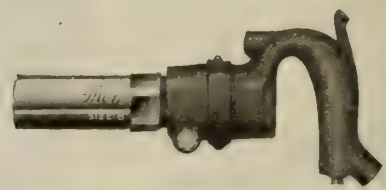
each perform a particular operation particularly well



*THOR---*
THE NAME
TO
LOOK
FOR



Start 1921 with a further acquaintance with THOR Tools through Catalog and Bulletins or our Service Engineers.



*Send for "1921" THOR Bulletin*

**INDEPENDENT PNEUMATIC TOOL COMPANY**

334 St. James St., MONTREAL 32 Front Street W., TORONTO 1142 Homer St., VANCOUVER 123 Bannatyne Ave. E., WINNIPEG

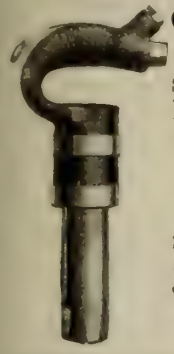
# Cleveland Sand Rammers

## FOR FLOOR, BENCH, PEIN AND FLASK RAMMING



Cleveland Sand Rammers are made in several sizes and weights, and are adapted for all kinds of Ramming in foundry service.

The Piston Rods are packed with a resilient packing that conforms to the shape of Rod without retarding its free action, and prevents any dirt from entering piston chamber and working parts—Rammers are fitted with either Round or Flat Rods as required. Cleveland Rammers are light in weight, have high speed and practically no vibration, making them ideal foundry tools.



## CLEVELAND CHIPPING HAMMERS

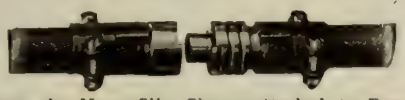
For Foundry Work. Are furnished in any required size or weight for grey iron or steel castings; they have high speed, and are particularly adapted for fast chipping now required by piece-work operators.



## BOWES AIR HOSE COUPLINGS

**Standard Equipment Everywhere**

**Bowes Couplings are instantly connected or disconnected.**



**Bowes Couplings are absolutely air tight under all pressures.**

Above cut shows the Never-Slip Clamp attached to Bowes Coupling.

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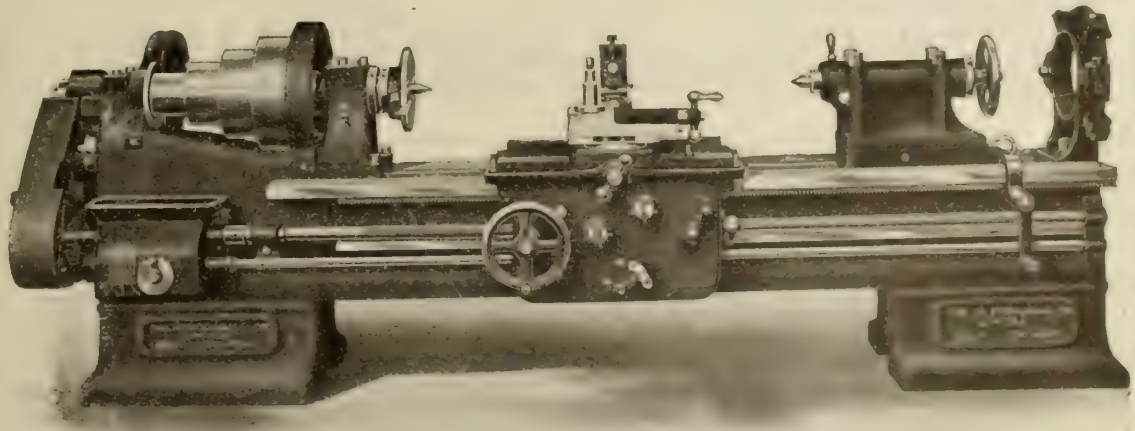
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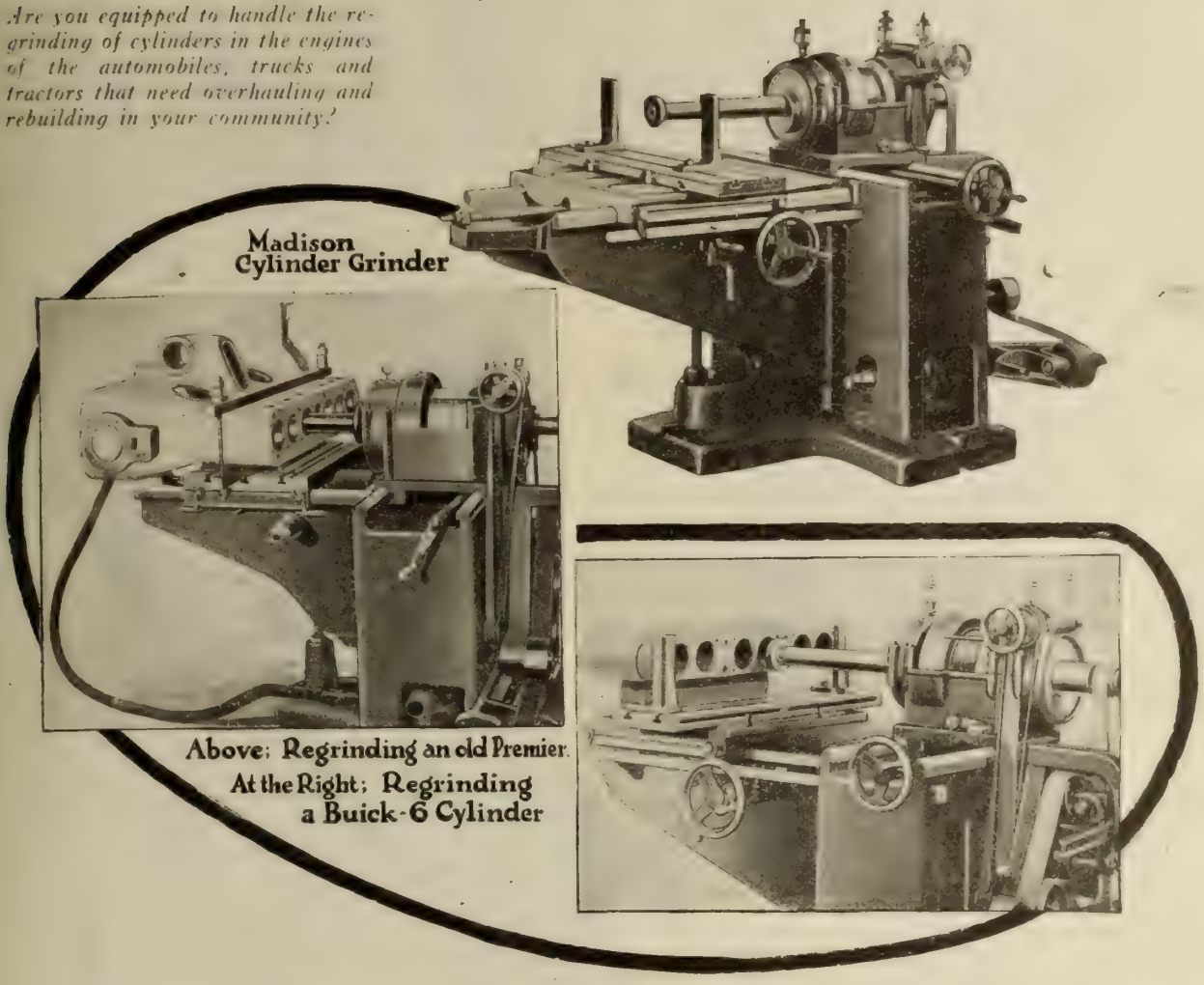
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2

CANADIAN MACHINERY
AND
MANUFACTURING NEWS

VOL. XXV. No. 2 January 13, 1921

# *Training the Machinist of the Future*

Practical jobs are tackled, not mere display parts. Outside work is often accomplished, and a small bench miller and several drill presses have been made by the students.

*By J. H. MOORE*



A PARTIAL VIEW OF MACHINE SHOP.

WHERE will the machinists of the next ten or twenty years come from? Were we to say "from the schools," that would hardly be correct, but if we say, "a great percentage will come from our technical schools," we would be on safe ground. There is, unfortunately, a popular misunderstanding as to the character of technical education. Some think of it merely as training of the hand and that such a school is a good place to send a backward child to. This is an erroneous impression, for the technical school is no dumping ground for stupid children. A walk through any technical school will convince the most skeptical on this point. Here will be seen clear-eyed, keen-witted boys, men in the making, boys who have decided on this method of developing their ability for the particular trade they desire.

A certain amount of book work is required of all pupils preparing for trades. No one can be a skilful worker in any trade without some instruction in mathematics and elementary science, therefore stupid children, or shall we say, backward children, would not make good at such a school. First, they must have planted in them the elementary seeds of knowledge.

Realizing the splendid work such schools are doing throughout the country, Canadian Machinery decided to study first hand one of these institutions. The Hamilton Technical & Art School was visited, and the story to follow will describe the conditions found there, touching especially on the machine shop and kindred trades, as it is in these we are most interested.

The present factory unit of this school was erected in 1918-1919, and was occupied for the organization of classes in September, 1919. Previous to that date, the school was run on a much smaller scale, and in a different part of the city. The demand, however, for technical education became so great that a six-foot plot was bought on Wentworth street, and the first unit erected. The building plan adopted provides for an extension to the present building that will cost in the neighborhood of $600,000. Even after this addition is made, the school will still have a very large athletic field for their students.

The number of pupils in attendance has increased amazingly during the last

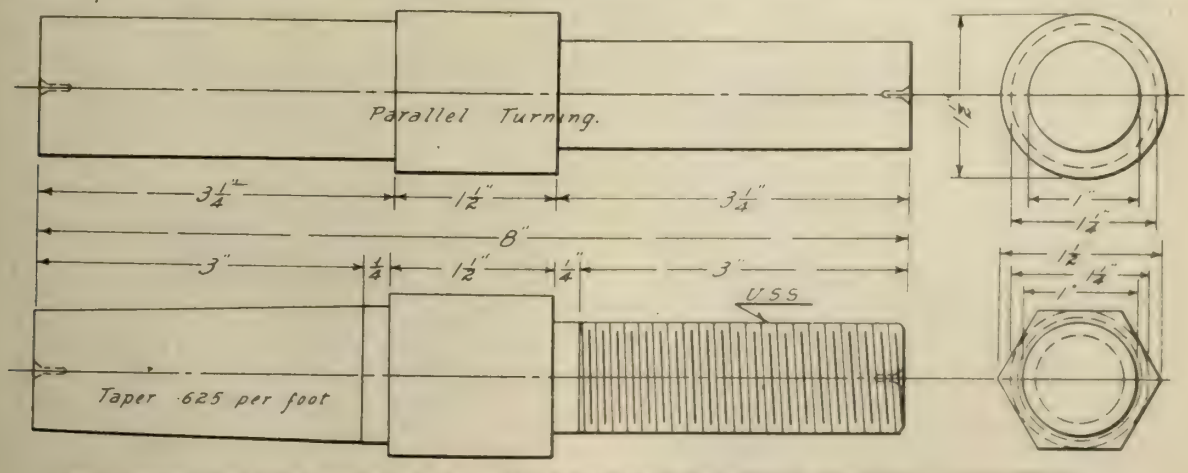



FIG. 1—THIS CAST IRON SPINDLE IS SPECIALLY DESIGNED TO EMBODY PRACTICAL OPERATIONS.



A PARTIAL VIEW OF PATTERN MAKING DEPARTMENT.



A CORNER OF THE ELECTRICAL DEPARTMENT.

four years. The attendance this year taxes the capacity of the present building, both in the day time and evening. During the day over 600 pupils attend, and in the evenings 5,407 students have enrolled. The records show that they have an average attendance every evening of 418. This figure was taken in October and has increased since then.

### Subjects Taught

The evening classes cover over fifty courses of instruction, and a staff of over 80 teach 120 evening classes each week. Briefly, here are the subjects covered, these being subdivided into first, second and third year studies, if deemed advisable:

Arithmetic, Telegraphy, Electricity, Pattern-making, General Woodworking, Cabinet Making, Advanced Carpentry, Stationary Engineering, Printing, Linotype Operation, Shop Sketching and Mathematics, Machine Drawing, both elementary and advanced; Architectural Drawing, Chemistry, Machine Shop Practice, Tool and Die Making, Oxy-Welding, Motor Mechanics, Applied Mechanics, Commercial French, Commercial Spanish, Structural Design, Cooking, Sheet Metal Drafting, Millinery, Plain Sewing, Dressmaking, Freehand Drawing, Lettering and Show Card Writing, Clay Modelling, China Painting and Design, Perspective Drawing and Water and Oil Painting.

### Day Courses

The day courses are naturally wider in scope, as the pupil has more time to study the various subjects. The course in which we are interested is the general industrial course, covering four years. Pupils of the junior fourth book standing in the public schools are admitted to this course, the second year of which leads to high school entrance standing. Upon completing the second year pupils have the option of continuing the industrial course, with special trade training, or of entering the technical high school course.

The first two years of this course not only prepares the student for entrance standing, but at the same time offers opportunity for training in carpentry, cabinet making, pattern making, machine operation, tool and die making, practical electrical work, motor mechanics, electro-plating, printing, mechanical and architectural drawing, and machine shop practice.

The work accomplished at this school is of an extremely practical nature. During 1919-1920, forty pupils were placed as apprentices to various trades. Twenty concerns in the city send their apprentices for a certain length of time each week, so that they can, through technical training, eventually become more valuable men.

We will not go into detail on the other subjects being taught, as after all, the machine shop is what we are chiefly interested in.

### The Machine Shop

Keeping in mind that each student attends school from 9 a.m. to 12 a.m. and from 1.30 p.m. to 4.30 p.m., let us see how he spends his time. Owing to the number of subjects he must cover, his work is subdivided into short periods on each subject. The schedule is so arranged that in addition to covering all the academic subjects, he spends 1½ hours each week in each of the trade rooms, such as printing, electrical, drafting room, machine shop, etc. In this way every student has a chance of covering the various trades. This arrangement goes on for two years, when the student must then make up his mind to specialize in some particular trade, or proceed with the high school course, if he is desirous of going to the university, rather than following a trade.

### The First Year's Work

The method of procedure was thoroughly discussed by the author and head instructor, F. H. Kirkpatrick, and, in as far as possible, the following subjects are covered in the first year:

Bench work is subdivided into six sections, hammer and chisel, files stamps, centering, calipers and hacksaw The drill press work covers two divisions first, drilling holes under ½" diameter and second, countersinking holes fo wood screws. In the first year worl all speeds and feeds are adjusted b the instructor in charge.

Next comes the lathe. This is di vided into five subjects, viz., facing chamfering, straight turning, roughin cuts, taper turning, and simple threa cutting.

The milling machine work is divide into three sections, viz., plain millin using the vise; plain milling, using th centres, and simple indexing. Shape work is classed in two sections, surfac

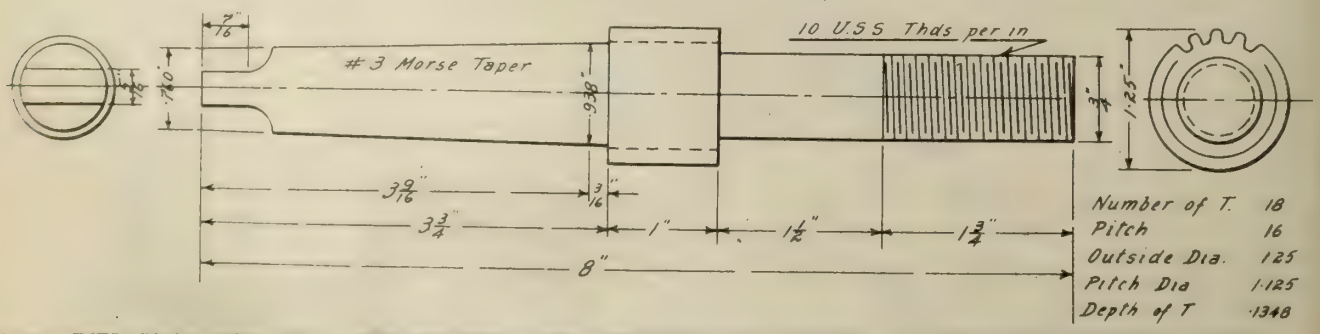



FIG. 2 AFTER COMPLETING FIG. 1 THE STUDENT MAKES THE PIECE TO CONFORM WITH THE DIMENSIONS SHOWN.

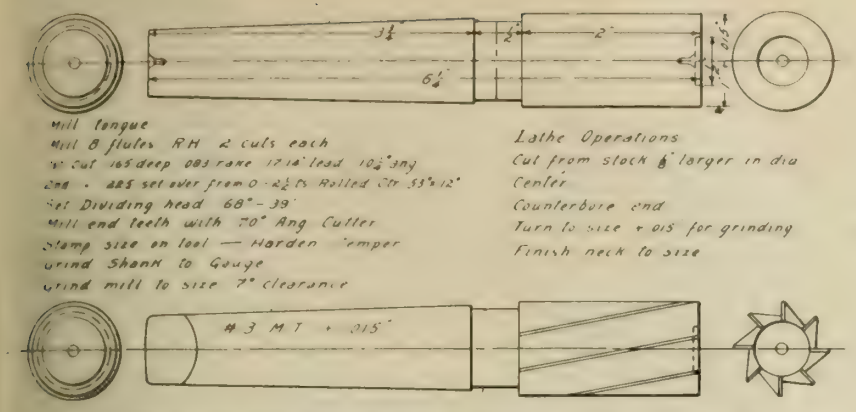



FIG. 4—HERE WE SEE THE VARIOUS INSTRUCTIONS ON THE MAKING OF A 1" SPIRAL END MILL.

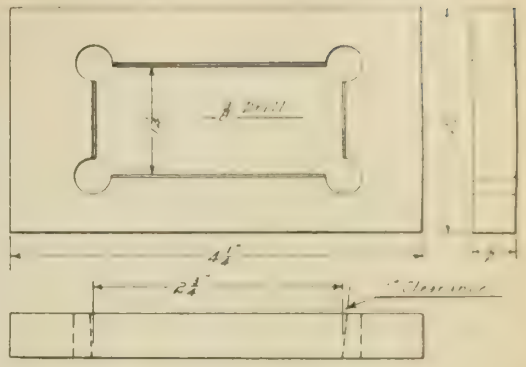


FIG. 3—THIS PAGE FORM BLOCK GIVES THE STUDENT LOTS OF PRACTICAL WORK

ing (roughing cut), and surfacing to a finished cut.

### Second Year Work

In second year subjects a review of the first year studies is always given. After this is completed the following further steps are taken. On bench work the student receives instruction on lay-outs, scraping, grinding drills, how to use a speed indicator, and determine his various speeds.

The drill press work is carried on up to holes 1¼" diameter, this meaning that they have to lay out the holes, watching their pop marks. The holes must be accurately drilled, and close check is kept on the students to see they have the right use of the chisel in correcting holes which are inclined to run. After the drilling come lessons in reaming.

The lathe work deals with parting, turning for drive, shrink and running fits, chuckwork, and crowning. Further instruction on the miller is given, this including the uses of the endmill, and problems in spur gear cutting. The shaper work is also advanced, parting, end cutting and down cutting being performed. These subjects are taken up, in addition to the review of the first year's work as already mentioned.

### Third Year Work

Taking it for granted that the student has now decided to follow up the machine tool trade, he is allowed to specialize on this trade, devoting more time to it, and eliminating from his studies such trades as printing, etc. In all third year work a review of both first and second year is given.

The bench work goes still further into detail. The uses of taps and dies are found by actual experience. Hand-reaming, elementary die work, hardening and tempering are next taken up.

On the drill press lessons are given on boring, using the boring bar and power feeds. Next comes counterboring, drilling to a layout, also cylindrical work.

The lathe work receives careful attention, the student being trained to turn correctly to shoulders, taper turning to gauges, turning, using the steady rest, cutting multiple threads, and all conditions of chuckwork such as boring, reaming, taper boring and inside thread cutting. Next comes knurling and eccentric turning.

Milling machine work advances very rapidly in this year, rack cutting, milling tee slots, cutting bevel gears, cam cutting, spiral cutting, and the cutting of worm gears being done. On the shaper the student learns to cut keyways and all types of angles. The fourth and last year he advances still further into machine shop practice, even to the building of bench milling machines, hand punch presses and drill presses. The tools are by no means models. They are practical machine tools made from proven designs and in fact are marketed by the school. Ten drill presses have so far been sold and are in use in various machine shops, proving very satisfactory.

### Practical Work

From the drop of the hat, so to speak, the student is taught to work on practical pieces, not display parts. Every job he performs contains real lessons in machine shop work. He is never wasting his time, for the course has been mapped out by practical men, who have passed through the mill themselves.

It is a great feeling to find that theory is given second place, and that practice with a capital P is given the seat of honor. As the instructor put it, "Boys are a peculiar problem. They must have something of real interest to them, yet you must not step them up too quickly if you want to make real tradesmen of them. We have no hard and fast rule regarding how fast a boy may advance. It is strictly up to the boy himself. We have a standard course. It's up to the boy to get through the course as promptly and efficiently as he can."

### The Use of Tables

It has been found to be splendid policy to provide students with tables for



GENERAL VIEW OF CHEMICAL LABORATORY.



THE BOYS DELVE INTO THE ART OF PRINTING IN THIS DEPARTMENT

their use, these sometimes taking the shape of blueprints, while in other cases they are printed in their own printing shop. These tables include such subjects as reading the micrometer, allowance for running and force fits, points for twist drill users, cutting speeds for high speed steel, laying out angles, turning tapers, operating an engine lathe, and so on. These tables are printed on good stock, and made of a standard size, suitable for filing. The boys take advantage of this fact on many occasions and always have at a moment's notice a set of handy references.

Before leaving the subject of the table form of instruction, let us quote a portion of what the table entitled "operating an engine lathe" has to say: "An engine lathe," says the pamphlet, "is an ordinary form of lathe fitted with a lead screw and power feed." The student is then asked to locate the following parts:

Bed, headstock, tailstock, tailstock base, carriage, apron, saddle, compound rest, cross slide, tool post, lead screw, feed rod cone pulley, faceplate, headstock spindle, tailstock spindle, live centre, dead centre, back gear, driving gear, the ways, stud gear, reverse lever, feed rack, feed clutch and split nut lever. After the student has looked these parts over he should be well able to at least talk intelligently regarding the names of the parts. The other parts of the lathe, including chuck, rest, etc., are then discussed.

Next come the instructions, "Never make adjustments to the machine while running. Never tighten two clutches at once, such as the feed clutch and the split nut, which is used only when cutting a thread."

"Never lean against a machine while it is running. The hand may slip against a moving part and be injured, or the clothing may be caught.

"Oil every moving part daily. See that oil holes are not filled with dirt. Wipe off all excess oil. A well oiled machine indicates a careful mechanic."

The operator should now learn to operate first by hand and then automatically, the longitudinal and cross feeds, reversing each; how to use the back gears, leadscrew and compound rest; how to clamp tailstock and tailstock spindle; how to secure high and low speeds.

We will not go into any further detail regarding these instructions. Enough to say that all statements are simple, clear and concise. In fact, there are many truths included that tradesman could take to heart.

### An Actual Job

Let us consider the cast iron spindle shown at Fig. 1. This spindle is so designed that the student who completes it successfully has mastered, in no small measure, the fundamental principles of lathe practice. He is given a blue print as shown, and proceeds as follows:

The piece is first centered, and a test made to see that centres are correct. The centre hole is next made on the drill press. Having proceeded thus far the piece is taken to the lathe and rough turned to 1-16" oversize. The ends are next faced to exact length, after which the shoulders are squared to length.

The next step is to rough and finish turn to blue print size. The taper is now turned on the end, this being done by the following process. The small end is turned to its proper diameter, after which the tailstock is set over enough to cut the desired taper. The formula, length of taper, multiplied by taper per foot is used. The thread is now cut on the front portion.

Next comes the milling of the hexagon, this being made to a special gauge nut. The six sides are milled, and the formula, 1.155 × flats=diameter, is used.

### The Next Step

When the student has completed this part he, in a way, advances still further with the same piece. Fig. 2 illustrates what he does in this case.

He rough and finish turns to the smaller sizes shown, also squaring the different shoulders to the blue print size. He next turns the No. 3 Morse taper to a gauge, using the following formula:

$$\frac{\sqrt{\text{of W} \times \text{T per ft.}}}{2} = \text{S. O.}$$

After this is completed he proceeds

### TEN SAFETY COMMANDMENTS

1. Thou shalt have no thoughts other than thy work.
2. Thou shalt take no unnecessary risks nor try to show off nor play practical jokes, for by thy carelessness thou mayest do injury which will have effect upon the third or fourth generation.
3. Thou shalt not swear nor lose thy temper, when things do not come just right.
4. Thou shalt not clean machinery while it is in motion.
5. Remember that thou art not the only one on the job and that other lives are just as important as thine own.
6. Honor thy job as thyself, that thy days may be long in employment.
7. Thou shalt not watch thy neighbor's work, but attend to thine own.
8. Thou shalt not let the sleeves of thy shirt hang loose nor the flaps of thy coat unbuttoned, as they may get caught in the machinery.
9. Thou shalt not throw matches or greasy waste on the floor nor scatter oil around bearings, as a dirty worker is also a clumsy worker and a clumsy worker is a menace to his fellow workers.
10. Thou shalt not interfere with the switches, nor the cables, nor the engines, nor anything else that thou art told is dangerous.

---

An ounce of prevention is worth a pound of cure.

Every man's task is his life preserver.

To live long it is necessary to live carefully.

Doing nothing is an apprenticeship to doing wrong.

### POINTS FOR TWIST DRILL USERS

If the drill chips on the edge it indicates that the lip clearance is too great and fails to support the cutting edge. This may be because the drill is too hard. It is advisable to ease off on the feed and watch the grinding.

If it splits in the web, it is either ground with improper centre lip angle or the feed is altogether too heavy. The centre lip should be at about 45 degrees to the cutting lips of the drill. The drill is in best condition when the chip comes out in a close coil.

If the outer corners wear it shows that the speed is too high and it should be reduced. This is particularly noticeable in drilling cast iron.

Drilling cast iron can be done at a little faster speed than for steel, but the corners must be watched.

### ALLOWANCES FOR RUNNING AND FORCE FITS

| RUNNING FITS | | FORCE FITS | |
|---|---|---|---|
| Diam. of Bearing | Diam. of Shaft | Diam of Hole | Diam. of Shaft |
| 1 | .999 | 1 | 1.001 |
| 2 | 1.998 | 2 | 2.003 |
| 3 | 2.997 | 3 | 3.005 |
| 4 | 3.9965 | 4 | 4.006 |
| 5 | 4.9963 | 5 | 5.007 |
| 6 | 5.996 | 6 | 6.008 |
| 7 | 6.9958 | 7 | 7.0085 |
| 8 | 7.9958 | 8 | 8.009 |
| 9 | 8.9957 | 9 | 9.01 |
| 10 | 9.9956 | 10 | 10.0105 |
| 11 | 10.9955 | 11 | 11.011 |
| 12 | 11.9954 | 12 | 12.0115 |
| 13 | 12.9953 | 13 | 13.012 |
| 14 | 13.9952 | 14 | 14.013 |
| 15 | 14.9951 | 15 | 15.014 |
| 16 | 15.995 | 16 | 16.0145 |
| 17 | 16.9949 | 17 | 17.015 |
| 18 | 17.9948 | 18 | 18.0155 |
| 19 | 18.9947 | 19 | 19.016 |
| 20 | 19.9945 | 20 | 20.017 |

Allowances for Drive Fits are one-half that of Force Fits.

to cut the thread. The last step is the cutting of the teeth on the centre portion of the spindle. From the foregoing description it will be noted that the student has received real practical tuition during the making of this piece.

### Another Example

Another good example of work is that shown at Fig. 3. This, on the face of it, looks like a very simple proposition, but note the various fundamental principles involved as the operations proceed. This piece is what is known as a 16-page form block, and is used in the printing department of the school for tuition purposes. Thus a double purpose is served, viz., a good practical job, that can be used elsewhere.

This piece starts off on the shaper, and the top surface is rough cut, also the edges. The next step is to rough and finish the bottom surface, after which the top surface receives a finish cut.

The piece is now taken to the milling machine, where the edges are milled parallel, and to the blue print size. Special care is taken to see that the edges are square with the face of the block. One end is now milled square to the faces and the edges.

### Bench Work

The block is next taken to the bench, where it is marked off by means of the square, scale and scriber. The end is now chipped by hammer and chisel to within 1-64″ of the marked line. It is next filed to the line, making sure the filed surface is square with the faces and edges.

### TURNING TAPERS BY SETTING OVER THE TAIL STOCK

Tapers are usually given in "inches per foot" and include the total taper or difference in diameters unless otherwise noted. In turning tapers in the lathe it is necessary to consider the total length of the bar, whether the taper extends the whole distance or not, and to set the tail stock over just as though the taper extended the whole length.

If the taper is ¾ inch per foot as in pipe threads and the whole bar is 16 inches long, then the total taper is 1 inch and the tail stock must be set over ½ inch. There is nothing to remember except to set the tail stock over half the total amount if the whole bar was tapered at the same rate.

The top surface is now scraped, using a surface plate to ensure proper accuracy. The block is next laid out, and the centre located. To allow students to become familiar with the use of the surface gauge, this instrument, in conjunction with the surface plate, is used.

The rectangular form, as shown in sketch, is now laid out, the dividers, scale, scriber, square and hermaphrodite calipers being the tools used. The ⅜″ corner clearance holes are next laid out, also the ¼″ holes inside, and tangent to the rectangular layout, and tangent to one another.

### Drill Press

The drill press is next used, when the ⅜″ and ¼″ holes are drilled. From here it goes back to the bench again and the webs are drifted out, and then the rough edge is chipped fine. Filing is next in order. First the edge of hole is rough filed, after which a smooth file is used to file to finish mark lines and square with the face. The last step is to file a one degree clearance on the edge of hole. A protractor is used to ensure accuracy.

It will be readily seen that this plan would not be adopted in an actual machine shop for the production of such pieces, but by arranging the steps in this manner the students get familiar with the use of the various tools, at the same time deriving considerable machine shop experience. No poor work is allowed to pass. For example, suppose a student is rather careless in the filing operation. Does he get away with it? Not much. He must start all over again and produce a block that is correct in every detail.

### Making An End Mill

We could go on indefinitely, quoting examples of work done, but for the purposes of this article, will take up only one other job in detail. The sketch shown at Fig. 4 illustrates, in reduced form, the style of blue print used in the making of a 1″ spiral end mill. As will be noted, all instructions are contained on the blueprint. The student can, by this method, go right through the job, feeling confident he is pursuing the right tactics.

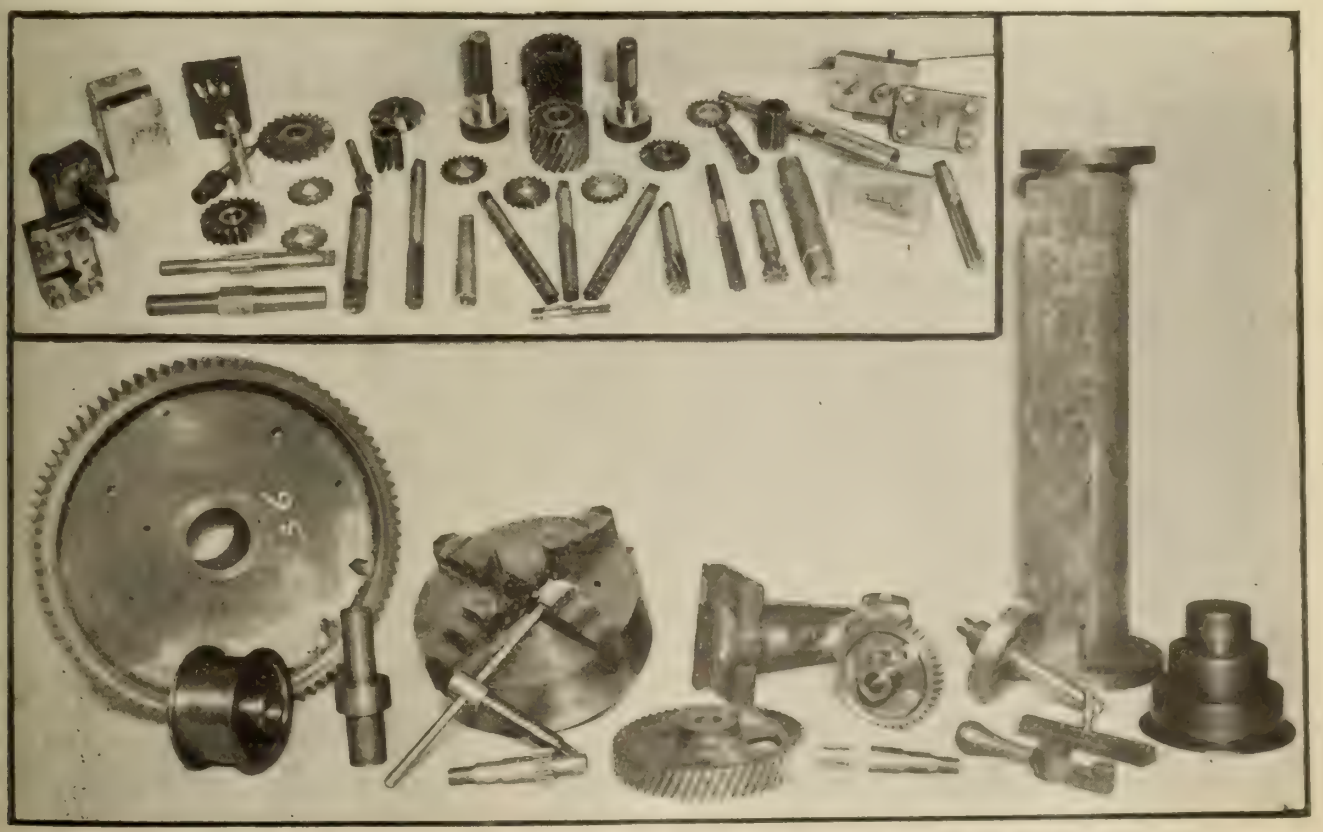


FIG. 5 LOWER VIEW: SHOWING A VARIED ASSORTMENT OF WORK COMPLETED.
FIG. 6 UPPER VIEW: A MISCELLAUEOUS GROUP OF SMALL TOOLS, SOCKETS, DIES, AS MADE BY THE BOYS

### Examples of Finished Work

To illustrate the variety of work accomplished, let us refer to Fig. 5. Here are shown several articles, which have been completed by the students, some of which are what is termed outside work. By outside work we mean work completed for some outside firm. Many concerns take advantage of this chance, and send in work to be finished, paying the school for the same. In this way the school is partially self supporting. The chuck shown is only one of many that have been completed by the students, and the writer inspected the same and found it to be excellent workmanship.

One would hardly believe that such accurate work could be done by boys. The tall casting to the right of the photograph is part of the column for the drill press mentioned earlier in the article. The cutting of gear teeth is something in which the boys excel, and the four examples shown in the photograph bear out this assertion.

Fig. 6 depicts a few of the small tools, gauges and dies produced by the students. In this group is shown the spindle we already referred to in the first example of lathe work. Note the small, three section, armature field die in the background, also the key blank die to the right. A great majority of the cutters used by the students are made by themselves. This statement holds equally true regarding sockets, arbors, reamers, end mills, taps, gauges, form cutters, drills, etc. In other words, the idea behind the tuition is to make the students capable of producing almost any tool or fixture needed. Nothing is purchased outside, except absolutely necessary.

### Die Press

Take for example Fig. 7. Here we see a die press, or in other words, a hand punch press. This machine was made by the boys themselves and is not a show machine by any means. The instructor can be seen in the foreground, while one of the full time boys (as he is called) is shown in the background. While on the subject of this young fellow, let us tell a little of his ambitions. The author purposely got him talking. "What's your idea in staying here all day long?" I asked. "In order to make myself a real mechanic," came back the reply. "Before coming here I was apprentice at ——— plant, but could not get the chance I wanted, so I saved up my money with the object in mind of coming here as soon as I had sufficient to keep me. As soon as I had enough I came here, and since that time I've had a real chance. I work on every machine in the department, get the best of instruction, and hope to be a real mechanic in the near future."

Judging from the way he spoke, and his confident bearing, I think he'll get his wish. When I was interviewing him I noted he was working on a special die for an outside concern. This die was by no means simple, but our young friend was getting along admirably.

### Equipment Used

The very nature of the work performed speaks well for the equipment used. The very latest machine tools are in evidence. The lathes are of the modern type, the planers and shapers of the best obtainable design, in fact every machine tool is a late model. The boys are not asked to perform wonders on some old machine that probably came from the ark, but get even better machines to work on than they might get at first, if learning their trade elsewhere. The line shafting is cleverly arranged, being driven by three separate motors, thus allowing the running of only such machines as necessary.

### Examples of Tables

To illustrate a few of the tables used for instruction purposes, let us refer to Figs. 8, 9 and 10. No. 8 describes all that is essential, while No. 9 is a very handy table for reference purposes. No. 10 soon tells the student the causes of poor drilling. Fig. 11 is nothing more or less than a warning notice, yet is gotten up in a nice style to attract the boys' attention. The remaining views of the school are simply general views taken for the purpose of showing a few of the trade departments.

"What do you think of the future for these boys?" I asked. The reply was not long in coming. "To my mind," said the head instructor, "we give a boy a training equal to any machine shop. It is of course up to the lad himself, but providing he has followed up our course from beginning to end, in an earnest manner, there is no reason why he should not become an excellent mechanic. You know," he concluded humorously, "we need good mechanics," and I agreed with him.



This is one of the machines made by the boys themselves. Mr. Kilpatrick, the head instructor, is shown in foreground, while the lad we speak of in our story is looking on attentively.

## GIANT ELECTRIC POWER STATION

The new electric power station at Glasgow, Scotland, takes rank as one of the largest in the country. It is designed for an ultimate capacity of over a quarter of a million horse power, and each generating unit—of which there are five in the first half of the station recently completed—will be of 24,000 horsepower. Each boiler is capable of producing 62,000 pounds of steam in an hour. All the latest labor-saving devices for loading coal into the bunkers, stoking the furnaces, and removing the ashes are installed, and a very high degree of economy in the production of electricity on a large scale is assured.

## NEW HOIST CATALOGUE

The Wright Manufacturing Company, of Lisbon, Ohio., manufacturers of high-speed hoists, screws and differential blocks, and steel trolleys, have just issued an attractive new catalogue descriptive of their line. It contains much data of use to those interested in hoists and a portion of the catalogue is devoted to a discussion of the various types of hoists and the field of usefulness of each.

# *Interest in Your Work an Absolute Necessity*

*By G. L. SPRAGUE, Principal Hamilton Technical School*

MODERN manufacturing methods have broken down standards in the machinist trades. Only in the tool room and repair departments are found men who could classify as all-round machinists. The rank and file of men operating machines in what is known as the metal trades are merely machine tenders, operators, and specialists, according to the mastery they possess in producing on some particular machine.

Increasing subdivision of labor in modern industry is responsible for this breaking down of trade standards. Manufacturing methods of today tend largely toward mass production. The output of the individual is only a part of the whole. His contribution is merged into that of the mass. His daily output travels to the assembling or fitting-up department. What the individual creates out of raw material rarely shows up before him as a finished product.

### Effect of Mass Production

The effect of mass production upon the individual is both mental and economic. On the psychological side his mind is dulled by montonous repetition of a limited performance of tasks. His mental capacity is not taxed, his initiative remains undeveloped, and he slumps into a condition of ambitionless effort. He goes to his day's work because it is necessary for him to earn the wherewithal to live and maintain those dependent upon him. As far as interest in his work is concerned, there is little to appeal to the average worker of this class. Work should be varied, should test a man's capacity for performance to enlist his interest. Men who have such work to do never suffer from labor unrest. Work to them is a natural function in which they find satisfaction and happiness. Economically, workers of this class are limited to opportunity for employment. They constitute the floating labor of to-day. They are not skilled, and they are not unskilled.

### What Can Be Done?

The problem is, what can, and what should be done, to revolutionize modern manufacturing methods, so that not only the physical, but also the mental capacity of men may contribute in the largest degree to industrial prosperity, and to the economic independence of workers.

To my mind apprenticeship should be established upon a modern basis. A term of four years in the machinist trade is sufficient to train young men in various operations and processes of the trade. Wages should be adequate to enable young men to live. They should be adjusted on a scale increasing every six months during the apprenticeship period, with a bonus granted upon the satisfactory completion of the course. Employers should keep faith with apprentices and assure them real training in all branches of the trade, not simply use them as cheap labor. For this purpose, in large plants apprentice shop instructors should be employed to change apprentices progressively from one class of work and machines to another. Instruction should be given one, or two half days each week in related mathematics and drawing, so that apprentices may master shop calculations and understand blue prints, also be able to make intelligible sketches of machines and machine parts. From apprentices so trained, employers could recruit efficient leaders in production.

The second step that is practicable, and should be attempted, is to establish a training department in machine operation in every large manufacturing plant. At the present time, breaking in of new men is left to the foreman, with a resultant increased scrap heap. How much the scrap heap costs modern manufacturing concerns, only their cost accounting systems will show. The cost of this scrap heap can be reduced, both to the good of modern industrial enterprises and the workers.

How is it now? A man wants a job. He applies for work, is asked if he can run a milling machine. He picked up what he could in odd moments from the other man about running a milling machine. Consequently, when in quest of work and the opening comes, he makes a bluff at running a milling machine. The foreman discovers that he is bluffing when some of his work is marked for the scrap heap.

Why should not large manufacturing plants have a shop fitted with machinery for training men, later turning them into the shops for more important work? Intensive training methods could be adopted which would provide the necessary supply.

### Rotation of Tasks

If apprenticeship training is seriously undertaken, and the special suggested training department put into operation, it would be possible in time to establish a rotation of tasks. This would give men that diversity which is the spice of life, an important factor psychologically in promoting satisfaction with work. By a gradual process of transfer from one class of work to another, output would not be seriously decreased, nor production costs increased.



G. L. SPRAGUE

THE students of the Hamilton Technical School are fortunate in having for their principal a man of such wide experience as Mr. Sprague. Previous to guiding the destinies of the youth of Hamilton he held the following positions:

He was general superintendent of apprentices for the American Locomotive Company, and was on the staff of the Vice-President of Manufacturing and Engineering. He organized the shop apprenticeship system of that company in 1910 for seven different plants.

He also held the position of efficiency engineer of the State Board of Public Affairs, Madison, Wisconsin, and made investigation of all departments of the State in 1912.

While in Madison he acted as assistant to State Board of Industrial Education and helped develop Continuation Schools in various cities. He also was superintendent of A. E. Norton Company Structural Steel Plant, Boonton, N.J.

From there he went to be special agent for the U.S. Commission on Industrial Relations at Washington, D.C., and acted as expert on industrial education and administration of child labor laws.

He was next executive secretary of the Public Education and Child Labor Association of Pennsylvania with office in Philadelphia. One year after accepting the above position, he came to Canada to take charge of the development of technical education in Hamilton, August, 1916. Since that time he has built the school to a point of high efficiency.

# Increasing the Capacity of Old Locomotives

## The Rebuilding of Old Type Locomotives—Points to Watch—How to Change Wheel Arrangement—Locomotives Having Outside Valve Gears Have Capacity and Economy Increased

By C. B. SMITH

IN these days of the high cost of railroading, responsible officers of the mechanical departments realize that the necessity for reducing the cost of all locomotive operation and maintenance is more urgent than ever. Such saving can be accomplished in two ways, one by using new and modern locomotives, the other by rebuilding old types.

The purchase of new locomotives is usually confined to the largest units permissible for each type required, and they are equipped with superheaters and other modern devices as selected by the purchaser. Older engines of modern type, but not originally supplied with superheaters, are also being so equipped at general shoppings of these engines on the greater number of the roads of the country, and as rapidly as local conditions will permit. This improvement brings the older locomotives up to the capacity of those more recently purchased, and such reconstruction will undoubtedly be continued until all such locomotives have been modernized. The wisdom and economy of this work are known to all.

On the majority of our roads there are still locomotives of the earlier modern types whose general features of construction are satisfactory, and which only require modernizing to make them economical transportation units. Improvements for such classes of locomotives may include, in addition to superheaters, piston valves in place of slide valves, outside valve gears in place of Stephenson motion, and such other improvements as are usually made upon engines at general shoppings.

### A Problem

The replacement or betterment of the older locomotives "in kind" is becoming more of a problem where suburban and local passenger service and branch-line traffic still require the maintenance of the lighter types of locomotives that can handle such traffic. Such engines are periodically returned to the shops for repairs, and the frequency of these shoppings could be reduced and mileage between them increased if the time were taken at one shopping to modernize them. Extensive reconstruction, however, requires a longer shopping period and reduces the number of engines available for road service.

In an excellent paper presented at the Convention of the American Railroad Association last June, G. M. Basford convincingly sets forth the present situation of the railroads. His paper furnishes a strong incentive for making a closer analysis of the conditions of our roads, and developing the greatest program that can possibly be carried out in rehabilitating existing locomotives.

Items which are to be considered in any program for increasing locomotive capacity are:

1. Superheater.
2. Pyrometers.
3. Brick arch.
4. Valve motion.
5. Mechanical stoker.
6. Power reverse gear.
7. Automatic fire door.
8. Feedwater heater.
9. Improvements in boiler design when new boilers are required.
10. Improved boiler circulation.
11. Increasing firebox heating surface.
12. Flexible staybolts — breakage zones.
13. Covering steam pipes.
14. Flange oilers.
15. Automatic driving-box wedges on heavy locomotives.
16. Steam-pipe joints at smokebox.
17. Pneumatic bellringer.
18. Chime whistle on freight — more audible to train crew.

These items are numbered for convenient reference and do not necessarily indicate the order of importance.

Factors which will increase the capacity of a locomotive may do so directly or indirectly, singly or in connection with others. When setting out to rebuild a locomotive the experienced supervisor appreciates the opportunity to apply many devices and facilities which will standardize the engine in accordance with the railroad company's practice, and in so doing reduce repairs and stores department expense in maintenance.

The aggregate of such improvements results in a locomotive which in proportion to its capacity will produce service results comparable with those of entirely modern construction, and at a cost approximately one-half that for a new locomtive of similar capacity. The difficulty in carrying forward an extensive reconstruction program, however, is in finding the shop facilities either on the railroad or among the locomotive builders in order to advance the work at a satisfactory rate of progress. Nevertheless, despite this difficulty the results which could be obtained from the operation of reconstructed locomotives, if they could all be rebuilt within the next few years, would than three years to complete the work, it would seem necessary to arrange for enlargement of shop facilities in order to hasten the reconstruction. If, however, adequate shopping facilities are not forthcoming, the improvement program for locomotives must be confined chiefly to the application of superheaters and the substitution of piston for side valves; together with the minor but relatively important betterments that may usually be applied at the shopping period. On some roads this work alone will require six years at the present rate to equip what can rightly be called the "early-modern" locomotives.

Some of the engines built within the past ten years have developed weaknesses in frames and in parts of running gear. It has proved justifiable to reconstruct them by substituting new parts of stronger design and thus avoid recurring breakages which interrupt both the road service of these engines and the repairs to others. On roads whose traffic and service conditions now demand and will continue to demand the use of light locomotives for passenger trains and freight trains on branch lines, the better classes of the light locomotives should also receive their share of improvements along with the heavier power.

Old locomotives requiring new boilers have very generally been scrapped, but where light train service demands no heavier engines than formerly, the writer believes it advisable to rebuild such engines with radial-stay boilers, superheaters, new piston-valve cylinders, main frames when necessary, and outside valve gears. If there is to be no increase in the boiler pressure over that formerly carried by the locomotive and the valve motion has given little trouble by breakages, the Stephenson motion may be connected to the piston valves through the usual rocker-shaft connections.

### Changing the Type

Old locomotives that are unsatisfactory as to wheel arrangement may be rebuilt and changed to another type and service. One road has converted 2-8-0 type or Consolidation locomotives to 0-8-0 switching service by removing the leading truck, applying a new boiler, new cylinders, outside valve gear, power reverse gear, and modifying the frames as required. The boiler was located to properly balance the engine. The use of the running gear and many of the parts of the original locomotive doubtless justifies such extensive reconstruction work where additional switching locomotives are needed.

The old eight-wheeled, American-type locomotives having crown-bar boilers

(Continued on Page 44)

# Fuels, Their Uses and Proper Application

## Steel Cannot Be Successfully Treated in a Coal Forge—Properly Designed Furnace is Essential—Be Careful to Use Proper Type of Furnace—Select Your Fuel With Care

By W. A. EHLERS*, Industrial Engineer, American Gas Association, New York

THE science of metal treating is unquestionably one of the most interesting and important subjects in the mechanical field to-day, and one which calls for the most careful and comprehensive study and application if correct results are to be secured.

Metal treating has come into greater prominence in recent years, due in a large measure to the ever-increasing demand for lighter, yet stronger and more durable moving parts in all forms of machinery subjected to unusual wear or shock, and also on account of the great development in automatic and special machinery.

Unfortunately many shops are still treating tool steel in the old blacksmith forge, which is as much a relic of the "dark ages" as the ox cart is in the field of rapid transit. Steel cannot be successfully treated in the coal forge, due principally to the condition of uneven heating. Uneven heating produces uneven cooling, which in turn produces uneven stresses in the piece when it is quenched, and hence will shorten the life of the finished part.

A uniform temperature throughout the entire heated area is necessary if correct results are to be obtained. It is surprising to find that many practical steel treaters continue to use the old and crude method in treating expensive steel, because they do not see the wisdom of purchasing modern furnace equipment, which will give better results and greater economy by prolonging the usefulness of the tool.

It is of interest to note that many of the manufacturers of so-called "special steels" for tool making purposes recommend that they be heat treated in gas-fired furnaces.

Certain fundamental conditions enter into the processes of metal treating which are of great importance. One of these is the necessity for obtaining uniform results, and the elimination of the possibility of producing work below the required standard. To obtain uniform results it is very necessary to regulate and maintain the temperature of the furnace within a reasonable degree of that required for the particular operation. This imposes the condition that the fuel must be of such nature that the amount of heat delivered can be changed very quickly. It is also necessary to have positive control of the furnace atmosphere.

The ideal furnace is one which maintains an evenly distributed heat throughout the parts to be heated when loaded to its capacity, and one in which the temperature and combustion products are under positive control.

From chemistry we learn that matter may be defined as that which occupies space; that matter is composed of infinitely small particles known as molecules. Molecules are again composed of atoms, and these combine to form elements or compounds. Thus, like atoms will form an element, and when combined with atoms of other substances they form a compound.

It has also been proven by experience that the molecules of all matter are never at rest, but are always in motion and the motion of these molecules produces heat, therefore the greater the activity of the molecules, the greater will be the amount of heat produced, all other things remaining unchanged.

Moreover each combustible substance has a definite temperature of ignition and when certain of these molecules reach the temperature of ignition they have a great affinity for oxygen. The resulting chemical union between these atoms gives rise to what we term combustion. Combustion has therefore been defined as "the phenomena produced on the surface when two substances unite to give light and heat."

In a further study of combustion there are certain fundamental factors and conditions to be met if proper combustion is to be obtained and the resulting heat properly applied. All fuels are made up of combustible substances, each giving a certain definite temperature of ignition and each forming a new compound when mixed with the proper amount of oxygen at the point of ignition. This leads to the conclusion that perfect or complete combustion can take place only when these substances are mixed with oxygen in the proper proportion. Or, stated in more familiar terms, a definite amount of air is required to completely burn a given quantity of fuel.

The properly-designed furnace is an important factor in heat treating. Time will not permit me to go into this very important subject. Poorly designed furnaces are not only uneconomical but they are largely responsible for unsatisfactory results. Many furnaces are operated without knowledge of the composition of the furnace atmosphere; with no control of the air supply or flue gases. There are certain fundamental principles such as type of construction, kind of fuel and the means of utilizing the heat of combustion that govern the design, but in general the character of the work to be performed, the kind and quantity of materials to be treated are the controlling factors. The real test of a furnace for a given operation is "the variation in temperature in all parts of the furnace around the mass to be heated when the chamber is loaded to full capacity."

### Type of Fuel Necessary

One of the first things to be considered in the proper heat treatment of metals is the kind of fuel necessary to produce the character of heat best suited for the particular operation. Unfortunately there is a prevailing belief among many that when it is desired to heat-treat a piece of steel the only thing necessary is to build a fire and plunge the material into it. If results are not forthcoming they blame the steel perhaps and not the method, which, in most instances, is the real cause.

For all practical purposes fuels may be classified into solid, liquid and gaseous. It must be remembered that in the case of solid and liquid fuels each must first be converted into gas before combustion really takes place, and for this reason they are not so easily adapted to exact furnace conditions and temperature control.

Of the solid fuels, coal and coke are principally used. Lump coal and coke are not very well suited for metal treating operations, except in very large furnaces for pack annealing and case hardening in large quantities. Even with these it is not easy to maintain a uniform temperature, and there is great danger of overheating. At best they are very wasteful of fuel, and it is difficult to control the products of combustion, which is particularly essential where the metal is subjected to the direct action of the flame.

Powdered coal has a great advantage over lump coal or coke in that it may be termed a "one stage" combustion, being complete and free from residual carbon. It burns directly to $CO_2$ without the attending losses of unburned carbon and carbon contained in the ash. Its chief advantage, however, lies in the mechanical preparation of it, as it must be crushed, thoroughly dried and stored, also in the harmful action of the ash upon furnace walls and linings.

Liquid fuels generally exist in the form of kerosene, gasoline, and fuel oil. Owing to the great demand for kerosene and gasolene for internal combustion engine and other purposes, their cost has advanced to such a point that they

*Presented before the American Society for Steel Treating.

cannot be considered for the heating of furnaces. Fuel oil as a general rule is more expensive to use than coal or coke, but its superiority of these fuels in its form of application to the furnace is sufficient to overcome the increased cost. Fuel oil is a by-product of crude oil refining, and its cheapness in the past has been due principally to crude methods in refining and an over production of crude oil. With the increasing demand for motor fuel, improvements have been made in refining methods, which have very materially reduced the fuel oil available for metallurgical purposes. This situation is largely responsible for the scarcity of fuel oil and the unprecedented high price, and according to reliable authority, including the U. S. Bureau of Mines, very little hope is given that it will be any cheaper for some time to come.

A good grade of fuel oil will range from 18,500 to 20,500 B.t.u.'s per pound, and a vaporizing point of about 170° F. Considering that air is composed of 20.7 parts oxygen and 79.3 parts nitrogen, one pound at 62° F. occupies a space of 13,141 cubic feet, and at 100° F. one pound occupies 14,096 cubic feet. Theoretically it requires about 14 pounds of air to give perfect combustion of one pound of oil. Therefore it will require 14×14.096 or 197.34 cubic feet of air to burn one pound of oil at 100° F. However, in practice, it requires from 17 to 20 pounds of air, or in round figures 2,000 cubic feet of air at 100° F. to completely burn one gallon of fuel oil.

### Oil Must be Atomized

In admitting oil to the combustion chamber of the furnace it must be broken up into a fine spray, commonly spoken of as atomized, by means of a suitable burner. Atomization may be obtained in one of three ways: Live steam, compressed air, and mechanical process. Of these compressed air is more generally used.

Where air is used for atomization it is usually found to vary in pressure from 1½ pounds to 60 pounds per square inch, depending upon the kind of burner used. The majority of installations work with an air pressure of about 20 pounds per square inch. This, however, is higher than necessary for good results. With air under pressure of 20 pounds per square in and oil at 100° F. there is required about 50 cubic feet of air per pound of oil.

Steam for atomizing is not so generally used in industrial operations, due perhaps to its greater cost over compressed air. Moreover in many places it is not available. According to Durand, 0.4 pounds of steam are required per pound of oil. This agrees closely with some investigations reported to the American Society of Mechanical Engineers (August 1911 Bulletin) which give an average of 0.5 pounds per pound of oil. The latter is perhaps a safer figure to use.

### POINTS TO REMEMBER

Uneven heating produces uneven cooling. This in turn produces uneven stresses in the piece when quenched. Such procedure shortens the life of the piece.

Poorly designed furnaces are not only uneconomical, but are largely responsible for unsatisfactory results.

Powdered coal has a distinct advantage over lump coal or coke because it is free from residual carbon.

It requires 2,000 cubic feet of air at 100 degrees Fahr. to completely burn one gallon of fuel oil.

Fuel oil often contains a small percentage of water which lowers its heating value. For each one per cent. of water the heating value is reduced 13.14 B.t.u.'s Thus for an oil having nominally a heating value of 18,500 B.t.u.'s per pound and containing 10 per cent. water the heating value is reduced to 16,518 B.t.u.'s, or a loss of 1,982 B.t.u.'s. If water is in the oil, combustion is incomplete, the violet flame never appears, but the end of the flame will be dark red and fringed with smoke.

Fuel oil being rich in hydrocarbons gives a very high heat for a comparatively small volume of oil. For this reason it is particularly adaptable to heavy forging work such as drop forging, the heating of heavy bars and rods for forging and upsetting. It is also a very excellent fuel for welding.

But there are many things which must be considered before selecting oil as a fuel, particularly on the purely heat-treating operations. There is the necessity for a large and expensive storage tank which must be buried in the ground. This tank frequently leaks and much oil is wasted before the leak is discovered. Smoke, grease and the roar of burners under high pressure are serious objections, and these are not conducive to making the surroundings pleasant for the shop men.

Moreover the use of oil does not permit of automatic temperature control by placing a thermovalve in the fuel line. Conditions affecting a continuous supply are not the best, and frequently much time is lost waiting for a new supply.

Gases which are most generally used for fuel purposes are natural gas and the manufactured gases such as coal gas, coke oven gas, water gas and producer gas. These gases are preeminently suitable for and by far the most satisfactory fuel for metal treating processes. These facts combined with the economic advantage makes gas the coming fuel of the future.

Gaseous fuel is economical because it can be applied in a way most adaptable to the requirements of the material to be heat treated. Other fuels as a rule must be burned in the furnace in a certain fixed way, there is very little flexibility in their application. Gas on the other hand can be applied in a way that will give the best results with the least waste of fuel.

By its nature and composition gas offers the greatest advantage from a purely scientific point of view. It is easy to thoroughly mix it with the proper amount of air for complete combustion. With other fuels this is impossible. Control of the air-gas ratio means a higher rate of combustion, a relatively higher flame temperature, and therefore a higher thermal efficiency.

The cheapest fuel, even with other things being equal, is not necessarily the one which gives the greatest number of B.t.u.'s per unit of cost, but the one which costs less per unit of production. Numerous examples can be given to prove this statement. However, one or two should be sufficient. In a certain town in the state of New York, gas selling at a rate of approximately one dollar per thousand cubic feet replaced soft coal at about five dollars per ton, for bright annealing copper wire. It was first demonstrated in an experimental way that coal was the most expensive fuel for this particular operation, although it contained perhaps four times more B.t.u.'s per unit of cost than found in the gas. It further demonstrated the fact that the thermal efficiency of the gas furnace was several times greater than the coal furnace.

A large oil-producing and refining company used large quantities of manufactured gas for heating solder baths at their refinery, where there was almost an unlimited quantity of crude oil, fuel oil, gasolene and kerosene.

The industrial heating department of a large and well known gas company found from actual operations that under the best conditions of oil utilization they could substitute 1,000 cubic feet of a 600 B.t.u. manufactured gas for 5½ gallons of 142,000 B.t.u. oil. Where oil was used at a low efficiency this company found that 1,000 cubic feet of 600 B.t.u. manufactured gas could be substituted for 14 gallons of oil of 142,000 B.t.u.'s per gallon.

In other situations the same company was able to substitute 126 B.t.u.'s of manufactured coal gas for 210 B.t.u.'s of producer gas. Again, 253 B.t.u.'s of manufactured coal gas gave the same results as 504 B.t.u.'s of producer gas.

### Correct Basis of Comparison

The above occurrences confirm the statement that fuels cannot be compared in relative heating value by their B.t.u. content in the fuel state. The only correct basis of comparison is the heating value of the combustible mixture. This fact is well established theoretically. A few calculations will show that a coke oven gas of 600 B.t.u.'s per cubic feet will give a theoretical flame tem-

perature of 3550° F. and a heat content of 100 B.t.u.'s per cubic feet in the products of combustion, while a blue water gas of 300 B.t.u.'s per cubic feet will develop a flame temperature of approximately 4000° F. and a heat content of 107.5 B.t.u.'s per cubic feet in the products of combustion.

Yet in the face of these facts, both theoretical and practical, we find many practical steel treaters in favor of coal and oil because of their erroneous belief that the B.t.u. value of the fuel as fired to be the real measure of its utility.

The principal combustibles in the fuels under consideration are carbon, hydrogen, and their many combinations known as hydrocarbons, also carbon monoxide. In addition to these are the incombustible such as nitrogen, oxygen, sulphur, carbon dioxide and ash. The combustible elements when mixed with air give a flue gas composed of carbon dioxide, water vapor, sulphur dioxide, nitrogen and carbon monoxide. Furthermore, by changing the proportion of air in the flue gases gives rise to three general conditions within the furnace: a reducing, neutral, or oxidizing atmosphere. These conditions are essential and are of great importance in different heat-treating processes. They also have a very vital relation to fuel economy and furnace efficiency.

A reducing atmosphere (one in which an insufficient amount of oxygen has been admitted with the fuel to give complete combustion) is a condition often desirable in heating tool steel and other steel parts, in order that no oxidization or scaling action shall take place. The flue gases should show a small percentage of unburned gases.

A neutral atmosphere is one which is hard to obtain with any of the fuels except gas. It represents a condition in which just enough oxygen has been admitted to completely burn the carbon hydrogen and other combustibles present. In this case a flue gas analysis will show no free oxygen or unburned gases.

The condition most frequently found in furnaces is the oxidizing atmosphere, where an excess of oxygen is necessary to accomplish certain results, or where too much has been admitted through poorly designed apparatus. This condition is very noticeable in coal-fired furnaces, where it is necessary to burn the coal with a large amount of excess air. Such a condition within the furnace is harmful in many ways. It causes over ventilation and thus carries away much of the sensible heat of the unburned gases. It produces a chilling of the flame, lowers the temperature of the furnace, and thus reduces its thermal efficiency. Steel exposed to this furnace condition oxidizes very rapidly.

For industrial heating operations, gaseous fuel should always be mixed with air before the gas has reached the zone of combustion, and in the proper proportion to give the desired furnace atmosphere. For all metal-treating work, some mechanical means should be used to produce air at sufficient pressure and thoroughly mix it with the gas. This is of great importance in burning gas. Many devices are used, but all may be grouped under three general types.

### OTHER POINTS OF INTEREST

Fuel oil often contains a small percentage of water which lowers its heating value. For each one per cent. of water, the heating value is reduced 13.14 B.T.U's.

Fuel oil is particularly adaptable to heavy forging work such as drop forgings, heating of heavy bars, and so on.

Gaseous fuel is economical because it can be applied in a way most adaptable to the requirements of the piece to be heat treated.

(1) The Air Injector—air under a pressure of a few ounces to one or two pounds per square inch is passed through an injector. Gas is admitted to a chamber surrounding the injector and the high velocity of the air in passing through the injector opening entrains the gas and the mixture is then led to the burner. This method requires both air and gas piping to the injector. It further requires valves on both the air and gas pipes and these are changed by the furnace attendant to give the desired mixture.

(2) Gas under relatively high pressure—under a pressure of from 8 to 10 pounds per square inch gas passes through a small orifice and entrains air under atmospheric pressure. The resulting mixture is led to the burner located nearby.

(3) Gas and air-mixing machines—a machine designed for this special purpose is located at a convenient point. Air and gas are brought together inside the machine in any predetermined proportion within the limits required for combustion. By means of a pump or fan the mixture is distributed from this point by means of a one-pipe system to the point of consumption.

It is to be regretted that in the majority of gas-fired furnaces the air injector is used for mixing. This is largely due to a lack of initiative in the past on the part of gas engineers, and also on account of the ease with which an injector may be constructed. We have no particular antagonism to the air injector as a mechanical means of mixing the air and gas, but the greatest evil lies in the very uncertain proportions of air and gas thus obtained by means of manual adjustment of the valves usually administered by unskilled furnace attendants. It is no exaggeration to say that the ordinary furnace fitted with an air injector and a two-pipe system and operated by the average furnace attendant will use as much as 50 per cent. excess air.

With the high pressure gas aspirators and air-gas mixing machines it is very easy to make adjustments that will mechanically control the air-gas ratio to give the desired furnace condition. After this adjustment has been made it is only necessary for the furnace attendant to regulate one valve in order to give more or less heat as the occasion may require.

#### Transferring of Heat

The application of heat in furnaces to the metal to be treated is another subject of great importance and one too often overlooked. Heat may be transferred from one body to another, or applied to a body from the point of combustion in three different ways—by conduction, convection and radiation.

Heat transfer by conduction takes place when it is transmitted from one part of a body to another without the occurrence of motion in any definite part or parts of the body, intermediate points being heated meanwhile. Thus a steam radiator becomes hot on the outside due to conduction of the heat of the enclosed steam within the radiator which passes through the iron to the exterior. Placing one's bare foot on a tile floor in a room well heated will give the impression that the tile is very cold. While if the foot is placed on a rug it will feel much warmer. As a matter of fact the tile and rug are perhaps of the same temperature, but the tile being a much better conductor than the rug, absorbs the bodily heat from the foot much quicker than the rug and is therefore known as a good conductor.

Heat transfer by convection takes place when it is conveyed from one place to another by the movement of air currents, or the circulation of liquids. When heat is applied to the bottom of a pan of water, almost instantly minute vapor bubbles form in the bottom of the vessel. These presently ascend and impart heat to other parts of the water, while cooler water takes its place at the bottom.

Heat transfer by radiation takes place when heat is transferred from a hot body to a colder one by a wave-like motion of the ether that occupies all space. The ordinary cast iron steam or hot water radiator starts a wave-like motion of the surrounding ether in all directions, and as these travel outward from the radiator similar to the waves of water when a stone is thrown into a still pond, the heat is imparted to the room, and this transfer of heat is called radiation.

For all practical purposes of furnace design the heat of combustion is transferred to the material to be heated by means of convection and radiation. Heat transfer by conduction is to be avoided as much as possible, for by this means the efficiency of the furnace is very much lowered if heat is allowed to be

conducted through the furnace walls and lost. For this reason it is important that all furnaces should be thoroughly insulated with the best kind of non-conducting material in order to reduce such losses to a minimum.

In the usual type of furnace, the heat is transferred by convection to the walls and arched roof, and from these a radiant heat transferred to the material to be heated. Then in order to get the maximum amount of radiant heat from the gas burned, there must be as near complete combustion as possible with a minimum amount of flue products.

The proper furnace conditions are hard to obtain with any degree of certainty or uniformity when coal, coke or oil are used to produce the heat. On the other hand, gas, on account of its flexibility of application, can be made to accomplish far better results.

Coal and coke are seldom considered to-day in connection with the larger and more important heat-treating operations because of the difficulty in maintaining proper furnace conditions.

Oil can no longer be considered a cheap fuel for furnace heating on account of the economic demand for it for other purposes.

Natural gas supply is continually growing less, as evidenced by the increase in shortage during the winter and the construction of manufacturing gas plants to augment the supply.

Producer gas plants and others that use coal at the sacrifice of the valuable by-products will sooner or later go into the discard.

It is possible we are approaching the dawn of a new day in industrial economy, a day when the gas manufacturing company will become a central fuel station from which can be supplied the entire fuel demand for industrial heating, but on account of the ridiculously unreasonable standards of candle power and heating value placed upon the gas companies by the State Utility Commissions in the past, it has not been possible to produce a gaseous fuel of the greatest economic advantage.

### Question of Proper Fuel

The question of fuel costs is a very vital one to every manufacturer. Unfortunately a decision has often been reached on a purely heat unit basis, without considering the efficiency of application and many items of expense incurred in handling such fuels before they reach the zone of combustion.

In the foregoing remarks the aim has been to state a few of the characteristics of each fuel together with some of their advantages and disadvantages. It must be remembered that the true fuel cost is not the cost of coal per ton, oil per gallon, or gas per thousand cubic feet delivered at the factory, but rather the cost of these fuels delivered to the hearth or burner of the furnaces.

There are many items of expense such as the handling of coal, removal of ashes, investment in storage equipment, labor, time lost in getting started with coal or oil, the noise and smoke nuisance so peculiar to the oil fire, and the deteriorating effect of coal and oil on the furnace causing frequent repairs. The proper fuel is the one which, regardless of cost per ton, gallon or cubic foot, gives the corerct heat application, perfect combustion, and proper temperature control.

Therefore in the final analysis the true furnace efficiency is measured by the quality of the work it produces and the cost per unit of product, and not upon the relative cost per unit of fuel consumed.

## CAPACITY OF LOCOMOTIVES

(Continued from Page 40)

with deep fireboxes between frames have become obsolete on many large roads, but on the small roads and on branch-line and local train service in much of the New England territory these engines, modernized as far as consistent, should be carefully considered where the traffic conditions warrant.

Because of limiting weight conditions, Mogul or 2-6-0 type locomotives have been assigned to passenger-train service on some outlying divisions. The application of superheater and piston-valve steam chests with outside steam-pipe connections as the principal features of improvement has increased the economy of these engines, added one passenger car to their tonnage capacity, and reduced train delays. Outside valve gears were not applied, shop limitations preventing, but their addition is desirable.

Atlantic-type locomotives having outside valve gears have had their capacity and economy increased by the application of the superheater. This work permitted the use of the engine in long-distance through service which was not previously successful.

Consolidation locomotives reconstructed with superheaters, new piston-valve cylinders, outside valve gears, new front-frame sections, and frame cross-ties have also had their capacity increased, and have been successfully used in regular freight service on a mountain division needing much power. The cost of the above-mentioned improvements, including heavy general repairs and entirely new fire-boxes, would not exceed one-half the cost of new locomotives of the same capacity.

When rebuilding locomotives there is a favorable opportunity for replacing old tenders as well, transferring the latter to older locomotives for spare use or as substitutes for damaged equipment. When the condition of old steel tender frames requires that they be replaced, the one-piece steel casting and a larger-capacity tank should be used, as both will reduce future expense in repairs. The success of autogenous welding eliminates any objections to the use of large steel castings for fear of breakages.

Tanks should be reconstructed in coal space to permit gravity delivery of the greatest amount of fuel that is possible at the coal gates within reach of the fireman's shovel. Application of power-operated coal pushers should be made to tanks where alterations for the gravity delivery of coal cannot be satisfactorily made and where the service conditions will show a saving in expense by its use over hand methods of shovelling forward coal while on the road or at short lay-over stations. Moving forward the rear coal board or plate on tanks and building higher side plates or "dickies" is one method which has been successful in making the maximum amount of coal accessible at the gates. Furthermore, care must be taken not to overload the journals of the forward truck axles.

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By means of a method of chemical analysis, in which the electric arc is utilised, Mr. W. R. Mott, an American research chemist, claims to identify readily about sixty-five elements, picking them out from their ores, compounds with oxygens, or alloys. According to the Chemical Trades Journal, the apparatus required is simpler than that for spectroscopic analysis, and includes a carbon arc lamp so enclosed as to project upon a screen an image magnified 20 diameters. A half-gram sample of the material to be tested is placed in a cup-like cavity, two-fifths of an inch wide and deep, hollowed out of the positive lower carbon of the pair. The elements are recognized by various phenomena, including the nature and colors of the material deposited on the carbon pole from distillation, the smoke, sparks and flame-tip color shown, and the odor of the fumes emitted, with many other peculiar characteristics. The smoke emitted from the hot upper carbon when the arc is broken appears only when molybdenum is present, being a delicate test for that element. The present of calcium is shown by its peculiar red color, and characteristic odors reveal iodine, arsenic, and tungsten. Many elements difficult to determine in other ways are said to be clearly identified by this new system.

## CATALOGUE ON CRANES

The Milwaukee Electric Crane and Manufacturing Company of Milwaukee, Wisconsin, has just issued a new 48-page catalogue illustrative and descriptive of their complete line of cranes. Much valuable information, the result of twenty-five years of active experience in the designing and building of hoisting machinery for shops, foundries, steel plants, and other establishments, is incorporated in this book.

Those interested in electric cranes or hoists, and especially in the prevention of accidents, will find this book chuck full of interesting data. A section of the catalogue is devoted to the horizontal drilling and boring machine made by this company and which is especially suited for operating, at one setting, on pieces too long or bulky for the usual type of machine.

# Have You Tried This Contest Yet? If not--- Do so Now

Do you want to win one of these scales?

It's very easy, and at the same time you add to your store of knowledge. The details are given below.



The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

## What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

There were 8 correct answers to our Dec. 16th contest. The ninth answer was so well recorded that we cannot help but send a scale to him as well as the winner. Here is how it happened: GORDON B. RILEY, who is the chap who had all correct but one, was really the fellow who would have been correct had the advertisement appeared for which query No. 11 was intended. We expected to run an advertisement for the W. S. Rockwell Co. In that advertisement was a cut of a blast gate. The reading matter suited our query No. 11 exactly. The advertisement was left out, however, too late for our changing the query. Mr. Riley stated in his letter that the advertisement that seemed to him as best suited to the query had appeared on Page 53 of our Dec. 9th issue. As this was perfectly correct, we award him a scale as well as the winner.
Here is the actual winner. R. P. BROWN, of the Garlock Walker Machinery, Ltd., Toronto, Canada. He stated Kearney & Trecker was the answer to query 11. This tallied correctly with the advertisement that appeared. Five others were correct in their lists, but were several days behind Mr. Brown in sending their replies. The others who were correct are as follows:
W. O. Bird, Edmonton, Alta.; Frederick Cubaynes, Chicoutimi West, Quebec; E. Bowers, Welland, Ont.; G. A. Todd, Penetanguishene, Ont.; J. J. Doyle, Brantford, Ont.; Geo Land, Peterboro, Ont., and K. M. Horton, Yarmouth, N.S

**CONTEST FOR JAN. 13TH ISSUE**

**Contestants are required to write us, stating to which advertisements we refer in this number.**

1—Something said to be a service to Canadian industry.
2—How to obtain full details of every heat treating operation.
3—How to keep down the cost of upkeep.
4—What to do if you desire strength and dependability.
5—How to get high speed combined with safety and power.
6—How to obtain air and steam tight jobs.
7—Something to watch for carefully.
8—How to secure something original.
9—How to obtain versatility.
10—How to create confidence.
11—A product that can be adopted for motor or chain drive if desired.
12—How to find what you want.

**These are Correct Answers for List from Dec. 16 Issue:**

1—A. R. Williams Co.
2—Wisconsin Electric Co., Ltd.
3—J. T. Ryerson Co.
4—J. Morrow Screw & Nut Co.
5—Union Carbide Co.
6—Canadian Blower & Forge Co.
7—General Combustion Co.
8—The Frost Mfg. Co.
9—The Shore Instrument Co.
10—The Independent Pneumatic Tool Co.
11—Kearney & Trecker Co.
12—Butterfield & Co.

## Closing Date for This Contest is February 3rd!



# WELDING AND CUTTING



# Foreign Comment on Effects of Alloys in Steels

## A Discussion of Welding in General—English and French Journals Comment on a Previous Statement Made in One of Our Welding Lessons—They Prove Interesting

By W. B. PERDUE, Director Welding Department, Healds Engineering School, San Francisco, Cal.

AN article which was originally printed in the June 3rd issue of Canadian Machinery seems to have attracted considerable comment, both favorable and unfavorable.

Despite the fact that the article contained the statement that "American products are made which excel by far any imported article which can be procured," it was translated into other languages and printed in its entirety by several foreign metal trades journals.

In this article, as in other writings on the subject of welding, I gave out the results of exhaustive tests which can be duplicated wherever tensile machines and other apparatus are available. The tests made by myself have been repeated in many other sections of the country, and in each test the results have been identical. As the engineer of a large steel producing concern engaged in the manufacture of special welding rods put it:

"We enclose a table of tensile tests applied to parts welded in various parts of the country by operatives both skilled and unskilled. You will note that these are in full accord with your articles on the subject. We label all our products with our own trade names, omitting any statement which would indicate the fact that they are steel or iron. Some welders use our steel wires thinking them to be wrought iron, and would even quit buying if they were disillusioned. The adverse comment abroad on your article merely shows the fear of American competition—in fact we have good cause to believe that these criticisms of your article have brought inquiries which may lead to considerable export business."

It is so easy to make an actual test to determine the merit of a welding material that it seems unusual for the editor of a reputable trade journal to express an opinion unsupported by facts. The following extract from a letter written by one of the best known engineers seems to bear out this statement with regard to the London "Acetylene and Welding Journal."

"The printing in our local 'Acetylene and Welding Journal' of a criticism of your article on the 'Effects of Alloys in Steels' is most unfortunate. The tone of the criticism is such as to foster and perpetuate the old idea that wrought iron can be used as an all purpose filling material."

"We entirely agree with you in your statement that 'the metal added must be similar in analysis to the original metal.' It is impossible to procure iron with sufficient tensile strength for use in life and death welds."

### From a Well Known Paris Authority

"Where welds are to be made in alloy steels we consider it of essential importance that the nature of the alloy be determined, and a steel filler rod selected that will supply the ingredients most liable to be destroyed or burned out in the execution of the weld."

### From a Large English Firm

"Recent tests of American welding rods, made since the appearance of the criticism of your article, were very much of a surprise to us. Tests of American products bought in open market several years ago proved them far inferior to those now available. We do not regard them quite the equal of our —— fillers, but believe those tested to be far superior to the average product of our competitors." Naturally, the salesman can not afford to admit that anything is superior to the goods he is selling.

Evidently the printing of the criticisms of these articles has served to attract attention to the articles themselves and incidentally to the quality of American goods as now produced and sold.

I do not for a moment question the sincerity of those who expressed criticisms of the article in question. I do question, however, the policy of expressing an opinion without determining the facts. We know by reason of oft repeated experiments that the tensile weakness of the very best wrought iron is such that it can not serve to bond parts of alloy steels which may have a tensile strength more than double that of the iron filler. To give the impression that it is unnecessary to make a special study of alloy steels and in each case select the proper filler is to promote a dangerous doctrine.

The phenomenal growth of the automotive industry in the United States, which eclipses that of all other countries combined, and of many other industries in which similar uses of the oxy-acetylene process is slowly but surely superseding more costly means of metal joining has afforded a wonderful incen-



A PECULIAR JOB FOR THE WELDER.

tive to scientific investigation in this country.

Vague theories, which may still be common in countries where welding is considered only as a means for emergency repairs, have been dissipated. When a demand is found to exist those who are in position to increase the markets for their products by producing a satisfactory article are quick to realize its possibilities and to supply the need. Think, for instance, how valuable would be a ferrous metal which could be used to produce a true weld in malleable iron parts!

In other countries the interest in welding is just as keen as in ours. The opportunities for invention, however, are lessened, due to the fact that there are not enough competing concerns able to finance and carry on the expensive experiments necessary to determine the value of some new idea. Fortunate indeed is the student of welding who lives in North America.

### Steel—the Master Metal

The amount of iron produced as wrought iron to-day is less than 10 per cent. of the amount produced 20 years ago. The demand for this particular product is rapidly waning. On the other hand, the demand for steel—and especially for high-grade alloy steels—is increasing with greater rapidity than that of any other known industrial metal.

Some day these various alloys of steel will be standardized and classified. The International Acetylene Association is now calling for facts stating the chemical analysis of the steel plate used in the construction of pressure containers and the analysis of the filler found to give the best results therewith. Such information will some day be available. The writer holds that the welding and steel industries are both too young for the tabulation of complete information on this subject, although much may be accomplished in the very near future. The principles given in my article in the May issue and repeated below are intended to govern the choice of fillers until such information is complete.

"First, that the steel rod added must be similar in its analysis to that of the original metal."

"Second, that none of the essential characteristics of the original metal shall be destroyed in the execution of the weld." When there is a tendency to lessen the proportions of any of the component alloys, a welding rod which will make good this loss must be used.

"Third, that the grain of the weld shall be equally fine as the original section welded." Heat treatment or other means necessary to produce this result may be used where a 100 per cent. weld is sought.

My own experience in supervising an average of more than 1,000 welds per month has taught me that etching, microscopic and tensile tests are essentials of the business, and that any appreciable change in the analysis of the plate used in pressure containers or other work where the strength of the weld must be from 80 to 95 per cent. that of the rolled plate demands a specially selected filler —a filler with a tensile strength far in excess of the best wrought iron that can be manufactured.

Any weld made by a good workman that is "beaded through," that is, in which the ripple shows on the reverse side, and that is very slightly reinforced will stand a greater tensile pull than the plate itself—provided the right kind of filler has been used, together with a torch which stirs the gases into thorough mixture.

In this series of articles I have outlined the method of preparation of almost every type of weld in steel; have emphasized the necessity for securing proper penetration; and have shown the beginners how to practice torch movements until they attain proficiency.

### POINTS BROUGHT OUT

That sometimes a product is labeled incorrectly. In one case welders used steel wires, thinking them wrought iron.

Recent test of American welding rods proves them to be of the best quality.

The amount of iron produced as wrought iron is less than 10 per cent. of the amount produced 20 years ago.

Every welder should have a few samples of his various alloy steels tested, then label them, so that he can determine the characteristics of the sparks. In a short time he will be able to distinguish the common alloys by sight without grinding.

Others have pounded the truth home through these columns in regard to these matters, but we've had many failures. Why?

Because many of our welders do not know the analysis of the metals upon which they are working nor the filler that they are using. More than 75 per cent. of the welding supply houses can not tell you the analysis of the rod they "personally guarantee." Try it. Next time you meet your supply man ask him the analysis of the various rods he sells.

Now I do not mean that every welder must install a chemical laboratory in his shop, but he should at least obtain a few samples of the various alloy steels and have them properly labeled to use as wheel tests to determine the characteristics of the spark. In a few weeks he will be able to distinguish most of the common alloys by sight without grinding.

It took years to develop the cast iron welding rod with an increased amount of silicon and the bronze welding rod with the correct proportion of phosphorus and aluminum. Even now many shops are trying to get by with common "Tobin" or "manganese," instead of a specially prepared and drawn welding bronze.

My experience has been that best results have been obtained with steel plate and rod in which the percentage of phosphorus and sulphur are kept at a minimum. The percentage of other alloys, including carbon, should be as nearly equal as possible. I can furnish the names of dozens of operators who can make welds with "similar metal" that will stand greater strain than the balance of the plate.

### Reinforced Welds

Lastly, a word to the critic. The welding industry needs facts. If you have obtained extraordinary results with a filler in which the amount of carbon was so many per cent. less or more than the plate welded, and a certain increase or decrease in the amount of manganese or other alloys was found beneficial tell us about it either through these columns or by personal letter.

Possibly, too, we owe our brothers across the water some sort of an apology. In making the statement "American products are made which by far excel any imported article which can be procured," we referred to the markets of North and South America. We did not hope to see our original article quoted all over Europe. Surely with the same formula, materials and facilities as are used in the production of the highest grade American products they could be duplicated in any other part of the world.

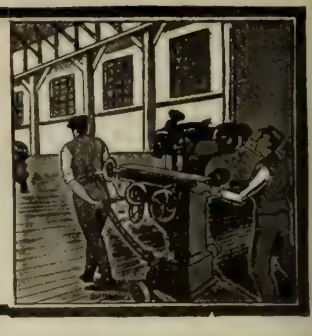
## THE WEIGHT OF A BLOW

Should there be a relation between the size of a tool and the weight of the blow struck? Certainly! For would not the use of a 7 or 10-lb. hammer, on a ¼ punch or chisel soon ruin the tool? It may be shown as a ready example of this that while you can drive a 16-gauge 2 in. wire nail into an ordinary brick until its head is flush, if you use a 4 oz. to 6 oz. hammer, yet if you use a 2 lb. hammer the nail will not enter, but simply collapse; in effect this is the same with all percussion tools. If you have a big-bodied chisel or punch you can use a sledge hammer on it, but if you have a small-bodied tool only a small hammer can be effectively used, and for the usual ⅛ in. to ⅝ in. hexagon steel punches and chisels more work can be done with a ¾ lb. to 1 lb. hammer than with one of larger size, owing to more of the force being utilized.

Five men were seriously burned about the face and arms, when one of the employees of the Pratt and Letchworth Co., Brantford, stepped back suddenly, striking a man carrying a ladle of molten metal.



# DEVELOPMENTS IN SHOP EQUIPMENT



## NO. 2 MAXIMILLER

The Kempsmith Manufacturing Co., Milwaukee, have placed on the market their No. 2 plain maximiller. This machine is of similar design to their No. 4 size and has the same balanced weight, rigidity, convenience of operation and efficiency in production. Its size adapts it to the medium heavy classes of automobile and aeroplane work, and it will also be found valuable in tractor, steam turbine and agricultural machinery plants. The very highest class of materials obtainable are used. All gearing stock is purchased to exact chemical analysis and is scientifically treated for the particular use to which it is put. Much of the shafting, especially that in the speed train, is also heat treated alley steel.

The column, knee, saddle and table, which constitute the main frame numbers, are of semi-steel, and have been carefully designed in regard to relative weight and strength. An exceptionally large area of base provides stability for the entire machine. No weight whatever has been added merely to have a heavy machine. Every pound of metal used is well placed, and serves a useful purpose.

The knee is of the solid top design, there being no openings whatever in the top plate of the knee. This construction serves to better resist clamping strains and the torsional effect of the table overhang. The side walls of the knee are practically solid, there being but two small openings, which are closed by plates. Cross-feed screw is located in a shallow depression in the top of the knee midway between the saddle V's. The greatest possible strength and accuracy is the result as the pull or thrust of the cross-feed screw is applied to the centre of the saddle.

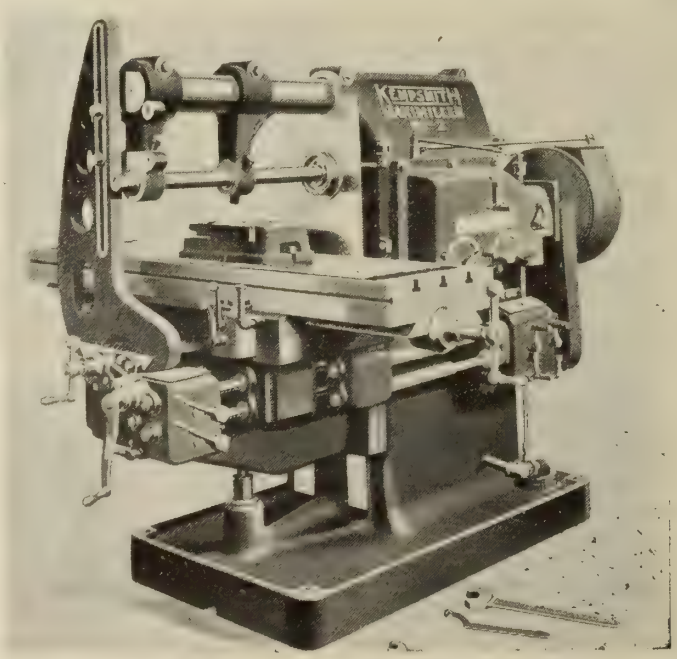
Column is well ribbed internally and has very few and small openings. The reservoir for the speed drive oil forms a solid rib or cross member midway of the column height, which has a great stiffening effect on the column. Saddle is long, heavy and rigid. Drive to table is located near end of saddle, which leaves the center solid where the most strain comes. Table is 12 inches wide with 56 inches working surface in length. Table gib is of adjustable taper type with locked adjustment.

The overarm is a solid steel bar 4¼ inches diameter and is a patented "wedge lock" type which keeps the arbor in alignment with the spindle at all times. The spindle hose is of patented type which provides for driving face milling cutters in either direction and also permits cutters to be quickly and easily removed. Right hand design has been used which means that normal direction of spindle rotation is correct for standard drills and boring tools. A spindle reverse has been incorporated in the machine for the reason that in order to get cutting strains in proper direction on gibs and tables a face mill must be run in the opposite direction to a spiral or slab mill.

The clutch is of friction plate type operated by a hand lever located at the front of the machine where it can be easily reached by the operator. Friction surfaces of clutch are large in diameter and are forced together by a combination toggle and plain lever movement which gives the required pressure on the plates with very little effort on the operating handle. Clutch is adjustable for wear without dismantling the unit. A brake operating on the reverse throw of the clutch lever overcomes the momentum of the spindle gear train and stops the spindle quickly.

The drive pulley is 15 inches diameter, takes 3½ inch double belt and runs at 400 R.P.M. It is mounted on ball bearings and with the clutch is enclosed in a protecting housing. The control of the longitudinal movement is by two levers, one for the feed and one for the power quick traverse. The operator merely pushes the one required in the direction he wishes the table to move. The knee and saddle movements are both controlled by a second set of levers, the unit which shall move being determined by push pins located in close proximity to the respective hand feed handles; while feed or quick traverse is determined by which lever is pushed. Operator can control the movement of the table in any direction either by power feed or quick traverse without moving from his position at the front of the knee.

The cooling system is a part of the machine. Pump is of the centrifugal type driven through a clutch which can be disengaged if the nature of the work does not require the use of a cooling fluid. The capacity of the pump is about 15 gallons per minute delivered to the cutter. Lubrication of all working parts has been given careful consideration in the design of the Maximiller. The gears and bearings in the entire speed and feed mechanism run constantly in oil and are lubricated by splash. The only exceptions to this are the sight feed oilers



GENERAL VIEW OF THE NO. 2 MAXIMILLER

sed to supply fresh clean oil to the pindle bearings and drive pulley. The ubrication of all mechanism supported y the knee is centralized at two points hich make it certain that none will be verlooked.

The spindle is very large and runs in hosphor bronze bearings which are asily adjustable to compensate for wear. ll other shafts in the speed transmission run on ball bearings. The entire pindle drive is located in an oil tight ase and runs in oil. Feed change echanism provides 18 changes of feed anging from 5-8 inch to 25 inches per inute in geometrical progression. The ars are all heat treated steel and run n an oil bath.

### Quick Traverse

The power quick traverse is available r all table movements without disturbg the set up for whatever rate of feed ay be in use. The available feed rates main constant, but power quick traerse rate has been reduced for the cross d vertical feeds to compensate for the ort travel distance of the former and e greater load in the latter case. The ngitudinal power quick traverse, is at e rate of 100 inches per minute while e cross and vertical travel is at e rate of 36 inches per minute. Oiling rections for this machine are simple d complete, a small plate on the speed being all that is necessary to explain em to new or unskilled operators.

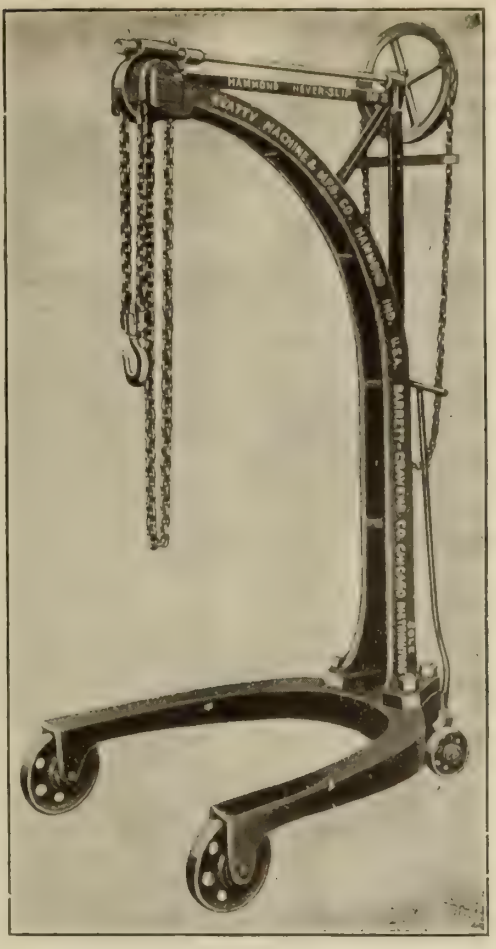
The drive is of the single pulley type rough a train of gears giving 18 anges of spindle speed ranging from 16 400 R. P. M. All speed changes are ared by sliding gears, there being no ubler gears, clutches or locking pins. ere are never more than three pair of ars in mesh. All heavy cuts are ven through the large spindle gears, t gear arrangement being such that cutters above 3 inches diameter are mally driven through this gear. hen desired and at an extra cost we furnish the above machine arranged f motor drive through belt in which e the motor recommended is 7½ H.P., ning at 1,200 R. P. M.

## PORTABLE CRANE

he Barrett-Cravens Co., Chicago, Ill., ve placed on the market a portable ne which is claimed to have various standing features.

he crane is of all steel construction, al the load is locked at all points of vel. The lifting mechanism is of the rm and gear type, thus allowing the ad to be raised to any desired height, en to a fraction of an inch. This is, ofcourse, a desirable feature when assembling or dismantling heavy machiner

he hoisting worm gear is made of bronze, and the screw is cut from solid steel shafting of goodly proportions.




GENERAL VIEW OF THE PORTABLE CRANE.

Both are enclosed in an oil tight cast housing to permit proper lubrication. The axle is chrome nickel steel, heat treated, and Hyatt roller bearings are used in all the wheels. The treads of the wheels are chilled to ensure long wear. The Ontario representative for this concern is the Anglo-Canadian Metals, Ltd., 52 Spadina Ave., Toronto, while B. and S. H. Thompson & Co., Ltd, 210 McGill St., Montreal, handle the other provinces in Canada.

## DRILL ATTACHMENT FOR MILLERS

The Purves Manufacturing Company of Syracuse, N. Y., are placing on the market a special attachment for the drilling of holes in work carried on the table of the milling machine. The fixture is so designed that the work may be located on the table without the use of a jig and the holes drilled to any desired angle by swinging the attachment to the required position. A small hand lever is provided for feeding the drill, this method giving a more sensitive control and aiding materially in preventing drill breakage. The feed lever may be placed in different positions to accommodate various shapes of work. For depth drilling adjustable stops are provided.

## 22-INCH UPRIGHT DRILL

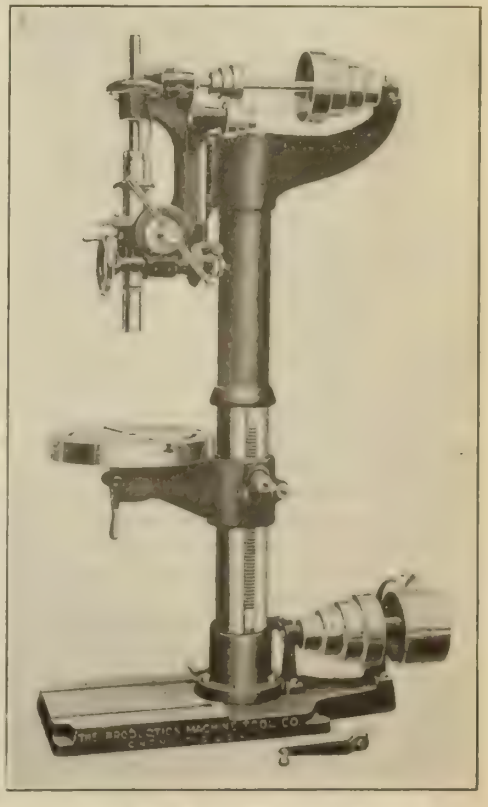
The Production Machine Tool Co., Cincinnati, Ohio, have placed on the market a new 22-inch upright drill. This machine has stationary head, bronze bushed throughout. It is built to do the regular type of drilling, boring, tapping, and facing work up to its range of 1¼-inch diameter drill.

The machine is regularly built with power feed, but this can be omitted if desired, Back gears, and tapping attachment can be added together with the type of drive best suited to conditions under which machine has to be used.

The frame is of ample proportion. The column is of tubular section, and if sufficient stiffness to withstand all strains. The table arm is a single casting and of box construction. The table is well ribbed, and has four tee slots of the same size as those in the base. Four radius slots are also provided. All other parts are proportioned to withstand heavy usage.

The drive is by means of tight and loose pulley through driving cones of large diameter and wide face. The driving level gears have a peripheral speed of less than 800 feet per minute. The spindle sleeve is bronze brushed, and the spindle has a suitable ball bearing for thrust. Four spindle speeds are obtainable on the plain machine, with four additional speeds through back gears.

A by-law was passed by the ratepayers, Dunville, Ont., authorizing an expenditure of $40,000 on a four-room addition to the public school.




THE 22" UPRIGHT DRILL PRESS.

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## The Cancellation Germ

ONE of the poorest things that has been allowed to grow up and become incorporated in our business system is the cancellation of contracts or orders.

There are undoubtedly cases where the only way out is to cancel, but the tendency of our commerce and trade should be set against this practice rather than in favor of its continuance.

Just this week Canadian Machinery talked with British agents in Canada, who were certain they could not take the business of certain Canadian firms to their houses again because it would not be considered until such time as they had discharged the obligations now on their books, but which they had seen fit to cancel.

In most cases the first intimation given that there was any intention of cancelling was when the expressman brought the goods to the door of the company's plant. Then the only word was to the driver of the wagon, and it ran like this, "Take these back, we don't want them."

There were cases in which these orders had been placed some months ago. The agent here had taken the business and sent it to his home office, where it had gone through the usual work in the factory and in some instances special work was required to meet the requirements of the firm ordering the goods.

There are too many contracts cancelled in this country.

A contract is a business obligation and if the firm to whom it is given lives up to its terms, it is the legal and moral duty of the purchaser to live up to his part and accept the shipment.

The reason why these business obligations are not discharged is, in the majority of cases, because it will not pay to do so.

It pays better to disregard business obligations, therefore disregard them and let the other firm worry about what is to be done about it.

Canada needs more common, every-day honesty in dealing with such matters as disregarded business obligations. It is a vicious practice and once started, strikes farther than any one would dare do in any other way.

Going through a season such as we are now, with contracts being cancelled simply because it does not pay consignees to honor their orders, creates a feeling of business instability that is hard to overcome and difficult to counteract.

It is generally understood that where a firm fails to make shipment on time, or where the goods are not up to samples, or faulty in any way, there are grounds for refusal and rejection. It is right and proper that such should be the case. This is a perfectly legitimate practice, and a defence for good business methods.

But this is far removed from the cancellation craze that has taken business by the throat in this country.

The way to weed out the cancellation germ is to weed it out.

Let us have in Canada a business community that will recognize contracts, and regard them as business obligations which they are morally bound to discharge.

## Time To Face Facts

THE International Harvester Co., at their Hamilton plant, publish a paper called "The Bulletin" each month. The current issue contains an appeal to the employees from the management. It goes on to point out that conditions are changing and that it is a harder matter for the firm to keep going than it was a few months ago.

Many a plant will find its own case stated in the appeal that is made for the elimination of the scrap heap.

Here is the way in which the case is stated, after reviewing the money markets, and showing how much more it costs to borrow necessary money now than formerly:

"So you see where we stand. There is no way to dodge the issue. We have got to meet it and go through. Every man and woman on the payroll will have to get down to business. Every one of us will have to save money for the company. We will have to get practical and ask ourselves practical questions:

"How much does a scrap pile cost?

"What does one bolt, lost or scrapped, cost, when multiplied by a thousand or ten thousand?

"What does a pound of brass cost, or a handful of nails, or three sheets of paper, or a pocketful of pencils—multiplied by the number of employees and purchased with borrowed money?

"How much does fifteen minutes of wasted time cost the company?

"What is the penalty of an hour a day lost from creative work?

"How much does it cost for every call a salesman does not make during the day, and for every unproductive call he does make?

"The time has come to ask ourselves the bluntest and most practical questions and get our schedules down to bedrock. In other words, we had just as well face it—to be an asset to the company we will have to be efficient.

"And it is an exceedingly poor time for any man to be anything but an asset to his company."

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It is stated in a recent report for 1919 that the total amount of tar distilled in the United Kingdom equalled 1,509,043 tons, of which 1,402,987 tons were obtained from gas and coke oven works. For pitch, out of a total of 698,290 tons, the gas and coke oven works contributed 636,435 tons.

# Canada's 1919 Iron, Steel and Tool Trade

DURING the year 1919 Canada imported from other countries a total of $181,332,310 in iron and steel. The year before it amounted to $173,340,779. The year 1920 may show a decrease. The great bulk of this came from United States.

Canada imported more iron and steel in 1913 than in 1917.

Here are some of the amounts coming in during the year 1919:

| | Tons | Value |
|---|---|---|
| Pig iron and kentledge | 35,800 | $ 1,022,871 |
| Ferro-alloys and chrome | 16,423 | 943,584 |
| Ingots, blooms, billets | 12,135 | 494,101 |
| Scrap iron and steel | 39,790 | 482,963 |
| Plates and sheets | 183,061 | 12,820,340 |
| Tin plate and sheets | 43,407 | 6,436,047 |
| Bars, rods, hoops, etc. | 147,726 | 12,771,836 |
| Structurals | 184,813 | 11,142,997 |
| Rails and connections | 14,059 | 774,985 |
| Pipes and fittings | 1,277 | 90,879 |
| Nails and spikes | 2,359 | 228,580 |
| Forgings, castings | 19,935 | 3,325,859 |
| Exports from Canada include: | | |
| Harvesters and binders | | $2,773,756 |
| Mowing machines | | 918,635 |
| Cultivators | | 638,741 |
| Ploughs and parts of | | 2,833,743 |
| Gasoline engines | | 1,184,664 |
| Locomotives and parts of | | 5,874,091 |
| Wire nails | | 1,302,413 |
| Other machinery and parts | | 5,852,327 |
| Bars and rods (52,191 tons) | | 3,394,894 |
| Rails (30,737 tons) | | 1,297,836 |
| Structural (5,515 tons) | | 465,989 |
| Imports in lines of iron, steel and machinery show: | | |
| Cream separators, steel bowls, and other parts | | $1,238,657 |
| Harvesters, self-binding | | 307,907 |
| Ploughs and parts of | | 1,794,736 |
| Threshing machines | | 822,819 |
| Plough plates, mould boards, or shares, land sides, cut to shape from rolled plates of steel, but not moulded, punched or made | | 417,711 |
| Automobile engines | | 5,586,127 |
| Gas and gasoline engines | | 1,751,824 |
| Gas and gasoline engines, n.o.p. | | 2,324,604 |
| Castings, malleable, n.o.p. | | 334,325 |
| Castings, iron, n.o.p., not malleable | | 1,037,744 |
| Adding machines | | 783,361 |
| Air compressors | | 225,622 |
| Electric motors | | 1,387,834 |
| Paper mill machines | | 1,004,990 |
| Rolling mill machines | | 582,422 |
| Other machinery of iron or steel, n.o.p. | | 16,353,427 |
| Power lathes | | 402,473 |
| Rolled iron or steel and cast steel in bars, bands, sheet or plate | | 4,298,705 |
| Bar iron or steel | | 2,274,770 |
| Iron or steel plates, coated with tin—"tin plate" | | 6,436,047 |
| Iron or steel plates, 30" wide, not less than ¼" thick, n.o.p. | | 1,618,099 |
| Iron or steel sheets, polished or not, No. 14 gauge and thinner, n.o.p. | | 2,831,411 |
| Skelp iron or steel, sheared or rolled in grooves, for making wrought iron or steel pipe | | 4,139,860 |
| Iron or steel angles, tees, beams, not punched | | 1,480,205 |
| Iron or steel angles, beams, channels, etc., not less than 35 pounds per lineal yard | | 3,405,724 |
| Iron or steel beams, sheets, plates, for ships or vessels | | 5,389,766 |
| Pig iron | | 1,022,871 |

**Iron Blast Furnaces in Canada, in 1919**

Dominion Iron & Steel Co., Sydney, C.B.: Six completed furnaces; one of 350 tons capacity and five of 250 tons capacity each per day; No. 1, operated 309 days; No. 2, 214 days; No. 4, 237 days, No. 7, 126 days; two furnaces idle throughout the year.

Nova Scotia Steel & Coal Co., Ltd., New Glasgow, N.S.: Two stacks and one set of stoves at Sydney Mines, C.B., of 250 tons capacity; stack No. 1, operated 156 days.

Londonderry Iron & Mining Co., Ltd., Londonderry, N.S. (in liquidation): One furnace of 100 tons capacity idle throughout the year; not operated since 1908.

Midland Iron & Steel Co., Ltd., Midland, Ont.; Acquired in 1918 the Midland blast furnace plant of Canada Iron Foundries, Ltd., of Montreal, Que. One furnace of 130 tons capacity at Midland, Ont., operated 215 days.

Parry Sound Iron Co., Ltd., Midland, Ont.: Acquired in 1918 the blast furnace plant at Parry Sound, Ont., formerly operated by Standard Iron Co., Ltd. One furnace 90 tons capacity rebuilt and operated 240 days.

Standard Iron Co., Ltd., Deseronto, Ont.: One furnace at Deseronto with a daily capacity of 60 tons, operated 160 days.

The Steel Company of Canada, Ltd., Hamilton, Ont.: Two furnaces, one of 260 tons capacity, operated for 341½ days, a second furnace of 430 tons capacity operated 285 days.

Algoma Steel Corporation, Ltd., Sault Ste. Marie, Ont.: Four furnaces at Steelton, near Sault Ste. Marie, two of 300 tons capacity each; one of 500 tons, and one of 400 tons. No. 1, in blast 285 days; No. 2, 364 days; No. 3, 171 days, and No. 4, 141 days.

The Atikokan Iron Co., Ltd., Port Arthur, Ont.: One furnace of 175 tons capacity idle throughout the year, not operated since 1911.

The Canadian Furnace Co., Ltd., Port Colborne, Ont.: One furnace of 325 tons capacity operated 363 days in 1919.

Canadian Steel Corporation, Ojibway, Ont.: Two stacks under construction, at the end of 1919 foundation had been completed for two blast furnaces of 550 tons each.

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"Railroad and Locomotive Engineering":—This isn't much of a railroad story, but it is mechanical enough to pass muster, and it is aptly illustrative of some parallel things that were done during the joy-inspiring period of government control. Things were pressing in France and the ordnance department in a certain city were ordered to gather together all pulleys possible and ship them forthwith. As no ordinary pulleys were obtainable a telegram was sent to Washington that they could not get any ordinary pulleys but they could get a quantity of split pulleys. Whereupon a prompt reply was sent from the supreme ones at Washington: "Ship the split pulleys, if they are not too badly split." There seems to be no place in the world so sure to harbor incompetents as some of the upper reaches of government appointive service.



# MARKET DEVELOPMENTS



## Prices Firm in Steel and Machine Tools

### Makers Claim There is No Advantage in Quoting a Lower Price as Buyers Are Not Ready Yet—Small Production Tends to Keep The Price Up—Steel Prices Are Also Well Maintained

BUSINESS has not improved in the iron, steel and machine tool market during the week, nor are there indications of any immediate recovery. This is stating the worst at the outset, because several dealers report that they have some encouraging inquiries now that should result in business later on.

The New York tool market does not look for immediate reductions in prices. Makers are putting through such a few machines now that their costs are going up instead of down because the few tools going through have to bear the overhead which was formerly distributed over a much larger number. Neither does the Pittsburgh market look for much in the way of reduction in the prices of steel. Only in a few cases does it seem likely that 1921 will have a better price than that which is now quoted. The Corporation mills continue to produce well, while many of the independents are down.

The steel warehouse business is rather quiet in Canadian centres, and great care is being exercised by buyers generally. Even boiler tubes, which generally sell very freely at this season of the year, are being taken on only for pressing repairs, and several cases are reported where the policy of "making it last" is being pursued.

Small tools are also being bought sparingly, and users are getting them only as they are needed. Railroads have been placing some orders in this line during the week.

The scrap metal dealers are getting no new orders and what business they are doing is simply on filling old contracts. Buyers, they claim, are taking opportunity of every defect in a car to refuse delivery, while in times when things are going well and the material is wanted, nothing is heard about such defects. Prices which dealers would pay for old material are down again this week, but it makes little difference as there are no consumers in the market at any price.

## "WATCHFUL WAITING" IS THE ATTITUDE OF MANY BUYERS

Special to CANADIAN MACHINERY.

MONTREAL, Que., Jan. 13.—Mists of uncertainty still enshroud the industrial atmosphere, and until these have cleared away the sunshine of activity will be prevented from giving light to many who are now striving to see the return of the normal business day. On nearly every hand one sees the waiting attitude, everyone apparently deferring buying until lower prices have been announced. What is really expected in this direction it is hard to define. Many expect to see a drop in a week from a position which required years to reach. To avoid serious consequences it is necessary that any adjustment to pre-war, or even near it, must take many months before a satisfactory and healthy condition can be attained.

### Gradual Improvement Looked For

While there are those in the trade that think prices on steel lines must be further reduced before consumers will be influenced into buying on an extensive, or even a moderately liberal basis, many of the dealers state that it is not likely that present quotations will be materially changed for some time. "Prices are about as low as they can go. Some slight reductions may be made in some lines, but nothing to speak of. Selling prices are based on cost of production and present quotations are as low as existing circumstances will permit." The dealers further stated that it could not be expected that trade would show any marked change so early in the year, and, as a matter of fact, they did not anticipate any heavy buying for several weeks. The statement of another merchant indicated that trade, though far from brisk, was nevertheless of an encouraging character. The stock on hand was possibly less than normally carried, but much of it was purchased at figures higher than those now obtaining. This is especially true in regard to high speed steels. "We have some in stock now that cost us a dollar a lb. and we would willingly dispose of it at 75 cents. There is very little demand for this steel at the present time. The movement of carbon and cold-drawn steels is fair, but below that usually recorded at thi period of the year." Before purchasin new stocks the merchants are adoptin every means to liquidate existing sup plies, even though it be accomplished a a loss. As one dealer remarked: "I is better to take a small loss now than greater one later on." It is the merchan that has been unfortunate in having heavy supply on hand that must take th heavier losses, but the logical thing i to get rid of the material as soon a possible, so as to be in a position to tak advantage of the market when the lov level has been reached. Local price quo tations are relatively the same, the higl rate of exchange acting as a barometer in maintaining these at the comparatively high levels.

### Prices Still Declining

Buying is still quiet in machine tool circles, but some dealers report an improvement over that of recent weeks. While the greater volume of business is done in small equipment, the movement of heavy tools is not dead. One dealer stated that he made quite a large deal last week, including some heavy tools. However, many factories are still operating light and taking on only such equipment and supplies as will tide them over the immediate future. Other plants have

resumed activities, on a conservative basis truly, but sufficient to create increased interest from the dealer's standpoint. The situation is still marked by declining prices in many commodities, and a falling market has seldom been a lodstone to draw out the buyer. Manufacturers are making inquiries, but actual sales are only made when materials are urgently needed. "We are not carrying heavy supplies of any kind," remarked a dealer. "We do not intend to, nor would it be advisable until a sounder working basis has been establisned. We have often found that on a falling market the purchase of material for stock has resulted in a financial loss before the goods are finally disposed of. For this reason we are only stocking sufficient supplies to cover the present requirements of our customers, which, for some weeks, have not been very great. Before May, however, we expect that conditions will have shown considerable improvement."

### Light Business With Prices Firm

The metal market enters on the second week of the year with conditions about as they have been for the past several months, with buying restricted to actual requirements and business light in nearly every line of activity. Warehouse stocks in this district are generally sufficient to meet only the immediate needs of the trade and few dealers have been caught with heavy supplies on hand. "Speaking generally," remarked a dealer here, "we believe that metals have attained the lowest possible level that can be reached under the present order of things. This is particularly true in regard to ingot metals, but in the case of semi-finished materials some further adjustments may take place, but this will be governed by future developments. In the case of virgin metals the adjustment was brought about much sooner than in other lines, due largely to the additional volume of labor involved in the manufacturing processes of semi-finished and finished products. It is a little premature to predict the trend of the year's activities, as nothing tangible has yet developed to give a definite tone to trade conditions, but it is safe to say that, apart from slight fluctuations, the metal situation will continue firm, if it does not take on additional strength." The copper market has become steadier, with a slight upward trend in prices. The uncertainty of the past few weeks has been replaced by a confident belief that prices in this metal have reached the bottom and early reports may indicate a rise in price quotations. Spelter and lead show a slight decline on a poor demand, the quotation of 8 cents for spelter and 7¼ cents for lead representing a drop of ½ cent and ¼ cent per lb. respectively.

## POINTS IN WEEK'S MARKETING NOTES

**New York machine tool dealers are of the opinion that price reductions are not likely to come until there is a greater volume of business in sight.**

—

**Scrap metal prices were marked down farther in some lines this week. Dealers are not getting any new business and nearly all of the trading that is taking place is being done on old contracts.**

—

**The complaint is still heard in several different lines, that contracts are being cancelled without any fair explanation. Many of these cancellations are not being accepted.**

—

**The automobile industry has sent word to one or two large shops, intimating their renewal of shipments on contracts which had been suspended for some time.**

—

**Pittsburgh claims that steel bars averaged 1.40c in the ten years 1904 to 1913, and were down to 1.05 in December of 1914. The presetn price is 2.35 at corporation mills. It is intimated that the market may find its real basis at 2 cents.**

—

**Most of the steel warehouses in district claim that they have gone through the high price stage safely, and are not too heavily stocked at the present time.**

—

**Boiler tubes are moving at a very ordinary rate for this time of year by being rather lighter than usual.**

## BUYING DONE IN CONSERVATIVE WAY

**Yards in Steel Business Looking Over Records Find They Have Little High Cost Stuff**

TORONTO.—Buyers are going ahead very carefully in any section of the iron, steel or machine tool market that one cares to consider—in fact, there are a number of the dealers who will dispute the words "going ahead" in this connection at all. It is easier, many firms report, to secure money for any legitimate undertaking than it was three months ago, but as in other times it is harder to get any buying movement under way.

It goes back to the position in which the manufacturer finds himself. He is still asked for a high price for anything he wants to secure in the way of raw materials, and he is curtailing his programme to conform to known and definite wants. He is not going to be caught again with a lot of high price stuff in his warehouse that he will have to write off.

Encouraging reports are coming of the re-starting of several of the firms that have been closed for the holiday season, and some of them for some weeks before. Some of the automobile shops are ready to open up in a small way as a starter, and expect that once they get under way they will be able to go ahead again and work up to capacity before many months pass.

### The Steel Market

Some of the merchants in the steel industry are busy now fixing up their own business for the year. It has been a time of reckoning for some of them to find out just how they stood in the matter of having cleared out their high-price material. Some of them have bought quite heavily from premium mills during the past eight months or so, and the getting of this material out of their stocks before the price broke was a matter of no small concern. Most of them, from what Machinery can learn, have come safely through the business, and have been able to keep their prices coming down to market levels by the mixing of high and low price material.

Boiler tubes should be better than they are now. Even in this line, on which deliveries are not too good, but buying is being cut closer than ever, and in some cases where in ordinary times repairs would be made, it is being allowed to "get along" for the present.

Merchant bar material is not moving in much volume. The open season may have helped a little, but for the present buying is small and for immediate requirements only. Some of the larger agricultural makers seem to be rather conservative in their programmes, and are not taking on the stock they generally are at this time of the year.

There is a fair business being done in sheets, and no change has been made in price. Plate is not called for extensively just now, and can be secured readily from existing stocks.

### The Steel Contracts

One of the steel merchants in discussing the keeping of contracts and the adoption of the policy that "A Bargain Is Binding," claimed that this could be made effective only when both sides to the contract were making a serious effort to live up to it. "During the past year," he claimed, "we were under a so-called contract with the mills to buy from them, shipment to be made at their convenience. When it comes down to real facts, this business of mill convenience never arrived, and we got no material at all during the time when we were very much in need of it. A a

general thing, the keeping of contracts should be insisted upon, but the contract in the first place should be of such a nature that it is not a jug-handled affair that simply binds the buyer not to send his business to any other mill, without giving him a corresponding assurance that he will get as good service as he can get elsewhere."

### The Scrap Market Dull

The scrap market showed a little life this week—in fact enough to stimulate one of the dealers to rise up and mark down the list we have been publishing for some weeks past. Zinc, heavy and tea lead, aluminum, heavy melting steel, malleable scrap, No. 1 machine cast iron, car wheel, machine shop turnings, stove plate and cast boring were all marked down to lower levels.

There is very little business being done, and all that is under contract, with no new contracts being made. When old contracts run out there is nothing being done to renew the tonnage they represent.

Buyers are more particular now than they have been for many months, is the way one dealer sized the thing up. He claimed that instead of cancelling contracts, they came about it another way in a good many cases. Were there anything wrong at all with a car of scrap metal, the thing would be rejected outright. Many of the buyers were doing this because they did not want to take on the tonnage for which they contracted, neither did they want to come out and try for a cancellation. In ordinary times, or when the material was much wanted, there would not even be a complaint over a car that calls for a reject now. This dealer was certain that some of the users were going over the cars with a fine comb and a glass looking for defects or departures from classification.

# STEEL PRICES WELL MAINTAINED BUT SOME LINES MAY COME DOWN

Special to CANADIAN MACHINERY.

PITTSBURGH, January 13.—Production of steel ingots in December was at the rate of about 31,000,000 gross tons a year, this comparing with a rate of about 36,300,000 tons in November and an average rate during the first nine months of 1920, when demand was very heavy, but when there were very serious operating difficulties, of about 42,000,000 tons. The actual production in 1920 was 40,000,000 tons or a shade more.

Actual capacity of the industry, given reasonably favorable working conditions, such as always obtained prior to November, 1916, but which have been very rare since then, is about 52,500,000 tons or about 22,500,000 tons for the Steel Corporation and 30,000,000 tons for the independents. The mills did not operate in December in these proportions by any means, as the Steel Corporation still had good order books and indeed increased its operations slightly, by reason of having greater supplies of coke, while the independents had almost run out of orders. The corporation operated in December at about 92 per cent. of capacity and the independents at about one-third capacity. As nearly as can be estimated, in December the Corporation produced ingots at the rate of about 21,000,000 tons a year, while the independents produced at the rate of about 10,000,000 tons. Independent mill operations have been declining continuously and thus are now at a materially lower rate than the average of December, probably between 20 and 25 per cent. of capacity or at 6,000,000 to 7,500,000 tons a year.

The greatly different positions of the Steel Corporation and independents is shown in another way by the record of blast furnaces. In December independent steel works and merchant furnace interests blew out 55 blast furnaces and blew in none, while the Steel Corporation blew out only one, and blew in five.

### Production Prospects

At the present moment steel ingots are being produced at the rate of about 28,000,000 tons a year. Of course, one would like to see prospects of the rate of production beginning to increase at once, but obviously that cannot be expected. In the first place, buying is very light, indeed, while from day to day old business is being completed. In the second place, a rate of 28,000,000 tons is precisely two-thirds of the 42,000,000 ton rate that obtained during the first nine months of 1920. Nobody can be so ignorant of general conditions existing, as compared with those in the major part of last year, to believe that the rate of steel consumption is decreased by only one-third. Finally, it is known that some of the steel now being shipped to dealers and consumers, and being accepted willingly by them, is not being consumed. The steel is accumulating. Obviously these buyers will not, for any length of time, continue to accept more steel than they are consuming.

Hence further decreases in production of steel may be expected. The question is when increased buying will have proceeded far enough to take up the slack and convert decreasing production into increasing production. In well posted and conservative quarters it is confidently predicted that there will be a decided improvement in buying of steel products some time in March, more likely in the second half of the month. It may not be until some time afterwards that the rate of steel production will back to the present rate, but it wou not require much to put the industry better shape than it is in at present.

### Prices Present and Prospective

Steel prices may be described as b ing well maintained, but that is real not saying much since so little busine is moving that there is scarcely any o portunity to cut prices. It may be sai however, that most mills are altogeth averse to cutting prices. It was or thing for the independents to redu their prices to the Steel Corporatio level. It would be another thing alt gether for them to cut the Steel Co poration prices. The independents woul of course like to operate their plants i full, but there is no chance of thei being able to do any such thing for th present. A good way to put in the tim is to reduce production costs, and period of idleness is not altogether ob jectionable, having some advantage Undoubtedly there will be competitio between some of the smaller mills, re sulting in price cutting, but there wil be none of this on the part of the Stee Corporation or several of the large in dependents.

A fairly steady market, therefore, i to be expected for some time to come perhaps for only a few weeks perhaps for several months. Eventual ly, without doubt, prices will be lower Some manufacturers virtually admi this. Others do not, but that is presum ably from policy or habit. There is am ple proof that steel prices will be low er. As noted above, production durin the first nine months of 1920 was at th rate of about 42,000,000 tons of ingot a year, and that was only 80 per cent of capacity. A greater output could no be realized because there were physica difficulties in the way, the chief of whic was shortage of fuel. Thus to employ the full capacity consumption would have to be one-fourth greater. It cannot be argued that physical disability will stand in the way, for when industry becomes active again it is going to be on an efficient basis. There will not be a full demand unless everything is functioning smoothly. It is a settled fact in the present readjustment that in future all industries will have to be content with moderate profits. When the Steel Corporation operated at well under capacity in 1920 it reported large profits, and practically everyone is convinced that the accounting methods were so conservative that the profits were really larger than were reported. Accordingly, very large profits would be yielded on present prices with full operation and with the reduction in costs from the present level that is now regarded as certain. Hence selling prices will be lower, but they will hardly be lower until costs have been reduced and until there is prospect for a moderately full operation of industry. Merchant

steel bars, the most prominent product of the steel industry, averaged 1.40c in the ten years 1904 to 1913 and were down to a minimum of 1.05c in December, 1914. The war control price was 2.90c and the present price, that of the Industrial Board and of the Steel Corporation, is 2.35c. According to whether the reduction in costs is mild or drastic, and the wait for large orders to be offered is short or long, the steel bar market will probably turn on either about 2.00c or 1.80c. Of course, definite predictions as to actual quotations cannot be made, and figures are mentioned here merely to assign a definite measure to the estimate of the forces that will be at work.

# TOOL DEMAND TOO LOW TO PERMIT OF ANY LOWER COSTS

Special to CANADIAN MACHINERY.

NEW YORK, January 13, 1921.—While so far as the machine-tool trade is concerned there was little indication of improvement in business in the first week of the new year, there were a few marked instances of betterment in the general business situation, which was reflected in a more hopeful feeling in machine-tool circles. Other lines of industry must recover from the depression before the buying of machine tools on a fairly normal basis can pick up. There is a slightly better inquiry for tools, but orders are still extremely scarce.

One reason for the improvement in the general business situation is that prices of many basic commodities are believed to have touched bottom. In some instances they are down to or below the pre-war level, and buyers are showing a little more confidence in placing orders. Moreover, the liquidation in retail stocks is now going on more rapidly, and this will be reflected soon in orders for jobbers and manufacturers in various lines.

The price situation is one that is somewhat disturbing to the machine-tool manufacturers. Buyers point to the fact that the liquidation which has gone on in other industries has, as yet, scarcely touched the machine-tool industry. It is true there have been some price reductions, but the majority of tool manufacturers are not reducing prices and have no apparent intention of doing so at present. Some of them say that when a sufficient amount of business comes into sight to justify lower prices they will consider making them; others say that there must be considerable reduction in their manufacturing costs before they will reduce prices. While pig iron and steel are cheaper, any saving thus effected by the machine-tool manufacturer is more than offset by the present low production. As fewer machines are being turned out each machine must stand a larger proportionate part of the general overhead.

Some machine-tool manufacturers have assured their machinists and other highly skilled mechanics that there will be no reduction in their wages. It is recognized that skilled machinists did not receive before the war a wage commensurate with their skill and the time required by them to learn their trades. There seems to be a general disposition to accord machine shop artisans a better wage than they received before the war.

Taking all of these factors into consideration the prospect of a very large reduction in machine-tool prices does not seem encouraging from the buyer's viewpoint. Just how the situation will work out is for the future to determine. It seems improbable that there will be many price reductions while the demand for tools is at its present low point.

## PIG IRON TRADE

Although the pig iron market entered the new year at a low ebb, the feeling among dealers is inclined to be optimistic.

A prominent valley producer in the Pittsburg district announced at the open of business this year that they were willing to sell basic pig iron at $30 valley, and bessemer and malleable at $32 valley. No sales of consequence are reported. There have not been enough sales of foundry iron to have a clear cut market but some furnaces would sell at $33 or less.

A number of inquiries have appeared this week on the Cincinnati market, and hope is held out that the slump will soon be over. There has been a withdrawal of some of the resale iron which was glutting the market.

On the Birmingham pig iron market, release orders have been encouraging, but they still fail to cover much of the help up tonnage.

There is a more optimistic feeling on the Buffalo market. It is believed that buying will soon become active though furnace operation is no livelier. No. 2 plain 1.75 to 2.25 silicon is quoted at $34 to $35 f.o.b. Buffalo and basic at $36.

New York has practically a lifeless market. Resale iron continues to be an important factor.

Furnaces in the Cleveland district have started the new year with a large tonnage of last half iron carried over on their order books. Pig iron will be further curtailed in this district by the shutting down of the Ford Motor Co. Furnaces are quoting foundry iron at $35. Several additional stacks have blown out during the week.

Inquiries on the Chicago market, though small, are more numerous and the passing of the old year resulted in the withdrawal of some resale offerings. Both these facts give the market a more cheerful tone.

## TO START WORK ON THE CONTRACT

**Ontario Firm Will Begin on Work For Auto Concern That is Restarting**

The announcement that the large motor concerns in Detroit are again manning up with the purpose of resuming operations is not without a note of encouragement to Canadian manufacturers.

The manager of a large plant in the Niagara peninsula told Canadian Machinery that a large order on which cancellation had been refused as far back as September had been practically ordered resumed, and that a representative of the motor parts institution concerned was calling on all plants interested in Western Ontario, advising them that orders would stand and at prices agreed upon.

It would appear that busy times are not far distant. Reports from Detroit indicate that car orders are coming in in fine volume.

## CUT THE WAGES IN STEEL MILLS

**Big Firms Make Reductions That Will Amount to 25 Per Cent**

JOHNSTOWN.—R. M. Custer, vice-president of the Cambria Steel Company, has announced a reduction of wages amounting to 25 per cent., and that all but a few of the smaller departments will be closed down for at least two weeks.

Extensive declines in the selling prices of iron and steel made necessary the wage reduction, according to notices posted on all bulletin boards in the big plant. These notices said that all Cambria workmen, whether employed by the hour, day, turn, tonnage or piece work, are included in the wage revision, as well as all salaried employees.

Executive officers of the principal independent steel company here, when informed of the wage readjustment in the mills of the Cambria Steel Company at Johnstown, frankly stated that drastic reductions would be announced for the Pittsburgh mills.

They took the position that while production costs were on the present basis there could be no stability in the steel market, and it was proposed to bring about the complete readjustment of wages as soon as possible.

SYDNEY.—A 20 per cent. cut in wages, effective January 17, has been announced by the Dominion Iron & Steel Co. The reduction will affect approximately 5,000 men, of whom about 2,100 are temporarily laid off.

# SELECTED MARKET QUOTATIONS

**Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.**

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $39 96 |
| Lake Superior, charcoal, Chicago | 53 50 |
| Standard low phos., Philadelphia | 44 79 |
| Bessemer, Pittsburgh | 41 96 |
| Basic, Valley furnace | 37 50 |
| Toronto price:— | |
| Silicon, 2.25% to 2.75% | 51 50 |
| No. 2 Foundry, 1.75 to 2.25% | 50 00 |

## IRON AND STEEL

| Per lb. to Large Buyers | Cents |
|---|---|
| Iron bars, base, Toronto | $ 4 75 |
| Steel bars, base, Toronto | 4 75 |
| Iron bars, base, Montreal | 4 50 |
| Steel bars, base, Montreal | 4 50 |
| Reinforcing bars, base | 5 50 |
| Steel hoops | 6 00 |
| Tire steel | 5 00 |
| Spring steel | 8 00 |
| Band steel, No. 10 gauge and 3-16 in. base | 5 50 |
| Chequered floor plate, 3-16 in. | 8 50 |
| Chequered floor plate, ¼ in. | 8 00 |
| Bessemer rails, heavy, at mill | |
| Steel bars, Pittsburgh | 3 00-4 00 |
| Tank plates, Pittsburgh | 3 50 |
| Structural shapes, Pittsburgh | 3 00 |
| Steel hoops, Pittsburgh | 3 50-3 75 |
| F.O.B., Toronto Warehouse | |
| Small shapes | 5 50 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 3 62 |
| Structural shapes | 3 72 |
| Plates | 3 67 to 5 50 |
| Small shapes under 3" | 3 62 |

## FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

| | C.L. | L.C.L. |
|---|---|---|
| Montreal | 58½ | 73 |
| St. John, N.B. | 84½ | 106½ |
| Halifax | 86 | 108 |
| Toronto | 38 | 54 |
| Guelph | 38 | 54 |
| London | 38 | 54 |
| Windsor | 35 | 50½ |

## METALS

| | Gross. Montreal | Toronto |
|---|---|---|
| Lake copper | $19 00 | $19 50 |
| Electric copper | 18 50 | 19 00 |
| Castings, copper | 18 00 | 19 00 |
| Tin | 44 00 | 46 00 |
| Spelter | 8 00 | 9 00 |
| Lead | 7 25 | 8 00 |
| Antimony | 8 00 | 9 00 |
| Aluminum | 34 00 | 35 00 |

Prices per 100 lbs.

## PLATES

| | | |
|---|---|---|
| Plates, 3-16 in. | $ 5 50 | $ 5 50 |
| Plates, ¼ up | 5 00 | 5 50 |

**PIPE—WROUGHT**

**Standard Buttweld Pipe**

**Per 100 Ft.**

| | Steel Blk. | Steel Galv. | Gen. Wrought Iron Blk. | Gen. Wrought Iron Galv. |
|---|---|---|---|---|
| ⅛ | $ 6 50 | $ 8 50 | $..... | $..... |
| ¼ | 5 31 | 7 41 | 5 91 | 8 01 |
| ⅜ | 5 31 | 7 41 | 6 91 | 8 01 |
| ½ | 7 10 | 8 63 | 7 95 | 9 48 |
| ¾ | 8 80 | 10 87 | 9 95 | 12 02 |
| 1 | 13 61 | 16 97 | 14 71 | 17 77 |
| 1¼ | 17 60 | 21 74 | 19 90 | 24 04 |
| 1½ | 21 04 | 25 99 | 23 79 | 28 74 |
| 2 | 28 31 | 34 97 | 32 01 | 38 67 |
| 2½ | 44 75 | 55 28 | .... | .... |
| 3 | 58 52 | 72 29 | .... | .... |
| 3½ | 74 06 | 90 62 | .... | .... |
| 4 | 87 75 | 107 37 | .... | .... |

**Standard Lapweld Pipe**

**Per 100 Ft.**

| | Steel Blk. | Steel Galv. | Gen. Wrought Iron Blk. | Gen. Wrought Iron Galv. |
|---|---|---|---|---|
| 2 | $32 01 | $ 38 67 | $35 71 | $42 37 |
| 2½ | 48 26 | 58 79 | 54 11 | 64 64 |
| 3 | 63 11 | 76 88 | 70 76 | 84 53 |
| 3½ | 75 90 | 92 46 | 85 10 | 101 66 |
| 4 | 89 93 | 107 55 | 100 83 | 120 45 |
| 4½ | 1 05 | 1 29 | 1 30 | 1 54 |
| 5 | 1 22 | 1 50 | 1 52 | 1 80 |
| 6 | 1 58 | 1 95 | 1 97 | 2 33 |
| 7 | 2 06 | 2 53 | 2 53 | 3 01 |
| 8L | 2 16 | 2 66 | 2 66 | 3 16 |
| 8 | 2 49 | 3 07 | 3 07 | 3 64 |
| 9 | 2 98 | 3 67 | 3 67 | 4 36 |
| 10L | 2 77 | 3 41 | 3 41 | 4 05 |
| 10 | 3 56 | 4 39 | 4 39 | 5 21 |

**Prices—Ontario, Quebec and Maritime Provinces**

## WROUGHT NIPPLES

4" and under, 60%.
4½" and larger, 50%.
4" and under, running thread, 30%.
Standard couplings, 4-in. and under, 30%.
Do., 4½-in. and larger, 10%.

## OLD MATERIAL

Dealers' Average Buying Prices.

| | Per 100 Pounds. Montreal | Toronto |
|---|---|---|
| Copper, light | $10 50 | $10 50 |
| Copper, crucible | 13 00 | 12 00 |
| Copper, heavy | 12 50 | 12 00 |
| Copper wire | 12 50 | 12 00 |
| No. 1 machine composition | 13 00 | 12 00 |
| New brass cuttings | 7 00 | 9 00 |
| Red brass turnings | 10 00 | 10 00 |
| Yellow brass turnings | 7 00 | 7 50 |
| Light brass | 5 00 | 5 00 |
| Medium brass | 6 50 | 6 00 |
| Scrap zinc | 5 00 | 4 00 |
| Heavy lead | 5 25 | 4 00 |
| Tea lead | 2 50 | 2 00 |
| Aluminum | 16 00 | 13 00 |

| | Per Ton | Gross |
|---|---|---|
| Boiler plate | $11 00 | $12 00 |
| Heavy melting steel | 18 00 | 16 00 |
| Axles (wrought iron) | 25 00 | 20 00 |
| Rails (scrap) | 18 00 | 18 00 |
| Malleable scrap | 20 00 | 20 00 |
| No. 1 machine cast iron | 32 00 | 28 00 |
| Pipe, wrought | 8 50 | 10 00 |
| Car wheel | 30 00 | 30 00 |
| Steel axles | 20 00 | 18 00 |
| Mach. shop turnings | 8 00 | 7 00 |
| Stove plate | 23 00 | 23 50 |
| Cast boring | 8 00 | 10 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, 7-16 and up | Net list |
| Carriage bolts, ⅜-in. and less | Net |
| Coach and lag screws | —20 |
| Stove bolts | 55 |
| Wrought washers | —25 |
| Elevator bolts | Net |
| Machine bolts, 7-16 and over | —5 |
| Machine bolts, ⅜-in. and less | —30 |
| Blank bolts | Net |
| Bolt ends | —5 |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | +25 |
| Machine screws, fl. and rd. hd., brass | net |
| Machine screws, o. and fil. hd., brass | net |
| Nuts, square, blank | +25 add $2 0 |
| Nuts, square, tapped | add 2 2 |
| Nuts, hex., blank | add 2 5 |
| Nuts, hex., tapped | add 3 0 |
| Copper rivets and burrs, list less | 15 |
| Burrs only, list plus | 25 |
| Iron rivets and burrs | 40 and |
| Boiler rivets, base ¾" and larger | $8 5 |
| Structural rivets, as above | 8 4 |
| Wood screws, O. & R., bright | 75 |
| Wood screws, flat, bright | 77½ |
| Wood screws, flat, brass | 55 |
| Wood screws, O. & R., brass | 55½ |
| Wood screws, flat, bronze | 50 |
| Wood screws, O. & R., bronze | 47½ |

## MILLED PRODUCTS

(Prices on unbroken packages)

| | Per Cent |
|---|---|
| Set screws —20% 25 and | 5 |
| Sq. and hex. hd. cap screws | 12½ |
| Rd. and fil. hd. cap screws | plus 25 |
| Flat but. hd. cap screws | plus 50 |
| Fin. and semi-fin. nuts up to 1-in. | 12½ |
| Fin. and Semi-fin. nuts, over 1 in., up to 1½-in. | —5 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2-in. | +12½ |
| Studs | +5 |
| Taper pins | —12½ |
| Coupling bolts | +40 |
| Planer head bolts, without fillet, list | +45 |
| Planer head bolts, with fillet, list plus 10 and | +55 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | +60 |
| Collar screws | list plus 20, 30 |
| Thumb screws | 40 |
| Thumb nuts | 75 |
| Patch bolts | add +8 |
| Cold pressed nuts to 1½ in. | add $1 0 |
| Cold pressed nuts over 1½ in. | add 2 0 |

## BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $60 0 |
| Open-hearth billets | 60 0 |
| O.H. sheet bars | 76 0 |
| Forging billets | 56 00-75 0 |
| Wire rods | 52 00-70 0 |

Government prices.

F.O.B. Pittsburgh.

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails, base | $5 7 |
| Cut nails, vase | 6 7 |
| Miscellaneous wire nails | 50% |

## ROPE AND PACKINGS

| | |
|---|---|
| Plumbers' oakum, per lb. | 0 10¾ |
| Packing, square braided | 0 38 |
| Packing, No. 1 Italian | 0 44 |
| Packing, No. 2 Italian | 0 36 |
| Pure Manila rope | 0 29 |
| British Manila rope | 0 28 |
| New Zealand hemp | 0 23 |

## POLISHED DRILL ROD

Discount off list, Montreal and Toronto ..... net

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | $ 0 27½ |
| Solder, guaranteed | 0 29½ |
| Soldering coppers, lb. | 0 62½ |
| White lead, pure, cwt. | 20 35 |
| Red dry lead, 100-lb. kegs, per cwt. | 15 00 |
| Gasoline, per gal., bulk | 0 42 |
| Pure turp., single bbls., gal. | 3 15 |
| Linseed oil, raw, single bbls. | 2 37 |
| Linseed oil, boiled, single bbls. | 2 40 |
| Wood alcohol, per gal. | 4 00 |
| Whiting, plain, per 100 lbs. | 3 00 |

### CARBON DRILLS AND REAMERS

| | |
|---|---|
| U.S. drills, wire size | 40 and 5 |
| Jan. carbon cutters, plus | 10 |
| Standard drills, all sizes | 40 and 5 |
| Fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 and 5 |
| Bit stock | 50 |
| Ratchet drills | 10 |
| U.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 50 |
| Sleeves | 50 |
| Taper pin reamers | 25 off |
| Drills and countersinks | net |
| Bridge reamers, carbon | 50 |
| Centre reamers | 5 |
| Chucking reamers | net |
| Hand reamers | 10 |
| High speed drills, list net to plus | 20 |
| Jan. high speed cutters, net to plus | 10 |
| American | plus 40 |

### COLD ROLLED STEEL

[At warehouse]

| | |
|---|---|
| Rounds and squares | $7.50 base |
| Hexagons and flats | 7.50 base |

### IRON PIPE FITTINGS

| | Black | Galv. |
|---|---|---|
| Class A | 70 | 85 |
| Class B | 30 | 40 |
| Class C | 20 | 30 |

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 8 50 | $ 9 00 |
| Sheets, blue ann., No. 10 | 7 00 | 7 50 |
| Canada plates, dull, 52 sheets | 13 00 | 13 00 |
| Can. plates, all bright | 14 00 | ..... |
| Apollo brand, 10¾ oz. galvanized | .... | .... |
| Queen's Head, 28 B.W.G. | 13 00 | ..... |
| Fleur-de-Lis, 28 B.W.G. | 12 50 | ..... |
| Forbal's Best, No. 28 | .... | .... |
| Colborne Crown, No. 28. | .... | .... |
| Premier, No. 28, U.S. | 10 00 | 11 00 |
| Premier, 10¾-oz. | 10 50 | 11 40 |
| Zinc sheets | 16 50 | 20 00 |

### PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., 10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

### ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., 13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

**Prices per 100 lbs.**

### FILES AND RASPS

| | Per Cent. |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 32½ |
| Black Diamond | 27½ |
| J. Barton Smith, Eagle | 50 |
| McClelland, Globe | 50 |
| Delta Files | 20 |
| Disston | 40 |
| Whitman & Barnes | 50 |
| Great Western-American | 50 |
| Kearney & Foot, Arcade | 50 |

### BOILER TUBES.

| Size. | Seamless | Lapwelded |
|---|---|---|
| 1 in. | $27 00 | $..... |
| 1¼ in. | 29 50 | ..... |
| 1½ in. | 31 50 | 29 50 |
| 1¾ in. | 31 50 | 30 00 |
| 2 in. | 35 00 | 30 00 |
| 2¼ in. | 35 00 | 29 00 |
| 2½ in. | 42 00 | 37 00 |
| 3 in. | 50 00 | 48 00 |
| 3¼ in. | .. .. | 48 50 |
| 3½ in. | 63 00 | 51 50 |
| 4 in. | 85 00 | 65 50 |

Prices per 100 ft., Montreal and Toronto

### OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | |
| Royalite, per gal., bulk | 28 |
| Palacine | 31 |
| Machine oil, per gal. | 58 |
| Black oil, per gal. | 27 |
| Cylinder oil, Capital | 1.01 |
| Petroleum fuel oil, bbls., net | 19 |

### BELTING—No 1 OAK TANNED

| | |
|---|---|
| Extra heavy, single and double | 6½ |
| Standard | 6½ |
| Cut leather lacing, No. 1 | 2 00 |
| Leather in side | 2 40 3 00 |

### TAPES

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES

| | |
|---|---|
| Polishing wheels, felt | $4 50 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, Turkish | 8¾ |
| Pumice, ground | 06 |
| Emery glue | 30 |
| Tripoli composition | 9½ |
| Crocus composition | 12 |
| Emery composition | 11 |
| Rouge, silver | 64 |
| Rouge, powder, nickel | 38 |

**Prices per lb.**

### ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | .08½ |
| Grits, 80 and finer | .6 |

BRASS—Warehouse Price

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 30 |
| Brass sheets, 24 gauge and heavier, base | 0 38 |
| Brass tubing, seamless | 0 42 |
| Copper tubing, seamless | 0 44 |

### WASTE

| | | | |
|---|---|---|---|
| XXX Extra | .23 | Atlas | .19 |
| Peerless | .22 | X Empire | .18½ |
| Grand | .21½ | Ideal | .18 |
| Superior | .21½ | X Press | .17 |
| X L C R | .20 | | |

Colored

| | | | |
|---|---|---|---|
| Lion | .16 | Popular | .12 |
| Standard | .14 | Keen | .10 |
| No. 1 | .14 | | |

Wool Packing

| | | | |
|---|---|---|---|
| Arrow | .35 | Anvil | .22 |
| Axle | .28 | Anchor | .17 |

Washed Wipers

| | |
|---|---|
| Select White | .20 |
| Dark colored | .09 |
| Mixed colored | .10 |

**This list subject to trade discount for quantity.**

### RUBBER BELTING

Standard ... 10% Best grades... 15%

### ANODES

| | |
|---|---|
| Nickel | .55 to .60 |
| Copper | .38 to .40 |
| Tin | .70 to .70 |
| Zinc | .16 to .17 |

**Prices per lb.**

### COPPER PRODUCTS

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | $35 00 | $37 00 |
| Copper wire, list plus 10. | | |
| Plain sheets, 14 oz., 14x60 in. | 40 00 | 44 00 |
| Copper sheet, tinned, 14x60, 14 oz. | 43 00 | 46 00 |
| Copper sheet, planished, 16 oz. base | 47 00 | 50 00 |
| Braziers', in sheets, 6 x 4 base | 39 00 | 42 00 |

### LEAD SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $10 50 | $14 50 |
| Sheets, 3½ lbs. sq. ft. | 10 25 | 14 00 |
| Sheets, 4 to 6 lbs. sq. ft. | 10 00 | 13 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS

| | |
|---|---|
| Acid, boracic | $ .23 |
| Acid, hydrochloric | .04¾ |
| Acid, nitric | .11 |
| Acid, sulphuric | .04½ |
| Ammonia, aqua | .15¾ |
| Ammonium, carbonate | .23 |
| Ammonium, chloride | .22 |
| Ammonium hydrosulphuret | .75 |
| Ammonium sulphate | .30 |
| Arsenic, white | .16 |
| Copper, carbonate, annhy | .41 |
| Copper, sulphate | .13 |
| Cobalt, sulphate | .20 |
| Iron perchloride | .62 |
| Lead acetate | .30 |
| Nickel ammonium sulphate | .20 |
| Nickel carbonate | .32 |
| Nickel sulphate | .20 |
| Potassium sulphide (substitute) | .40 |
| Silver Chloride (per oz.) | 1.15 |
| Silver nitrate (per oz.) | 1.10 |
| Sodium bisulphate | .13 |
| Sodium carbonate crystals | .04 |
| Sodium cyanide, 127-130% | .39 |
| Sodium hyposulphite per 100 lbs | 9.00 |
| Sodium phosphate | .15 |
| Tin chloride | .30 |
| Zinc chloride, C.P. | .30 |
| Zinc sulphate | .08 |

**Prices per lb. unless otherwise stated**

# $150,000,000 in Steel From the U.S. to Canada

## Lloyd Harris Brings Up an Important Point in Address at London—What Has Been Done Along These Lines to Make Use of The Canadian Iron Ore Deposits?

LONDON,—Lloyd Harris, of Brantford, addressing the Canadian Club at a banquet at the Tecumseh House, announced that Canadian scientists have succeeded in developing a method by which Canadian refractory ores can be treated. He explained that, because of the difficulties of ore treatment and the fact that practically all coal now comes to Canadian mills from American mines, numerous experts had reported that the Dominion has not the basis for a steel industry. This country, he said, imports $150,000,000 worth of steel from the United States every year, and as a result the difficulties of exchange are rendered more acute. Efforts are now being put forth to devise some method of standardizing steel forms so that Canada's wants may be supplied at home. To this end an Australian system of standardization is being studied.

### Use Electric Furnace?

In connection with this matter, Canadian Machinery put the matter up to several men who have experimented largely with the electric furnace. W. F. Sutherland, who has worked in conjunction with James W. Moffat, M. E. I. C., answered the point on the reduction of iron ores, as follows:

In the manufacture of steel, the electric furnace has won a place its many advantages justly entitle it to, but in the field of ore reduction past processes and equipment have not proved commercially successful unless under exceptional circumstances. This is due to a number of causes, chief among which is the inability of any of the processes to make steel directly from the ore with any degree of uniformity or economy. And while in many cases a varying amount of carbonaceous material, coke or charcoal has been saved the extremely large amount of power required has more than counterbalanced any saving in fuel.

The reduction of iron ores in the blast furnace is a process which is fairly well understood to-day and with its adjuncts, the blast furnace is a comparatively cheap mechanism to run. The carbon monoxide content of the gases given off in reduction is of use in preheating the blast and also for the furnishing of power to steel mills and other portions of the plant not directly connected with the blast furnace itself.

The consumption of fuel in the blast furnace is however high in that approximately three to four times as much fuel is charged as is required to supply the reaction heat, the remainder being used to heat the charge, melt the slugs and metal and besides unavoidable losses, heating the large amount of air which has to be supplied. This latter item is a very considerable one and may be set down almost as a total loss.

### More Need for Economy

With the ever mounting price of coal and its resulting coke, fuel economy is very important, particularly so where suitable coking coals are either nonexistent or scarce. For this reason it is to be expected that direct processes, saving in coke and using electrical energy for certain stages of the process should meet with favor.

An important advance both in ferrous and non-ferrous metallurgy has recently been made in a process devised by James W. Moffatt, M.E.I.C., of Toronto, Ont., and the production of iron and, steel from ore direct, has been brought appreciably nearer solution.

In this process for which patents have been obtained in the United States, U.S. Patent No. 1,294,514, and principal foreign countries use is made of two separate and discontinuous step in two separate types of apparatus. The ore is first finely ground and if necessary concentrated and is then charged into a reduction furnace. Here the carbonaceous reducing material is added and reduction to iron sponge or finely divided and porous metallic iron takes place. This sponge is then charged directly into an electric furnace of the ordinary type and is there melted down by electric heat. In this melting down the electric furnace is used through the certainty with which a reducing atmosphere can be obtained and through the desirable qualities of the steel or other metals obtained by its use. The duplexing of the electric furnace with the reduction furnace and the avoiding of the re-oxidation of the sponge in its transference from the one to the other are the basic features of the process patents obtained. Particular stress is laid on the prevention of re-oxidation since nearly all metals in a reduced and finely divided state will oxidize very readily at even moderate temperatures.

### Cheaper Than Open Hearth?

The process as worked out in practice lends itself to economical results and is quite comparable to other present day methods in this respect. Given the right conditions it is possible to produce steel more cheaply than can be done in the open hearth.

This economy is obtained in great measure through a reduction furnace which has also been patented by Mr. Moffat, U.S. Patent No. 1,348,889. As mentioned above the blast furnace requires a very considerable volume of air for its continued operation and muc heat is lost through the escaping gases of which the nitrogen in the a forms no inconsiderable amount. In th present reduction furnace the carryin on of reduction and the supplying of th heat for the reaction are kept separat The reduction is carried on in a reto heated on the exterior and the gase given off consist entirely of carbon mon oxide with a certain percentage of ca bon dioxide only. They are thus of hig heat value and containing no diluent such as nitrogen are comparatively ric and of smaller volume. Theoretically the amount of carbon monoxide give off is sufficient in its heat value whe burned to supply the heat necessary fo the carrying on of the reaction and i the present instance provision has bee mode for their utilization in this manner In practice a small amount of heat ha to be supplied from another source, bu the total fuel consumption is limite to a slight excess over the theoretica amount required for reduction togethe with the small amount of auxiliary fuel The reduction of the ores by this metho will show a very much decreased cost fo fuel when compared with the blast fur nace.

### Can Be Charged Hot

By the using of the more expensive electrical heat in the final melting down only, a marked saving in power cost also results. The ordinary six ton electric furnace working on alloy or plain carbon steels, running two slags will have a power consumption of about 700 to 800 k.w. hours. In the present case a saving will be effected over this amount since the iron sponge resulting from the reduction operation can be charged hot.

Furnace operation is also smoother and, on starting each heat, inductive troubles with consequent lowering of power factor, and short-circuit conditions are absent.

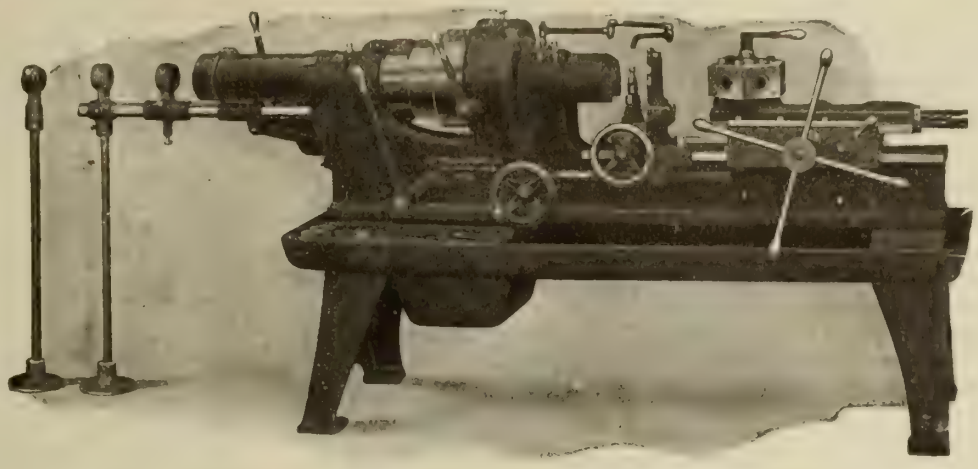
An interesting feature of the process is its extreme flexibility. With carbon control as provided for, irons can be made varying from pig iron through high carbon steel to a practically carbon free metal of extreme softness. The reduction furnace is also capable of roasting operations and the elimination of sulphur is thus quite easily carried out. This feature is of advantage in the treatment of many ores unavailable at present except by roasting and a subsequent briquetting operation. Since in any case crushing is necessary for this direct process, concentration is easily carried out and a large number of ore bodies too lean for economical working

Continued on page 60

# Warner & Swasey Screw Machines

For large output and close limits—If you are figuring on screw machine work you can depend on W. & S. machines being right for the job.

**We can supply you from stock immediately.**



## The A. R. Williams Machinery Company, Limited

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WINNIPEG, VANCOUVER

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CANADIAN MACHINERY wants a representative in every town and city where there is a metal working plant or large machine shop.

We require first of all the ability to demonstrate to mechanics the value of reading technical journals in general and CANADIAN MACHINERY in particular, and to secure their subscriptions.

Second—we want men who can tell news when they see it. Not necessarily men who can write, but men who are alert for news, and who will give us the facts, briefly and plainly.

We will pay you liberally if you can handle this work for us in your city.

## Canadian Machinery and Manufacturing News

**143 University Ave. Toronto, Ont.**

# Machinery Agencies Wanted

A well established machinery supply house in Nova Scotia, covering the entire province, which has been handling American machinery, would like to hear from Canadian manufacturers of the following lines:—

**Woodworking Machinery**
**Ironworking Machinery**
**Contractors' Machinery**
**(Hoists, Mixers, etc.)**
**Pumps**
**Electric Motors**

*Address:*

MACHINERY
P.O. Box 847
HALIFAX

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# The Week's Events in Montreal Industry

Lieut.-Col. Gardiner, of Robt. Gardiner & Son, Montreal, who has been confined to his home for the last three weeks by illness, is now reported to be progressing favorably and sitting up, and it is hoped that he will soon make his reappearance down town.

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Mr. Roy Wolvin, president of the British Empire Steel Corporation, is still in London, but is expected back in Montreal about the end of this month, and at that time it is expected he will have some announcement to make regarding the form which the merger will eventually take.

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The Watt Machinery and Equipment Company are now well established in their new offices at 344 St. James St., Montreal. They have ample space for carrying large supplies and in a very brief time will be in a position to meet every requirement for machine tool equipment and sundry supplies.

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The Angus shops of the Canadian Pacific Railway in Montreal have again resumed operation after a shut down of about ten days. It has been stated that work has been continued with the same staff as before the holidays, the number of employees now engaged being around 5,500. The wage scale remains the same as that in force before the suspension of activities.

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The Holden Company, of 354 James St., Montreal, are distributing to the trade a very attractive calendar of the Chicago Pneumatic Tool Company. The calendar is printed on coated stock, 12 inches wide by 24 inches deep, the upper section of each page carrying a large reproduction of one of the applications of one of the company's air-operated tools. The entire calendar is neatly arranged and well deserving of a place in any engineering office.

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At a recent meeting of the Montreal Automobile Association it was decided to change the name to that of the Montreal Motorists' League. The Board of Directors, under the leadership of president J. D. Chesney and Vice-president Malcolm LeMieux, are making efforts to increase the membership to 5,000 during the coming year. In the absence of T. C. Kirby, the secretary-treasurer of the Association, the duties of the office will be looked after by Director J. K. Blyth.

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William Petts, travelling mechanical inspector of the Ocean Accident and Guarantee Corporation, died last week after a long illness. Mr. Petts was born in England 64 years ago, coming to Canada in 1882. He has occupied quite a number of prominent positions, his first here in Canada being foreman for the railway machine shops in Montreal. He was about 12 years with the Laurie Engine Company, and with the C.P.R. before entering the services of the Ocean Accident and Guarantee Corp.

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A course of lectures on Industrial Chemistry will be one of the features of the present season at McGill. This series of addresses is designed to be of interest to anyone desiring scientific information applicable to their own occupations. The lectures will be conducted by specialists from Montreal manufacturing plants, and the talks will be as free as possible from technical language, and the subjects will cover chemical processes in use in plants manufacturing sugar, pulp and paper, paints and varnishes, Portland cement, steel, lead and other products.

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Following the closing down of the large blooming mill of the Nova Scotia steel plant some three or four weeks ago, the remaining departments of the works suspended operations last week. The action of the management in this respect did not come as a surprise as the employees have been expecting some such move for the past three weeks, or since the stopping of the mill. With the exception of two spike machines and a few machines in the nut and bolt department, the entire plant will be closed for an indefinite period. In addition to affecting the workmen, it is stated that about seventy-five of the head office staff have been notified that their services will not be required after the last of this month.

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A demonstration of specially designed tractors for the removal of snow from the city streets was given before the city commissioners of Montreal last week. The exhibition was given on the Champ de Mars, the three manufacturers demonstrating their machines being the J. T. Tractor Company of Cleveland, Ohio; the Cleveland Tractor Company of Montreal; and the Holt Manufacturing Co., of Peoria, Ill. The operation of the machines is on the same principle as the steam shovel, the work being accomplished by the caterpillar spikes breaking up the snow, and the weight of the tractor pushing it aside, the snow being then lifted and placed in cars or carts. One of the machines was so small that it could be worked to advantage on the ordinary sidewalk.

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William Beardmore and Company, of Scotland, have opened a Canadian office at 385 Beaver Hall Hill, Montreal. This firm carries on an extensive business in many lines of engineering activity, manufacturing steel shaftings and forgings of all sizes types and axles, small tools, jigs and fixtures, locomotives of every description, lapwelded furnaces and flanging work of all kind. They also plates and sections, and complete boilers of every type and size. They are builders of steam, turbo, Beardmore-Tosi Diesel and Beardmore crude oil engines, centrifugal and semi-rotary wing pumps. They are also naval constructors, having built H. M. S. Raleigh and other war vessels. They are now installing a semi-Diesel crude oil engine of 320 B.H.P. in one of the new Hudson Bay vessels.

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**$15,000,000 IN STEEL**

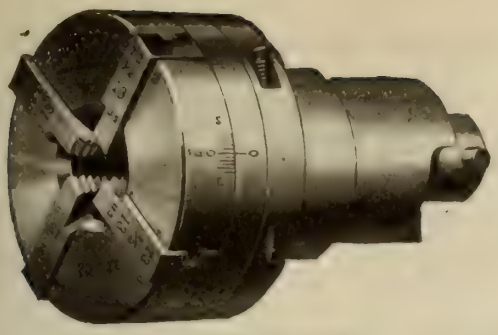
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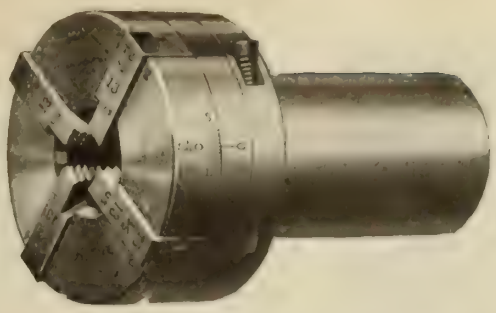
to-day will thus be rendered available With the depletion of the Minnesota and other high grade beds the leaner ores of the country will become of more importance in the coming decade and a process which can use concentrates without further treatment will thus be of much value in metallurgy.

The reduction of iron ore without fusion or its manufacture into sponge dates back into the dawn of the iron age. The primitive man probably first made it in his crude forges, and the Catalan forge, in common use in Europe until comparatively recent times, made a form of sponge. Later attempts at direct processes also made use of sponge iron to some extent but difficulties in the prevention of re-oxidation, together with the comparatively expensive nature of the processes, prevented their commercial success.

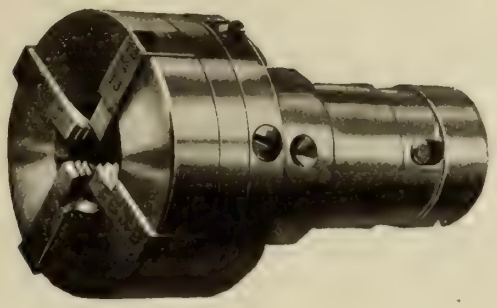
While the process will find its greatest field of usefulness in ferrous metallurgy it is equally adapted to non-ferrous metals and where such can be obtained in the oxide form, and are suitable for reduction by this means, their economical winning will be possible.

The successful outcome of fifteen years' research on the part of Mr. Moffat should prove of considerable value in the utilization of Ontario iron ores, many of which can only be successfully treated by means of concentration and, in the case of siderate ores, by calcination. It is interesting to note that only recently the utilization of domestic ores has received consideration at the hands of the Advisory Research Council and that Professor Stansfield has been carrying on research under grant from the council with the some end in view during a portion of the past year. Attention is drawn by Mr. Moffat to the fact that his patents are basic and cover any metallizing furnace in combination with any electric furnace for the production of iron and steel direct from ore by the sponge process.





# Geometric Solid Adjustable Die Heads



When one uses the word "ONLY," he needs to be sure of what he is talking about. With confidence we use the word in saying that a Geometric Solid Adjustable Die Head, fitted with a set of milled dies, is the only solid die head that will back off without stripping the thread.

Geometric Solid Adjustable Die Heads may be fitted with either a releasing shank, plain shank, or with special shank for the Gridley Automatics. The releasing shank permits the head to disengage from the shank upon completion of the thread. The plain shank fits the head for use on the turret of a lathe or on a live spindle, such as a drill press.

Apart from the fact that it is not equipped with the self-opening feature or the roughing and finishing attachment, the Geometric Solid Adjustable Die Head is the same in principle and construction and will do equally as accurate work as the other styles of Geometric Die Heads.

**Whatever the requirements, there is a type of Geometric Die Head best adapted to the work.**

## THE GEOMETRIC TOOL COMPANY
## NEW HAVEN CONNECTICUT

***Canadian Agents:***

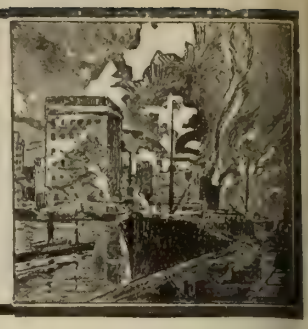
Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.
Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg; St. John, N.B.; Halifax, N.S.

*If interested tear out this page and place with letters to be answered.*



# INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES



## EXPECT MORE TRADE IN 1921

**Convention of the International Business Machines Finds Canada In The Lead**

Optimism was the keynote at the Convention of the Canadian sales force of the International Business Machines Company, held at the offices of the Company, Royce and Campbell avenues, Toronto, in the week of January 3rd, 1921. "A fifty per cent. increase in business in 1921" is the task to which they have addresed themselves and not a few expressed the conviction that even this mark would be passed long before the close of the year.

About 75 salesmen in all were in attendance at the convention. They represented the three divisions of the company—International Time Recorders, International Dayton Scales and International Tabulating and Sorting Machines.

Figures presented at the convention showed that the Canadian organization held all sales records for 1920 against the sales forces of the American firms manufacturing similar products. In fact, the Canadian organization has led the entire world in sales, on percentage of quota, for four successive years.

The factory organization did itself proud in decoration to welcome the boys from the field. When the latter arrived from all parts of Canada—from Vancouver to Newfoundland—they were greeted by a group of pretty office girls, who pinned a buttonhole bouquet on each of their lapels, and who further had prepared a song applicable to each member of the sales force.

F. E. Mutton, vice-president and general manager of the International Business Machines Co., Limited, is proud of his sales force and advises that not only he, but the entire sales organization never were more optimistic as to the future.

The convention was addressed by Thomas J. Watson, president of the Computing Tabulating-Recording Co., of New York; Joseph E. Rogers, general manager of the Tabulating Machine Company, New York; S. M. Hastings, president of the Computing Scale Company of America, Chicago; S. Spahr, general manager o fthe Computing Scale Company of America, Dayton, Ohio.; D. C. Wells, general manager of the Moneyweight Scale Company, Chicago.

Monday evening, January 3rd, was spent at a theatre party at Shea's Theatre, and Tuesday evening Mr. Mutton gave an exclusive banquet to the members of the I.B.M. Club, comprised of men who lead the entire organization, at the King Edward Hotel. Wednesday evening was devoted to a supper dance to the entire organization at Masonic Hall, at which some novel vaudeville features added materially to the merriment. Friday evening closed the convention with a banquet at the King Edward Hotel.

## AUTO COMPANIES TO REOPEN PLANTS

**Men Being Taken on Gradually, Depending on Demand for Cars**

Detroit.—That the renewed tendency of the public to buy whatever it needs is having its effect on Detroit industry was indicated Saturday, when the Liberty Motor Car Company announced it would renew production on a small basis January 17.

According to officials, the reopening of the plant is based entirely upon the demand for cars. Three hundred men will be put to work at first, and this number will be increased after the New York show, which is expected to stimulate sales.

Three hundred employees of the Chalmers Motor Company, laid off December 24, will go back to work Monday morning or some time next week, according to employment officials of the firm.

The Studebaker Corporation intends to open its Detroit plant on a three-day schedule Monday morning. A limited number of old employees will be given work, and a plan to build up to normal capacity from this nucleus has been adopted, said James E. Spencer, assistant to the vice-president.

**For Gold Work.**—Wayne Forge & Machine Company, Toronto, have just completed a special furnace for annealing gold. The gold in strip form, is fed in the furnace and comes out the back, the operation being continuous. This furnace is about seven feet in length. It was built to the order of a local jewelry manufacturer.

## Trade Gossip

**In New Premises.**—Elliott & Whitehall, manufacturers of small tools, Galt expect to be in their new building by Spring.

**Put in Machine Shop.**—The MacFarlane Enginering Co., Paris, have installed a well-equipped machine shop in connection with their foundry.

**Starting in Kitchener.**—The majority of the Kitchener industries will be in operation, after having been closed during the holiday season. With the exception of a few furniture factories, the industrial activities of the city will again be normal. Owing to the furniture exhibition here this week, most of the factories will remain closed until the seventeenth.

**Re-open Plant.**—The Studebaker Corporation of Canada, Limited, Walkerville, reopened on Monday morning with a force of 200 men, it was announced by Edward Mackie, plant superintendent. The company has retained 100 men during the inventory and will again take on another 100 men, all of whom were formerly employed. Married men will be given the preference in hiring back old employees.

**British Trade.**—Mr. T. R. Mason, a representative of a Sheffield steel concern who is visiting Canada to gain an intimate knowledge of the trade conditions here, said that Great Britain was reassuming and recapturing trade which it had lost during the war and was even going into new fields in the face of strong competition. Business gloom is vanishing in England, and within five years England will be farther ahead than it ever was.

**Plants Re-open.**—The Wabasso Cotton Company and the Tidewater Shipbuilding Company, at Three Rivers Que., reopened their doors after a week's shutdown. All the men were taken back. Wages were reduced 10 per cent. at the Wabasso. The St. Maurice Paper Company have reduced the wages of their lumber cutters to $60 and $75 per month. The shutting down of the Wayagamack Pulp & Paper Company's plant has been postponed for a few days. A poster advises the men that the plant will close its doors on or about the 15th of January for a short time. There will be no reduction in wages.

# STEEL & IRON PRODUCTS

Quality Service

## OF EVERY DESCRIPTION

### HAMILTON PIG IRON
Basic Malleable Foundry

### STEEL AND IRON BARS

### OPEN HEARTH STEEL SHEETS

### RAILROAD TRACK MATERIAL
Angle Bars Track Bolts Tie Plates Tie Rods Spikes

| SCREWS | WIRE | NAILS |
|---|---|---|
| Steel | Steel and Brass, Copper and | Wire |
| Brass | Bronze, Heavy and Fine, | Cut |
| Bronze | Bright, Annealed, Coppered, | Boat |
| Wood and | Galvanized, Tinned, Stranded, | Horseshoe |
| Machine | Steel and Copper Cable, | Shoe Nails |
| Screws | Barb, Woven Clothes Line | Tacks |

### POLE LINE HARDWARE
Pole Steps Cross Arm Braces Guy Clamps Guy Rods

| WROUGHT PIPE | FORGINGS | LEAD PRODUCTS |
|---|---|---|
| Black Pipe | Car Axles | Lead Pipe |
| Galvanized Pipe | Shape and Drop Forgings | White Lead |
| Nipples | Carriage and Automobile | Shot |
| Couplings | Hardware | Putty |

BLOOMS
BILLETS
PLOW BEAMS
ANGLES
CHANNELS

THE
## STEEL COMPANY
OF
## CANADA
LIMITED
HAMILTON MONTREAL

WIRE RODS
HORSE SHOES
FENCING
RIVETS
BURRS

*If interested tear out this page and place with letters to be answered.*

# ENGINEERING

The National Castings Ltd., will build a foundry at Belleville, Ont.

A by-law for $75,000 for fire apparatus was carried at Fort William.

Ratepayers of Perth, Ont., carried a by-law for a new hospital there.

The ratepayers of Ford City, Ontario, have passed a by-law for technical school.

A by-law was carried to provide $135,000 for a new school for Terrace Hill, Brantford, Ont.

Tuttle-Bailey Mfg. Co., Bridgeburg, Ont., are making arrangements to enlarge their plant.

Alfred LePage, 1775 Georgia St. W., Vancouver, B.C., will erect a storehouse and machine shop.

The property owners of Kingston, Ont., passed a by-law to grant a site to the Kelley Driver Co.

Reynold Moore and Benz Co., Ltd., Higgins Ave., Winnipeg, contemplate the erection of a factory at Vernon, B.C.

The Electric Foundries Ltd., Tudhope Knox Building, Orillia, Ont., will build a foundry at a cost of $20,000.

London, Ont., is to have a Home for Incurables, and a new Children's Hospital. By-laws were passed by the ratepayers of $50,000 for each.

R. N. Irvine is to erect a three-storey building at 340-4 Yonge street, Toronto, for the Thornton-Smith Co. Estimated cost, $100,000.

Tenders will be called in March for the erection of an addition and alterations and improvements to the Sheldon Hotel, Blenheim, Ont.

The general contract for erection of a garage on Lansdowne Ave., Westmount, has been awarded to Fussing & Jorgensen, 6 Durocher St.

Niagara Glass Co., 40 King St., St. Catharines, have purchased the building at 220 St. Paul St., which they will alter to suit their requirements.

The Consumers Gas Company, 19 Toronto St., Toronto, are erecting an addition to their office building at a cost of $50,000. Work will commence shortly.

The Dominion Bridge Company have received the contract for steel in connection with the erection of a large hotel for the Mount Royal Hotel Company, Ltd.

The contract for the soldiers' pavilion and reception hospital at Selkirk, Man., was awarded to the Carter-Halls-Aldinger Co., Ltd., Winnipeg, the price being $469,000.

Plans are being revised by Pratt & Ross, architects, Electric Rly. Chambers, for addition to show rooms, to cost $15,000, for the Manitoba Motors Bldg., 293 Garry St., Winnipeg.

# USING PROFITS TO WRITE OFF HOLD-OVERS FROM WAR YEAR

RE-ORGANIZATION of their business program to meet changing contions has occupied the attention of a good many firms during the past few weeks. A feature of the work has been the wiping out or writing off, or erasing from memory—whatever phrase suits best—of overhangs or adverse items that were handed down from the strenuous days of war. Many of these matters could not possibly have consideration in the warp and woof of business as it is being shaped to-day, and are best forgotten. At the same time firms who have the right perspective are strengthening their sales forces and selling equipment, for all are agreed that strenuous and more competitive days are ahead—if they have not already arrived.

"To wipe these things off and forg about them, so as to start anew wi a clean slate, is the only business-li method," said B. J. McCormick, of t Canada Forge, Welland, to Canadi Machinery, recently. "There is a han cap in left overs and the same, it seer to me, applies to conditions confronti the dealer as well as the manufacture Cash on hand is more useful to the dea er than shelves full of stagnant stoc bought at prices which the public will n meet, for ready money makes possib the purchase of new goods at prese values and puts the merchant on an u to-date selling basis. There is som times better strategy in taking a lo than in sitting tight. A strategic lo nowadays seems to be essential to th most effective offensive."

Ratepayers of Midland decided to grant a fixed assessment of $35,000 to Mason and Co., for the extension of their sawmills, and a similar exemption to Manley Chew for the construction of a fibre board plant.

Notice has been given to the effect that the Winnipeg assembling plant of the Ford Motor Company of Canada, which has been closed since November, will reopen on January 12. It is announced that no cut in wages will be made.

The unemployment situation is much brighter in Stratford as the local factories, which closed down for stock taking and the holiday season, have resumed operations with practically full staffs.

Anglin-Norcross Ltd., 65 Victoria St., Montreal, have received the general contract for extension to factory for the Standard Paint Co., of Canada, 52 Victoria Sq.

The contract for electrical work on $300,000 theatre being erected in Victoria, B. C., by the Famous Players Canadian Corp. has been awarded to the C. H. E. Williams Co., 509 Richards St., Victoria.

# PERSONAL

Mr. D. F. Griffith, sales manager of B. Greening Wire Co., Ltd., Hamilton, is in New York on business. He will be absent about ten days.

Mr. George Bertram, sales manager of the Lincoln Electric Company of Canada, is in Cleveland, Ohio, this week, on business.

M. H. Wood, who for the past year has been conducting a jobbing machine shop at Aylmer, Ont., has disposed of his interests there. Mr. Wood has removed to Toronto and is now on the sales staff of the National Electro Products, Ltd., manufacturers of oxygen and hydrogen gases for welding purposes.

D. M. McLean, formerly chief engineer of the Dover Boiler Works, Dover N. J., general sales manager of the I & I. J. White Company, Buffalo, N.Y etc., and for the past four years manage of the publicity department of the Can adian Ingersoll-Rand Company, Sher brooke, Quebec, recently left the latte company to assume control of C. & C Limited, Rock Island, Quebec, manufac turers of fancy biscuits and candies Mr. McLean's son, F. A. McLean, A.M C.M.I., and formerly with the Crocker Wheeler Company, Lackawanna Steel Company, McKiernan Terry Core Dril Company, etc., and latterly genera assistant publicity department Canadian Ingersoll-Rand Company, has been appointed as his successor.

# OBITUARY

The death occurred on January 7 of Edward G. Little, engineer of the local Hydro power plant, at Erindale, Ont.

J. C. Kennedy, C.E., died very suddenly at Owen Sound on New Year's day He was formerly city engineer of that city.

Charles W. McGuire, manager of the Imperial Oil Co., London, Ont., died on January 9th at his home, 799 Hellmuth avenue, following several weeks' illness from heart trouble. Mr. McGuire was one of the most prominent Masons in Western Canada.

**What's This?**—A wireless message from Moscow saying that a great many mechanics from Detroit, Mich., are now working in the Donetz coal basin of Russia has caused considerable speculation in diplomatic circles, coming after reports from Berlin to the effect that 4,000 United States citizens now in Germany are going to the same region to man the factories. Most of these men are said to be experienced in automobile construction.

# MORROW!

## It Means So Much to You to Say "MORROW'S" When Ordering Drills

*TAKE NO OTHER—*
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# NEW CATALOGUES

**The Automatic Transportation Co., Buffalo, N.Y.,** have sent us several of their publications. These include bulletin 25, which describes their automatic tiering lifting truck; bulletin No. 26 which describes their automatic storage battery industrial trucks, tractors and engines, and a booklet entitled Conclusive Evidence, which shows copies of various letters received from satisfied customers. Another booklet tells the story of their type L electric lifting platform truck.

**The Cleveland Twist Drill Co., Cleveland, Ohio.**—A very useful handbook for drillers. This little volume is prepared for the use of drillers. The parts of a twist drill are first discussed, points of grinding are talked on, this including all the common errors. The third chapter is devoted to drill speeds and feeds, while chapter four is full of miscellaneous helps. The last chapter tells of some common errors and their results, while a few remaining pages discuss certain products.

**Armstrong-Whitworth of Canada, Ltd., Montreal.**—Brochure No. 11, which is devoted to A. W. non-ferrous products. This booklet illustrates various of their lines and particulars of the same.

**The L. S. Starrett Co., Athol, Mass,** have issued a new catalogue that contains information on about twenty-one new tools not included in previous catalogues. Some of the new tools included are a universal bevel protractor, a micrometer caliper gauge, a tool-maker's button, a metric micrometer caliper, and others.

**The Chicago Flexible Shaft Co., Chicago, Ill.**—Catalogue No. 56, dealing with gas and oil blast furnaces for the heat treatment of metals. A table is given showing the proper type of furnace for certain classes of work. Combination furnaces, high speed steel furnaces, barium chloride furnaces, bench oven furnaces, annealing tool and die heating oven furnaces, cyanide hardening furnaces and others are included in this book.

**The Langhaar Ball Bearing Co., Aurora, Ind.**—A catalogue dealing with Langhaar self-adjusting ball bearings. A complete description of this type bearing is given, also some illustrations of typical installations.

**The Canadian Atlas Crucible Steel Co., Ltd., Welland, Ont.**—A catalogue dealing with their various lines of tool steels. Various hints as to the working of the different steels are also given.

**The Landis Machine Co., Waynesboro, Pa.**—A very useful handbook for all operators of Landis threading machinery. Instructions for grinding the chasers is given. Care and operation of die heads for the different machines, certain don'ts, which should be read carefully, special threads and other interesting subjects are discussed in this valuable aid which is edited by C. F. Meyer and C. H. Kirkpatrick.

**The McDonough Manufacturing Co., Eau Claire, Wis.**—A catalogue devoted to the Sterling universal tool grinder. Various photographs are shown which illustrate the machine's adaptability for various classes of work. A full description of the design is also given. Another book describes their cylindrical grinders in detail.

**The Oliver Instrument Co., Adrian, Mich.**—A book devoted to their varied line of filing machines. These machines are explained fully and their capacities are stated in each case. Examples of work performed are also shown.

**The Wright Manufacturing Co., Lisbon, Ohio.**—Catalogue No. 10, dealing with their steel hoists, hand cranes and steel trolleys. The construction of these hoists is given, also specifications. Various photographs of installations are shown.

**The Quigley Furnace Specialties Co., New York.**—A little booklet dealing with their line of Q metallic alloys. The uses of their alloys are explained. Carbonizing boxes, cyanide and lead pots, tubes, retorts and sheets are shown all made from Q alloys. It is stated that these alloys can be welded, machined or fabricated as desired.

**The Ross Heater & Mfg. Co., Inc., Buffalo, N.Y.**—Catalogue F, dealing with the Ross heater. This heater is of the closed or tubular type. They are used for heating all kinds of fluids and the customary heating medium is steam. The common liquid heated is water, but oil, sugar juice, chemical compounds, or any other liquid can be heated. There are two types of heaters, instantaneous and storage. Various photographs, specifications and sectional views are given in this catalogue.

**The Hanna Engineering Works, Chicago, Ill.**—Catalogue No. 3. A very complete catalogue dealing with compression yoke riveters; 48 pages are filled with real, live information, showing details of construction, specifications and completed riveters of various types. This concern have also sent us a book of instructions that should be in the hands of anyone operating one of their riveters. It is full of practical and valuable hints that should save any trouble in operating, not to speak of obtaining maximum production. They also have a catalogue No. 10 that deals with their line of foundry moulding machines in splendid detail.

**Hardinge Bros., Inc., Chicago, Ill.**—A very complete catalogue dealing with their line of precision bench lathes and attachments. This book is filled with illustrations of all kinds of lathes and discusses the chucks used, etc., etc. Small milling machines for bench use, tool stands, saws, emery paper discs and in fact all parts for precision tools are produced by this concern. The catalogue has 116 pages and is a small encyclopedia in itself.

**Terrell's Equipment Co., Grand Rapids, Mich.**—A catalogue describing their line of steel cupboards, wardrobes, lockers, shelving and bench drawers. Different arrangements are shown and all dimensions of the various sections are stated.

**The Wheel Trueing Tool Co., Detroit, Mich.**—A catalogue dealing with all types of diamonds for industrial use. Holders of various natures are shown, also glaziers' tools. Diamond pointed tools are also described.

**The Electric Furnace Co., Alliance, Ohio.**—Booklet 9B, dealing with Baily electric furnaces. These furnaces are of various types and are used for melting non-ferrous metals, annealing and the general heat treatment of steels.

**The Sibley Machine Co., South Bend, Ind.**—A catalogue dealing with their various lines of drill presses. The various sizes are discussed in detail and the catalogue is well illustrated throughout.

**Internal Grinding Machine.**—Swing, 6 in. inside of water guard; 10 in. with water guard removed. Length that can be ground, 3¾ in. Diameter that can be ground, from 1¼ to 2 in. Wheel table has two traverse speeds, 34 and 78 in. per min. respectively. Workhead has three rotative speeds, 180, 325 and 590 r.p.m. respectively. The work spindle has a 13-16 in. hole clear through. The centre line of the spindle is 46 in. from the floor. Front bearing of work spindle is 1⅝ in. and the rear bearing 1⅜ in. in diameter. The countershaft which, together with one grinding head, assortment of grinding wheels, and the necessary wrenches, is included in the machine equipment, runs at 600 r.p.m. and has a pair of tight and loose pulleys 10 in. in diameter by 2¾ in. face. The pump and water tank are extra. Floor space occupied is 28 by 56 in. The net weight of the machine is 1,300 lb.; crated for domestic shipment, 1,600 lb.; and boxed for ocean shipment, 1,800 lb.

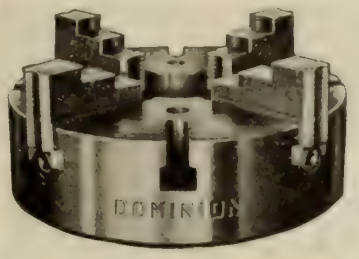
**Closed the Plant.**—The Martime Nail Works, St. John, N.B., closed on December 31st, for an indefinite period. As a result two hundred men are thrown out of employment, and the business interests of the city will be deprived of a payroll approximating $25,000 a month. Mr. Elkin, Managing Director, informed the Canadian Press that the works would be reopened when the men employed are ready to accept a wage schedule consistent with conditions in the steel market to-day.

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**New Radiator.**—The Hamilton Tool Co., Ltd., Hamilton, Ont., have recently perfected a new radiator particularly adapted for trucks and tractors. The tubes are of seamless copper tubing held in place by a packed nut. In case of a frozen or otherwise damaged tube it is claimed this radiator can be dismantled, tube replaced and radiator mounted again in about thirty minutes' time. One motor truck manufacturer is already using this radiator on all trucks now building.

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**In New Office.**—The Delora Smelting & Refining Co., Ltd., manufacturers of stellite tools and cutting metal, are now in the new office, 1404 C. P. R. Bldg., Toronto. In future all shipments will be made direct from Delora, Ont. Sales and service departments remaining in Toronto.


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SCREWS are made of the best grade steel. Both ends are broached and are heat treated after machining. They are reversible, so that either end may be used, are large enough in diameter to stand the torsional strains applied by operator when setting up his work. They are made to give the best service—and may be depended upon to stand up under the hardest usage.

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# Classified Opportunities

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BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 738. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

## MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (etfm)

## MACHINERY WANTED

WANTED—ONE PORTABLE FLOOR CRANE and hoist lift. 7 feet or over. W. G. Utley, Yarmouth, N.S. (c2m)

WANTED—NEW AND RE-MANUFACTURED gas and gasoline engines, boilers, saw-mill machinery, planing mill and sash and door factory machinery. New and manufactured iron and wood-working machinery. Electric motors, dynamos, direct connected steam operated generators, portable electric tools. Builders' hoists, elevators. Box 739F, Canadian Machinery.

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2 22" x 10' Davies Lathes
1 24" x 10' London Lathe.
6 20" x 8' C.M.C. Lathes.
1 18" x 8' Mueller Lathe
3 19" x 8' C.M.C. Lathes.
1 18" x 8' London Lathe.
1 16" x 8' C.M.C. Lathe.
1 16" x 6' McDougall Lathe.
1—D-1 H. D. Colburn Drill.
2—No. 24 H. D. Foote-Burt Drills.
1—28" B. G. Barnes Drill.
1—22" B. G. Barnes Drill.
1 D.C. Compound Wound Generator, 7.5 Watts, 125 Amp.
2 No. 54 Perkins Sprue Cutters.
2 2" x 26" Pratt & Whitney Turrets.
1 6.0" x 72" Plain Landis Grinder.

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LONDON
Hale St., London, Ont.

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Tender forms can be obtained from the Department's Sales Officer at 590 King Street West, Toronto, where the above is on view.

Act quickly. Tenders will close January 14th.

## FOR SALE

STELLITE—WE HAVE A LARGE QUANTITY of No. 2 Stellite in the right number for lathe or planer works. Standard squares and rectangles at $2.50 per lb. Midland Engine Works Co., Midland, Ont. (c2m)

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Machinists, special machinery made to order, repairs, cylinder grinding, pistons, rings and wrist pins. Satisfaction guaranteed. (c2m)

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1 24" Smith & Mills Shaper.
1—3' Bickford Radial Drill.
1 36 x 36 x 10 Bertram Planer.
3 3 x 36 J. & L. Turret Lathes.
1 2 x 24 J. & L. Turret Lathe.
1 18 x 8 Mueller Lathe, Q.C.G.
1 18 x 8 Stevens Lathe.
1 26 x 12 C.M.C. Lathe, Q.C.G.

We are offering the above machines at attractive prices for quick sale.

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GENERAL MANAGER REQUIRED IMMEDIately for small engineering works in Ontario employing about 100 men and comprising machine shops and grey iron foundry manufacturing machine moulded castings; must be thoroughly experienced in this class of work and competent to take entire charge, including office and sales end of the business; preference given to one having experience in agricultural machinery; good prospect for energetic man; apply, stating age and salary required and give references; applications will be treated in confidence. Box 745, Canadian Machinery. (c4m)

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WANTED — RESPONSIBLE ENGINEERING firm wants Blue Prints and use of patterns or Blue Prints and one set of Castings each, of Planer about 46" x 46", Horizontal Boring Mill and Pipe Bending Machines, various sizes. Above wanted for advertiser's own shop and not for selling purposes. State what you can offer and terms to M. T. L., Ltd., P.O. Box 1185, Montreal. (c2m)

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| 500 | 400 | 1500 | WESTINGHOUSE-PARSONS | 500 | 150 lbs |
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| 850 | 880 | 1500 | WESTINGHOUSE-PARSONS | 750 | 150 lbs. |
| 1000 | 2300 | 1500 | WESTINGHOUSE | 750 | 150 lbs. |
| 1000 | 550 | 1500 | ALLIS-CHALMERS-RATEAU | 1000 | |
| 1250 | 6600 | 1500 | WESTINGHOUSE | 1000 | 140 lbs. |
| 1500 | 370 | 1500 | GENERAL ELECTRIC-CURTIS | 1250 | 175 lbs. |
| 2500 | 2400 | 1500 | WESTINGHOUSE | 2500 | 150 lbs. |
| 5000 | 11000 | 500 | GENERAL ELECTRIC-CURTIS | 5000 | 175 lbs. |
| 6500 | 6600 | 750 | ALLIS-CHALMERS | 6500 | 175 lbs. |

**If interested in 60 cycle Turbo Units write for particulars.**

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1 No. 10 Racine 8" x 8" cap. (new).
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1 No. 7 Watkins 9" cap. 18" blade (used).

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1 Arbor Press No. 4 "Greenard" (new).
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1—Riveting Machine No. 81-A, "Grant" (used).
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# MILWAUKEE MILLING MACHINES

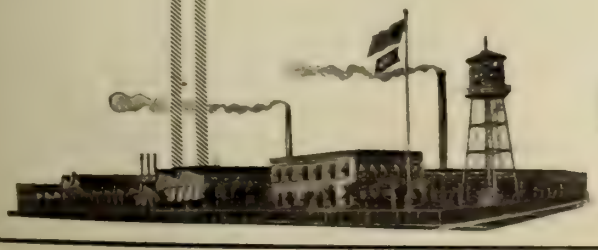


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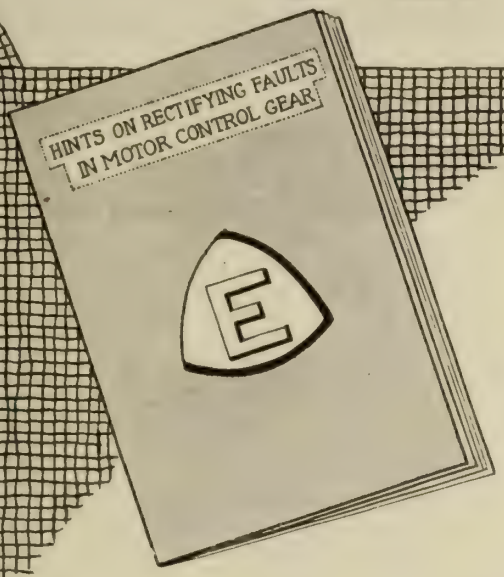
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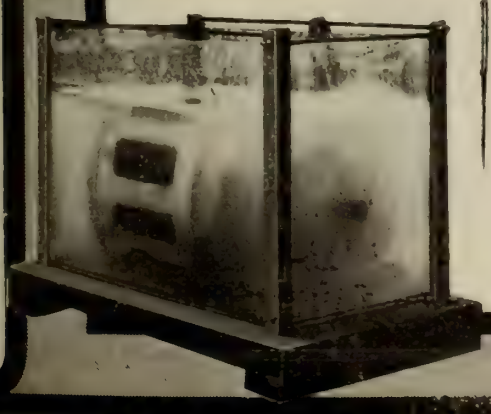
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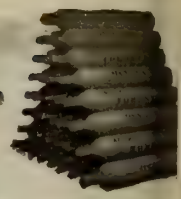
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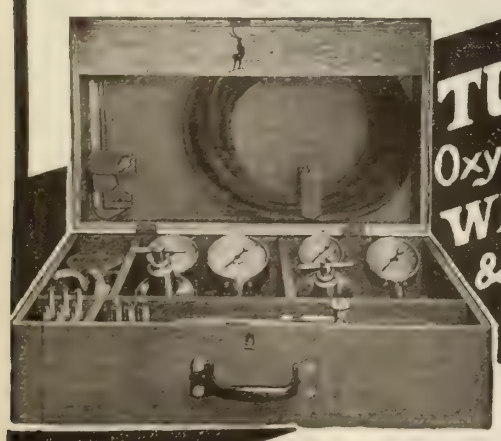
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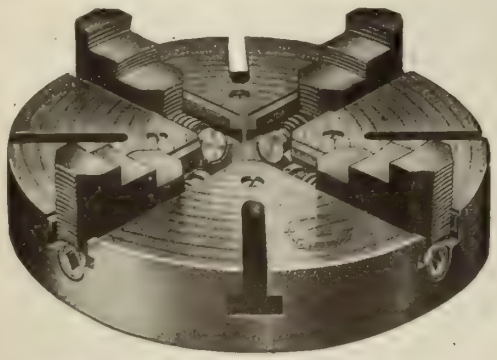
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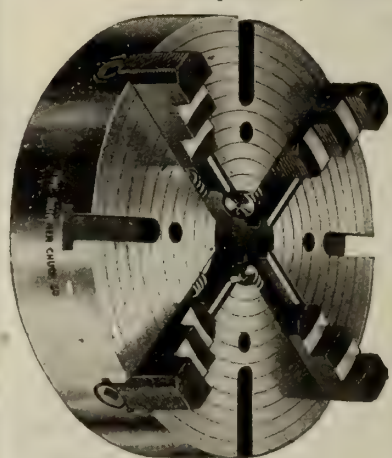
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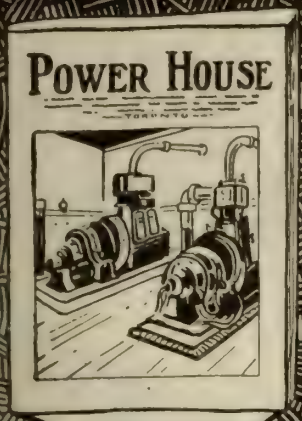
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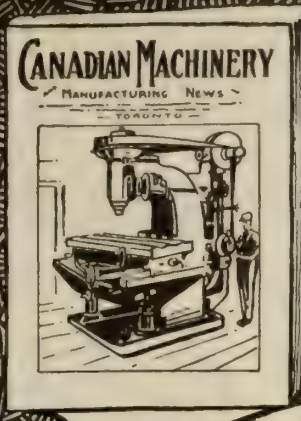
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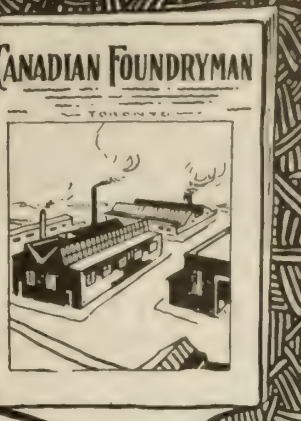
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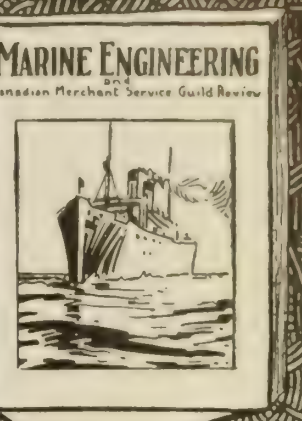
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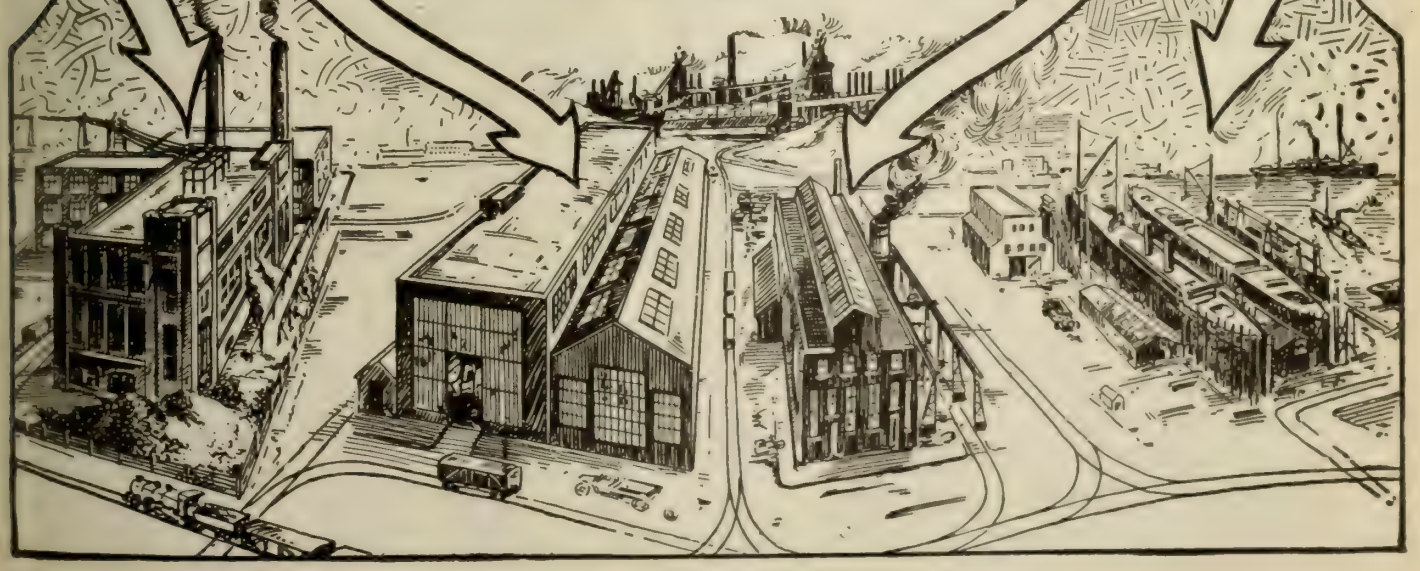
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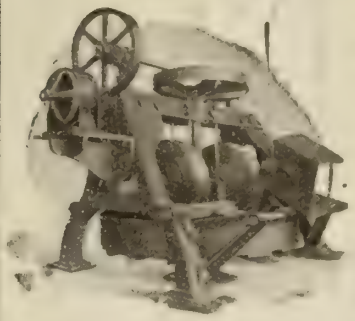


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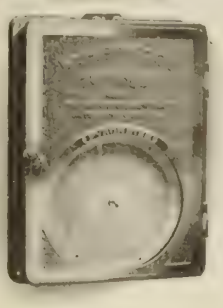
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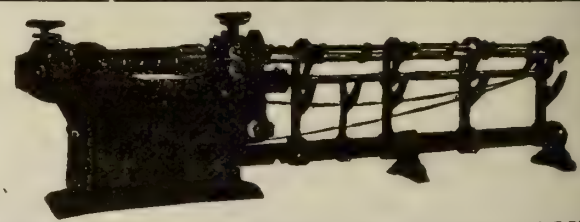
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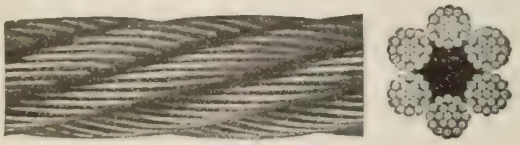
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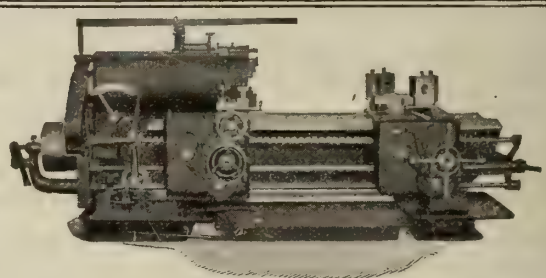
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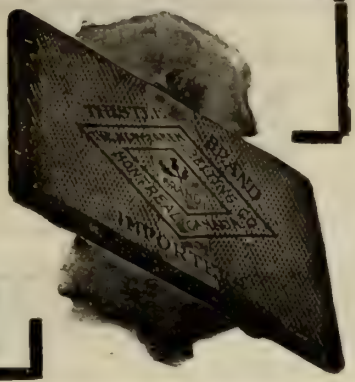
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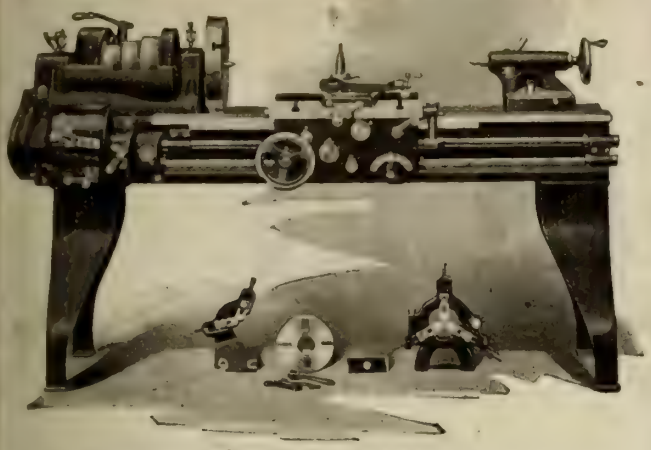
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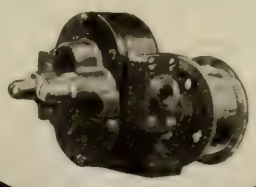
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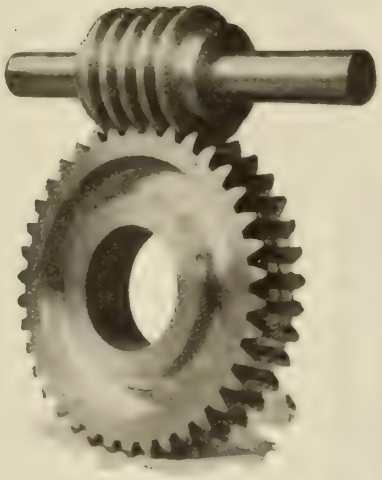


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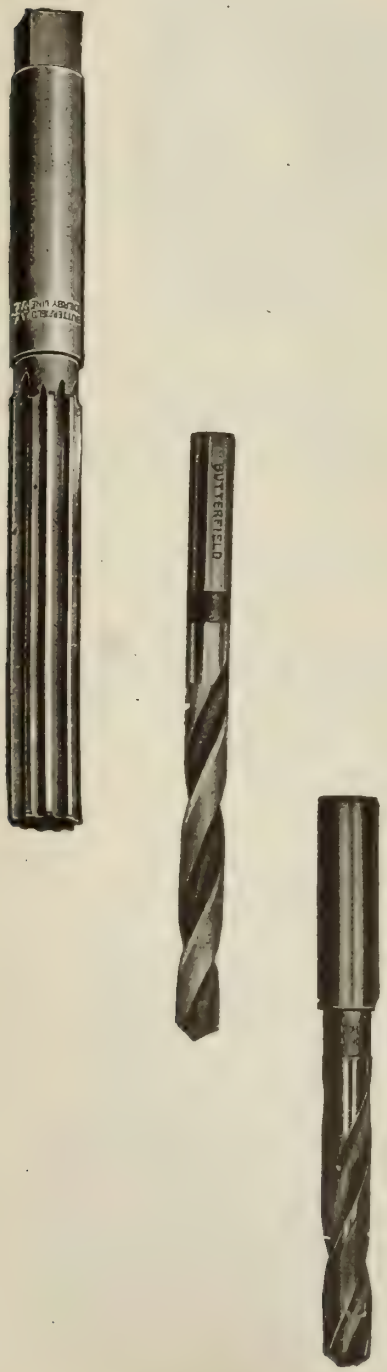
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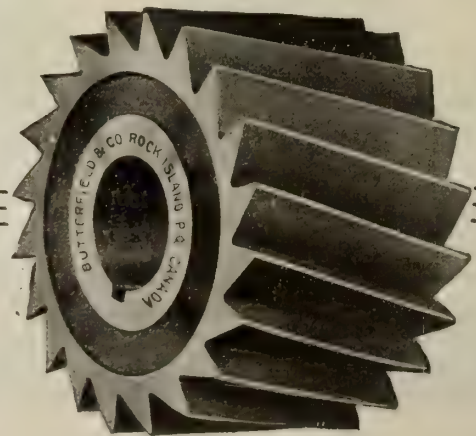

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Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
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Skinner Chuck Co., New Britain, Conn.

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McDougall Co., Ltd., R., Galt, Ont.

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Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Madison Mfg. Co., Muskegon, Mich.

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Can. Steel Foundries, Montreal, Que.
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N. S. Steel Co., Ltd., New Glasgow, N.S.
Pilot Steel & Tool Co., Montreal, Que.
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Vanadium Alloys Steel, Latrobe, Pa.
Wilkinson & Kompass, Hamilton, Ont.

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Railway Roller Bearing Co., Syracuse, N.Y.

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Railway Roller Bearing Co., Syracuse, N.Y.

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Franklin Die-Casting Corp., Syracuse, N.Y.
Taulman Brass & Metal Co., Hamilton, Ont.

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Taulman Brass & Metal Co., Hamilton, Ont.

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Pilot Steel & Tool Co., Montreal, Que.
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Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

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Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

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Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
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Goodhue J. L. & Co., Danville, Que.
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McLaren Belting Co., J. C., Montreal, Que.
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Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.
Quaker City Rubber Co., Philadelphia, Pa.

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Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.

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Aikenhead Hardware Ltd., Toronto, Ont.

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Bertrams Ltd., Edinburgh, Scotland.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
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Ford Chain Block Co., Philadelphia, Pa.
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Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
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Fisher Motor Co., Ltd., Orillia, Ont.
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**Blocks, Pillow**
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General Combustion Co. of Can., Ltd., Montreal, Que.
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Sheffield Engineering Supplies, Ltd., Montreal, Que.
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Greenfield Tap & Die Corp., Galt, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.

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**Bolts and Nuts**
London Bolt & Hinge Works, London, Ont.
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National Acme Co., Cleveland, Ohio.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Petrie, Ltd., H. W., Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.

**Bolt Threading Die Heads**
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Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa.
Universal Boring Machine Co., Hudson, Mass.

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Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Boring Heads**
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**Boring Tools**
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Gisholt Machine Co., Madison, Wis.

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Elk Firebrick Co. of Can., Ltd., Hamilton, Ont.

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Hamilton Bridge Works Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

**Broaching Machines**
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Garlock-Walker Mchy. Co., Toronto, Ont.

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Canada Metal Co., Ltd., Toronto, Ont.
Taulman Brass & Metal Co., Hamilton, Ont.

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U. S. Electrical Tool Co., Cincinnati, O.

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Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.

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General Combustion Co. of Can., Ltd., Montreal, Que.
Thresh Co., W. S., New York City.

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Brown, Boggs & Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

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MacKinnon Steel Co., Sherbrooke, Que.

**Castings, Aluminum**
Dominion Electric Castings Co., Ltd., Orillia.
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Electric Steel & Engineering Co., Welland, Ont.
International Machinery & Supply Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

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Can. Steel Foundries, Montreal, Que.

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Katie Foundry Co., Galt, Ont.

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Can. Steel Foundries, Montreal, Que.

**astings, Iron**
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Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
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Canada Electric Castings Co., Ltd., Orillia.
Electric Steel & Engineering Co., Welland, Ont.
Fleck Ltd., Alexander, Ottawa, Ont.
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

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**Castings, Monel Metal**
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Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Nickel**
Can. Hanson & Van Winkle Co., Toronto, Ont.

**Castings, Semi-Steel**
Davidson Mfg. Co., Thos., Montreal, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

**astings, Steel**
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

**Cements, Iron**
Smooth Mfg. Co., Jersey City, N.J.

**Centering Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy Co., Toronto, Ont.

**Chains (See Sprockets and Chains)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio

**Chains, Driving**
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio

**Chasers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chemists**
Toronto Testing Laboratory, Toronto, Ont.

**Chucking Machines**
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio

**Chucks, Drill**
Jacobs Mfg. Co., Hartford, Conn.

**Chucks, Drill and Tap**
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Goodell & Pratt Co., Greenfield, Mass.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Lathe**
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Magnetic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**
Columbia Hdwe. Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

**Cleaners, Metal, Waste, General**
Oakley Chemical Co., New York, N.Y.

**Clocks, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Clutches, Friction**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**
Can. Link-Belt Co., Toronto, Ont.

**Collars, Shaft or Set**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

**Collets**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compressors, Air**
Curtis Pneumatic Machinery Co., St. Louis, Mo.

**Compressors, Air and Gas**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**
Ford-Smith Machine Co., Hamilton, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Copper**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Cotter Pins**
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Counterbores**
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Countershafts**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Couplers, Car and Locomotive**
Can. Steel Foundries, Montreal, Que.

**Couplings, Flexible**
Holden Co., Ltd., Montreal, Que.

**Couplings, Rigid**
Bernard Industrial Co., A., Fortierville, Que.

**Couplings, Shaft**
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

**Cranes, Electric**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Cranes, Hand (See Hoists, Hand)**
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

**Cranes, Locomotive**
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Cranes, Traveling**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Crank Pin Turning Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia, Pa.

**Cutters, Flue**
Holden Co., Ltd., Montreal, Que.

**Cutters, Gear**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**
Atkins & Co., Inc., E. C., Indianapolis, I.
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Milling**
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Milling Machine Co., Clevela
Elliott & Whitehall Tool Co., Galt, O
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, W
Morse Twist Drill & Machine Co., N Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Wilt Twist Drill Co. of Canada, Lt Walkerville, Ont.

**Cutters, Stay Bolt**
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, I
Pratt & Whitney Co., of Canada, Lt Dundas, Ont.

**Cutters, Thread**
Butterfield & Co., Inc., Rock Island, Q
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Sprin field, Vt.
Landis Machine Co., Inc., Waynesboro, I

**Cutting-Off Machines**
Bertram & Son Co., Ltd., The Joh Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R
Garlock-Walker Mchy. Co., Toronto, O
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Cutting-Off Machines, Pipe (See Pi Cutting and Threading Machine**
Landis Machine Co., Inc., Waynesboro, I
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Bra ford, Ont.

**Cutting-Off Tools**
Armstrong Bros. Tool Co., Chicago, I
Pilot Steel & Tool Co., Montreal, Que.

**Cutting Oil Filters (See Oil Filteri Systems)**
Bowser & Co., Inc., S. F., Fort Wayne.
Cataract Refining Co., Toronto, Ont.

**Cutting, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, O

**Dealers, Machinery (See Searchlig Section)**
Ford-Smith Machine Co., Hamilton, O
Petrie, Ltd., H. W., Toronto, Ont.

**Deckle Straps**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Diamonds, Black and Rough**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond, Carbon and Bortz**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond Tools**
Aikenhead Hardware Ltd., Toronto, On
Can. Desmond-Stephan Co., Hamilt Ont.
Ford-Smith Machine Co., Hamilton, O
Wheel Trueing Tool Co., Detroit, Mich.

**Diamond Crossings**
Can. Steel Foundries, Montreal, Que.

**Die Sinking Machines, Automatic**
Jones & Lamson Machine Co., Sprin field, Vt.
Walcott Lathe Co., Jackson, Mich.

**Dies, Screw and Thread Cutting**
Ackworthie, Ltd., John, Birmingham, E
Butterfield & Co., Inc., Rock Island, Q
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Sprin field, Vt.
Landis Machine Co., Inc., Waynesboro, P
Murchey Machine & Tool Co., Detro Mich.
National Acme Co., Cleveland, Ohio.

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**
Brown, Boggs & Co., Ltd., Hamilton, O
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, O
Toledo Machine & Tool Co., Toledo, Oh

**Dies, Forging**
Brown, Boggs & Co., Ltd., Hamilton, O
Canada Foundries & Forgings Co., W land, Ont.
Canadian Atlas Crucible Steel Co., Lt Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Cath rines, Ont.

**Dies, Self-Opening, Adjustable**
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Sprin field, Vt.
Landis Machine Co., Inc., Waynesboro, P
Murchey Machine & Tool Co., Detro Mich.
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Lt Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Dies, Threading-Opening**
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Sprin field, Vt.
Landis Machine Co., Inc., Waynesboro, P
Morse Twist Drill & Machine Co., N Bedford, Mass.

# BUYERS' DIRECTORY

Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**isc Cement**
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**ividing Heads**
Ackworthle, Ltd., John, Birmingham, Eng.
Brown, Fred. C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**egs. Lathe and Milling Machine**
Armstrong Bros. Tool Co., Chicago, Ill.

**rafting Boards and Tables**
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**rafting Materials**
American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**rassers, Grinding Wheel**
Carborundum Co., Niagara Falls, N.Y.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.

**rill Holders**
Armstrong Bros. Tool Co., Chicago, Ill.

**rill Rods**
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**rill Speeders**
Canada Machinery Corp., Galt, Ont.

**rilling Machine Heads**
Henry & Wright Mfg Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

**rilling Machines, Automatic**
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

**rilling Machines, Bench**
Beacon Engineering Co., Tipton, England.
Can. Blower & Forge Co., Ltd., Kitchener.
Greenfell & Pratt Co., Greenfield, Mass.
Henry & Wright Mfg. Co., Hartford, Conn.
High Speed Hammer Co., Rochester, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**rilling Machines, Electric and Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock Walker Mchy. Co., Toronto, Ont.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**rilling Machines, Gang**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Hilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**rilling Machines, Heavy Duty**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock Walker Mchy. Co., Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

**rilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Hobbs, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.

**rilling Machines, Multiple Spindle**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

**rilling Machines, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Drilling Machines, Portable**
Haskins Co., R. G., Chicago, Ill.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Radial**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Toomey Inc., Frank, Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Drilling Machines, Sensitive**
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
High Speed Hammer Co., Rochester, N.Y.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Turret**
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

**Drilling Machines, Vertical**
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng.
Streiinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Drills, Center**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Drills, High Speed Twist**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co., Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.
Taylor Tool Co., J. A. M., Toronto, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Drills, Twist and Flat**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Dust Handling Equipment**
Can. Blower & Forge Co., Ltd., Kitchener
Sturtevant Co., B. F., Boston, Mass.

**Electrical Instruments**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Electrical Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O.

**Elevating Trucks (See Trucks)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Elevators and Conveyors**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Emery Cloth**
Wausau Abrasives Co., Chicago, Ill.

**Emery Wheels (See Grinding Wheels)**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Carborundum Co., Niagara Falls, N.Y.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
International Machinery & Supply Co., Montreal, Que.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Engines, Capstan**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Engineers, Mechanical**
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.

**Expanders, Tube**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Eyeglasses, Safety (See Goggles, Safety)**
Prest-O-Lite Co. of Can., Toronto, Ont.
Willson Goggles, Inc., Reading, Pa.

**Fans, Electric**
Can. Blower & Forge Co., Ltd., Kitchener
Northern Electric Co., Montreal, Que.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Exhaust**
Can. Blower & Forge Co., Ltd., Kitchener
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Ventilating**
Can. Blower & Forge Co., Ltd., Kitchener
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Fibre**
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**File Handles**
Ingersoll File Co., Ltd., Ingersoll, Ont.

**Files and Rasps**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Filing Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Filler, Iron (See Cements, Iron)**
Smooth Mfg. Co., Jersey City, N.J.

**Fire Extinguishers**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Fittings, Pipe**
International Malleable Iron Co., Guelph, Ont.

**Flexible Shafts**
Aikenhead Hardware Ltd., Toronto, Ont.
Haskins Co., R. G., Chicago, Ill.

**Flux, Galvanizing**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Fluxes, Welding**
L'Air Liquide Societe, Toronto, Ont.

**Forging Machinery**
Acme Machinery Co., Cleveland, O.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.

**Forgings, Drop**
Canada Foundries & Forgings Co., Walkerland, Ont.
Dominion Forge & Stamping Co., Ltd., Toronto, Ont.

**Forgings, Hammer**
Canada Foundries & Forgings Co., Walkerland, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.

**Foundry Equipment**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que.
Ford Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Foundry Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Frogs, Spring or Rigid**
Can. Steel Foundries, Montreal, Que.

**Fuel Oil Burning System**
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Heat Treating Coal**
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Oil and Gas**
Bellevue Industrial Furnace Co., Detroit.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces and Ovens, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces, Tempering and Annealing**
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furniture, Machine Shop**
Garlock Walker Mchy. Co., Toronto, Ont.
Ministry of Munitions, London, Eng.
National Engineering Co., Sarnia, Ont.

**Gages, Dial**
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont.
Peerless W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass.

**Gages, Measuring (See Tool Work)**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Gages, Recording**
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.

**Gages, Snap, Thread and Cylindrical**
Ackworthle, Ltd., John, Birmingham, Eng.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co. of Canada, Ltd., Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co. of Canada, Ltd., Dundas, Ont.

**Gages, Standard**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis.
Hilliard & Whitehall Tool Co., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.

# BUYERS' DIRECTORY

**Gages, Thread**
Ackworthie, Ltd., John, Birmingham, Eng
Greenfield Tap & Die Corp., Galt, Ont
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass

**Garnet, Emery and Flint Paper and Cloth**
Ritchey Supply Co., Toronto, Ont
Wausau Abrasives Co., Chicago, Ill

**Gas, Coal Compressed**
L'Air Liquide Society, Toronto, Ont

**Gas, Compressed**
Prest-O-Lite Co. of Can., Toronto, Ont.

**Gaskets**
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

**Gear Blanks**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que
Dom. Foundries & Steel, Hamilton, Ont
Philadelphia Gear Works, Philadelphia, Pa.

**Gear-Cutting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

**Gear Testing Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Gears, Cast**
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

**Gears, Cut**
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Gears, Dressed**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Gears, Forged**
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Gears, Herringbone**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

**Gears, Machine Moulded**
Can. Steel Foundries, Montreal, Que.

**Gears, Rawhide (See Gears, Cut)**
Philadelphia Gear Works, Philadelphia, Pa.

**Gear, Silent Chain**
Gardner & Son, Robt., Montreal, Que
Morse Chain Co., Ithaca, N.Y.

**Gears, Worm**
Dom. Steel Products Co., Brantford, Ont.

**Generators, Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Generators, Electric**
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal, Que
Petrie, Ltd., H. W., Toronto, Ont
Sturtevant Co., B. F., Boston, Mass

**Goggles, Safety**
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y
Willson Goggles, Inc., Reading, Pa

**Grab Buckets**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Grease Cups, Pressed Steel and Brass**
Can. Winkley Co., Ltd., Windsor, Ont.

**Greases, Lubricating**
Canadian SKF Co., Toronto, Ont
Cateract Refining Co., Toronto, Ont.

**Grinding Discs**
Ritchey Supply Co., Toronto, Ont
Wausau Abrasives Co., Chicago, Ill

**Grinding Machines**
Brown & Sharpe Mfg. Co., Providence, R.I

**Grinding Machines, Abrasive Belt**
Dixon Engineering Co., Tipton, England
Norton Co. of Can., Ltd., Hamilton, Ont

**Grinding Machines, Automatic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Bench**
Aikenhead Hardware Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Goodell & Pratt Co., Greenfield, Mass.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co., Waltham, Mass.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Grinding Machines, Center**
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Cutter and Reamer**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Cylindrical**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Die**
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

**Grinding Machines, Disc**
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Drill**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Face**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Floor and Tool**
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.
Wilkinson & Kompass, Hamilton, Ont.

**Grinding Machines, Internal**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Manhattan Machine & Tool Works, Grand Rapids, Mich.

**Grinding Machines, Portable**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Carborundum Co., Niagara Falls, N.Y.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Haskins Co., R. G., Chicago Ill.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wilkinson & Kompass, Hamilton, Ont.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Power Oscillating Tool**
Herbert Ltd., Alfred, Toronto, Ont.

**Grinding Machines, Ring Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Snagging**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Surface**
Garlock-Walker Mchy. Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machinery, Tool Post**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wilkinson & Kompass, Hamilton, Ont.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Universal**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Machine Co., Greenfield, Mass.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co., Waltham, Mass.

**Grinding Wheels**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Carborundum Co., Niagara Falls, N.Y.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
International Machinery & Supply Co., Montreal, Que.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Guards, Machinery and Window**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Gun-Barrel Machinery**
Steinle Turret Machine Co., Madison, Wis.

**Hack Saws, Power**
Ackworthie, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Garlock-Walker Mchy. Co., Toronto, Ont.
Goodell & Pratt Co., Greenfield, Mass.
Lyman Tube & Supply Co., Montreal, Que.
McKenzie Machinery Co., Guelph, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hammers, Chipping**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hammers, Drop**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

**Hammers, Electric**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Hammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Ryerson & Son, Jos. T., Chicago, Ill.

**Hammers, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bradley & Son, Inc., C. C., Syracuse, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
High Speed Hammer Co., Rochester, N.Y.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.

**Hammers, Riveting**
Cleveland Pneumatic Tool Co., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.

**Hangers, Shafting**
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Terry & Co., John C., Birmingham, Eng.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hardening, Case-Hardening and Tempering**
Hamilton Gear & Machine Co., Toronto, Ont.

**Hardness Testing Apparatus**
Shore Instrument Co., Jamaica, N.Y.

**Hobbing Machines**
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hobs**
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Hoists, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Volta Mfg. Co., Welland, Ont.

**Hoists, Hand**
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Hoists, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Holders-On, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Cleveland Pneumatic Tool Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Hose, All Kinds**
Quaker City Rubber Co., Philadelphia, Pa

**Hose, Flexible**
Gutta Percha & Rubber, Toronto, Ont.

**Hose, Industrial**
Dunlop Tire & Rubber Goods Co., Ltd. Toronto, Ont.
Goodyear Tire & Rubber Co. of Can. Ltd., Toronto, Ont.

**Hose, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Foamite Firefoam Co., Hamilton Ont.

**Hose, Steam, Suction, Water**
Quaker City Rubber Co., Philadelphia, Pa

**Hose, Steel**
International Machinery & Supply Co. Montreal, Que.

**Hydraulic Leather**
Graton & Knight Mfg. Co., Worcester Mass.

**Hydraulic Machinery**
Bertram & Son Co., Ltd., The John Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Stewart & Co., Duncan, Glasgow, Scot

**Index Centers**
Dickow, Fred. C., Machinery Co., Chicago, Ill.

**Igniters, Gas Engine**
Canada Foundries & Forgings Co., Welland, Ont.

**Indicators, Speed and Test**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.

**Jacks, Hydraulic**
International Machinery & Supply Co., Montreal, Que.
Norton, A. O., Boston, Mass.

**Jacks, Planer**
Armstrong Bros. Tool Co., Chicago, Ill
Starrett Co., L. S., Athol, Mass.

**Jigs and Fixtures (See Tool Work)**
Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Keyseating Machines**
Bilton Machine Co., Bridgeport, Conn.
Elliott & Whitehall Tool Co., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Toomey Inc., Frank, Philadelphia, Pa.

**Keys, Machine**
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

**Knives, Machine**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Knurl Holders**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lacing Leather**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

# BUYERS' DIRECTORY

**umps, Electric**
Federal Engineering Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**ithe Attachments**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Steele, Ltd., H. W., Toronto, Ont.

**ithe Pans, Portable**
Canada Machinery Corp., Galt, Ont.

**ithe Tools**
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

**ithes, Automatic and Semi-Automatic**
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**ithes, Bench**
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**ithes, Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

**ithes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
McKenzie Machinery Co., Guelph, Ont.
Pearson & Son, Jos. T., Chicago, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**ithes, Engine**
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hastings Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Ministry of Munitions, London, Eng.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Sidney Machine Tool Co., Sidney, Ohio.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**ithes, Extension and Gap**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**ithes, Heavy Duty Projectile Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blakhill Wire Machy. Co., Ltd., Montreal.
Sidney Machine Tool Co., Sidney, Ohio.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**ithes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio.
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**ithes, Polishing (See Polishing and Buffing Machines)**
Ford-Smith Machine Co., Hamilton, Ont.

**ithes, Relieving**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**ithe, Universal Hand**
Brown & Sharpe Mfg. Co., Providence, R.I.

**ithe, Speed and Hand**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.

**ithes, Spinning**
Terry & Co., John C., Birmingham, Eng.

**Lathes, Threading**
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

**Lathes, Vertical Turret**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Roelefson Machine & Tool Co., Toronto, Ont.

**Lathes, Wood Turning**
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Lighting Fixtures**
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

**Linoleum Mill Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Liquid Air Plants**
L'Air Liquide Society, Toronto, Ont.

**Lockers, Clothes**
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

**Lubricants**
Cateract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Lubricating Systems**
Bowser & Co., Inc., S. F., Fort Wayne, I.

**Machinists' Small Tools**
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Goodell & Pratt Co., Greenfield, Mass.
Ker & Goodwin Machine Co., Brantford, Ont.
Ministry of Munitions, London, Eng.
National Machine Tool Co., Racine, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Ryerson & Son, Jos. T., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Mandrels, Expanding**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Mandrels, Solid**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Measuring Machines**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Metals, Alloy**
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Ministry of Munitions, London, Eng.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Metalite Cloth**
Ritchey Supply Co., Toronto, Ont.

**Micrometer Calipers**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Milling Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Milling Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Milling Machines, Automatic**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Bench**
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Hand**
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

**Milling Machines, Horizontal and Planer Type**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Milling Machines, Plain**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
Toomey Inc., Frank, Philadelphia, Pa.

**Milling Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Milling Machines, Universal**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Mchy. Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill
Toomey Inc., Frank, Philadelphia, Pa.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Milling Machines, Vertical**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

**Monel Metal**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Motors, Electric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que
Northern Electric Co., Montreal, Que
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis

**Moulded Rubber Goods**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Nickel, Bars, Sheets, Wire, Etc.**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Nickel Plating Outfits**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Nickel Silver**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Nitrogen**
L'Air Liquide Society, Toronto, Ont.

**Nut Tappers (See Bolt and Nut Machinery)**
Acme Machinery Co., Cleveland, Ohio
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio

**Nuts, Finished and Semi-finished**
Galt Machine Screw Co., Galt, Ont.

**Nuts, S.A.E., Plain and Castellated**
Galt Machine Screw Co., Galt, Ont.

**Oil Filtering and Storage Systems**
Bowser & Co., Inc., S. F., Fort Wayne, I.

**Oil Storage Engineers**
Bowser & Co., Inc., S. F., Fort Wayne, I.

**Oils**
Canadian Oil Companies, Ltd., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Hole Covers**
Can. Winkley Co., Ltd., Windsor, Ont.

**Oils, Soluble**
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Stones**
Carborundum Co., Niagara Falls, N.Y.

**Oxygen**
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

**Oxy-Acetylene Apparatus**
L'Air Liquide Society, Toronto, Ont.

**Packing, Hydraulic**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.
Gutta Percha & Rubber, Toronto, Ont.
International Machinery & Supply Co., Montreal, Que.

**Packing, Rod and Steam**
Quaker City Rubber Co., Philadelphia, Pa.

**Packing, Steam**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.
Gutta Percha & Rubber, Toronto, Ont.
International Machinery & Supply Co., Montreal, Que.

**Paper Mill Conveyors**
Bertrams Ltd., Edinburgh, Scotland.

**Patents**
Fetherstonhaugh & Co., Ottawa, Ont
Marion & Marion, Montreal, Que.

**Pans, Wet and Dry**
Frost Mfg. Co., Chicago, Ill

**Pattern-Shop Machinery (See Woodworking Machinery)**
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Patterns, Wood and Metal**
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Penstocks, Steel**
MacKinnon Steel Co., Sherbrooke, Que.

**Phosphor Tin**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Photographic Duplicating Machines**
Commercial Camera Co., Providence, R.I.

**Pipe Bending Machines**
American Pipe Bending Machine Co., Boston, Mass
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

**Pipe Cutting and Threading Machines**
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**
Landis Machine Co., Inc., Waynesboro, Pa.

**Pipe Fitters' Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa.

**Piston-Ring Machines**
National Acme Co., Cleveland, Ohio
Steinle Turret Machine Co., Madison, Wis.

# BUYERS' DIRECTORY

**Planers, Parallels**
& P. Mfg. Co., Niagara Falls, Ont

**Planing Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Toomey Inc., Frank, Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

**Planing Machines, Rotary**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Pneumatic Tools**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
International Machinery & Supply Co., Montreal, Que.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Pressed Steel Parts**
Ackworthie, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Streiinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Presses, Drop and Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Toledo Machine & Tool Co., Toledo, Ohio

**Presses, Foot and Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

**Presses, Forcing**
Atlas Press Co., Kalamazoo, Mich.
Niagara Machine & Tool Works, Buffalo, N.Y.
Stewart & Co., Duncan, Glasgow, Scot.

**Presses, Hydraulic**
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Niagara Machine & Tool Works, Buffalo, N.Y.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

**Presses, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**
Brown, Boggs & Co., Ltd., Hamilton, Ont
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Protractors**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Propellers**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Pulleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal**
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Canadian SKF Co., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Pulp and Paper Mill Equipment**
MacKinnon Steel Co., Sherbrooke, Que.

**Pumps, Barrel and Boiler-feed**
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coolant**
Trahern Pump Co., Rockford, Ill.

**Pumps, Geared and Hand**
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.,
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

**Pumps, Lubricant and Oil**
Bowser & Co., Inc., S. F., Fort Wayne, I.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**
Bowser & Co., Inc., S. F., Fort Wayne, I.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can.-Blower & Forge Co., Ltd., Kitchener
Jardine & Co., A. B., Hespeler, Ont.

**Punches, Power**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Toledo Machine & Tool Co., Toledo, Ohio.

**Punching Machines, Horizontal**
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Racks, Cut**
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**
Holden Co., Ltd., Montreal, Que.

**Reamer Holders**
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

**Reamers, Expanding**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Reamers, Solid**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co., Montreal, Que.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Reamers, Taper**
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Taylor Tool Co., J. A. M., Toronto, Ont
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Recorders, Temperature**
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Recorders, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Rheostats**
Northern Electric Co., Montreal, Que.

**Resistance Materials**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Respirators**
Willson Goggles, Inc., Reading, Pa.

**Rivets**
Parmenter & Bulloch Co., Gananoque, Ont.

**Rivet Heaters**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.
Ryerson & Son, Jos. T., Chicago, Ill.

**Riveting Machines**
Bilton Machine Co., Bridgeport, Conn.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**
Stewart & Co., Duncan, Glasgow, Scot.

**Rolls (Rubber Covered)**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rudder Frames, Steel**
Can. Steel Foundries, Montreal, Que.

**Rubber Goods, Mechanical**
Quaker City Rubber Co., Philadelphia, Pa.

**Rules, Steel**
Chesterman & Co., Ltd., J., Sheffield, Eng.

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Rust Preventatives**
Oakley Chemical Co., New York, N.Y.

**Sand Paper**
Wausau Abrasives Co., Chicago, Ill.

**Sand Equipment**
Can. Link-Belt Co., Toronto, Ont.

**Sand Mills**
Frost Mfg. Co., Chicago, Ill.

**Sand Rammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Saw Frames and Blades, Hack**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Sawing Machines, Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Ryerson & Son, Jos. T., Chicago, Ill.

**Sawing Machines, Power Hack**
Ackworthie, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Saw Sharpening Machines**
Atkins & Co., Inc., E. C., Indianapolis, I
Oliver Machinery Co., Grand Rapids, Mich

**Saw Tables, Universal**
Atkins & Co., Inc., E. C., Indianapolis, I
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
McKenzie Machinery Co., Guelph, Ont.
Oliver Machinery Co., Grand Rapids, Mich
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**
Atkins & Co., Inc., E. C., Indianapolis, I
Simonds Canada Saw Co., Montreal, Que
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I
Simonds Canada Saw Co., Montreal, Que.

**Saws, Hot and Cold**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Saws, High Speed Steel**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Metal Band**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saws, Metal, Power**
Clemson Bros., Inc., Hamilton, Ont.

**Saws, Metal Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

**Saws, Milling**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Saws, Screw Slotting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Swing Cut-off**
Oliver Machinery Co., Grand Rapids, Mich.

**Scales**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal, Q.

**Screens**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Screw Driving Machine**
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Screw Extractors**
Cleveland Twist Drill Co., Cleveland, O.

**Screw Machine Work**
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
Tallman Brass & Metal Co., Hamilton, Ont.

**Screw Machinery, Wood and Lag**
Cook Co., Asa S., Hartford, Conn.

**Screw Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Screw Machines, Automatic**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

**Screw Machines, Plain or Hand**
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio.

**Screw Plates**
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

**Screws, Cap and Set**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Screws, Machine**
Barnes Co., Wallace, Bristol, Conn.

**Screws, Safety Set**
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Second-Hand Machinery (See Searchlight Section)**
Petrie, Ltd., H. W., Toronto, Ont.

# BUYERS' DIRECTORY

**Separators, Moisture and Oil**
Bowser & Co., Inc., S. F., Fort Wayne, I
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que

**Separators, Oil and Waste**
Bowser & Co., Inc., S. F., Fort Wayne, I

**Shafting**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery Co., A. R., Toronto, Ont
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Shapes, Cold-Drawn Special Steel**
Union Drawn Steel Co., Hamilton, Ont

**Shaping Machines**
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Mckenzie Machinery Co., Guelph, Ont.
Rockefeson Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Toomey Inc., Frank, Philadelphia, Pa.
Walcott Lathe Co., Jackson, Mich
Williams Machinery Co., A. R., Toronto, Ont.

**Shapers, Wood**
Oliver Machinery Co., Grand Rapids, Mich.

**Shears, Hand**
Can. Blower & Forge Co., Ltd., Kitchener

**Shears, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y
Stewart & Co., Duncan, Glasgow, Scot
Toledo Machine & Tool Co., Toledo, Ohio.
Williams Machinery Co., A. R., Toronto, Ont

**Shearing Machines, Angle, Iron Bar and Gate**
Bertrams Ltd., Edinburgh, Scotland

**Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio.

**Sheets, Nickel, Resist, Alloy**
International Nickel Co. of Can., Ltd., Toronto, Ont

**Side Frames, Locomotive**
Can. Steel Foundries, Montreal, Que.

**Slotting Attachments**
Ford Smith Machine Co., Ltd., Hamilton, Ont
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

**Slotting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont
Canada Machinery Corp., Galt, Ont.
Ford Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

**Solders**
Buffalo Smelting & Refining Co., Ltd., Montreal, Que.

**Special Machinery and Tools**
Brown Engineering Corp., Ltd., Toronto
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Crescent Machine Co., Ltd., Montreal, Q.
Ford Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio

**Spectacles, Industrial**
Wilson Goggles, Inc., Reading, Pa

**Springs**
Bertram Co., Wallace, Bristol, Conn
Canadian Wire Spring Co., Cleveland, O.
Durfee Bros. Co., Bristol, Conn.
Stone, Ltd., James, Guelph, Ont

**Sprockets and Chains**
Can. Link-Belt Co., Toronto, Ont
Jones & Glassco, Montreal, Que.
Lovell Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que

**Squares**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Stamping, Metal**
American Pulley Co., Philadelphia, Pa.
Bertram Co., Wallace, Bristol, Conn
Diamond Saw & Stamping Works, Buffalo, N.Y.
Elliott & Whitehall Tool Co., Galt, Ont
United Motor Co., Ltd., Orillia, Ont
Ingersoll Pneumatic Tool Co., Grand Haven, Mich
Parmenter & Bulloch Co., Gananoque, Ont
Taylor Brass & Metal Co., Hamilton, Ont.

**Stamps, Steel**
Diamond Saw & Stamping Works, Buffalo, N.Y.

**Stairways, Wrought Iron**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Steam Specialties**
Crane Ltd., Montreal, Que.

**Steel Plate**
Dom. Foundries & Steel, Hamilton, Ont.

**Steels, Tool**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel, Cold-Rolled Strip**
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q

**Steel Castings**
Dom. Foundries & Steel, Hamilton, Ont

**Steel Forgings**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Steel, Shafting and Free Cutting Screw**
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

**Steel, Sheet**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Illingsworth Steel Co., John, New York City, N.Y.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

**Steel, Tanks**
Can. John Wood Mfg. Co., Toronto, Ont.

**Steel, Stainless**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steels, Alloy, Open Hearth and Electric**
United Alloy Steel Corp., Canton, Ohio.

**Steels, Alloy and Carbon**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Illingsworth Steel Co., John, New York City, N.Y.
Pilot Steel & Tool Co., Montreal, Que
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steels, High-Speed**
Armstrong Bros. Tool Co., Chicago, Ill
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q
Illingsworth Steel Co., John, New York City, N.Y.
Pilot Steel & Tool Co., Montreal, Que
Rice Lewis & Son, Ltd., Toronto, Ont
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa

**Steel, Magnet**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel, Structural**
MacKinnon Steel Co., Sherbrooke, Que

**Steel Tubing, Close Joint and Welded**
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

**Stern Frames, Cast Steel**
Can. Steel Foundries, Montreal, Que

**Stools, Shop**
Ministry of Munitions, London, Eng

**Straightening Machinery**
Bertrams Ltd., Edinburgh, Scotland
Ryerson & Son, Jos. T., Chicago, Ill

**Studs**
Galt Machine Screw Co., Galt, Ont

**Surface Plates**
Bilton Machine Co., Bridgeport, Conn

**Swaging Machines**
Atkins & Co., Inc., E. C., Indianapolis, I

**Switches, Railway**
Can. Steel Foundries, Montreal, Que

**Switches and Switchboards**
Northern Electric Co., Montreal, Que.

**Tachometers**
Aikenhead Hardware Ltd., Toronto, Ont
Bristol Co., Waterbury, Conn.

**Tanks, Steel**
MacKinnon Steel Co., Sherbrooke, Que
Can. John Wood Mfg. Co., Ltd., Toronto, Ont

**Tanks and Pumps, Oil**
Bowser & Co., Inc., S. F., Fort Wayne, I
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont

**Tap Holders**
Greenfield Tap & Die Corp., Galt, Ont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont

**Taper Pins**
Galt Machine Screw Co., Galt, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Tapes, Measuring**
Chesterman & Co., Ltd., J., Sheffield, Eng
Starrett Co., L. S., Athol, Mass.

**Tapping Machines and Attachments**
Ackworthie, Ltd., John, Birmingham, Eng
Archibald & Co., Chas. P., Montreal, Q.
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Taps and Dies**
Ackworthie, Ltd., John, Birmingham, Eng
Butterfield & Co., Inc., Rock Island, Que
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
International Machinery & Supply Co., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Taylor Tool Co., J. A. M., Toronto, Ont.

**Taps, Collapsing**
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Teeth, Dredge Bucket**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Testing Metals and Materials**
Toronto Testing Laboratory, Toronto, Ont.

**Thermometers**
Bristol Co., Waterbury, Conn

**Thread-Cutting Tools**
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Galt, Ont
Murchey Machine & Tool Co., Detroit Mich.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Thread Cutting Machines**
Landis Machine Co., Inc., Waynesboro, Pa

**Threading Machines**
Acme Machinery Co., Cleveland, Ohio
Geometric Tool Co., New Haven, Conn
Greenfield Tap & Die Corp., Galt, Ont
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio
National Machinery Co., Tiffin, Ohio
Williams Tool Corp. of Can., Ltd., Brantford, Ont

**Thread Lead Testing Machines**
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Thread-Rolling Machines**
Bliss Co., E. W., Brooklyn, N.Y.

**Tongs**
Hepburn Ltd., John T., Toronto, Ont

**Tool Cases**
Rice Lewis & Son, Ltd., Toronto, Ont

**Tool Holders**
Armstrong Bros. Tool Co., Chicago, Ill
Bilton Machine Co., Bridgeport, Conn
Gisholt Machine Co., Madison, Wis
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Markers, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que

**Tool Posts, Lathe**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Steels for all Purposes**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Tools, Small (See Machinists' Small Tools)**
Armstrong Bros. Tool Co., Chicago, Ill
Bertrams Ltd., Edinburgh, Scotland
Burgess & Macfarland, Montreal, Que
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont
Elliott & Whitehall Tool Co., Galt, Ont
Foss Machinery & Supply Co., Geo. F., Montreal, Que
Geometric Tool Co., New Haven, Conn
Greenfield Tap & Die Corp., Galt, Ont
Hamilton Engineering Service, Ltd., Hamilton, Ont
Keller Pneumatic Tool Co., Grand Haven, Mich
Kimber & Hillier Mfg. Co., St. Catharines, Ont.
Ministry of Munitions, London, Eng
National Machine Tool Co., Racine, Wis
Rapid Tool & Machine Co., Lachine, Que
Rice Lewis & Son, Ltd., Toronto, Ont
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Truing Tool Co., Detroit, Mich
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Tool Work**
Brown Engineering Corp., Ltd., Toronto
Crescent Machine Co., Ltd., Montreal, Q
Ford-Smith Machine Co., Hamilton, Ont

**Torches, Blow**
Can. Hauck Burner Co., Port Hope, Ont
International Machinery & Supply Co., Montreal, Que.
Perdue, W. B., San Francisco, Calif
Prest-O-Lite Co. of Can., Toronto, Ont
Rice Lewis & Son, Ltd., Toronto, Ont

**Trackwork, Railway**
Can. Steel Foundries, Montreal, Que

**Trackwork, Manganese Steel**
Can. Steel Foundries, Montreal, Que

**Transformers**
Northern Electric Co., Montreal, Que

**Transmission Machinery**
Bernard Industrial Co., A., Fortierville, Que
Can. Link-Belt Co., Toronto, Ont
Garlock-Walker Mchy. Co., Toronto, Ont
Jones & Glassco, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont
Petrie, Ltd., H. W., Toronto, Ont
Positive Clutch & Pulley Works, Toronto, Ont.
Renold (Hans) of Canada, Ltd., Montreal, Que

**Transportation Systems (See Trucks)**
Mathews Gravity Carrier Co., Port Hope, Ont.

**Treated Bits**
Can. Atlas Crucible Steel Co., Toronto, Ont
Vanadium Alloys Steel, Latrobe, Pa

**Trolleys and Tramways**
Can. Link Belt Co., Toronto, Ont
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Wright Mfg. Co., Lisbon, Ohio

**Trucks**
Can. Fairbanks-Morse Ltd., Montreal, Q
Cowan Truck Co. (R. B. Smiley), Toronto, Ont
Diamond State Fibre Co., Toronto, Ont
Hepburn Ltd., John T., Toronto, Ont
Maple Leaf Mfg. Co., Montreal, Que
Ministry of Munitions, London, Eng
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont

**Trucks, Industrial Motor**
Maple Leaf Mfg. Co., Montreal, Que
Ministry of Munitions, London, Eng
National Steel Car Corp., Ltd., Hamilton, Ont

**Tube, Products**
Tube Co. of Canada, Toronto, Ont

**Tubing, Electric Welded or Oxy-Acetylene Welded**
Tube Co. of Canada, Toronto, Ont

**Tubing, Flexible**
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Tubing, Seamless Steel**
Tube Co. of Canada, Toronto, Ont

**Tubing, Seamless Steel, Brass and Copper**
Dom. Steel Products Co., Brantford, Ont
Lovell Tube & Supply Co., Montreal, Que
Taylor Brass & Metal Co., Hamilton, Ont

**Tubing, Welded**
International Nickel Co. of Can., Ltd., Toronto, Ont

**Tubing, Welded Steel**
Tube Co. of Canada, Toronto, Ont

**Turbines, Water**
Kennedy & Sons, Wm., Owen Sound, Ont

**Turret Heads**
Alexander, Ltd., James, Birmingham, Eng
Bertram & Son Co., Ltd., The John, Dundas, Ont.

# BUYERS' DIRECTORY

**Turret Machines (See Lathes, Horizontal Turret)**
Acme Machine Tool Co., Cincinnati, Ohio
Cook Co., Asa S., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Stemle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Turrets, Tool Post**
Gisholt Machine Co., Madison, Wis.

**Unions, Pipe**
Crane Ltd., Montreal, Que.

**Universal Joints**
Ford-Smith Machine Co., Hamilton, Ont
Holden Co., Ltd., Montreal, Que.

**Valves**
Can Fairbanks-Morse Ltd., Montreal Q
Cleveland Pneumatic Tool Co., Toronto, Ont.
Crane Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.

**Valves, Rubber Pump**
Quaker City Rubber Co., Philadelphia, Pa.

**Vises, Drilling Machine**
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.

**Vises, Metal Workers'**
Aikenhead Hardware, Ltd., Toronto, Ont.
Columbia Hdwe. Division, Cleveland, O.

**Vises, Milling Machine**
Brown & Sharpe Mfg. Co., Providence, R.I.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.

**Vises, Pipe**
Columbia Hdwe. Division, Cleveland, O.
Greenfield Tap & Die Corp., Galt, Ont.

**Vises, Planer and Shaper**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Superior Machine Co., London, Ont.

**Vises, Wood Workers'**
Columbia Hdwe. Division, Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Victor Tool Co., Waynesboro, Pa.

**Voltmeters**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Wagon Loaders**
Can. Link-Belt Co., Toronto, Ont.

**Washers**
Barnes Co., Wallace, Bristol, Conn.
Diamond State Fibre Co., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Parmenter & Bulloch Co., Gananoque, Ont.

**Washers, Rubber**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Welding Apparatus, Oxy-Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Welding, Electric**
Carter Welding Co., Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.

**Welding Filler Rods**
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

**Welding Machines, Oxy-Acetylene**
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

**Welding, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

**Welding Supplies**
British Smelting & Refining Co., Ltd., Montreal, Que.
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Canada, Ltd., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

**Wheels, Industrial**
American Pulley Co., Philadelphia, Pa.
Hull Iron & Steel Foundries, Hull, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.

**Winches, Electric**
Volta Mfg. Co., Welland, Ont.

**Winches, Headgate**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Winches, Stoplog**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Wire**
Barnes Co., Wallace, Bristol, Conn.
Canada Metal Co., Ltd., Toronto, Ont.
Dennis Wire & Iron Works, London, Ont.
Greening Wire Co., B., Hamilton, Ont.
Northern Electric Co., Montreal, Que.

**Wire Cloth**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Wire Rope**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Wire Straightening and Cutting Machinery**
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Schuster Co., F. B., New Haven, Conn.

**Wire, Welding**
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Wires, Special**
Dennis Wire & Iron Works, London, Ont.
Greening Wire Co., B., Hamilton, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Woodworking Machinery**
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Wrenches, Drop Forged**
Armstrong Bros. Tool Co., Chicago, Ill
Canada Foundries & Forgings Co., Welland, Ont.

**Wrenches, Machinists'**
Armstrong Bros. Tool Co., Chicago, Ill.
Canada Foundries & Forgings Co., Welland, Ont.

**Wrenches, Pipe**
Canada Foundries & Forgings Co., Welland, Ont.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.

**Wrenches, Tap**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.


**DIE-CASTINGS**

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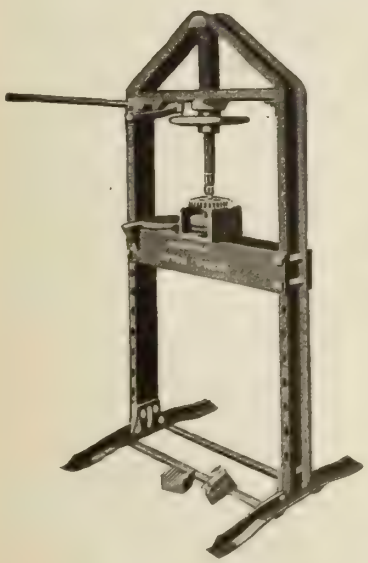
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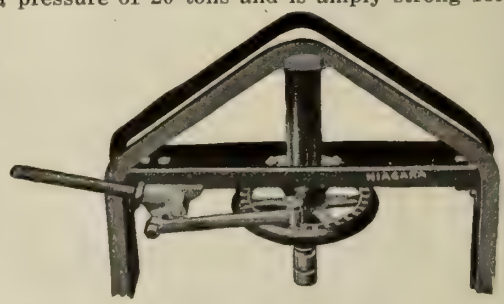
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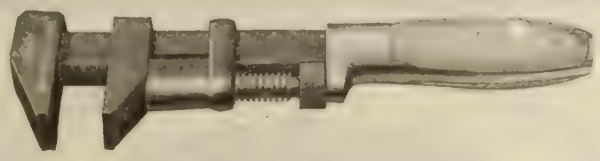



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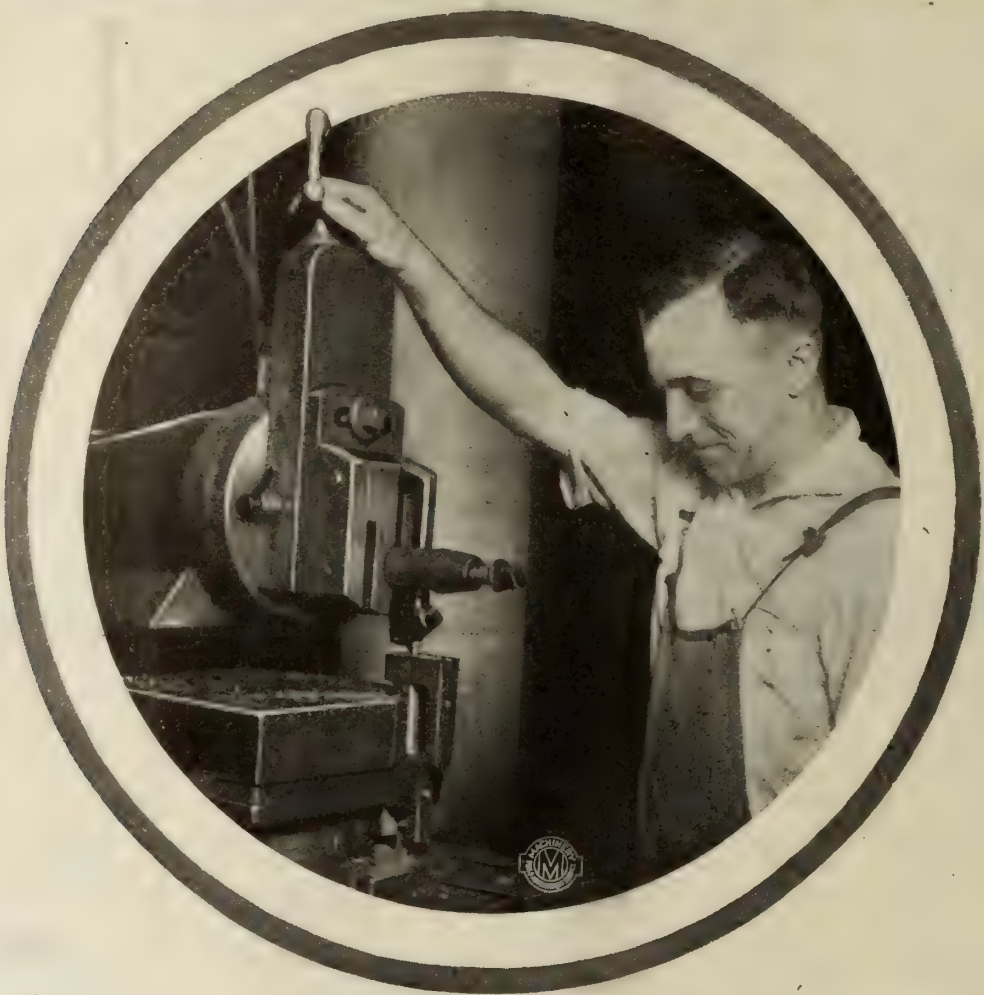
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## Real Satisfaction on Precision Work

The Bates Valve Bag Company installed their Hendey Shaper some eight years ago. Since that time they have purchased another Hendey Shaper, and a Hendey Lathe.

This company produces special machinery for filling cement bags. The work here shown is a die block for a wire bag tying machine and the limit of accuracy demanded is .001".

The Bates Valve Bag Company say that for real satisfaction on precision work there's nothing to equal Hendeys.

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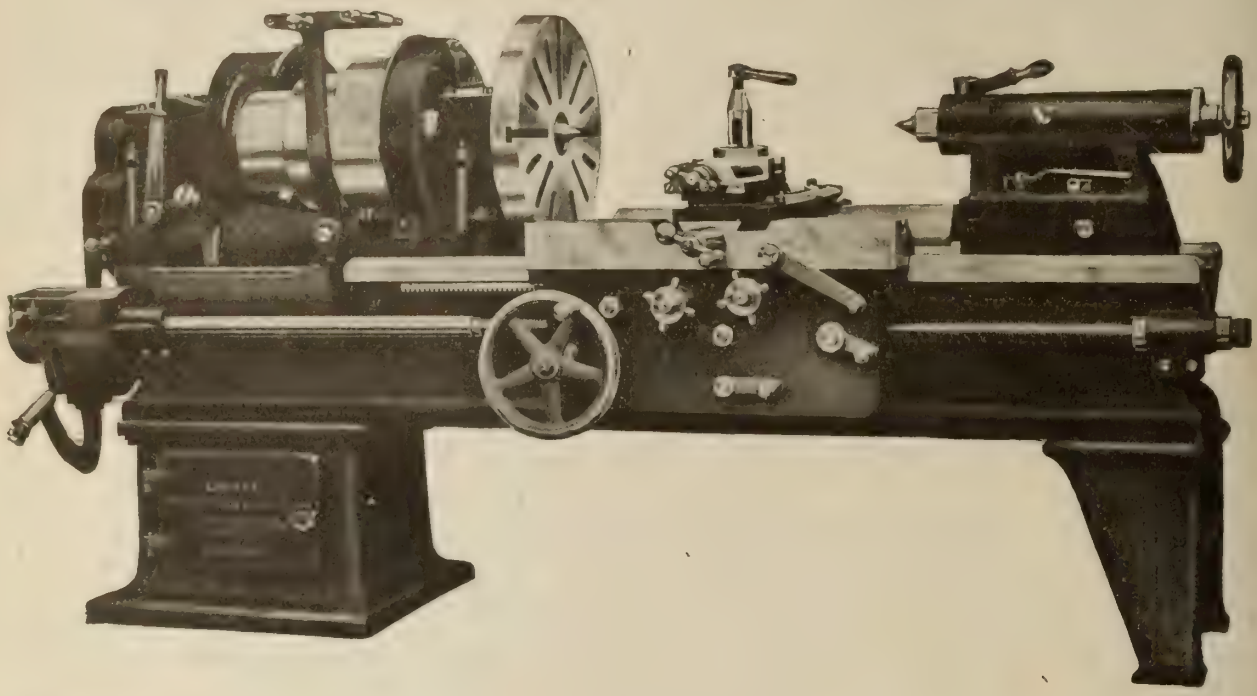
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# CANADIAN MACHINERY AND MANUFACTURING NEWS

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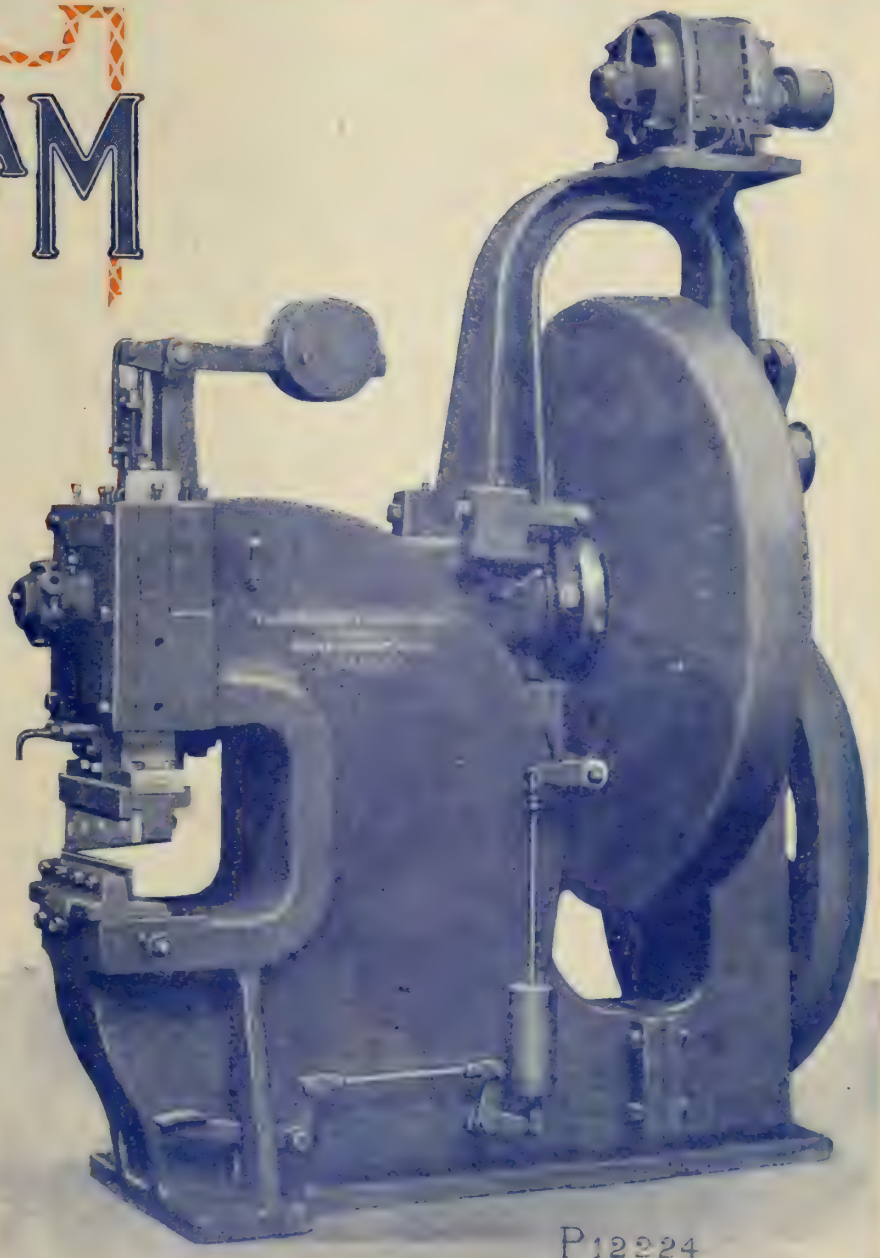

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Illustration shows our No. 4 Single Punch and Shear. 12" Throat Motor Drive through belt, fitted with plate shearing attachments.

## Capacity

To punch 1" hole through 1" Plate
To shear 1" Plates
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P12224

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The BERTRAM Page

MACHINE TOOLS

# 18-inch Crank Slotting Machine

A. C. Motor Drive Through Speed Box

10 H.P. Motor—1,000 R.P.M.




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# *Does It Pay to Order Just* "HACK SAW BLADES?"

Many hack saw users grow careless. They order just "hack saw blades."

Because it has been the standard blade for 35 years, most dealers will fill this order by sending you Star Saws, but —

It doesn't pay to take the chance. You might get fooled some day by receiving an inferior saw blade. It's much safer to specify "Star," every time.

The poorer blade will mean a loss, both in time and material that will amount to much more than the difference in price between Star and ordinary blades.

Slow cutting blades waste valuable time not only in cutting but in frequent changing. They run up your production costs and cut down your profits more than many manufacturers realize.

Ordinary blades have the old "wood saw" tooth and two-way clearance. Star blades have an undercut tooth and three-way clearance that are made for cutting the hardest metal and do a variety of work that is impossible with ordinary blades.

Star saws prove their better quality very quickly in two ways — they will go through metal that other blades refuse to cut. And one Star blade will cut a far wider variety of sizes, shapes and metals than is possible with ordinary saws.

Make these two tests yourself with Star saws and you will never be satisfied to have other blades used in your shop. Our service men will be glad to help you solve your production problems on Hack Saws if you will write us.

**STAR SAWS NOW SOLD BY THE MAKERS**

We now sell our own product for we believe no other organization is in such a good position to give selling service on Star Saws as our own factory that has made them for 37 years.

We are not satisfied only to sell you Star Blades but stand ready to render you every service in getting the best results in their use.

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**304 Imperial Office Building, Hamilton, Ont.**

"Good workmen know the difference"



# *Not bolted to the floor—why?*

*(Ask Gordon Scott, He Knows)*

This was in August, 1919.

Gordon Scott, Manager of the Peerless Surfacing Machine Company of Troy, New York (manufacturers of Peerless Surfacing Machines), laid down the report of the tests. "It's as if we had built a fine safety razor but couldn't get good blades for it," he said.

These tests showed that Peerless Surfacing Machines were O. K., true-running, production boosters —that the defective work complained of was due to the abrasive belts used.

"Ordinary belts won't do," ran the report. "Their belt joints are thicker than the rest of the belt and give a marked 'hop' or 'jump' on each revolution. This causes marred, scratched work."

And a little further down Scott read, "One belt stands out—Speed-grits Uniflow belt. Recently developed by Manning Abrasive Company. Has an absolutely flat joint. No 'jump' or 'hop' no matter how many R. P. M. Gives perfect finish."

Now notice the picture above. A Peerless Surfacing Machine running at top speed while simply set on the floor (*not* bolted). Its "jumpless" Speed-grits Uniflow belt is grinding a block of carbon steel.

On steel, alloy, iron, wood, or hard rubber—smooth-running Speed-grits Uniflow belts give speed in production *plus* perfect finish.

Today you can order Speed-grits Uniflow belts by mail—one or a dozen. Just send a piece of a wornout belt of the type now being used.

(Many abrasive-belt users tell us that taking the "jump" out of the belt joint is the biggest thing accomplished in the abrasive industry since the discovery of artificial abrasives.)

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*"Good Workmen Know the Difference."*

Send for "The Difference Book." Address

**RITCHEY SUPPLY COMPANY**

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Or Send to Manning Abrasive Co., Troy, N. Y., U. S. A.

*Manning Speed-grits*

Look for this trade-mark on the back of every belt, sheet or disc.

# *Manning Speed-grits*

Reg. U.S. Pat. Off.

**Don't say sandpaper—say Speed-grits**

***Speed-grits***

comes in the following varieties:

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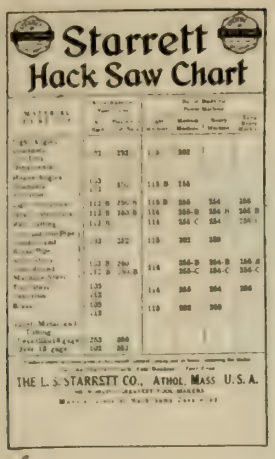
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Picking the right blade for the particular kind or shape of metal is easy if you use Starrett saws according to the Starrett Hacksaw Chart.

We will be pleased to mail you a copy of the chart. Free. Also ask for Catalog No. 22 "3".

THE L. S. STARRETT COMPANY
*The World's Greatest Toolmakers*
*Manufacturers of Hack Saws Unexcelled*
ATHOL, MASS.

STARRETT HACK SAWS CUT QUICKER LAST LONGER

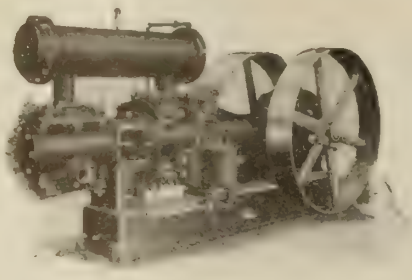
STARRETT TOOLS

42-131

# Use Starrett Hack Saws

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Its uses throughout the plant from foundry to paint shop and shipping floor are so numerous and so extensive that the question is not whether to use air, but rather, where else can we use compressed air?

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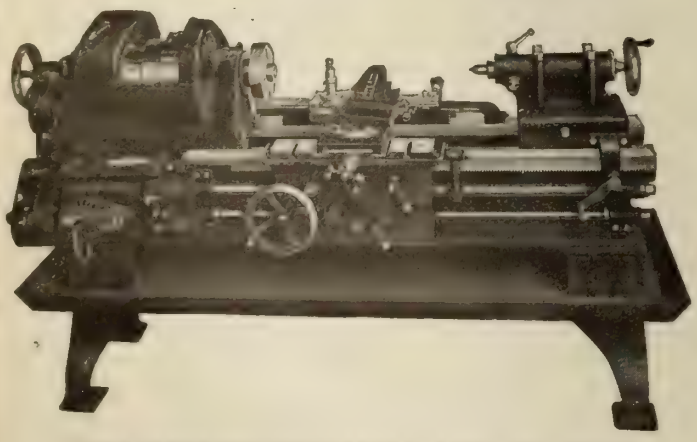
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These dies are designed for use on either vertical or horizontal spindles. Die is re-locked by forward motion of sleeve, which may be actuated by a yoke working in the groove or by a fixed stop making contact with rear edge of sleeve at the return stroke. Die is unlocked in the usual manner by retarding its forward motion or by a fixed stop, making contact with the external tripping button shown on the face of the die. External tripping button is especially desirable in cutting very short threads as it relieves the thread of the strain incidental to unlocking by the pull-off device

**The diameter of the No. 2, Type R die is 3 3-16 in., and its length as shown is 3½ in.**

**The Die cuts both right and left-hand threads ½ in. to 1 in. in diameter, and from 10 to 40 threads per inch.**

**Shanks are varied to meet individual requirements.**

**A set of standard chasers in carbon steel is supplied gratis with each Die.**

**No tools of any kind need be used in changing chasers.**

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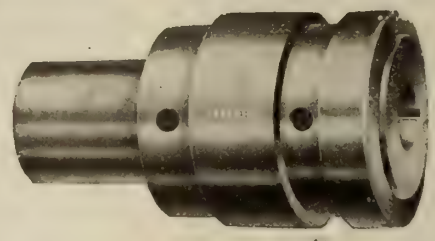
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Play safe and equip with Johnson Clutches.



*Write for Our Yellow Catalog and Booklet "Clutches as Applied to Machine Building"*

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you are looking for the machine with the highest rate of production, the smallest amount of lost time, and the longest life. In all probability you will find that machine equipped with a Johnson Clutch, for the Johnson Clutch not only gives best service, but adds greatly to the convenience and speed of operation.

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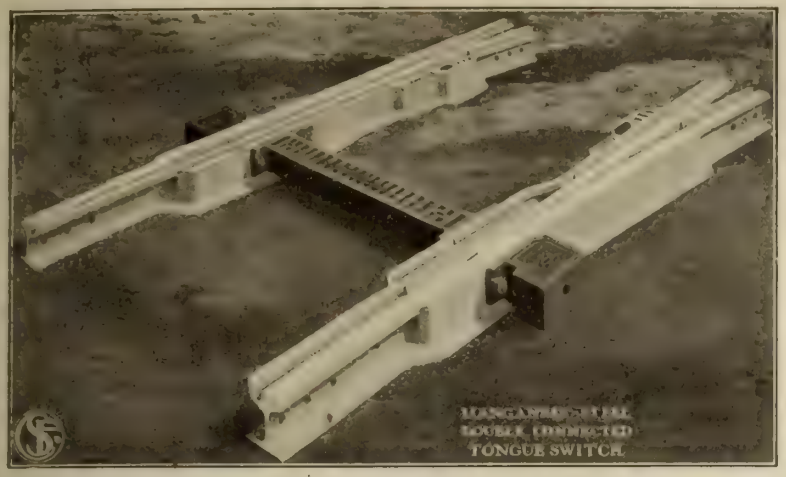
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Pumps for pulp and paper mills, Pumping Engines for municipal purposes, Centrifugal Pumps.

*If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.*




# MANGANESE STEEL TRACKWORK

*for*

Steam and Electric Railways

*Manufacturers of Balkwill Articulated Manganese-Steel Crossings*

## CANADIAN STEEL FOUNDRIES LIMITED

Transportation Building, Montreal

WE CAN SUPPLY

# STEEL PLATE

—IN—

Universal Edge - up to 40 in. wide

Sheared Edge - up to 60 in. wide

Any Thickness Any Lengths

*Send Us Your Enquiries.*

## Dominion Foundries & Steel, Limited

HAMILTON, ONTARIO


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# Grinding and Polishing Equipment

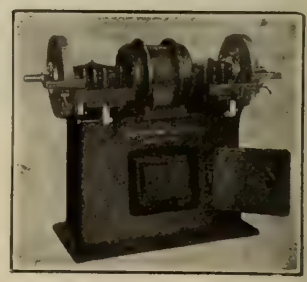
*Necessary Tools in Every Shop*



Water Tool Grinder

SO many and varied are the jobs handled by Ford-Smith Grinders and Polishers that it becomes almost a modern necessity to have them in your shop. Ford-Smith Grinders and Polishers are sturdily constructed, dependable tools built for all kinds of heavy work. They go a long way toward lowering costs by conserving power and saving time.

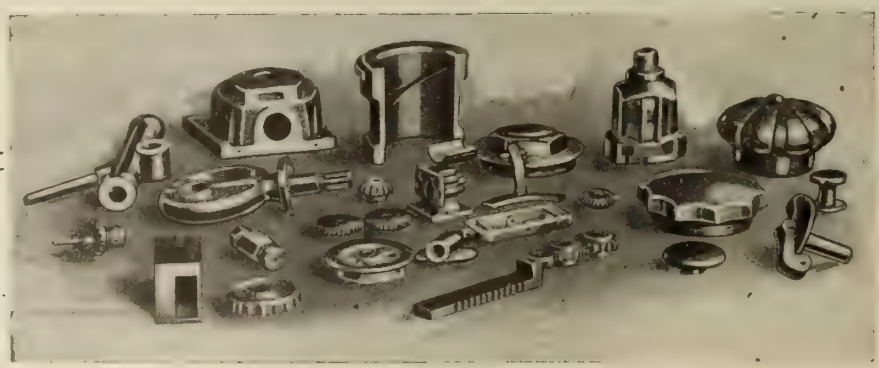
Ford-Smith tools include Motor Driven Grinders, Floor Grinders, Bench Grinders, Water Tool Grinders, Swing Grinders, Special Grinders, Buffers and Polishers, Hack Saws and Swivel Tables.



**Complete Catalogue on Request.**

## THE FORD-SMITH MACHINE CO., LIMITED
**HAMILTON, CANADA**

FOREIGN AGENTS: W. E. Storey, London, England: Gollin & Co., Melbourne, Australia: British & Canadian Hydraulic Tube Co., Johannesburg, S.A.



# FISHER DIE-CAST PARTS

## *Possess Strength, Uniformity, Accuracy and Clean Finish*

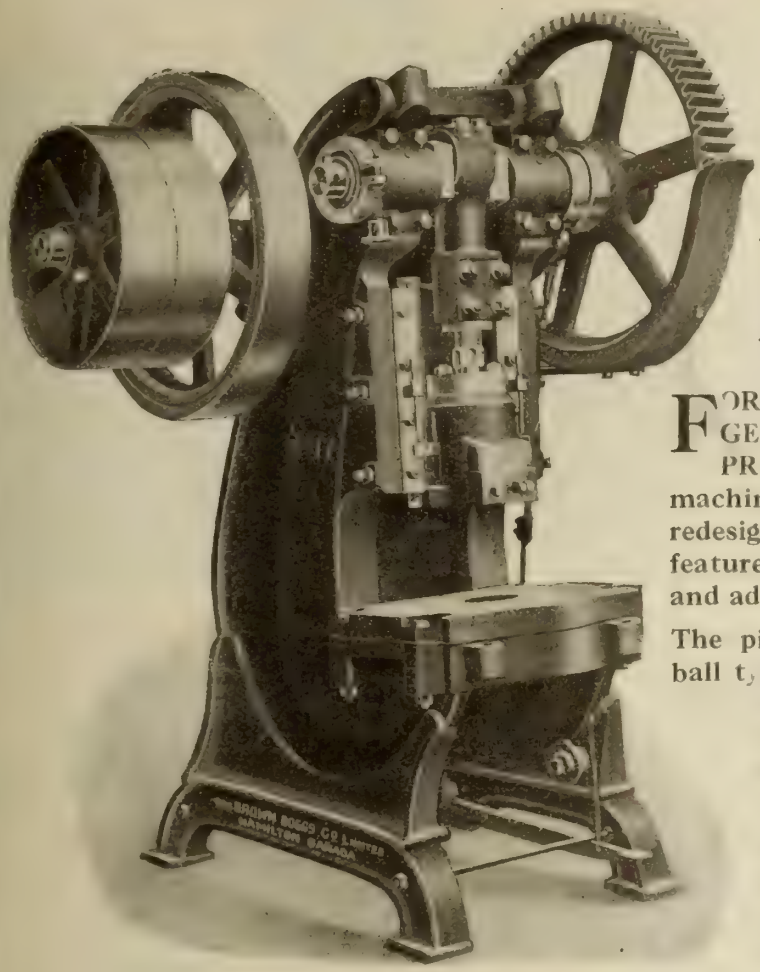
When Fisher Die-Castings are delivered to you they are ready for assembling —no machining required. Save time, save labor, save expense—use Fisher Die-Castings for production work. No parts too intricate.

***Largest Makers of Die-Castings in Canada***

## THE FISHER MOTOR CO., LIMITED
ORILLIA, ONTARIO

# BROWN-BOGGS

B B



## "BB" Power Presses

FOR general efficiency this No. 17 GEARED INCLINABLE POWER PRESS is far in advance of any machine tool of its kind. It is our redesigned type and embodies several features that increase its output and add life to the dies.

The pitman connection is of the ball type, made from High Carbon Steel, carefully heat treated so as to give the maximum Service.

Crankshafts are also made from Carbon Steel properly heat treated, which greatly increases their tensile strength and prevents crystallization.

*We manufacture a full line of Power Presses for blanking, forming, punching, trimming, etc., in many different types. Let us send you full particulars.*

## THE BROWN-BOGGS CO. LIMITED
## HAMILTON, CANADA.

# STEEL *for*

## Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

**We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.**



**Steel Ingots**
*by the*
**HARMET**
**Liquid Process**

## Nova Scotia Steel and Coal Co., Limited

*Head Offices:*
New Glasgow, N.S.

Sales Offices:
Western Room 14 Windsor Hotel
MONTREAL

# DIAMOND TOOLS

FOR TRUEING GRINDING WHEELS

QUALITY SERVICE SATISFACTION

INDUSTRIAL GEMS

**Tools For All Mechanical Purposes**

FURNISS CLARKE & COMPANY
364 University St.
MONTREAL

*Sole Canadian Agents for*

THE JOYCE-KOEBEL COMPANY, INC.
Formerly Geo. A. Joyce Co., Ltd.
NEW YORK LONDON

# LA SALLE

## Has an Advantage Over Other Grinders

There is some outstanding feature of all La Salle Grinding Machines that lends it exceptional productive ability.
The American Drill Grinder is especially adaptable for grinding twist, flat and three-lipped drills, because it has automatic lip rest and caliper jaw device, which assures proper clearance on all sizes of drills automatically. Send for descriptive matter covering our entire line of grinding machinery.



**American Drill Grinder For Wet or Dry Drill Grinding 1/8" to 2¼". Also 1/8" to 3½" dia.**

## LA SALLE TOOL CO.

La Salle, Illinois, U.S.A.

Represented in Canada by

**A. R. Williams Machinery Co., Ltd.**
64-66 Front Street W., Toronto
Halifax St. John, N.B. Montreal Winnipeg Vancouver

# W·ATKINS&CoLd Sheffield ENG

The
**HIGH SPEED STEELS**
*For superior cutting power:*
**"Double Waco" and "Waco Superior"**
**Carbon Tool Steels**
*For all Purposes.*
"Turtle Brand," unequalled for reliability.
MINERS' DRILL STEELS
Solid and Hollow.
All Sections.




Representative
MARSHALL SON & BUNNEY
39 Richmond St East
TORONTO

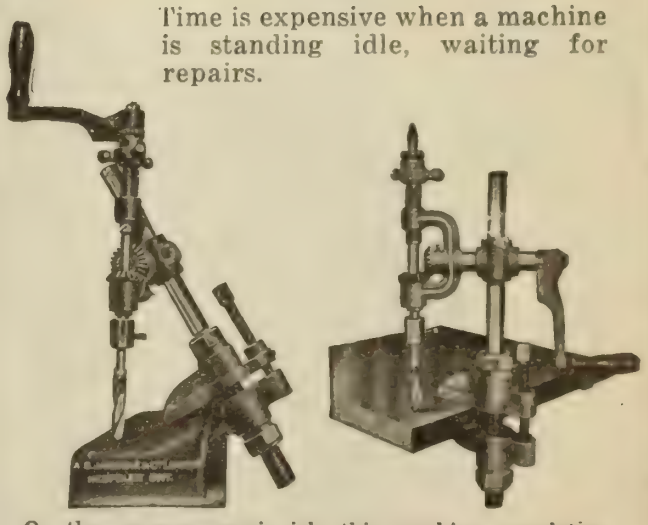
# Crucible
*AND*
# Open Hearth Steel
# *Tool Steel*
# "ARGO" BRAND *HIGH-SPEED* STEEL

**The John Illingworth Steel Co.**
1856
Frankford, Phila.
New York Office 217 Broadway

*RALPH B. NORTON, AGENT*
124 Craig St. W.
Montreal, Canada

# Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



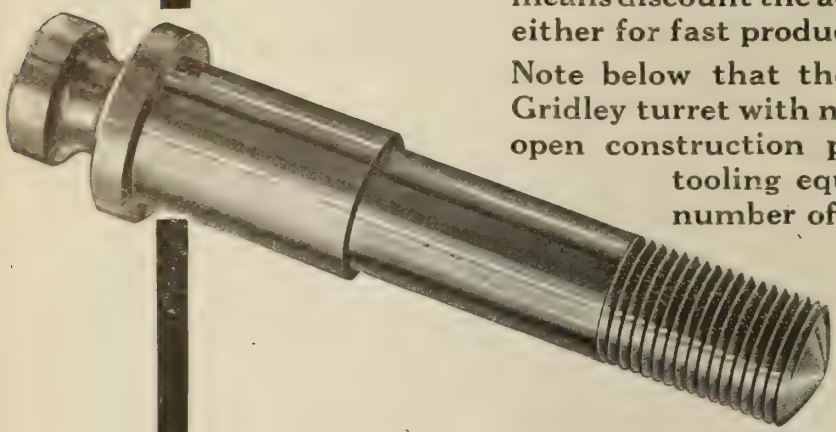
On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.
Sold by all Machinery and Supply Houses.

**A. B. JARDINE & CO., Limited**
HESPELER, ONTARIO


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# For Fit and Finish— the GRIDLEY



Requirements for fine fit or exceptional finish by no means discount the advantages of Gridley Automatics, either for fast production or low costs.

Note below that the tools are held securely on the Gridley turret with no overhang. More than that the open construction permits the use of all kinds of tooling equipment to secure a maximum number of operations as well as facility in setting up the job.

These are backed up by the known high standards of Gridley Turret Lathe construction.

Get Gridley output figures—accuracy guaranteed.

## THE NATIONAL ACME COMPANY

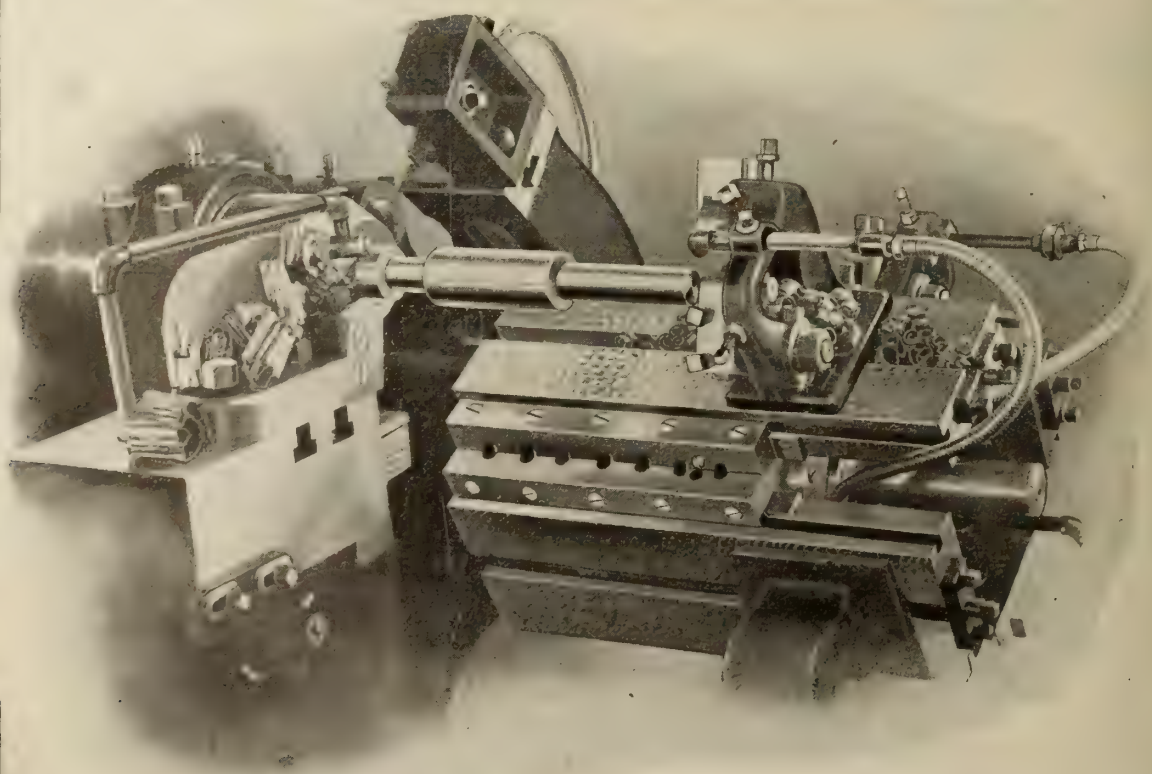
WINDSOR, VERMONT

GENERAL OFFICES, CLEVELAND, O. CANADIAN SCREW PLANT, MONTREAL, P. Q.

BRANCH OFFICES: NEW YORK BOSTON CHICAGO DETROIT BUFFALO

WAREHOUSES: NEW YORK AND CHICAGO REPRESENTATIVES IN PRINCIPAL FOREIGN COUNTRIES

*Makers of Gridley Single and Multiple-Spindle Automatics at Windsor, Vermont; and Acme Automatics, Threading Dies, Collapsing Taps, and Screw Machine Products at Cleveland, Ohio*



MINISTRY OF MUNITIONS G R

# The Disposal Board

Have

# STOCKS

## Lying in the United Kingdom and

## AVAILABLE FOR EXPORT

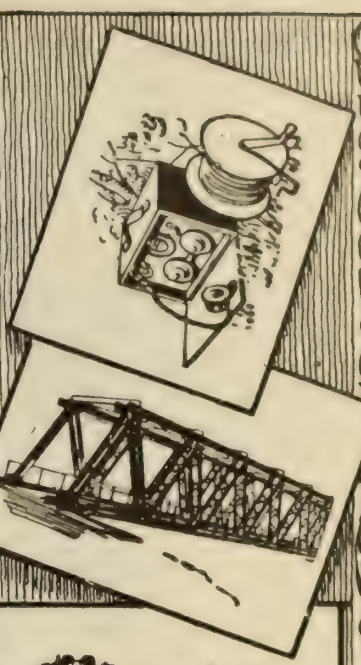
*of*

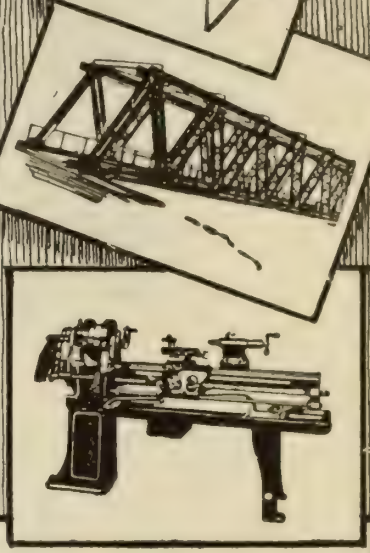
## ENGINEERING STORES

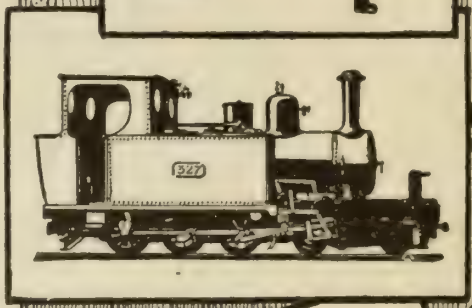
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| Ferrous and Non-Ferrous Metals | Medical Stores |
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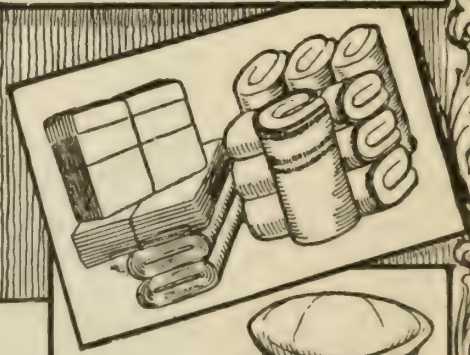
*Buyers should instruct their representatives in the United Kingdom to communicate with The Secretary, Disposal Board, Ministry of Munitions, Caxton House, Tothill Street, London, S.W. 1.*

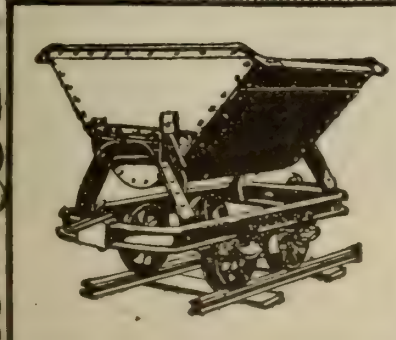
*Cable Address :*
*"DISPEXPORT, MUNORGIZE, LONDON."*

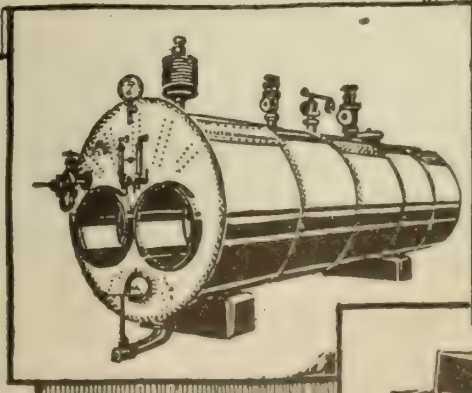




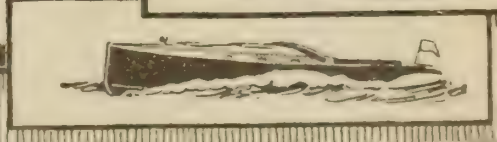












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# Cab Tire Cable

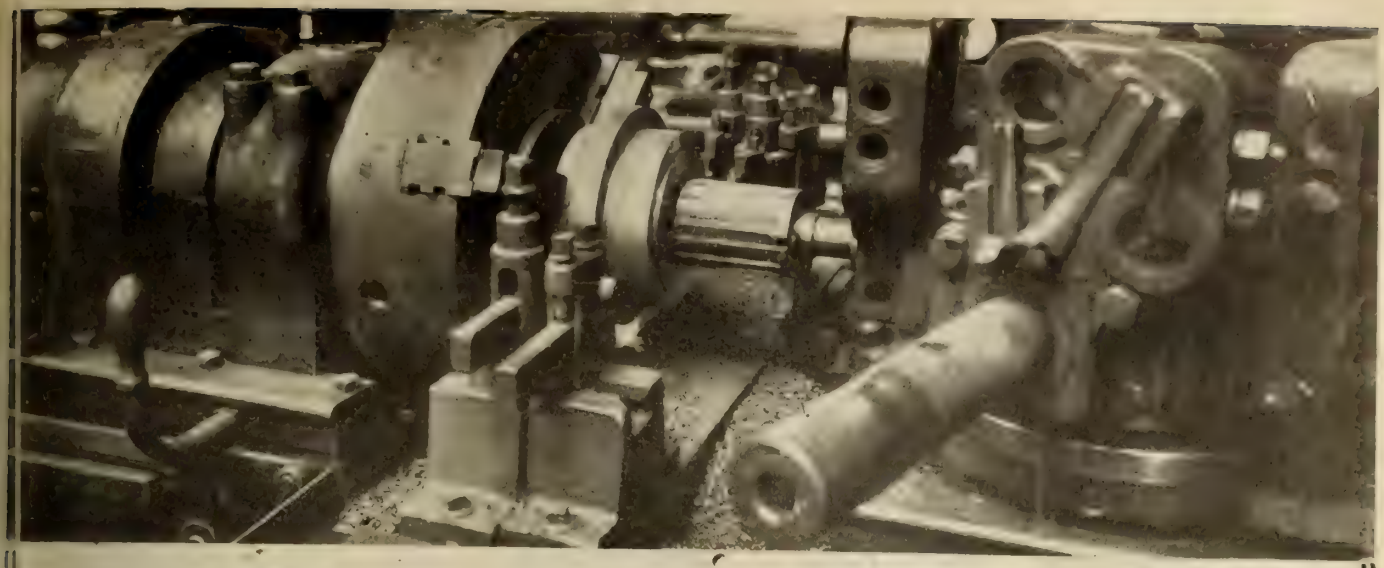
A flexible, wear-resisting cable especially designed for industrial use. The several conductors are individually insulated with rubber and further protected by a heavy outer jacket of smooth, tough, and flexible rubber.

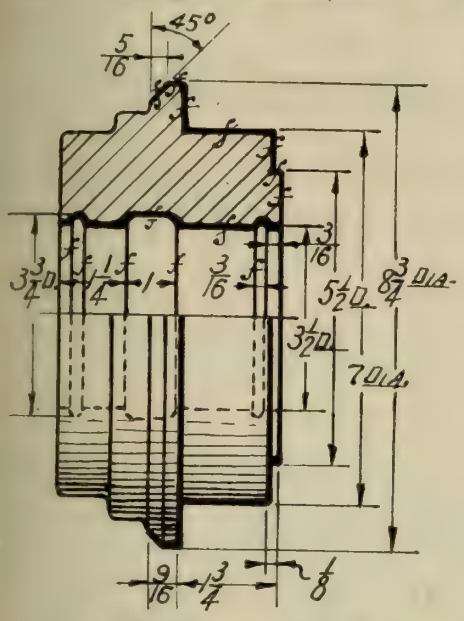
Like its namesake, the Cab Tire, it is manufactured to stand rough usage and to give service under the most trying conditions.

Railways, Shipbuilding Companies, and Industrial Works are amongst the largest users. It fills a long-felt want for a suitable flexible for portable lights on ships. Railways find it the ideal cable for motor-driven tools in shops and round-houses, while in Chemical Works the absence of braid covering has made it particularly desirable.

## Northern Electric Company
LIMITED

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| Montreal | Toronto | Regina |
| Halifax | Hamilton | Calgary |
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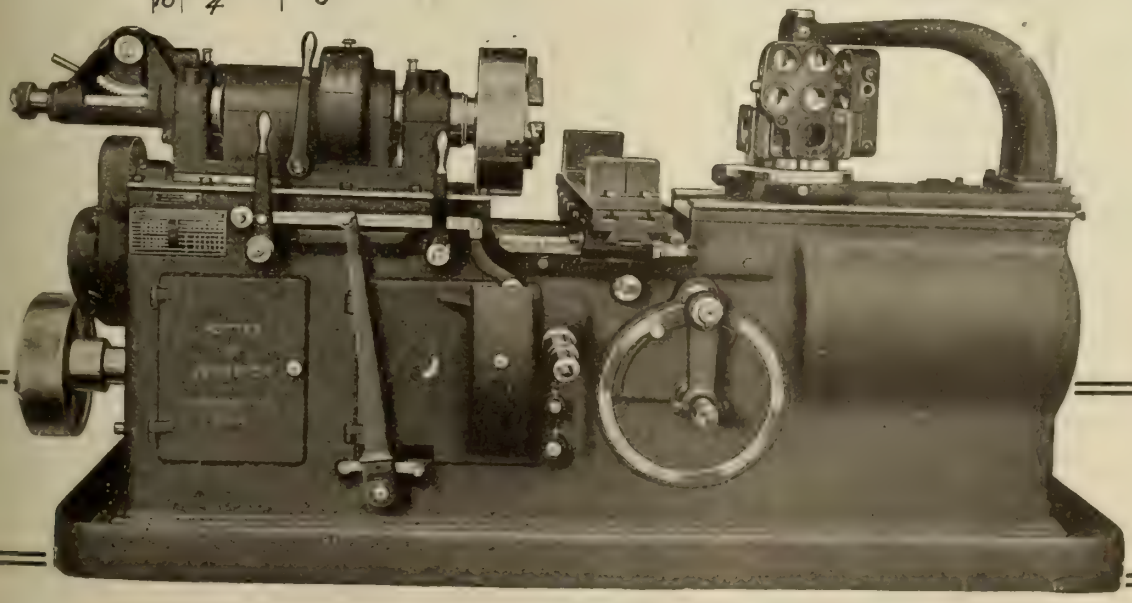

# *Are you Getting*

your equipment requirements for your New Year productions?

Let us give you some figures that will help you to decide.

Compare the illustration with some of your parts, and then send your prints or samples along.

**Ask for Bulletin No. 41.**



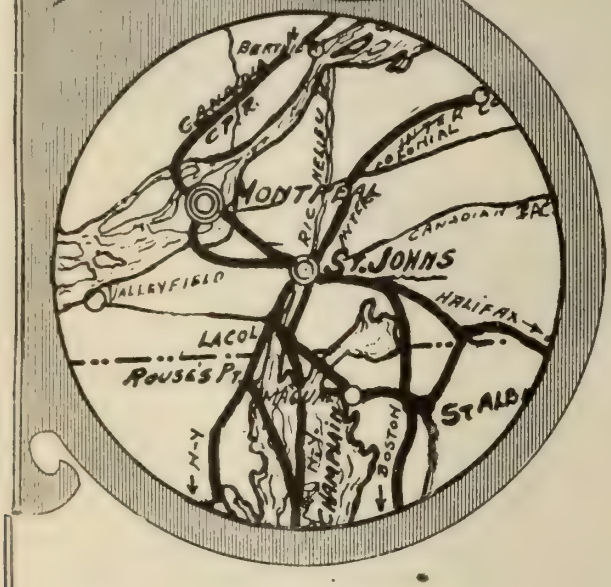
*Canadian Offices:* POTTER & JOHNSTON MACHINE CO.

## ROELOFSON MACHINE & TOOL CO., LIMITED

*Head Office and Showrooms*

**11 Wellington Street East—Toronto, Canada**

# The City of ST. JOHNS, QUEBEC




## Offers To Manufacturers—

### *A Cash Bonus On Your Payroll, Exemption From Taxes, Etc.*

Already a busy industrial centre, St. Johns is rapidly expanding and now offers unparalleled inducements to encourage the establishment of new industries.

Every new industry is exempt from taxation for a period of fifteen years, such period being subject to extension. A bonus of 5 per cent. will be paid on your payroll for a period of five years. If you desire it, the city will advance this to you to be applied to the purchase or erection of any building suitable to your purpose. All public improvements you may require, such as street extensions, sidewalks, waterworks and sewage will be attended to by the city.

In addition to these inducements, St. Johns enjoys one of the finest industrial locations in Canada; has unequalled transportation facilities, an adequate fuel, power and labour supply, making it an unusual industrial opportunity.

## No Other City Can Offer These Combined Advantages

Seven railroads, including Canada's great transcontinental lines.

Finest ocean shipping facilities.

Canal connections with New York, the Eastern States and the Great Lakes.

Cheapest labour market in Canada.

Plentiful supply of skilled and unskilled labour.

Cheap and abundant electric power.

Cheap coal and lower freight rates.

Desirable factory sites with all public conveniences immediately available.

Extraordinary inducements to new industries.

*For more specific information write to*

## The Secretary of the City Council

**ST. JOHNS, QUEBEC, CANADA**

## Steel Fingers Slip into The Flutes



Grip the broken tap and back it out before you've had time to count three times sixty.

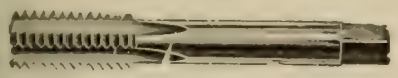
# The Walton Tap Extractor

removes broken taps buried below the surface of the work without trouble or loss of time. It removes any broken tap without injuring the thread. It saves the casting or forging. Pays for itself over and over—often on the very first job.

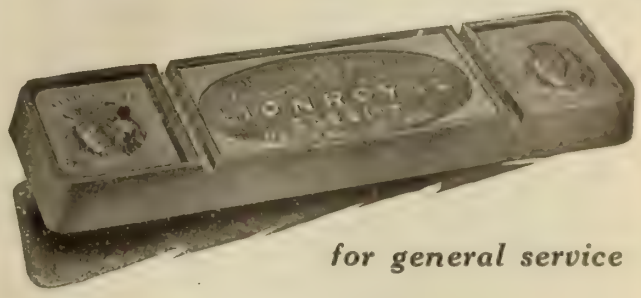
**How many do you want on trial?**

**The Walton Co.**

Hartford - - - - Conn.



*"Alloyed under the Stanley Process"*



*for general service*

# Lionroyal

*Made in Canada*

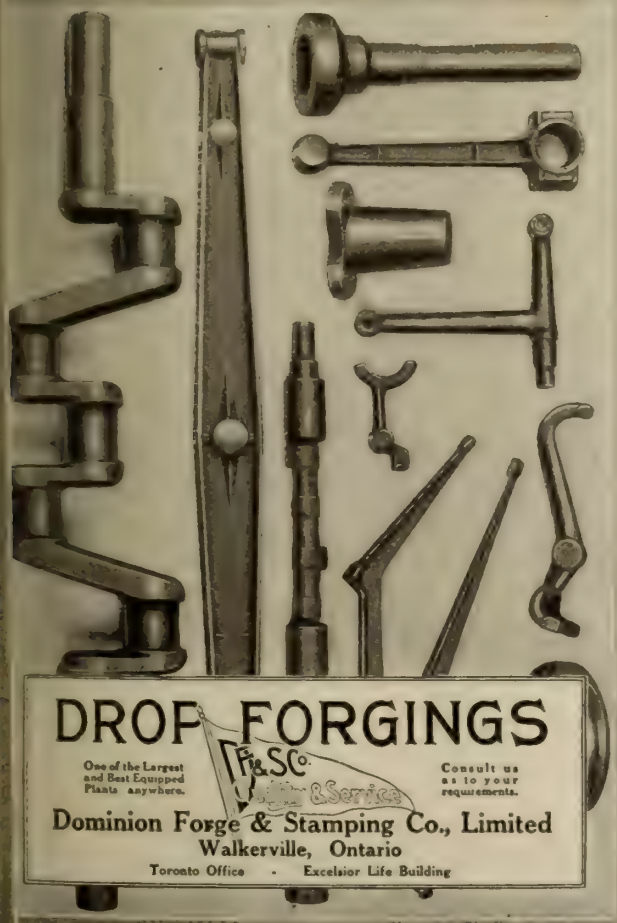
This BABBITT Metal has a greater range of service than is possible in any other Bearing Metal at a corresponding cost—it has a strength which will easily withstand impact and pressure, yet will run cool at high speed with little lubrication—

*There are thousands of places in which high-priced Genuines are used where "LIONROYAL" will serve as well.*

***Try a Sample Case and Judge for Yourself.***

**BRITISH SMELTING & REFINING COMPANY LIMITED**

**MONTREAL**



## DROP FORGINGS

One of the Largest and Best Equipped Plants anywhere.

Consult us as to your requirements.

**Dominion Forge & Stamping Co., Limited**

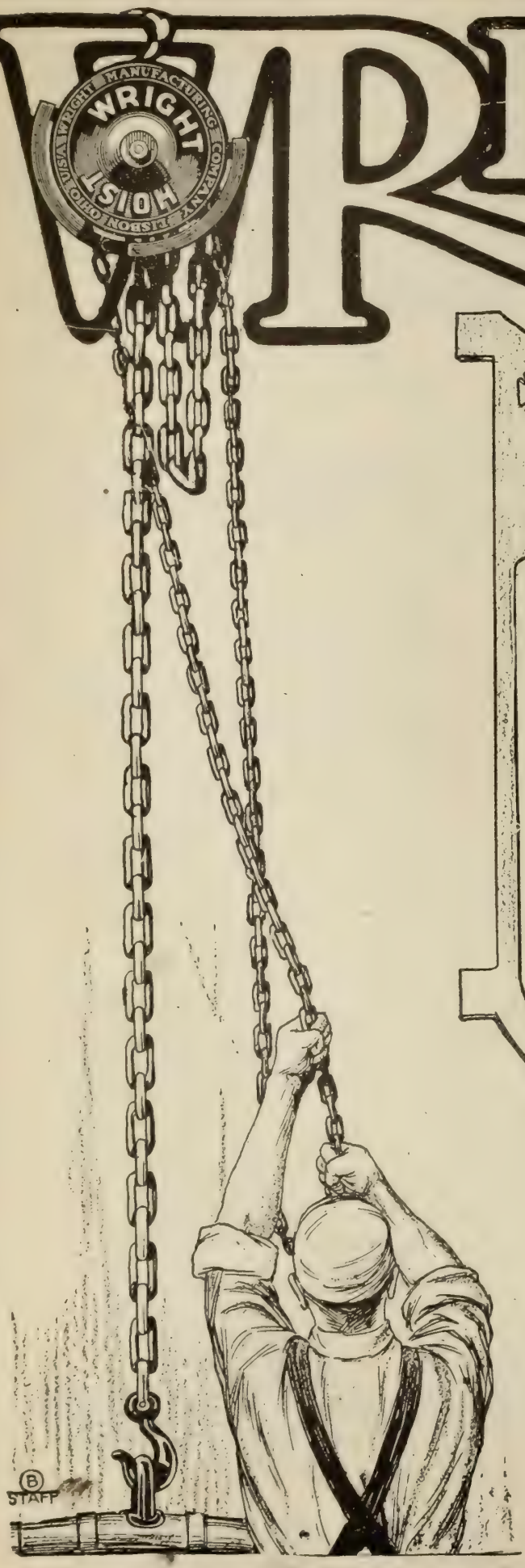
Walkerville, Ontario

Toronto Office - Excelsior Life Building


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# WRIGHT

## HOIST




When you buy a hoist you want a *Wright* because it is a specialist in strength, dependability and safety.

*Made by the company that specializes in hoists.*

WRIGHT MANUFACTURING COMPANY

***LISBON, OHIO, U.S.A.***

*Canadian Distribution*

The A. R. Williams Machinery Co.

*St. John Halifax, Toronto, Winnipeg, Vancouver, Montreal*

# A Problem In Every Spring

BECAUSE a spring is more than a twisted wire, it is only rarely that the experience of the manufacturer enables him to properly design the springs which go into his product. If you can we will follow your specifications to the letter.

Otherwise, better depend upon us for this service as hundreds of manufacturers do. For our 63 years of spring-making experience, added to our sound engineering practice, enables us to fill your requirements in a practical way. Only the other day our Engineering Department re-designed a client's spring so that it can be produced for half the cost. And we supply exactly the springs you need - daily, weekly or monthly.

Let us put this ability at your service on your product -new or old.

## THE WALLACE BARNES COMPANY

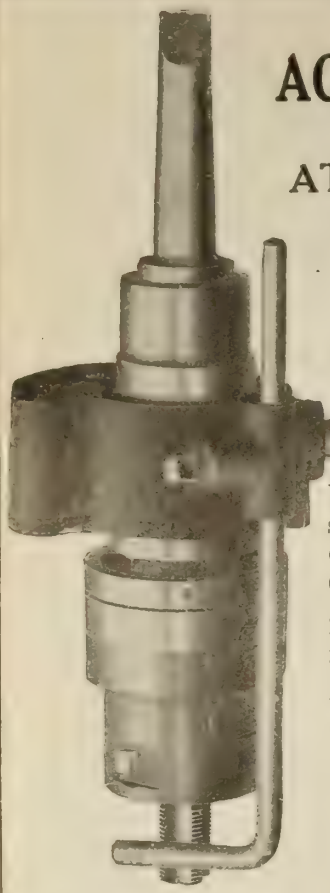
*"Spring Makers for Three Generations"*

Main Office and Works: Bristol, Conn.
Western Sales Office; Book Bldg., Detroit




Springs of steel, brass, phosphor bronze or vanadium—flat, coiled, spiral—compression, extension or torsion. Wire Forming, Spring Washers, Small Parts of steel, brass, etc., in any finish. Assemblies. High Carbon Cold-Rolled Steel.


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THE
ACKWORTHIE
TAPPING
ATTACHMENT.

BRITAIN'S PREMIER CHUCK

Made in 6 sizes.
To tap from ¼ in. to 1¼ in. Whit.

We have made some thousands of these Chucks during the last 11 years, every one of which has given satisfaction. For tapping holes there is nothing to equal them for speed and handiness.

*Shall we mail you particulars?*

J. ACKWORTHIE, Ltd.
Coleshill Street,
BIRMINGHAM

DUNBAR SPRINGS

ACCURACY ASSURED

You can always depend upon Dunbar Springs being accurate. Before proceeding with any order the first few springs are carefully tested and checked up for this very purpose.

Seventy-two years' experience making flat and spiral springs of every description enables us to furnish you with springs of the highest quality, that can be depended upon under all conditions.

Send blue prints for estimates.

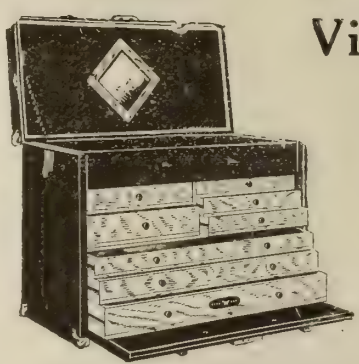
The Dunbar Brothers Co.
BRISTOL, CONN.



# Machine Shop and Construction Supplies

The Rice Lewis line includes Pipe Vises and Pipe Wrenches, Micrometers, Torches, Set Screws, Cap Screws, Machine Screws, High-Speed and Carbon Drills, Files and Machinists' Tools of every description.

We also carry large stocks of Bar Iron, Sheet Iron (black and galvanized), Machine Steel, Cast Steel, High-Speed Steel, Cold-Rolled Steel.



## Victor Hack Saw Blades

Durable, fast cutting blades which cut true on the toughest metals. Users find that Victor Blades cut faster and last longer than ordinary ones.



## CRESCENT
BELT FASTENERS



Maintain a uniform grip, the entire width of the belt. They clinch beneath the surface on the pulley side—no part in contact with the pulley.

### Machinists' Tool Chests

All Rice Lewis goods are quality products—made to give the greatest service for your money. Ask for quotations as to prices and dates of delivery.

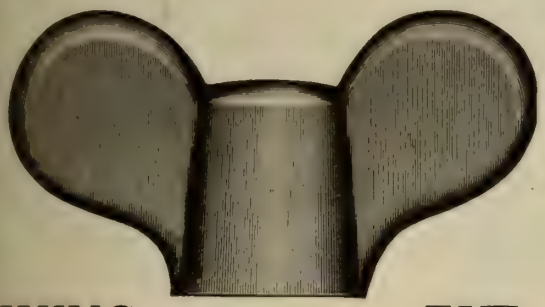
## Rice Lewis & Son, Limited

*Established 1847*

19 Victoria St., Toronto, Ont.

CANADA
FOUNDRIES & FORGINGS
LIMITED

DROP FORGED STEEL



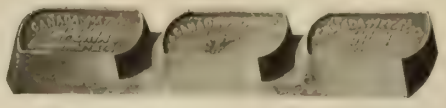
WING NUTS

EYE NUTS

*All Sizes*

Canadian Billings & Spencer Plant
Welland

BABBITT METALS



Imperial Genuine

Made for extra heavy duty, such as Main Bearings on Turbine Generators, Calender Rolls in Pulp Mills, is specially adapted for Marine Engines.




HARRIS HEAVY PRESSURE

THE BABBITT METAL WITHOUT A FAULT

For Donkey Engines, Saw Carriages, Small Motors, Transmission Line Shafting and all steady heavy pressure duty.

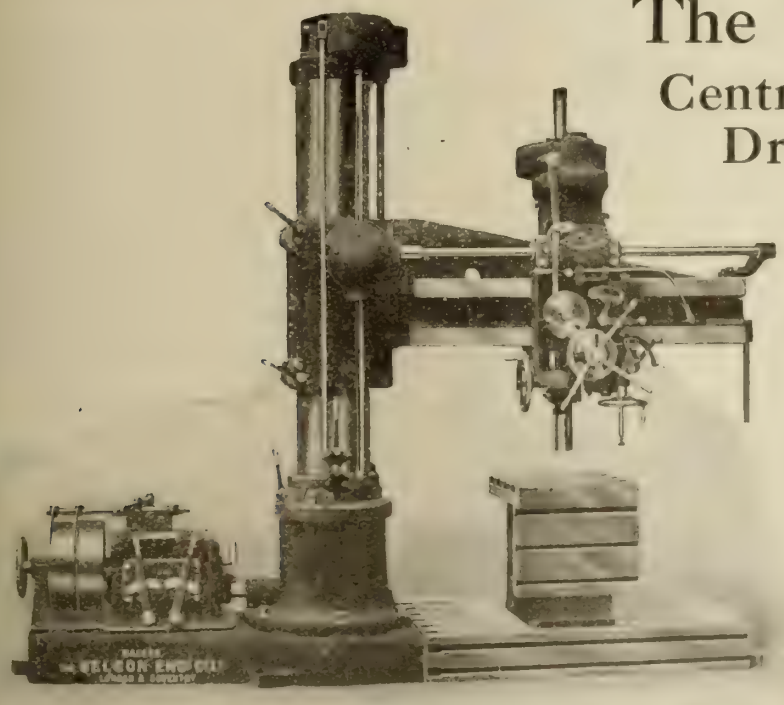


Matchless

Suitable For Slow-Moving Bearings

THE CANADA METAL CO., LIMITED
TORONTO HAMILTON MONTREAL
WINNIPEG VANCOUVER

The "Selson"
Central Thrust Radial Drilling Machine

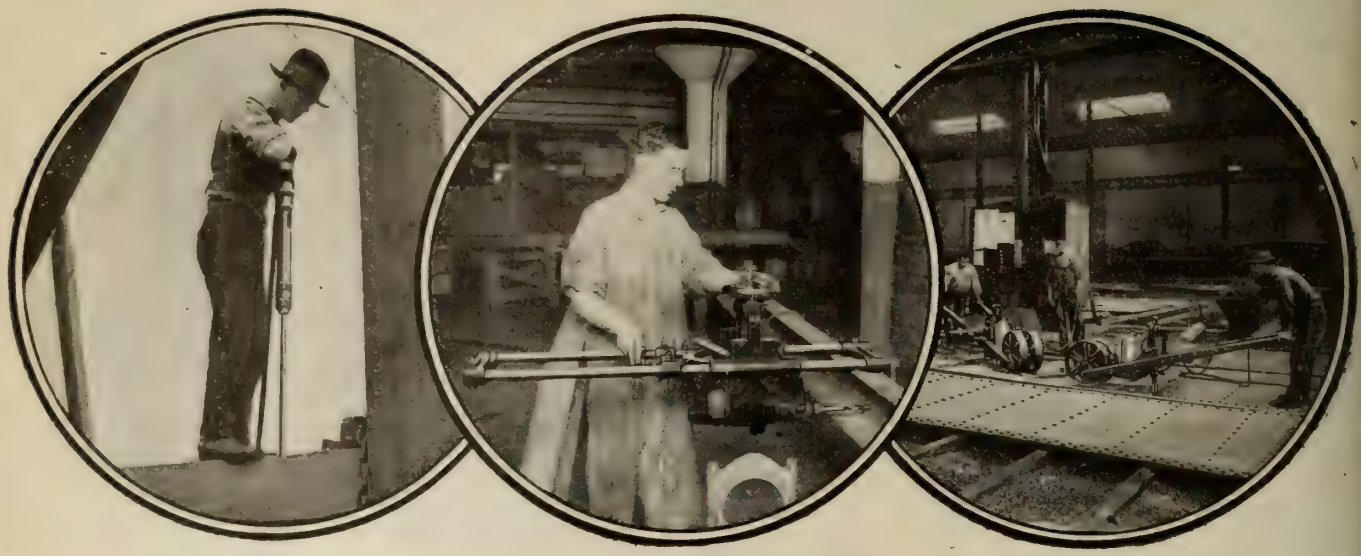


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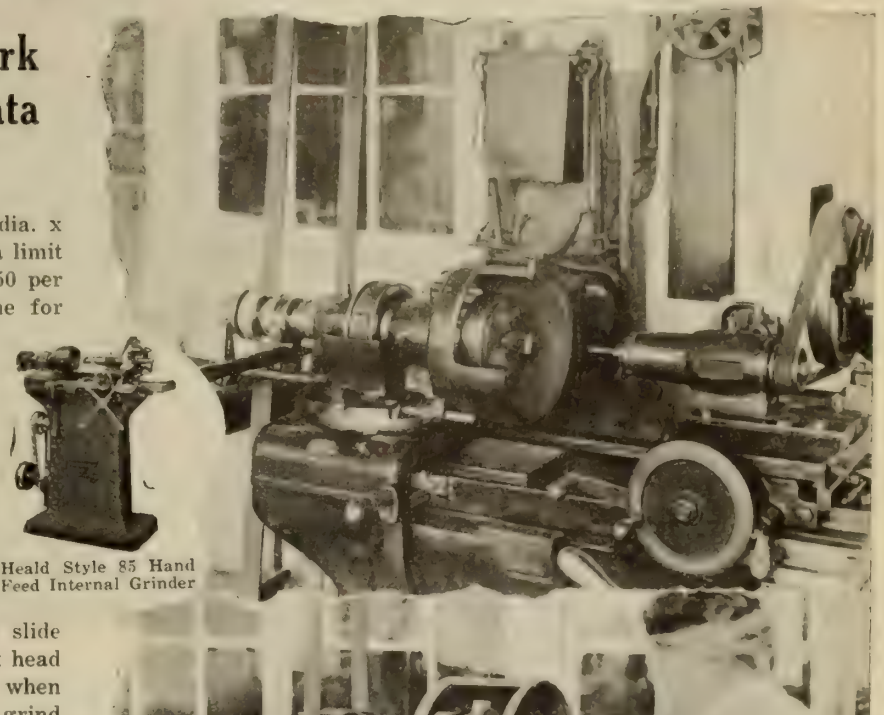
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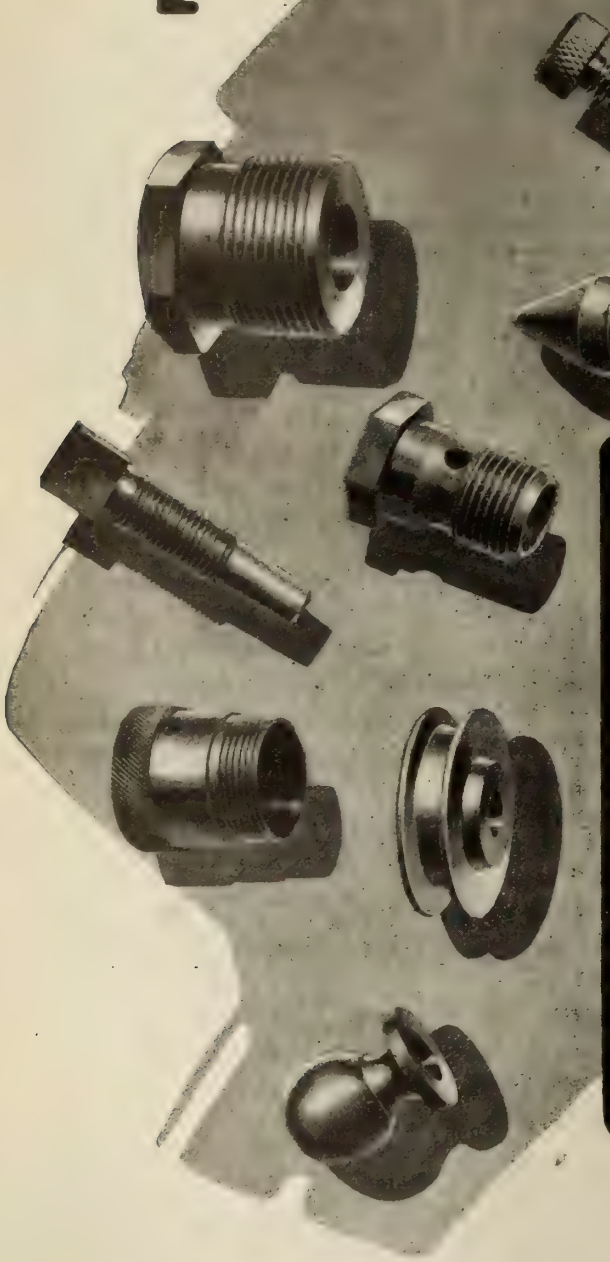
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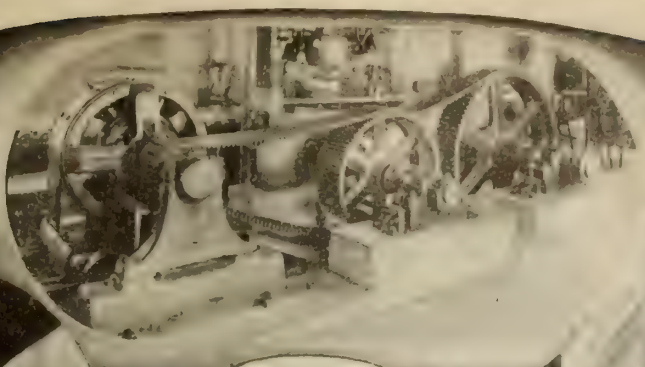
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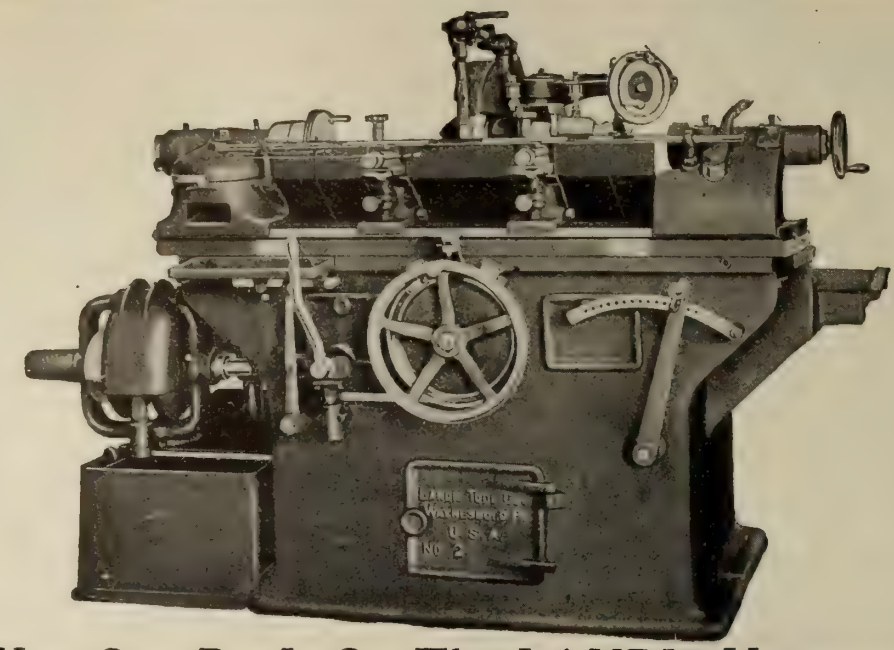
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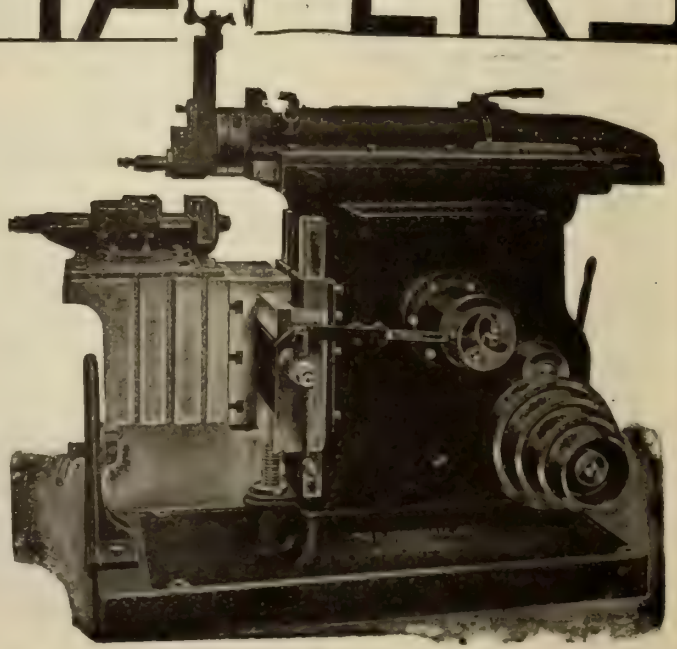
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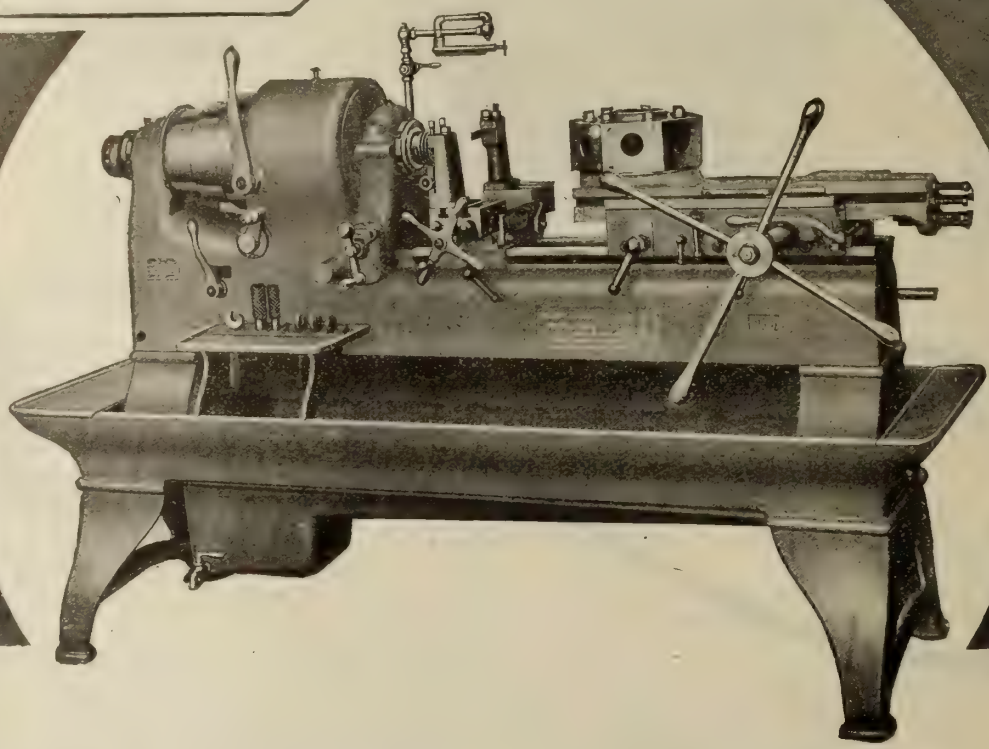
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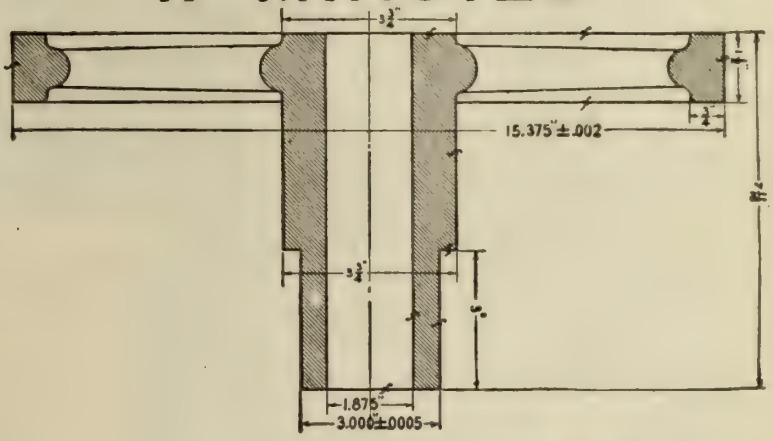
## Spur Gear Blank of Cast Iron

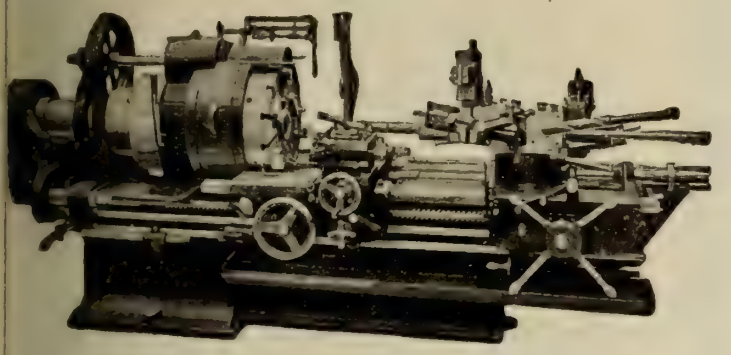
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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

VOL. XXV. No. 3 January 20, 1921

# The Problem of Producing a Geneva Gear

## A Tale That Will Make You Smile. It's a Mixture of Invention and Mechanics, and Brings Into Play a Scotsman, a One-legged Man, a Hebrew, Yes—and Even a Minister.

By DONALD A. HAMPSON

IN our October 26th issue we published an article dealing with the problem of machining the Geneva motion shown at Fig. 1. This problem has evidently got our readers thinking and here is how one of them would machine the piece.

The question of the Geneva gear is one that I had to answer for myself on just the same kind of a job five or six years ago. The gear for that particular purpose brings to mind a series of events such as everyone experiences when taking in model and experimental work. Your clients appear out of the thin air —their proposition or idea is as different from the previous one brought in as day is from night—you run the risk of losing some money before you get through with them, but you add **immensely** to your experience, chiefly along the line of your changed view of human nature.

When Sandy Moritz came in and wanted to hire the use of a lathe, we refused him. We always do so, and besides this gentleman was a total stranger to us. Later, he brought in several cylindrical grinding jobs which he insisted on seeing done (and even assisted in doing, when the foreman wasn't looking). All these little things, however, were laid to his Hebrew nature.

Some months later, a one-legged stranger appeared and wanted to speak to me confidentially. I told him to "shoot" right where he was, for I was able to keep any secrets he wished to disclose, but I would not entertain any proposition that was shady. Well, in a soft, cultivated voice he told me that he wished to get some work done on a mechanism that had to be guarded very jealously from outsiders who might steal the idea. He also told me that he was a retired minister, that in his work as a lecturer he had noted the ripe field for this device, which when perfected would make him independent, and the manufacturer whom they selected secure against any lack of work. I had heard of that kind of bunk before, though I was too polite to say so.

Another lapse of a month and my ministerial friend reappeared, bringing a brother minister, Dr. Morse of a local church, and his son, an insurance agent, an echo or repeater of everything the elder Morse said. They had a small package between them which the doctor, in his most unctuous voice, told me contained their machine which they would show me in private. Said machine, on being exposed, was found to be the half-finished model of a moving picture projecting machine, but the model so far had included nothing more than the film moving parts. It was explained that this machine was so much simpler and lighter than the Pathescope and other commercial types, and the films could be handled so much more readily that it would find instant sale among churches, lecturers, and societies who could not afford to buy the expensive machines that required a skilled operator.

I noted that the machine was "open side," a light plate of cast iron into which the roller and gear studs were set. This was one of the features making for easy loading. There was also an absence of toothed feeding wheels for the film. The scheme was to feed by passing the film between two friction rollers, one of which was driven by a curious looking Geneva gear. This Geneva was a "special design of their Mr. Moritz" and was to give the film a faster speed with the same dwell. I dropped the remark that I had seen an improved design of just such a gear in a recent number of a trade paper, but my friends said I must be mistaken because Mr. Moritz had originated this Geneva himself, working on it for the past eight months.

It seemed that Mr. Moritz was their engineer, engaged for the purpose of developing the picture machine, though when this was afterwards mentioned to him alone, he claimed to be an equal partner in the enterprise through his having conceived the whole thing, the others simply putting up the money. My ministerial visitors explained that they were tired of fooling along with Sandy. Frankly, they thought he was stringing the job along as a means of earning a soft living—and they wanted our place to finish the machine in a first-class manner.

If Moritz came along and wanted work done that we deemed advisable, we were to do it, but otherwise to follow instructions, and our best judgment.

A little thought applied to the design proved that it was too light for the scheme, with its feed rollers supported on studs and depending on the grip of the rollers to apply a positive movement

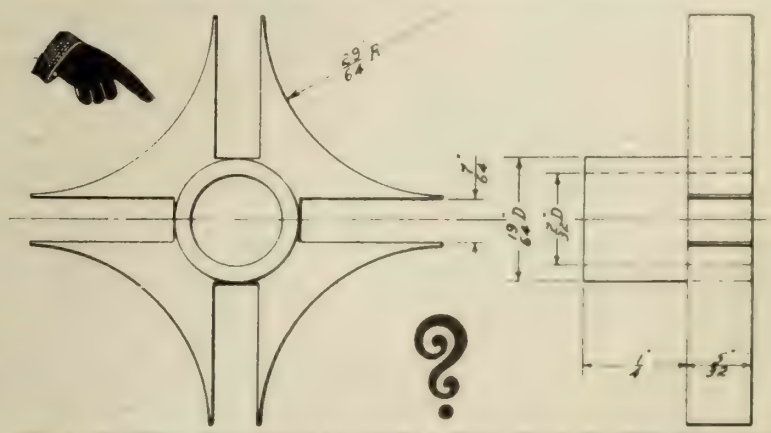
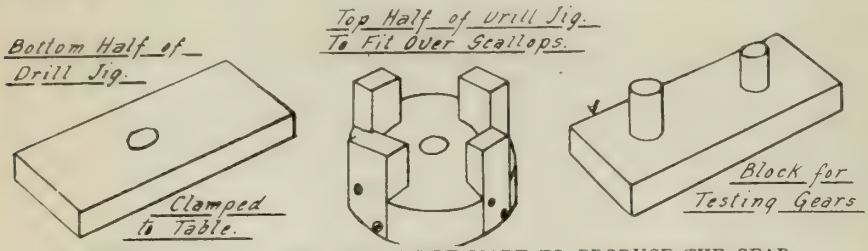


FIG. 1 SHOWING THE ORIGINAL GENEVA GEAR THAT STARTED THE TALK

to the film. We were forced to tell the trio this, but evidently they considered themselves better qualified on this point, for our objections were overruled, so we went ahead with the work. It turned out to be one of those jobs where there are loose fits and improper materials and inadequate design, where you re-make and tinker and patch, only to have a piece of junk on your hands in the end. But anyway, we made a number of demonstrations, each of which proved that the whole thing would have to be constructed along different lines if it were ever to be a success. The friction feed, the open side, and the hand-made Geneva all failed miserably. Even the clerical gentlemen could see this.



HERE ARE THE PARTS THAT WERE MADE TO PRODUCE THE GEAR.

### The Task of Re-designing

In the end, we were allowed to re-design the machine on a more practical basis. One of the men made a perspective of the proposed machine so our customers could "see" how it would actually appear. This pleased so much that we were commissioned to go ahead with some of the parts for a hundred machines, among the parts being the Geneva gears, and some pins of odd size drill rod. That drill rod is around yet. The driven member of the Geneva pair was slightly larger than the one illustrated in Canadian Machinery.

We had no trouble in producing smooth, close working parts for this purpose. We cut pieces of machinery steel five inches long, centered them carefully, turned all the shoulders or necks and turned the flange parts to the outside diameter of the points. Then we milled the slots and rough milled the scallops; the slots are the least important part of the gear and a slight inaccuracy only results in an interference with the driving roller, easily remedied by filing the mouth of the slot. Finally, with a sharp cutter and a fine feed, the half-rounds were finished to size, paying careful attention to the condition of the centers of the piece being milled.

The shaft hole in the gear was made in a drill press. A simple jig located the hole concentric with the half-rounds, with the blank lying in a cast-iron block on the table of a sensitive drill press. We concluded that this would be a more satisfactory and accurate method of making the holes in single or double blanks and cutting the latter on arbors—and we were very well satisfied with our method.

For the milling, we bought a special radius cutter from one of the well-known manufacturers of such tools. Our method of trying the work was to micrometer the pieces during the milling operation and to test the two members of a pair on a simple two-stud fixture such as is used for spur gear running tests. The operations throughout were simple, as we had planned, and we rejected but a small percentage of the pieces. We tried turning the parts out of square stock to save some milling but we found that the damage to center holes in turning affected the accuracy of the milling, so we stuck to round stock with its even cut in the lathe.

Our experience with moving picture machines might have been greatly broadened from that time if we hadn't in some way offended the promoters. It came about through Moritz's borrowing the original machine, presumably to take to their own little workshop for experimental tests. We hadn't been told not to let him have the run of things and so we let the machine go, but we had a suspicion that Sandy was trying to make a getaway and we took the trouble to phone Dr. Morse, who swore under his breath and made a bee-line for the railroad station, catching Sandy just in time. Following that episode, the former made for our place and gave us a most wonderful dressing down, polished and embellished by years of hell-fire ranting in the pulpit. We laughed.

A few days later on some pretext, they took the Geneva gears away. They already had the design of the new machine in their possession. Still later, the one-legged dominie showed up and asked for the focusing lens that we had, said lens having been brought around for measuring purposes—our design of machine having included this unit, the shutter, tripod, lights, and tilting arrangements. As we had had the lens only an hour or two, this demand struck us as funny—not so the good man, who raved most unbecomingly and muttered threats of police as he went off. Our pay? We got part of it, but the trio insisted that they should not pay for the "poor work' upon the original machine—and they didn't. We had no redress, because you can't collect much from a one-legged dominie, a minister of a city church, an insurance agent, and a Jew, all of whom are out to get rich without working—so when this combination appears in your machine shop with an invention to be developed, either insist on a drawing account at the bank or plead more work than you can handle. Dr. Morse has given up the pulpit and neighbors of the one-legged man say they are now on easy street. Sandy has permanently disappeared, from which we conclude that we gave them a fair start in business after all.

## CAUSES OF CORROSION

"To my mind," said Dr. O. F. Hudson, of the Admiralty research laboratory, at a recent meeting of the Society of Chemical Industry, in Birmingham, "electrochemical is not the sole cause of corrosion in the case of copper and brass, and that in most cases, in neutral or slightly alkaline solutions, that action was relatively unimportant, the greater part of corrosive attack in these cases being due to direct chemical action. In acid liquids, and industrial waters which had a distinctly acid reaction, electrochemical action might play a more important part, but in such cases the metal e.g., condenser tubes, failed by general thinning rather than by pitting or localized attack, which was in other cases generally the chief trouble. Electrolytic protection processes probably owed their efficiency largely to the production and maintenance of a uniform resistant scale of calcium carbonate. There was little hope of finding an alloy which would resist corrosion under all conditions.

## DRILLING IRREGULAR SHAPED HOLES

The accuracy which has been attained in the drilling of square holes has led inventors to proceed still further. It is now claimed that a Hungarian named Bartholomius has a machine that is said to be free from the defects of earlier types, and is automatic in its action.

It can be attached to any boring machine, lathe, etc., without regard to the type or method of supporting of the particular machine. The device is, in fact, an independent and self-contained tool. The angular holes are drilled very accurately, as the drill is guided over the whole of its length, and the work-piece and the clamping device are in immediate contact with the guides. At the same time that round holes are being drilled, the new type of boring tool automatically drills hexagonal and polygonal holes. To obtain different sized holes it is only necessary to change the drill used. From the description we imagine it to be somewhat similar to those at present on our own market.

## WELDING SOCIETY

The next meeting of the Canadian Welding Society will be held on Wednesday evening, January 26th, 1921, at p.m., in the offices of L'Air Liquide Society, Suite No. 451, Confederation Life Building, Toronto. The entrance to this building is at 12 Richmond St. East and all interested are requested to be on hand.

# An Interesting Industrial Plant in Quebec

By J. H. RODGERS

THE new plant of the National Farming Machinery, Ltd., Montmagny, Quebec, contains many features of interest. This plant is engaged in the manufacture of all kinds of agricultural machinery and farming implements. A big feature in connection with this plant is the fact that not only will they make the implements, but they will produce the material used for the same, as far as possible.

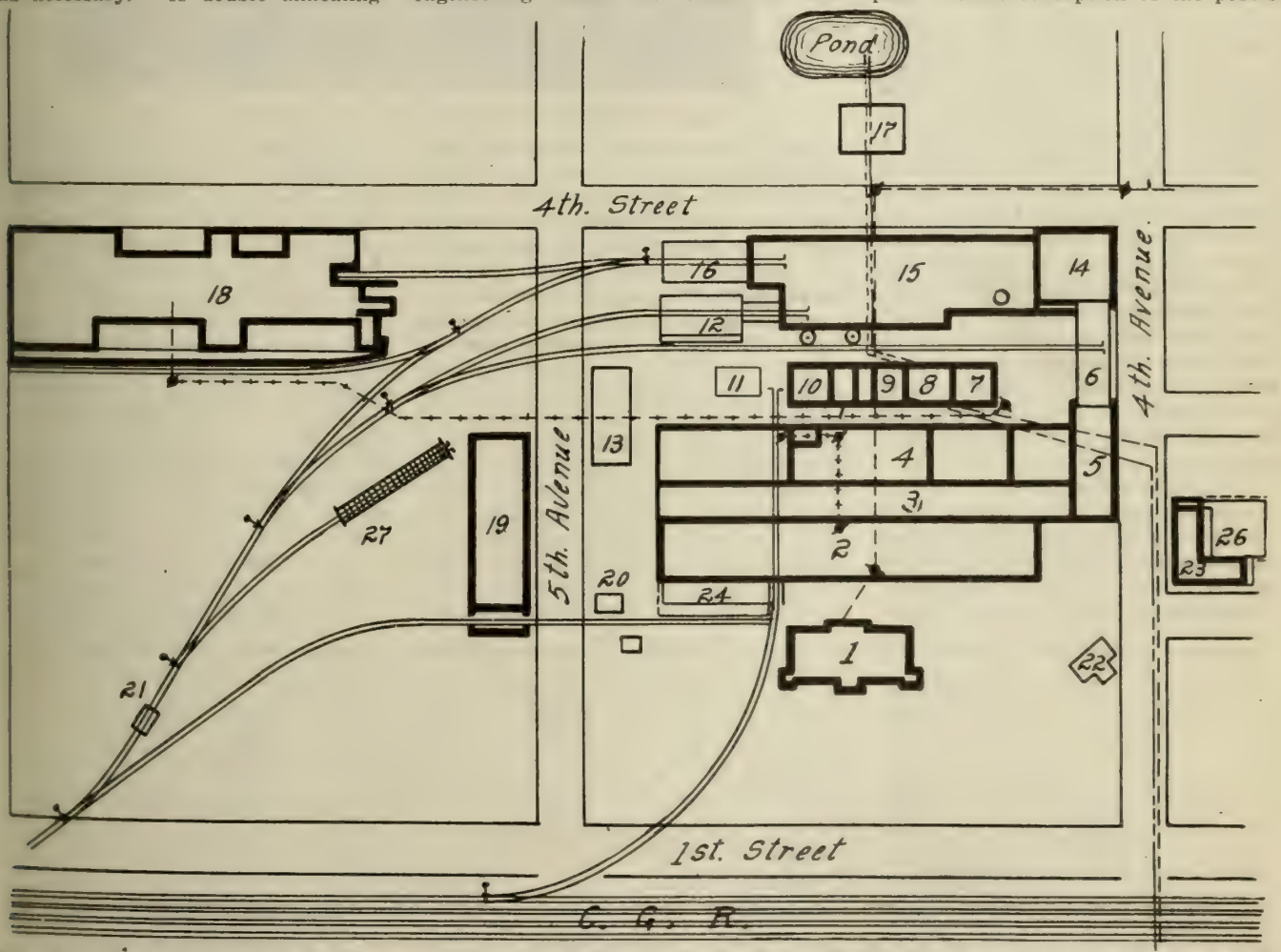
With this idea in mind they have installed a complete modern rolling mill for the necessary steel bars and shapes used in their plant.

A general plan of the entire works is shown, this view illustrates the layout of the property and the different buildings. At the rear is the foundry, 342 feet long by 115 feet wide, containing two basic open hearth steel furnaces, each one capable of producing 1,500 tons of steel per month. Foundations are also laid for a third furnace if found necessary. A double annealing oven, 20 x 10 x 10 feet, oil fired, is located alongside the furnaces to provide for the annealing of large castings. In this foundry all the steel rolls required for the mills will be cast. In addition to the steel furnaces there is a one-ton Bessemer converter, and two 5-ton grey iron cupolas. An extension is being provided, approximately 100 x 100 feet, to increase the moulding floor capacity of the cast iron section. Three overhead travelling cranes, one 50-ton and two 25-ton capacity operate in this department. The foundry is fully equipped with moulding machines, and all the latest and modern appliances for rapid and efficient production.

### Administration Building

The administration building is a two-storey brick and concrete structure, situated at the front of the property and facing the main line of the Canadian National Railways. All executive and engineering offices are located in this building, and likewise adequate show rooms for the wide variety of product manufactured and sold by this company. Immediately in the rear of the general offices is the machine shop and gas engine department. This building, constructed of brick and reinforced concrete, has a total length of 450 feet and a width of 110 feet, the center portion for the complete length being designed for crane runways. A section of the machine shop, 120 feet by 28 feet, is devoted to tool room work, die sinking and metal pattern making. Every modern facility in machinery and equipment has been provided, both in the tool room and the machine shop, to augment the rapid and accurate production of every variety of work passing through the many departments.

It is interesting to note that no small number of the larger machines, used on special parts of agricultural machines, were designed and constructed at this plant. Some conception of the possibil-




This view shows the general layout of the plant. Following are the key numbers to the various buildings. 1. Administration; 2. Machine shop gas engine department; 3. Axe, pick, hammer and storage; 4. Blacksmiths' Shop; 5. Stores; 6. Boiler Shop; 7. Power House; 8. Engine Room; 9 Experimental Dept.; 10. Pattern Making and Storage; 11. Fuel Oil Storage; 12. Foundry Sand Storage; 13. Stores; 14. Rumblers; 15. Foundry for Steel, Cast Iron, Brass and Aluminum; 16. Foundry Stores; 17. Stables; 18. Rolling Mill; 19. General Stores; 20. Lumber Yard Office; 21. Track Sales; 22. Watchman's Office; 23. Printing Department; 24. Gas Engine Testing Dept.; 25. Pumping Station; 26. Machine Storage; 27. Coal Trestle.

ities of the plant may be had from the fact that the 12-inch and the 9-inch mills are being built entirely in the shop, the foundry supplying the necessary castings and the machine shop doing the finishing. To permit the work of building the mills quickly, and at a future date facilitate the repair and maintenance, a new design of mill housing has been developed by the engineer of the plant, and one of the views shows how the open side planer handles four or more of these pieces at one setting.

### Gasoline Engine Department

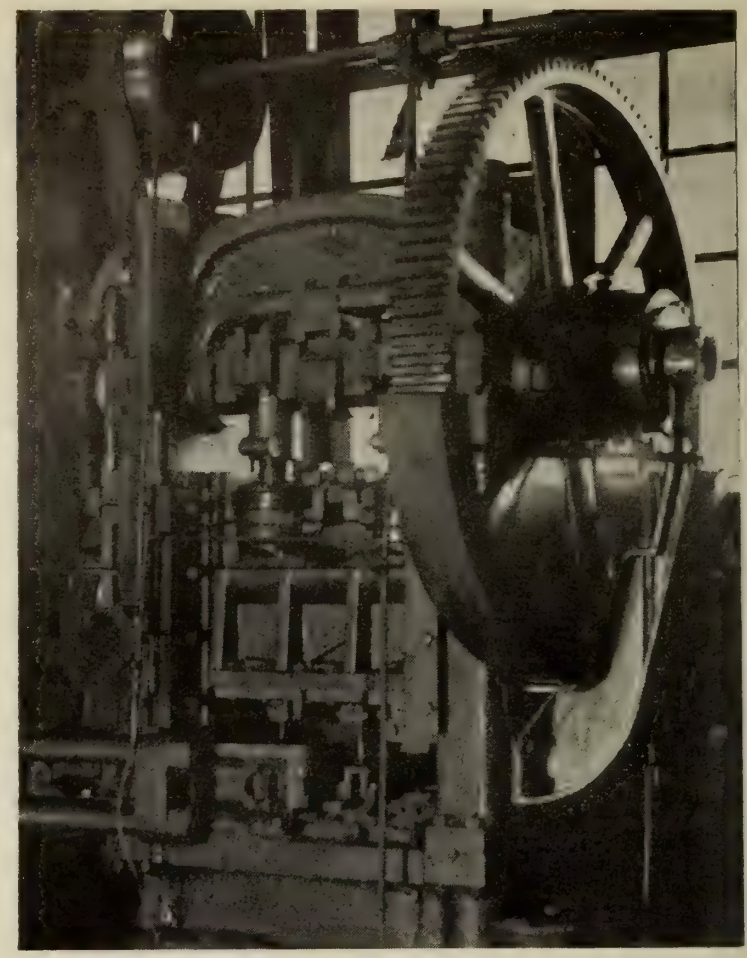
The gasoline engine department, located in one end of the general machine shop, is 133 feet by 110 feet, and the greater number of the machines are of special character particularly adapted to the duties they are to perform. The design and the development of these machines were carried out by the plant engineers. The purpose has been to provide equipment that will handle the product quickly and economically, on mass production, for the sizes of engines mostly in demand by the farming community throughout Canada, these sizes ranging from 1½ to 12 H. P. All engines are subjected to endurance tests before leaving the factory, a special building being devoted to this work. Adjoining this department is the paint section where the engines are given the final finishing touches before being crated and shipped. A railroad siding runs parallel to the shipping platform.

Immediately adjoining, and parallel to the machine shop, is the new building just completed to house the axe, plow tempering, grinding and finishing departments, together with the smith shop and the general stores. In common with other departments the equipment of the axe shop is of special design, developed by the plant engineers, and, in every way, the work produced has been highly efficient and economically manufactured. The large press shown herewith, for forming the eye of the axe, is of special interest.

### The Rolling Mill

As already stated the product from the mill will provide all the necessary bar and structural material used in connection with the machinery and equipment made in the plant. The mill building, which is approximately 450 feet long by 126 feet wide, is of steel, brick and reinforced concrete construction, with a crane operating throughout its entire length, thus facilitating the handling of the material, and the placing and removal of the different rolls, and likewise the maintenance and repairs to all equipment. For breaking down the ingots a 20-inch three-roll high train is installed, operated by a 1,000 H.P. D.C. motor, driving through double helical reducing gears. The 12-inch mill, and the 9-inch Belgian mill, are operated by D.C. motors of 500 and 350 H.P. respectively. Each mill is supplied by the necessary furnaces, hot beds and finishing racks.

The foundry is casting 8-inch ingots of special steel, which are broken down in the 20-inch mill and afterwards rolled to the necessary section on the smaller train of rolls. From the mill the finished steel is placed in the steel storage department, located at the end of the main forge, being taken from there as required, cut and punched in the press department, forged and necessary hot work put on in the main forge, passing from there to the wheel and erecting section to be assembled, and then transferred, by means of a continuous elevator, to a two-storey paint department, constructed of reinforced concrete, 100 feet by 100 feet approximate dimensions. The warehouse, 225 feet by 75 feet, two storeys, adjoining the painting department.

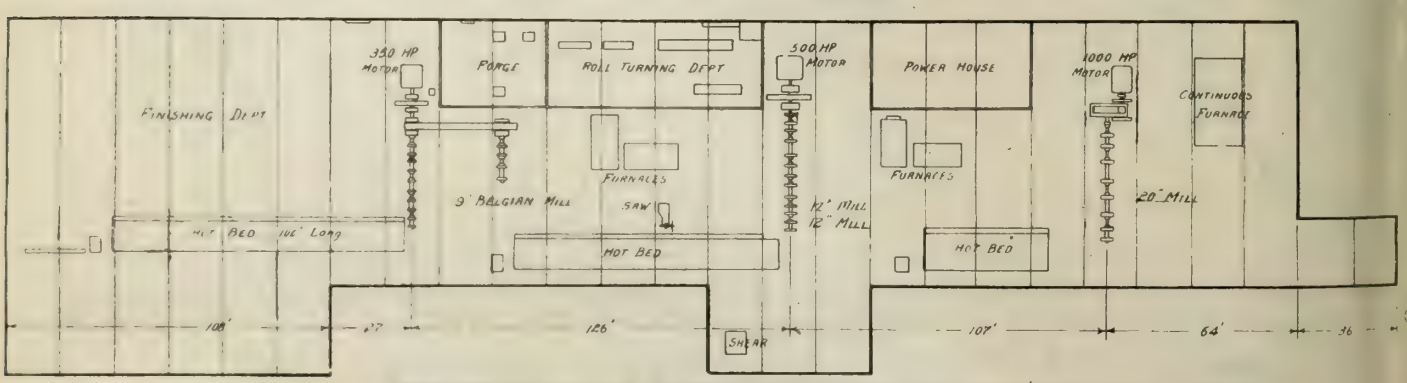


SPECIAL PRESS USED FOR PUTTING EYE IN AXES.

### Boiler Department

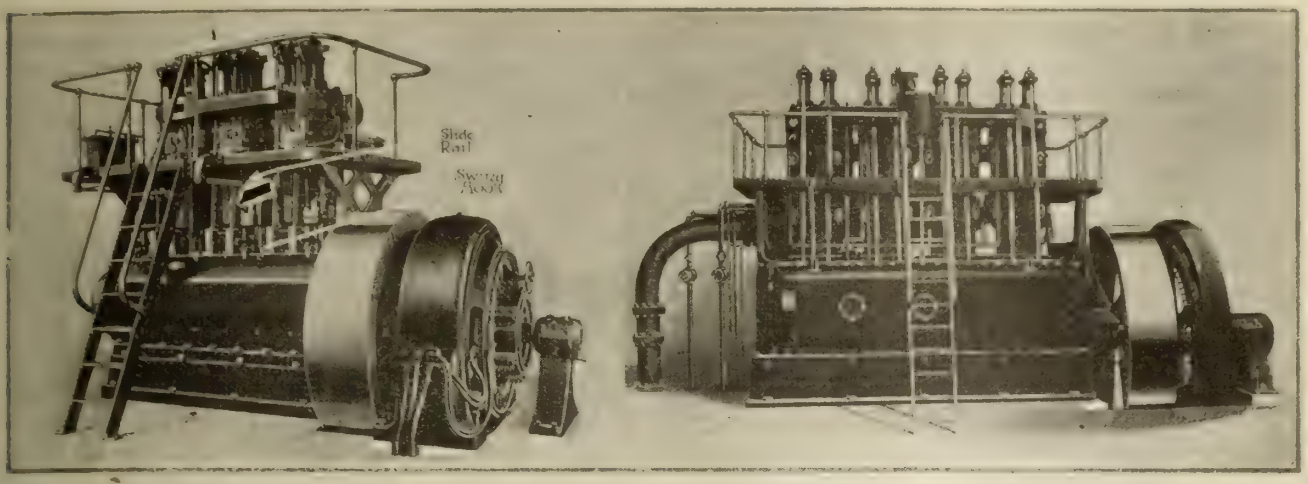
The boiler making department, now

(Continued on page 40)




INTERESTING DIAGRAM SHOWING THE ROLLING MILL LAYOUT.

# A New Development of the Heavy Oil Engine



*By F. A. McLean, Canadian Ingersoll-Rand Co.*

FOR power plant service the advantages obtainable from the use of oil engines are briefly: simplification of equipment, a reduction in labor charges, the elimination of standby losses, a saving of space—due to the absence of boilers and accessory equipment—and a simpler and more convenient fuelling problem, representing in their entirety a much lower cost for power output.

Plant owners and engineers have paid close attention to the story of oil engine development, which within the last few years has been one of gradual transition from the Stuart or Diesel type, with its well-known high fuel economy, but poor flexibility in starting and stopping, and necessity for operating on high temperatures and at high pressures, with consequent trouble, due to the inability of the metals obtainable to stand the severity of the service.

Following this came the development of the so-called Semi-Diesel type, which eliminated some of the complications of the earlier type, but introduced others that are equally undesirable. In comparison with the Diesel type it has a much lower operating economy; consumes more lubricating oil; is difficult to start, and requires the use of a blow torch for the preliminary heating of a hot plate, cap or bulb, for ignition purposes.

Numerous attempts have been made by different designers to overcome the objectionable features of both the Diesel and the Semi-Diesel types and to develop a low compression engine possessing high operating economy.

The Ingersoll-Rand Company along with others entered this field, made an extensive study of heavy oil engines and, as a result of their researches and experiments, recently placed on the market a line of stationary and marine oil engines of a distinctly new type.

These new engines are different from any other oil engine on the market, being neither of the Diesel nor Semi-Diesel type, although it is asserted that they possess the advantages of each type with none of their disadvantages. They are known as the Ingersoll-Rand, Price Rathbun type, heavy oil engines, and operate with highest economy on a new principle, which permits their simplification to a remarkable degree. Engineers who are familiar with the extreme simplicity of the ordinary gas engine, can well appreciate what has been done in this line.

In the past, heavy oil engines of high economy have operated on cylinder compressions of between 500 and 600 pounds air pressures of approximately 1,000 pounds per square inch being used for the injection of fuel, thus requiring the use of a two or three stage air compressor attached to the engine itself, or separately driven. In either case the power required to operate them amounted to at least 10 per cent. of the total power output and they required considerable attention on the part of the operating force. All this troublesome and inefficient air injection equipment has been eliminated in this new engine, and it has demonstrated some things heretofore considered impossible.

In a rigid 72-hour test conducted a few months ago a three-cylinder engine built for central station service in Cuba showed at full load an average fuel consumption of 0.425 pounds of fuel per brake horse-power hour, with a compression pressure of less than 200 lbs. per square inch. At three-quarters load the average fuel consumption was 0.45 lbs. and at half load 0.51 lbs., the oil used being of 28° Baume. In considering the fuel economy of this engine (approximately 0.4 lbs. per brake horse-power hour), it is interesting to remember that in marine practice it has been customary to give fuel economies on the basis of indicated horse-power, and inasmuch as the mechanical efficiency of a Diesel engine is about 75 per cent., 0.4 of a pound per brake horse-power is equivalent to 0.30 lbs. per indicated horse-power hour for the Diesel engine.

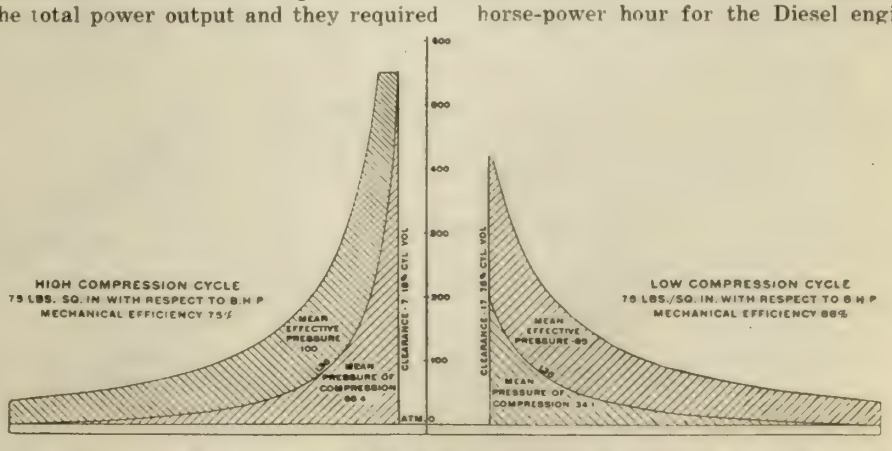



FIG. 1 DIAGRAM ILLUSTRATING MARKED DIFFERENCE BETWEEN HIGH AND LOW COMPRESSION CYCLE.

In other words, the Diesel engine would have to operate at 0.30 lbs. per indicated horse-power hour to equal the figures given for the new engine.

### Cycle of Operation

The engine operates on the four-stroke cycle, with low compression (approximately 200 lbs. per square inch), with direct fuel, or as it is sometimes termed, solid fuel injection, and is absolutely independent of hot tubes, bulbs, caps and starting torches, nor is it a surface ignition engine.

The inlet valve is opened mechanically and the piston travels downwards on the suction stroke, drawing in a full charge of pure air. The intake valve is closed by its spring and the piston returns, forcing the air from the cylinder into the combustion chamber and compressing it to a pressure of approximately 200 pounds per square inch.

Injection of fuel starts near the end of the compression stroke and is completed before the piston reaches the end of its travel. Perfect working stroke combustion at constant volume occurs almost exactly at dead centre, the pressure rises from 200 to approximately 400 lbs. and the piston moves downward on the working stroke.

Near the end of the working stroke the exhaust valve is opened mechanically, the pressure drops, and the piston expels the burnt charge on its return.

### Various Cycles

The cycle of this new P. R. engine is closely related to that of the ordinary four-cycle or automobile engine, and the marked difference between this cycle and that of engines of the high compression type is clearly indicated by Figure 1, while comparative indicator cards for the Diesel, the Ingersoll-Rand, and a Corliss engine are shown in Figure 2. It will be noted that the cycle of the new engine falls in between the Diesel and Corliss engine cycle. The ratio between the amount of work delivered by the engine and the amount of work done in the engine cylinder during the compression and expansion strokes is 35 per cent. for the Diesel, 49 per cent. for the Ingersoll-Rand, and 75 per cent. for the steam engine. This ratio may be called "The co-efficient of durability" or "power factor" in the same sense as the expression is used in electrical computations. An alternator which has a power factor of 75 per cent. is performing within itself 100 units of power, of which 75 units are available for use. The life of an engine, the cost of lubricating oil, repairs and attendance required is indicated by this power factor or "co-efficient of durability." In other words we have the Corliss with a high power factor of 75 per cent. lasting for very long periods and requiring very little lubricant, repairs or attention. Next comes the new engine with its power factor of 49 per cent. indicating that it will last 40 per cent. longer and require correspondingly less lubricant and attention than the other, with its 35 per cent. power factor.

### Advantages of Low Compression Cycle

In the Ingersoll-Rand cycle, as already mentioned, the compression is carried to approximately 200 lbs., when combustion at constant volume occurs, raising the pressure to about 400 lbs., at which point almost perfect adiabatic expansion begins. In the high compression type the pressure is carried about 500 lbs. and oil is admitted gradually, so as to produce combustion at constant pressure until the piston has travelled a portion of its stroke, from which point expansion begins. Thus there are four points of particular advantage in the low compression cycle.

First, a lower ignition temperature is required, due to the elimination of the refrigeration action of the injection of air in the Diesel engine, as it expands from 1,000 pounds per square inch down to the cylinder compression pressure. Second, the engine we are discussing does not require an air compressor for fuel injection, friction losses are lower, and—due to its higher mechanical efficiency—the mean effective pressure which is proportional to the net work developed in the engine cylinder for the same brake horse-power of engine need only be 85 per cent. of that of the high compression cycle.

The mean pressure of compression which is proportional to the work done in the engine cylinder during the compression stroke is approximately half that of the high compression cycle, and although it is true that this work is not lost, but returned to the piston during the expansion stroke, nevertheless the performance of this extra work of compression by the piston and the return to the latter of an equal amount of excess work during the expansion strike represents considerably more wear on the piston, cylinder and bearings. For equal brake horse-power the low compression cycle subjects the engine to about 30 per cent. less wear. Parts of equal dimensions will therefore wear considerably longer and require much less attention.

As previously mentioned, the new engine is free from hot caps, tubes, bulbs, uncooled apron castings, etc., an electric igniter being used for the first few ignitions when "starting cold." The absence of hot caps or hot surfaces of any kind is of great advantage in eliminating overheating troubles at full load and underheating troubles at light loads. As there are no highly heated parts, a full charge of air can be drawn in, instead of heated, expanded, and reduced in volume. This is one of the ways in which the higher power attained with this engine for a given piston displacement may be accounted for. The splitting of hot caps is eliminated, the absence of starting torches reduces the fire hazard, and tends to make a cleaner and cooler engine room. The engine being comparatively cool at all points, the operator is enabled to attend to it with greater ease.

### Fuel Supply and Injection

A pump driven from the engine elevates the oil from the main supply to a filter of special construction located at one end of the platform from which the oil is fed to the fuel injection pumps by gravity. The fuel injection pumps, one for each cylinder, are mounted on the housing near the cylinders and operated by cams from the side shaft, which also drives the centrifugal governor used to control the amount of fuel injected and vary the intake of air so as to maintain

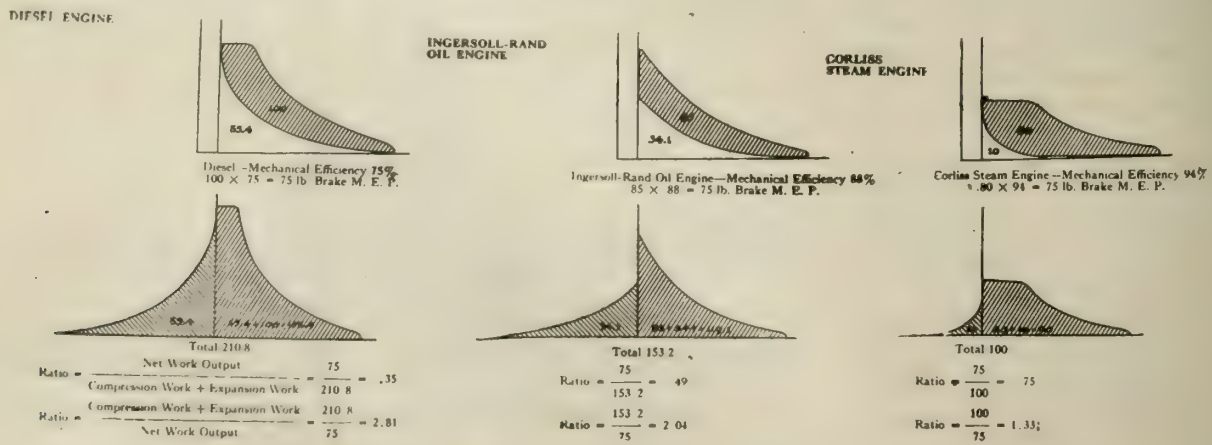



FIG. 2—CHARACTERISTICS OF DIESEL, INGERSOLL-RAND AND CORLISS ENGINE CYCLES COMPARED.

the cylinder temperature under various loads.

Fuel is injected by the fuel pumps without the use of air injection equipment and the economy is said to be just as high, or even higher, than that of the most complicated air injection engine.

The question that will naturally be asked is this: How does the engine operate without injection air? The answer is simple: The fuel injection system used reduces the fuel to such extremely small particles that a tremendous amount of oil surface is exposed to the action of the increasing temperature obtained during the latter part of the compression stroke. The fuel injection system thus pulverizes the fuel to a "fog cloud" and at the same time obviates the impingement of the oil upon the walls of the combustion chamber.

So perfect is the "fog cloud" formed that it has been found possible to inject the oil with the engine at rest, allow the fog cloud to dissipate and then demonstrate that the walls of the chamber were perfectly dry. The fuel sprays are located at diametrically opposite points on the combustion chamber, so that they are not only balanced against each other, but the resulting motion of the "fog cloud" after impact is opposed by the air coming up through the passage from the cylinder to the combustion chamber, as will be noted by referring to Figure 3. Injection of the fuel begins about 40 degrees before compression dead centre and ends about 10 degrees before compression dead centre.

### High Fuel Economy

A statement that one sometimes hears from those who do not realize that economy and dependability are intimately related is that, since the fuel cost of an oil engine is so low, a gain in economy is a small factor, dependability being the principal requisite. Every heat unit in the fuel, however, that is not transformed into useful work must be dissipated in some way. Either through the walls of the combustion chamber or through the cylinder walls to the water in the jacket, or else it is carried past the exhaust valve and its seat during exhaust, or it may disappear as friction in the bearings or cylinders with consequent bad effect on the upkeep and durability of the engine.

If the engine is inefficient, not only is a large percentage of useful fuel wasted, but in getting rid of the waste heat more or less rapid deterioration results. The waste oil must be added to the fuel bill, or paid for in additional lubricating oil required to preserve the oil film on the overheated piston and cylinder walls; or else paid for in the increased amount of cooling water required to dissipate the waste heat and ultimately in engine upkeep. High fuel economy means, therefore, low fuel cost, low lubrication cost, low cost of cooling water, lower cost of repairs and longer engine life.

It is perhaps needless to say that when an oil engine operates at such high economy as does the type described, no carbon will be deposited in the cylinder and that the exhaust will be practically colorless. The cylinders of these engines after long periods of continuous operation are said to look as clean and bright inside as do the cylinders of a high-grade steam engine, and the piston and rings also remain bright and free.

### General Description

The Ingersoll-Rand "P.R." stationary oil engine is of the vertical multi-cylinder, single acting, four cycle type and is offered for general power plant service for either belt or direct connection to alternators, direct current generators, or other classes of machinery. It is said to be especially suitable for driving alternating current generators in parallel and is built at present in seven sizes, with capacities of 105 to 480 brake horse-power. It consists essentially of a heavy base or bed plate, to which is bolted a housing carrying the cylinders with their heads, manifolds and fuel injection pumps.

### Base and Housing

The bed plate is of heavy construction and simple design, cast so as to form a reservoir for the lubricating system. Ribs and broad flanges give rigidity and ample bearing on the foundation. The crank shaft bearing pedestals are also cast integral with the base, as can be noted by referring to Figure 4. The housing which encloses the driving parts and forms the top half of the oil reservoir is a strong ribbed casting provided with ample means for gaining access to the interior. Doors placed at the back directly opposite the crank throws permit easy inspection or adjustment of the driving parts, while a single cover bolted to the front of the engine and supported on swinging hooks, trolleys and slide rails suspended from the platform, permits access to the side shaft, governor, eccentrics, etc. This arrangement is shown in Figure 5. Working stresses in the housing are eliminated by the use of stay bolts or tie rods, which transmit the working stresses from the top of the housing to the bed plate.

### Main Bearings

Four bearings are used on the three cylinder engine and five on the four cylinder size, and as there is perhaps no other one feature in the design of the vertical multi-cylinder oil engine that has more to do with its mechanical upkeep, the main bearings of the engine have been designed along lines which ensure true and permanent alignment, and provide for quick and easy adjustment. As shown in Figure 4, the bear-

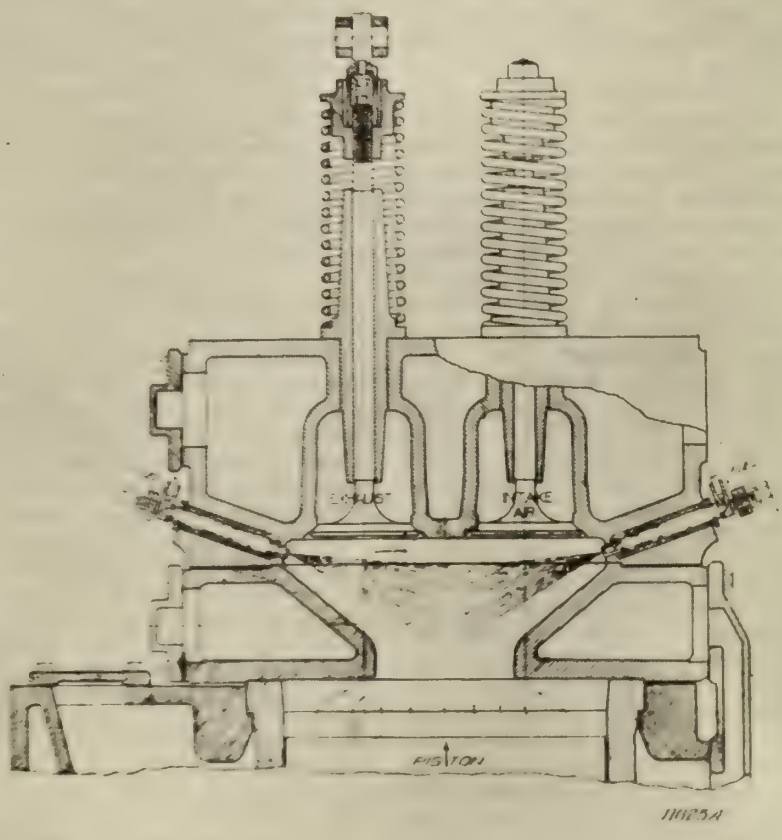



FIG. 3—CROSS SECTION OF COMBUSTION CHAMBER SHOWING LOCATION OF FUEL INJECTION NOZZLES AND MOTION OF FOG CLOUD.

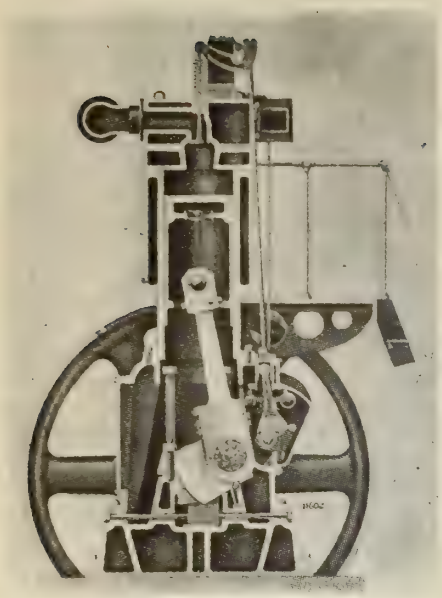


FIG. 4—CROSS SECTION OF P. R. STATIONARY OIL ENGINE.

ing caps are bolted securely to the bed plate; the bottom halves are held rigidly sidewise in the bed plate and supported on wedges which are adjustable from the outside by wedge bolts. By shifting the wedges the bottom half of each bearing may be raised until the shaft is brought into contact with the firmly held bearing caps, securing perfect alignment. The wedge bolts are then tightened and prevent further movement. By removing the wedge and bolts any one of the lower bearing caps can be taken out and renewed without disturbing the other parts of the engine.

**Cylinders and Heads**

The cylinders are semi-steel castings, well water jacketed and supplied with conveniently located clean-out holes. The cylinder and cylinder head water jackets are connected by outside manifolds in place of the more usual jacket to jacket connection. This permits the use of metal to metal joints and eliminates troublesome gaskets and packing at points of high pressure.

Cylinder heads are in two parts, the intermediate head forming the combustion chamber and carrying the compressed air starting valve and starting element and the main head, containing fuel injection, nozzles, air inlet and exhaust passages and valves.

**Pistons**

The pistons are cast from a special material designed to withstand wear and avoid warping. They are carefully finished and fitted with a "fire" ring near the top, three beveled rings held by bevelled segments and flat springs near the middle and a wiper ring in the skirt. The latter prevents an excess of crank case oil entering the cylinders, or used cylinder oil entering the crank case. Surplus lubricating oil in the cylinder is conveyed to a separator and vented to the atmosphere.

**Valves and Valve Motion**

Valves are of the poppet type located in the head, as previously mentioned and are operated through a valve motion known as the "roller path type" from eccentrics mounted on the side shaft. Timing of the valves and fuel injection is obtained from this side shaft through the medium of a pair of spur gears driven by the crank shaft and the entire valve motion and timing mechanism works smoothly and quietly.

**Crank Shaft and Connecting Rods**

A solid one-piece steel forging is used for the crankshaft, ensuring uniform strength and stiffness. The connecting rods are forged from mild steel with a solid eye and adjustable bronze box at the wrist pin and a babbitted steel half box and a babbitted steel strap bolted and keyed to the rod at the crank pin end.

**The Fly Wheel**

The flywheel is of the split hub type, massively constructed and acts as a strong and rigid coupling between the main shaft and the extension shaft, the dimensions of which vary according to the requirements of each installation. A self-aligning outboard bearing provides additional support for the extension shaft.

**Lubrication**

As previously mentioned, the bed plate and housing are arranged to form a reservoir for the automatic lubrication system. Adjustable dippers on the connecting rods dip into the oil at each revolution and drench the working parts with oil. Troughs on the inside of the housing catch part of the oil and convey it through pipes to the main bearings. In operation, oil from an elevated filter is supplied to the main bearings through open sight feed oilers, insuring a constant supply while the engine is running. The oil level in the base is adjustable and the overflow is returned to the filter by a small pump.

**Starting**

Electric ignition—by means of a small element in the combustion chamber, heated to a dull red—is employed for the first few revolutions, when the engine is absolutely cold, while compressed air from a tank under pressure of 150 pounds is admitted to each cylinder in succession by means of mechanically operated starting valves and serves to turn the engine over. As the engine is turned over fuel is injected and after a few revolutions the air and ignition are cut off and the engine continues to ignite entirely by compression. Where compressed air and electricity are not available for starting purposes they are usually provided by a small gasoline or kerosene oil-driven compresser and a belted generator.

## FARM MACHINERY PLANT

(Continued from page 36)

temporarily installed in the press shop, has been responsible for the fabrication of all the columns and roof trusses and general steel work necessary in the construction of the new buildings, as well as the steel flume pipe for the electric development power station that supplies the rolling mill with power. This hydro-electrical development consists of a concrete dam 150 feet wide by 75 feet high, 1,700 feet of wood stave pipe, 6 feet in diameter, and 360 feet of steel pipe between the dam and the power house, which is situated 20 miles from the plant. This dam was completed on the 4th of December, 1920, and it is estimated that the power station will be completed and current delivered by the middle of January. This work has been carried out by the Corporation D'Energy de Montmagny, F. L. Gagon being the consulting engineer; the latter is likewise chief engineer of this company.

The electrical current will be delivered to the rolling mill power house at 55,000 volts, there transformed down to 550 vots and then, by means of Westinghouse rotary converter to 250 D.C. for the mill motors and cranes. The electrical power for the shops is generated by the plant's own power house. Three Wickes vertical boilers are installed for this purpose, each with a rated capacity of 300 H. P. The electric equipment consists of two 500 K. W. General Electric generators, driven by Bellis and Morcom compound steam engines; one 1,000 K.V.A. rotary turbine generator made by the Allis-Chalmers Company, excited by a Westinghouse motor generator set. There is likewise one D.C. generator driven by a Curtis turbine. Connection is made from the local power plant to the rolling mill switchboard so as to provide for the operation of the mill in case a breakdown occurs along the transmission line from the hydro-electric plant.

The forge shop, containing rope, board and steam drop hammers, Bradley hammers, bulldozers, upsetters and bending machines, rake tooth furnaces and tempering tanks, is designed to handle all classes of work comprised in the agricultural line.

The wood working section of the plant's operations is at present being carried on in a building somewhat removed from the main works, but a site has been allotted near the new rolling mill for a thoroughly up-to-date wood working shop and drying kilns, and it is the intention to proceed with this structure as soon as the snow is off the ground.

A malleable iron foundry is also in course of construction which will supply all the malleable iron castings required for the various implements.

From the foregoing description it will be seen that this plant, with the exception of fuel and raw materials, is practically self contained. At a later date we intend showing interesting operations as performed on this class of machinery.

# Calculating Foundations for Machinery

## Causes of Vibration—Vibration as Affected by Degrees of Freedom—Vibration in a Body With One and Two Degrees of Freedom, and the Basis of Foundation Design

By N. W. AKIMOFF

THE WEIGHT of the Great Pyramid is approximately 5,274,000 tons, its base is 764 ft. square, and its height about 486 ft. It is built on leveled rock. The Washington Monument rests upon a bed of fine sand 2 ft. thick. The piers of Brooklyn Bridge are founded 44 ft. below the bed of the river upon a layer of sand, 2 ft. thick, which rests upon bedrock. The massive St. Isaac's Cathedral, Petrograd, is built on a swamp, and the piling has been so carefully proportioned that the exceedingly heavy doors of the cathedral swing easily, whereas the slightest lack of uniformity in settling would doubtless lock them. These well-known structures are here mentioned by way of illustrating the obvious purpose of the foundations upon which they rest. The object of such foundations is double: (1) To distribute the load in as nearly uniform a manner as possible; and (2) to secure uniformity in settling, it being a well-known fact that all heavy structures settle, some to a considerable extent, 6 to 12 in. and sometimes even more.

Just how all this applies to foundations for all sorts of machinery, and in particular to rotative machinery, is not easy to say. Indeed, the weight, say, of a large pumping engine or of a turbo-generator outfit is generally much lower per square foot of floor space occupied than the limits prescribed by municipal laws or building ordinances, and furthermore, uniformity of settling of a relatively small volume of this nature (substructure plus engine, etc.) can be secured without going to the extremes usually observed in designing footings for buildings.

What, then, would be the general governing idea in proportioning a foundation, say, for an engine of a given type? Should it be heavy or light? Should it be deep, resting on rock or sand if possible? Should it be independent of the footings of the building, or would it be desirable to tie it to the latter?

By examining the existing records we can find a great variety of rather contradictory answers to each question, but the predominant idea in the mind of the designers appears to be somewhat as follows: Since the engine is likely to vibrate, let us tie it as firmly as we can to the earth itself. The mass of the earth being practically infinite, the amplitude of the resulting vibration will probably be zero. The designer may be utterly unconscious of this reasoning, but he applies it through instinct or "horse sense" and gets results which sometimes are satisfactory and sometimes exceedingly poor.

It is especially interesting to see how the same designer, having decided to provide as solid a foundation as practical considerations allow, will often unconsciously neutralize his whole theory by such means as: (a) resting the foundation upon a layer of rubber, cork, felt, or other yielding material (see Fig. 1, A and B); (b) providing a space between the foundation of the walls of the building and filling it with sand (if the foundation is so heavy and so deep as to secure immunity from vibrations, why fear its contact with the walls?); (c) using various pads, buffers, cushions, etc. (see Fig. 1, C and D), which, if at all yielding, of course tear to the ground the very idea of solidity of the foundation of the earth.

### Causes of Vibration

A rational basis on which to work is thus seen to be lacking and it is accordingly the object of this paper to point out some definite lines along which a rational theory of substructures for engines and moving machinery can in general be built up. To begin with, it is important to realize that vibrations are caused by two distinct orders of agencies: (1) Those due to unbalance, or, more correctly, lack of running balance; and (2) those due to causes other than unbalance.

As regards unbalance, it may be said that this can be so easily corrected in the construction of machinery that all specifications should invariably call for perfect running balance at all speeds, that is, complete absence of tremor or of "periods" under all conditions. The writer feels that such a complete practical solution of this problem of balancing has been offered by him for bodies of all kinds that there is now absolutely no excuse for the manufacture of unbalanced machinery. However, there are many causes quite independent of balance, each of which is likely to result in vibrations, as for instance, "whipping" of a slender body (crankshaft, arma-

*Paper presented before American Society of Mechanical Engineers.

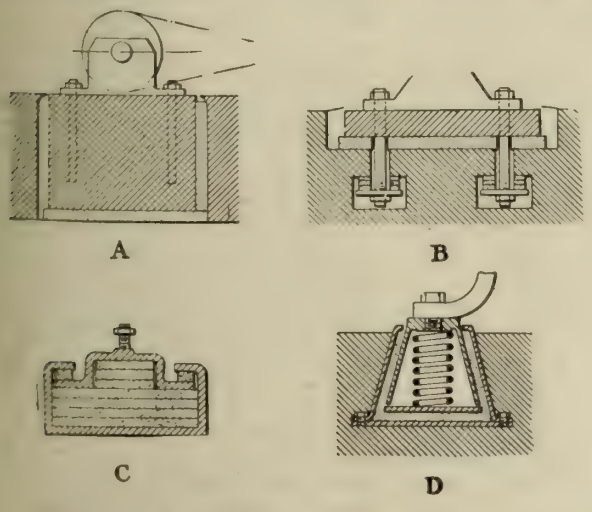



FIG. 1—SOME COMMON METHODS OF NEUTRALIZING VIBRATION.

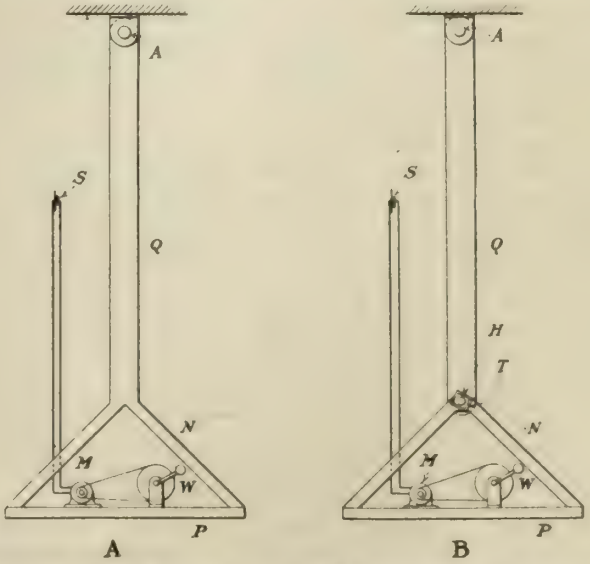



FIG. 3 A SYSTEM WITH ONE DEGREE OF FREEDOM; B SYSTEM WITH TWO DEGREES OF FREEDOM, ONE OF WHICH MAY BE SUPPRESSED.

ture, turbine rotor, etc.); water in a steam turbine; peculiarities of the reciprocating mechanism,—for instance, a 4-cylinder or an 8-cylinder V-type engine where certain forces do not cancel out and where running balance alone is not conducive to perfect results; or torsional vibrations, which under certain conditions produce an effect very similar to that of unbalance. Our problem, then, is to analyze the effect of these various causes, with the view of designing a substructure for a given machine that will be least responsive to these causes, for this is what the "relative" freedom from vibrations really means.

But whatever may be the cause of vibrations, it is safe to say that in general they are always due to forces, acting in a plane or planes, perpendicular to a certain axis, also to centrifugal couples, located in a plane, rotating about a certain line, usually the axis mentioned just above. We know from elementary mechanics that any motion of a body can be resolved into six distinctly separate motions: three along the three mutually perpendicular axes drawn through any point, within or without the body, and three about these same axes. A free body, capable of displacement in any of these six modes, is said to possess six degrees of freedom.

### Vibration as Affected by Degrees of Freedom

If the body is rigidly locked so that no displacement of any kind is possible, we say that all six degrees of freedom have been suppressed. By fixing two points in the body we have the effect of rotation about an axis, and only one degree of freedom, that is, the angular displacement about the axis, characterized by these two points. By fixing one point we suppress all bodily motion along any three axes through this point, but we still have three degrees of freedom, that is, freedom of angular displacement about any or all three axes. Fig. 2 shows a body whose point O is fixed. Such a body can have only three kinds of displacement: (1) about the axis y, as shown by the arrows a or b; (2) about the axis z, as shown by arrows c or d; and (3) about the axis x, as shown by arrows m or n. It makes absolutely no difference what the forces are which act on the body, no other motion is conceivable.

On the other hand, placing a body upon a thick sheet of yielding material, or for that matter on four springs, means freedom in all six directions; and of course the same applies to cushions or pads. For this reason it appears to be of extremely questionable value to interpose layers of such material between a massive sub-foundation and the foundation proper of a machine, even if isolated examples are on record where such an arrangement actually happened to give satisfactory results.

### What Is Stability?

With the foregoing in mind, let us digress for a moment. Stability with regard to our subject is a somewhat relative term. Why was the Great Pyramid built upon leveled rock, even, we are told, dovetailed therein? To insure stability. Why is a ship's compass or barometer mounted in gimbals? To insure stability. Why build a massive foundation for an engine? To insure stability. Why provide a layer of yielding material or springs or rubber pads? To secure stability. In other words, it is quite necessary to define in a more rational way the purpose of a foundation for an engine of a given type. We shall attempt to do this, first stating, however, the well known effects of vibrations on various types of apparatus

In large power plants where the main units are of the modern turbo-generating type the steam mains have been known to burst, and subsequent investigation has often revealed no defect in either material or in general arrangement of piping. The accident can thus only be explained as due to "rough" running, that is, vibrations. What, then, would be the remedy? To anchor the unit still firmer, or to place it on more yielding substance, thus encouraging the effect commonly known as "flopping around"?

The operation of a printing plant or of a leather-working factory is often extremely unpleasant for adjoining dwellings, and sometimes even for buildings located at a rather considerable distance. Inspection often reveals the machinery in such plants as firmly secured to extremely massive foundations and the owners are at loss as to how to remedy the trouble.

Within the building itself, irrespective of the effects on neighboring properties, the action of machinery is often felt and has been known to cause a great deal of annoyance and dissatisfaction. In addition to the printing press and the leather-surfacing machine, the types of machinery usually apt to cause trouble are as follows: triplex pumps, ice machines, air compressors (direct-driven), and various types of purely rotative machinery, such as blowers, centrifugal pumps, etc.

An internal-combustion engine often exhibits a certain amount of vibration which can be felt all over the understructure. In fact, owing to violent vibrations some of the tie rods, lamp brackets, etc., on automobiles have been known to snap in two, and in aircraft some of the instruments to drop off the board, yet these were parts of the understructure, to which they, as well as the engine itself, were firmly secured. The point we wish to emphasize is that in an understructure too much rigidity is as harmful as too much freedom to yield.

### Stability Defined

We are now ready to formulate the new criterion of "stability" for foundations. Stability is here characterized by remoteness of the operative speed from any one of the several synchronous speeds at which the frequency of the operative speed would be nearly, or exactly, equal to the frequency of the free oscillation of the system, if displaced from natural state of rest and let go.

How many distinct synchronous speeds a system is capable of having depends upon the number of degrees of freedom. An absolutely free system, for instance, placed upon an elastic sub-foundation, may have six independent synchronous speeds, or "critical" speeds, as they are sometimes called. A massive foundation resting upon rock is likewise often apt to be, in the larger sense, free in all six degrees, since it occasionally does vibrate and propagates the vibration to other buildings, etc. A system with one fixed point may have only three such synchronous speeds, while a system mounted to rotate about an axis can have only one such speed or "period," such as it is often termed. If we could control these synchronous speeds, so as as to make sure that none comes anywhere near the actual speed of operation of the machine, we would then have a fairly complete solution of our problem.

### Vibration in a Body With One Degree of Freedom

In order to understand clearly the foregoing as well as the broad methods here proposed, let us consider the following experiment and the general consequences manifestly derived therefrom. Imagine a pendulum (Fig. 3-A) consisting of a platform P rigidly connected to the member Q by means of the side members N. The system is free to swing about the axis A in the plane of the figure. A small motor M fastened on the platform P operates a countershaft carrying an off-center weight W. The motor is fed through a suitable flexible connection and it is always possible to adjust the speed of the countershaft carrying the weight W so that the number of revolutions per minute of the former will be equal to the number of double oscillations per minute of the pendular system, if the latter is slightly displaced from its vertical position of equilibrium and let go The effect of this adjustment of speed will be the so-called "synchronism," and the extent of swing (amplitude) of the pendular system, in general very slight for arbitrary values of the rotative speed of the weight W, will now become violent, in fact, out of all proportion to the magnitude of the weight W itself

This phenomenon of synchronism of cause and effect has been well studied The amplitude at the exact condition of synchronism should theoretically be infinite, but of course in practice resistances of various kinds are always present, so that instead of infinite we have large amplitudes. The most curious fact is that in the vicinity of synchronous speed, both above and below, the amplitude drops down to a value almost

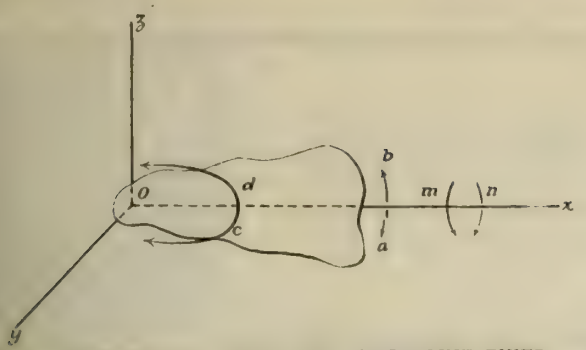



FIG. 2 DIAGRAM OF A BODY WITH ONE POINT FIXED.

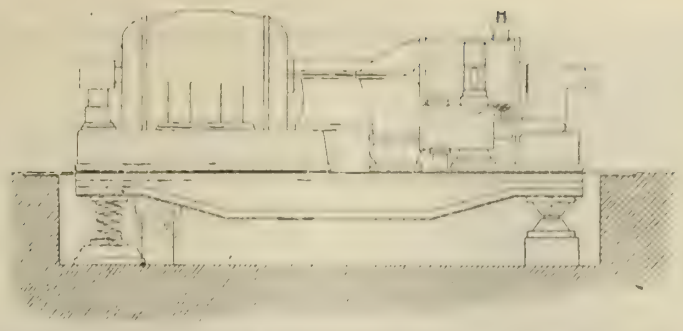


FIG. 4 APPLICATION OF AUTHOR'S DESIGN TO A TURBO-GENERATOR

insignificant, so that if the weight W is small the system appears to be practically at rest. Furthermore, any further increase of speed will not produce any effect, contrary to the current opinion of those not very well versed in the matter. For the sake of illustration let this synchronous speed be 100 r.p.m.

### Vibration in a Body With Two Degrees of Freedom

As a modification of the experiment let us now provide another system (Fig. 3-B) identical with the first except that the platform P is not solid with the member Q but is pinned thereto at H, the pin used being both frictionless and at the same time so arranged that it can be tightened up by means of the nut T, so as to lock the joint, thereby securing the exact effect of the rigid pendular system of Fig. 3-A. Providing the pin H in the language of dynamics is the introduction of an additional degree of freedom, thus securing a system of two degrees of freedom; while the tightening of the nut T, amounts to suppressing one of the degrees of freedom, thus converting a two-degree into a one-degree system. In experimenting we shall first deal with the system of one degree of freedom, tightening the nut T and thus converting the pendulum into a system exactly similar to that discussed above, the synchronous speed being, say, 100 r.p.m. The pendulum will oscillate violently. We now loosen up the nut T, introducing an additional degree of freedom, with the apparently surprising result that the amplitude decreases practically to zero. If we reduce the speed considerably, say to 50 r.p.m., violent oscillations of the whole system will reappear, as will likewise be the case in speeding up the countershaft, say to 150 r.p.m. These figures are purely illustrative; whether they will actually correspond to exact facts will of course depend upon the characteristics of the system.

In other words, by introducing an additional degree of freedom we have accomplished this double result: (1) What was synchronous speed for a system with a single degree of freedom is no longer synchronous speed for the same system provided with an additional degree of freedom; (2) the new system has two frequencies of oscillation, at which it is sensitive to disturbing influences (such as centrifugal action of the weight W), one being below and the other above the value corresponding to that of the same system with the additional degree of freedom suppressed.

It should be especially observed that the oscillations were thus reduced practically to zero, not by steadying the system by something without it, but by some sort of an adjustment wholly within the vibrating system itself. Furthermore, what we did was to increase in a measure the flexibility of the system by breaking it in two; and although at first glance this might have increased the effects of the disturbing agency (rotation of off-center weight W) the actual effect was practically to bring the system to rest. It is still more important, however, to note the fact that we introduced the additional degree of freedom precisely in the sense of action of the disturbing agency, that is, in the sense of the plane of the figure and not at right angles thereto; or, say, in an up-and-down sense, as for instance by providing a coil spring instead of joint H.

### The Basis of Foundation Design

This, then, will be taken as basis for our further discussion: In contemplating the design of a foundation we shall always separate those directions (or axes of instantaneous rotation) about which the system cannot (or at least is not likely to) oscillate from those directions (or instantaneous axes) about which the system is more or less certain to vibrate. We next shall select a "steady" point from purely practical considerations, and finally devise such means of controlling the "free periods" of the system as will secure the desired degree of remoteness from synchronism under the actual operative speed. Such means of course will be springs, exceedingly heavy, and not in the least calculated to allow of any free wabbling of the system. They will also be adjustable so that the desired periods may be readily varied within wide limits; and in general structurally arranged to introduce as few changes as possible in the arrangement as a whole.

The author feels that to submit too many particulars as regards the detailed designs of such an arrangement would certainly defeat the purpose of this paper, which is merely to introduce the broad idea and not any one of the scores of individual designs which might readily suggest themselves to the engineer confronted with the problem of designing a foundation for a given machine. Considering, therefore, only one type of apparatus, a turbo-generator (Fig. 4), we must start out with the selection of the steady point. We will naturally place it as near the steam main as possible (not to the exclusion, of course, of a suitable expansion joint), as under all conditions, should there be a choice of position, preference should be given to that point as far as possible from the center of gravity of the system, so that any static unbalance (whipping, etc.), would be made to act not as a force upon, but as a moment about that steady point. Such point should actually be made as steady as possible and no trouble should be spared in providing suitable piling or digging down to the solid ground and constructing suitable footings.

The next problem is to design a substructure adapted to receive the bedplate of the apparatus and made stiff enough so as to eliminate any "periods" of its own. This bedplate may be made of structural steel or of reinforced concrete, in which latter case the ends thereof may be made of cast iron. The substructure is supported upon the steady point either by a ball-and-socket arrangement, or is simply bolted at that point to the floor plate underneath by a bolt which need not necessarily be very light, but which must be arranged in a manner to secure the minimum area of actual contact. Remembering that in apparatus of this sort the tendency to oscillate about the axis x (Fig. 2) is always rather negligible, we have practically only two degrees of freedom and only two periods to adjust so as to have them well out of the limits of the operative speed. Hence the two sets of springs, one to take care of the period corresponding to oscillation in the vertical plane, the other to control motion in the horizontal plane. It should not be imagined, however, that these springs will necessarily be very light; they will always have considerable stiffness, but their function is that of being the only members that can yield and the whole situation is controlled by the proper choice of these yielding elements.



# WHAT OUR READERS THINK AND DO



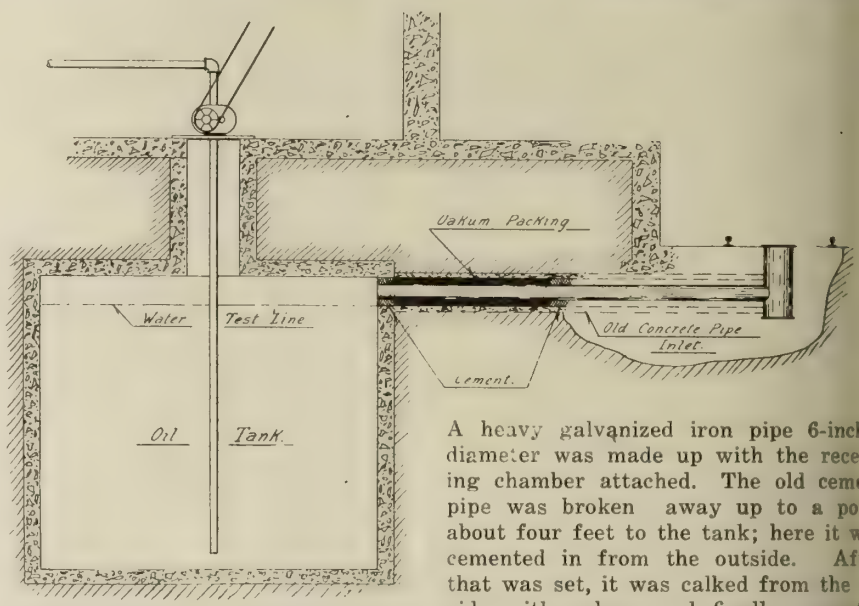
## FUEL OIL STORAGE TANK

By John Homewood

The accompanying illustration depicts a fuel oil storage tank made entirely of concrete. This tank has a capacity of fifteen thousand gallons and is accessible only through a man hole in the top. A new building was erected over the tank, but either through damage caused in the construction of the new building, or through a slight earthquake, the tank was found to have developed a serious leak. As soon as the fuel oil was exhausted it was decided to have an examination made so as to ascertain the location and conditions of the break.

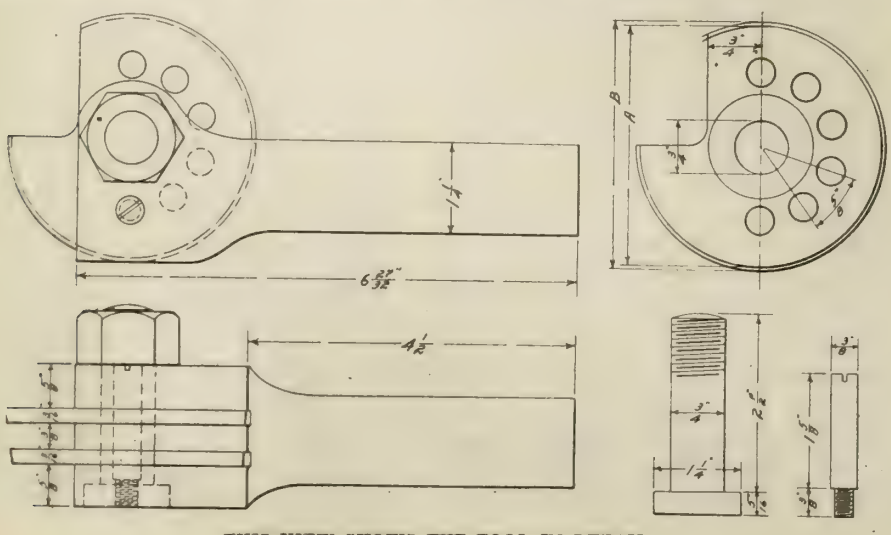
It is well known that there is great danger prevalent for a man to enter an empty tank that has held crude oil. A battery of three vacuum cleaners was connected to three pieces of 1½-inch pipe that reached the bottom of the pit where the heavy gases lay. These cleaners were in operation for four hours before a man ventured down.

The examination did not disclose anything in the form of a crack or break of any kind. As a leak showed up when the tank was filled, it was decided to give it a water test. The tank was filled to the top with water and measurement taken. In a few days another measurement was taken and the level showed to be in line with the intake. Several days more elapsed before another test was taken, which showed the same level. The intake to the tank was an eight inch cement pipe that led out to the centre of the track so that the tank car could empty into it direct. The excavation as shown was made, which disclosed that the pipe was in very poor condition at the joints and evidence to the fact that the leak was in the pipe. To attempt to repair the pipe was futile, so other means were resorted to.




SECTIONAL VIEW OF THE STORAGE TANK.

There in the tank was fourteen thousand gallons of good water to remove without any means at hand except that we might try converting a pressure blower into a pump. This was attempted with great success and the water was soon removed. Now that we had the water out, and knew where the leak was, we could proceed with the repair. A heavy galvanized iron pipe 6-inche diameter was made up with the receiv ing chamber attached. The old cemen pipe was broken away up to a poin about four feet to the tank; here it wa cemented in from the outside. Afte that was set, it was calked from the in side with oakum and finally cemente from the inside. The new pipe was en cased in a concrete retaining box.



THIS VIEW SHOWS THE TOOL IN DETAIL.

## DOUBLE PARTING TOOL

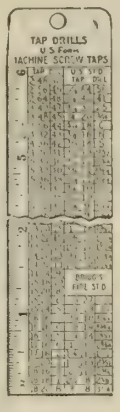
By Clyde D. Thorburn

Some time ago we illustrated a dou ble parting tool for use in cutting pisto rings from sleeve casting, and the illus tration herewith is that of another dou ble tool for the same purpose. Thi tool was designed so as to have a longe life and would always be standard widt between cutters. It is ground only o top of cutting edge, its design allowin the necessary clearances required. Boc of tool is made from mild steel forgin shaped on all flat surfaces and tw grooves sawn in head to receive the hig speed circular cutters. The cutters a turned slightly concave to insure co tinuous clearance and bevel on cuttin face to make a clean cut-off.

The top tool is turned ⅛ inch larg in diameter than bottom tool. This to allow for sufficient strength of met to hold on the lower ring when partin off upper ring. Six ⅜ holes are drill through the cutters and hole to corr spond through jaws being tapp through one side of jaw to take the r taining pin. This allows for the mo ing of cutters as they are ground ba through wear. The tool can be used the side head of a Bullard vertical ordinary vertical boring mill. We a using it there and find it a distinct a vantage over previous tools.

# Have You Tried This Contest Yet? If not--- Do so Now

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.




The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

## What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

The Prize Winner for December 23rd Issue List is J. A. RUSH, Weston Shops, Canadian Pacific Railroad, Winnipeg, Man. He Had All Answers Correct.

**CONTEST FOR JAN. 20TH ISSUE**

**Contestants are required to write us, stating to which advertisements we refer in this number.**

1—That more than a broken tooth can be removed—and as the dentist would say—without trouble.
2—Something that was redesigned and saved half the former cost.
3—A machine said to have considerable versatility.
4—Something that permits of various kinds of tooling.
5—A portion of a machine that is carefully heat treated.
6—A product that is quickly relocked.
7—That you must vary your cutting tool if you want the best results.
8—A product that is said to prove its quality quickly.
9—How to take the jump out of a belt.
10—Something that is made to stand rough usage.
11—Something that is said to be the understudy of necessity.
12—A product said to work without a slip.

**These are Correct Answers for List from Dec. 23rd Issue:**

1—Geo. F. Foss Machinery & Supply Co.
2—The L. S. Starrett Co.
3—E. C. Atkins Co.
4—Kearney & Trecker Co.
5—Bilton Machine Tool Co.
6—Hendey Machine Co.
7—J. Ackworthie, Ltd.
8—Canadian Link-Belt Co.
9—The Sidney Tool Co.
10—Canada Machinery Corporation Co., Ltd.
11—Nicholson File Co.
12—The Geometric Tool Co.

## Closing Date for This Contest is February 10th



# DEVELOPMENTS IN SHOP EQUIPMENT



## SELECTIVE HEAD LATHES

The Lehmann Machine Co., St. Louis, have placed on the market a line of improved selective head lathes. This geared head gives a large numbr of speeds with very few gears. The tooth travel is moderate at all spindle speeds, thus ensuring quiet running.

There are only ten gears in the headstock which give sixteen spindle speeds, (on 16-inch lathe from 10.5 to 422 R. P. M. and on 22-inch lathe from 8.5 to 330 R. P. M.) These speeds are in almost exact geometrical progression and all obtained without the use of the countershaft. No safety or interlocking device is required to avoid engagement of differing gear ratios at the same time, as design makes it impossible for this to occur.

All gears in the headstock are of heat treated steel of a special selected grade for the purpose. Some of the gears and back gear clutch are carbonized and hardened. All shafts are high carbon steel and run on ball bearings. Shafts having sliding members are made with four keys milled integral with the shaft. All shifting members are operated by a ring which runs in a groove and completely encircles same.

The gear ratio on the 16-inch lathe is 57.1 to 1, and on the 22-inch lathe 70.6 to 1. The other sizes are in proportion.

The spindle, which is made of alloy steel, has hardened and ground bearings and runs in bronze boxes. Where the back gear clutch slides on same there are four keys milled integral with the spindle. There are two diameters on spindle nose both giving bearing for face plates or chuck plates, one bearing being in front and one bearing behind the threads on spindle nose. This makes a very rigid connection of chuck plates on spindle and very greatly facilitates the putting on and removal of same.

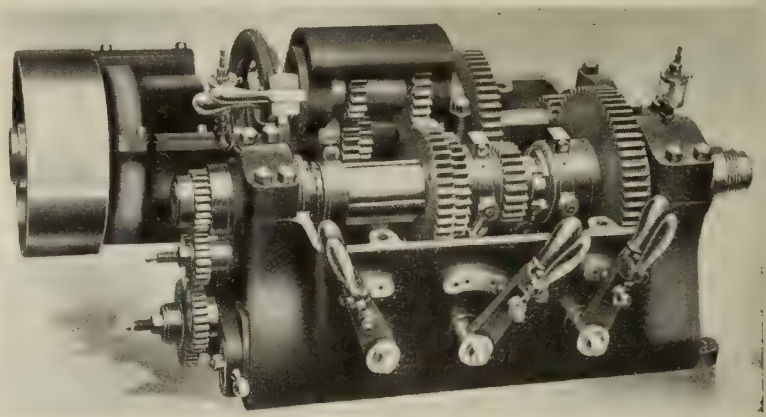


FIG. 2—HEADSTOCK OF LATHE WITH COVER REMOVED.

### Friction Clutches

The friction clutches have forward and reverse, or brake, operated by handle on apron and a similar handle at headstock end of bed. This mechanism is operated through helical spur gears which run in oil and are mounted on shafts having ball bearings. These clutches require no adjustment and are said to always pull a little more than the load imposed. Cover on clutch housing forms an oil tight case and the clutches run in oil all the time. The film of oil covering cone surfaces has to be displaced when clutch is engaged which gives an easy pick-up and practically eliminates any wear. Male cone is made of hardened steel and female cone of cast iron which insures a very long life of these parts. Forward and reverse will engage and disengage very easily with slight movement of control handles and it will pick up whilst under full load without any trouble whatever.

Fig. 3 shows the construction of rocker. The large diameter of its bearings in headstock, and the method for operating same without having openings in head-

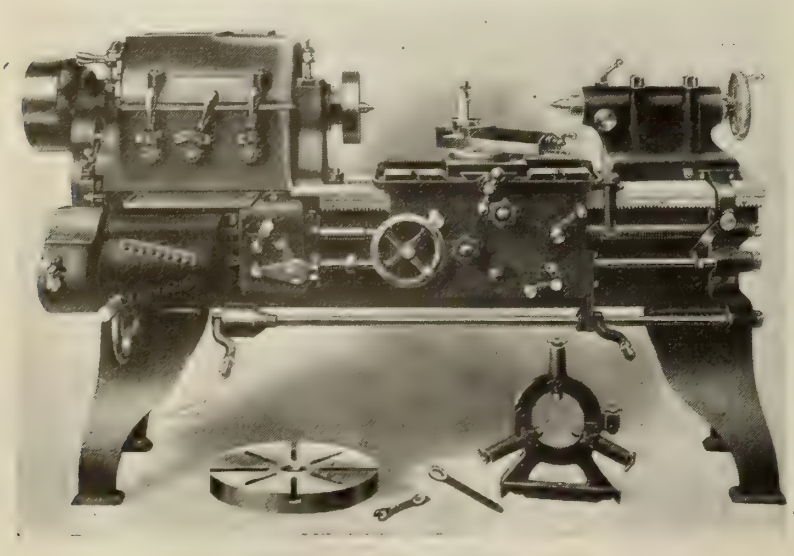


FIG. 1—GENERAL VIEW OF THE LATHE.

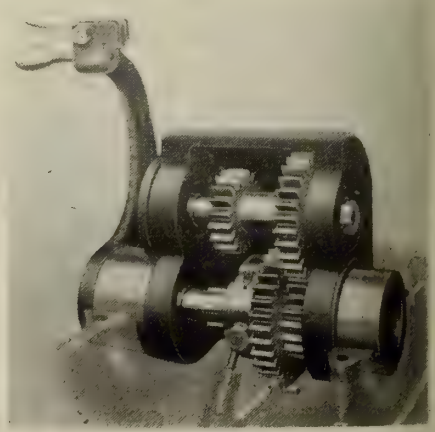


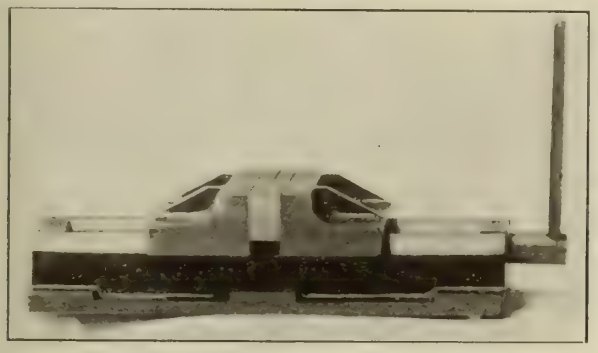
FIG. 3—SHOWING CONSTRUCTION OF ROCKER.

stock for the controlling handle can be noted. This view also illustrates the mechanism for shifting gears. The same substantial device is used for other shifting parts in headstock and eliminates possibility of trouble from this source.

The usual arrangement for direct drive is to mount motor on headstock with drive through belt and idler. This idler runs on ball bearings. With the fast belt travel on these geared head lathes this will be found a very satisfactory application and no trouble will be experienced on account of short belt, the pull on same being much less than is usual on account of the large diameter and high speed of driving pulley. This also permits the use of a high speed motor (1,800 R. P. M.) which makes same smaller, lighter and less expensive. Suitable guard for belt and pulley is provided. The direct drive can also be furnished with motor mounted on a base hinged to leg of lathe. Some users prefer this method of mounting the motor and on this no idler is required. Suitable guard for belt and pulley is provided.

## NEW VISE

The Lang Manufacturing Co., Ltd., Guelph, Ont., have placed on the market



USING THE VISE IN A FLAT POSITION.

a new type of vise that is said to be especially adaptable for lathe, shaper, miller, drill press, and, in fact, all general uses.

The illustrations herewith show clearly the vise's general appearance. It will be noted that this vise is so constructed that it can be used flat, as at Fig. 1, or on its side, as shown at Fig. 2. This feature allows holes to be drilled at right angles without removing the work from the vise. This vise can also be used on the lathe face plate if so desired, and takes, as it were, the place of the chuck.

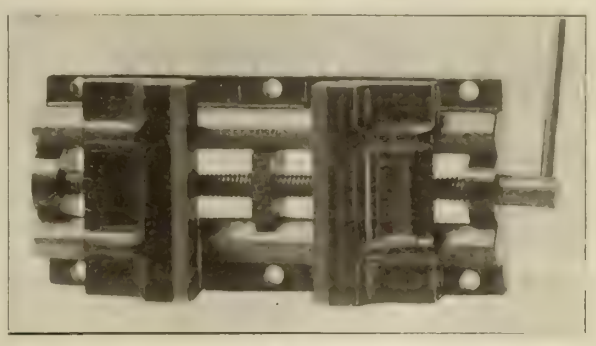
Attention is called to the fact that the sides of the vise are bevelled on both sides. This angle is designed so that all cuttings will fall off the slides and not stick and get ground into them.

The concern who manufacture this vise have stated that they have thoroughly tested its efficiency before placing it on the market, having had one under actual working test for over a year. They claim that quick action with increased power is obtained, also that the jaws are always centrally located irrespective of the size of work held. There is said to be a live grip on both jaws, and no loss of power through the usual thrust collars.

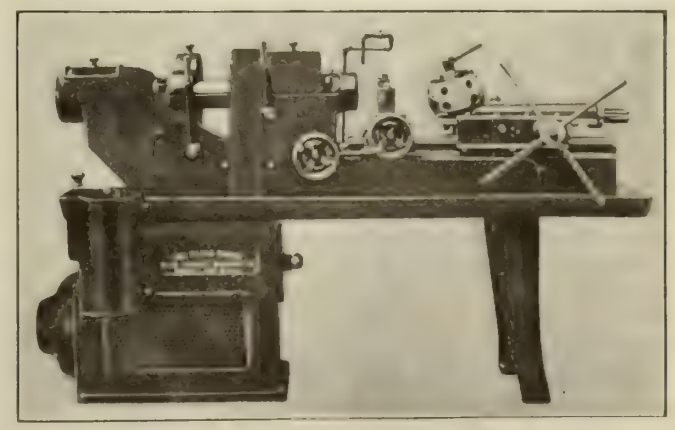
It will be noted from Fig. 2, that there is a centre nut which braces and strengthens the power of the vise screw. This nut goes clear to the base. The vise handle is light of construction, yet is amply strong to exert the necessary gripping power.

## MOTOR DRIVE FOR TILTED TURRET LATHES

The improved motor drive illustrated has been adopted by the Wood Turret Machine Co. for use on their line of Tilted Turret lathes and screw machines. It will be noted that the motor base or cabinet leg is so arranged that the motor may be easily removed for cleaning or repairs, by the loosening of three screws that hold the circular lid at the end of the base. The power is transmitted from motor to the main driving pulley on machine spindle by means of a wide leather belt. This belt passes up through the oil pan and is protected from chips and cutting compound by guards which are welded to the pan. Belt tension is controlled by a double acting idler and is operated by the lever shown at the right hand end of cabinet leg. The controller box crank as well as all operating levers are so grouped that they are within easy reach of the operator, without necessitating a change of position. The principal advantage of this type of motor drive is the compact way of mounting and the adoption of an extra wide belt which can be controlled by the double acting idler mentioned above.



ILLUSTRATING THE VISE AS USED WHEN ON ITS SIDE.



GENERAL VIEW SHOWING MOTOR DRIVE.

## AIR LINE SEPARATOR

For the purpose of cleaning the air that is delivered to pneumatic tools, the Independent Pneumatic Tool Company of Chicago have developed a special separator for installation in pipe lines for the removal of dirt and moisture from compressed air. The air from the compressor is forced into the separator so that it strikes the walls of the casing tangentially, causing the air to revolve rapidly, thus throwing the dirt and moisture to the outside wall, whence it falls to the bottom of the chamber, the cleaned air passing on to the main pipe line. Provision is made for draining the dirt and water from the lower chamber. Two sizes are made, 150 and 400 cu. ft. per min.

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## Says Conditions Are Better

WHEN Judge Gary, chairman of the U.S. Steel Corporation, states for publication that he can see nothing unfavorable on the business horizon, it carries weight.

"I think I am justified in saying," said Judge Gary a few days ago, "so far as my opinion extends, there is nothing unfavorable on the business horizon. Certainly at present the tendency is toward improved business conditions.

"That does not necessarily mean that there is a decided increase in volume, but it does mean that the general aspect, including the temper of business men, is better. If that continues, it is certain to have a decided improvement within a comparatively short time.

"As before stated, the principal reason for apparent dullness in some lines is that the purchasing public is waiting for such information as will influence it to conclude bottom prices have been reached. It should be evident to everyone that in certain lines or departments further decreases in selling prices are necessary and therefore likely to be reached. I have heard of cases where lower prices have been fixed by retailers than the prices they paid to the wholesalers for the same goods. It shows a disposition to make adjustments which have been determined upon for the purpose of complete readjustments, promptly disposing of stocks and of getting into a financial position which will enable the retailers to proceed in the regular way. And this is only an illustration of what must be done in all lines before we can expect good business.

"However, we all know by experience that after any movement of importance commences, as it progresses it gathers speed and will within a short time reach a momentum that means early completion of the movement.

"I see increasing signs of a disposition on the part of producers and wholesalers to recognize conditions and to submit to such reductions in selling prices as are necessary before a return to a normal volume of business.

"Also, it must be evident to everyone that a large percentage of workmen are disposed and are proposing reductions in wages immediately following the action of their employers to make reductions in their prices. This is a good sign and will have a decided effect. I hope and believe this disposition on the part of employees will be reciprocated by the employers.

"In the steel business to-day those who are buying are buying from the standpoint of necessity and this up to date has secured, for our corporation at least, a satisfactory volume of business considering the times and will, I hope, enable us to continue the payment of interest and the usual dividends. Under these circumstances how could we feel any other than optimistic?"

## Improving Your Time

THERE is something highly encouraging in reports coming from some of the leading technical schools, especially in classes that deal with the practical and advanced practices of mechanics. There are a number of young men out of work now in nearly all the industrial centres. Many of these came into the mechanical field during the war work or shortly after. They had no previous mechanical training, and the munitions shop was a poor place in which to make a man anything like an all-round mechanic. It was the idea that he should learn to do one thing well, and once he had learned to do that one thing well he made good money. But the thing has changed now. There is very little for the handy man to do. Many of the shell-shop mechanics got a liking for this class of work and they are doing the only possible thing now when they have a chance, viz., get on the right path, and start at the start.

Mr. H. B. Beal, principal of the London Technical and Art School, reports that "we find that on account of the shortage of work an increasing number of young men, from 18 to 23 or 24 years of age, who have had some machine shop practice, are coming to the school in special day classes to receive machine shop work and draughting instruction. This movement seems to be steadily on the increase."

There are young men in all the industrial centres who are not hard up. They have no one depending on them and in many cases they have a little surplus.

Right now would be a good chance for them to do the very thing that a number are doing in the technical schools. They are studying. They are finding out the why and the wherefore of the things that used to be beyond them in machine shop practice before because they lacked the training. They are learning to read blue prints intelligently—they are learning in this way the fundamental principles of machine tool design. They might have been able to do a piece of work on a turret lathe before, but they did it as they were told—they can now find out the best way to tool for these operations. They can learn the value of jigs and fixtures to present-day quantity and production, the handling of materials by hoists and the general practice of good machine shop usage.

Investing a few months in this way will bring handsome returns in the future. If your purse will stand the strain, go in for it.

# Sees Great Time Ahead in the Steel Trade

THOSE who are pessimistic regarding business should remember that as far as iron and steel are concerned the world's market is empty in many places.

Syren and Shipping, in an able presentation of Britain's case, says:

"Moderate supplies of both home and foreign iron ores, improved coal output; slightly better pig iron and steel production; downward price revisions; little buying until consumers are quite sure there can be no further concessions; hampered export business through exchange uncertainties; much talk of foreign competition but very little actual competition, owing to restricted outputs in rival countries—such are the surface features of the iron and steel situation.

Fundamental conditions are sound. Amid all the current difficulties and uncertainties, and in face of all the trade slump and foreign competition talk, it cannot, we think, be too often repeated, or too strongly insisted, that Britain stands, ultimately, to gain the most of what there is to be gained out of the unprecedented steel trade conditions created by the war and the war's immediate after effects.

With anything like a return to normal, this country will import more iron ore, and export very much more finished steel, than ever it did, or dreamed of doing, before the war.

### Here Are Four Reasons

The four cardinal points are these:

(1) A world's shortage of steel goods, due to the damages and constructional delays since 1914.

(2) The paralysis of Germany, our greatest pre-war rival, through the loss of the Lorraine and the stoppage of her export subsidization scheme.

(3) The inability of France to exploit her newly-acquired resources through labor shortage and transport deficiencies.

(4) The inability of the United States to meet the world's needs in heavy products through abnormal home demands, excessive transport costs, and the dollar premium, this latter being due to the smallness of American imports.

### America Must Buy More

America may produce the cheapest steel in the world, but she cannot permanently conduct a great export trade in steel, to far distant markets, unless she is prepared to take something like corresponding imports of the products of other countries. Averaged over the 16 leading foreign countries to-day, the American dollar, on the exchange, stands at $1 88. This 88 per cent. premium is a huge tax on American exports.

Out of these four cardinal points arises the fact that Great Britain, with her most convenient raw material supplies, her mines and furnaces side by side, her works close by her docks, and her unique shipping facilities, can beat the world in exportation of heavy steel and engineering products. Our greatest drawback is costly coal. But America is the only rival getting cheaper coal, and this advantage on the side of the United States is offset by long haulage distances for heavy mineral traffic.

**The American coal, iron and steel group of trades have an average inland haul of 500 miles against the British average of less than 30 miles.**

This is no time for panic or pessimism over British trade prospects. It is a time for hope, confidence and a determination to improve our production so that we can obtain that share of international trade to which our resources entitle us.

### Time to Go Ahead

Let us convince our workmen of the need for bigger output and then many of our commercial troubles will vanish. In the steel trade, at all events, we have a world to conquer.

The single State of Brazil, on official authority, wants 16,000,000 tons of railway steel alone.

The wants of the Argentine and Chile are little less.

China has hardly been tapped yet as a steel market.

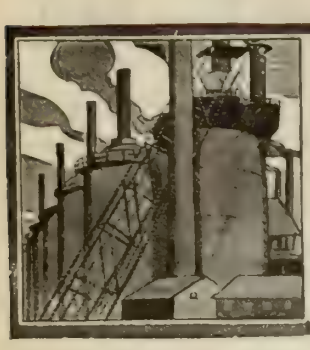
British India wants new railway extensions and equipments exceeding the mileage and furnishings of the United Kingdom railways combined.

The world's steel shortage, due to the war, the war damages and the war delays, whilst so many steel plants were on munitions, is **equal to three full years' production of every steel plant in the world, working at full capacity.**

And this great shortage is additional to the normal wants of the world, amounting to 80,000,000 tons a year before the war and additional to the fresh wants due to the demand for implements and machines to take the place of hand labor, now so costly. Against this huge demand, which will not be relaxed for many years, what are the competitive conditions? They are as already stated.

Germany is not producing at more than half her pre-war rate. The same remark applies to France and Belgium. The entire Continent of Europe is producing no more steel than Germany alone produced before the war. The United States has such an enormous home demand, and has to battle with such long transport distances, and is so prejudiced by the exchange, that she cannot retain, much less improve upon, the trade she secured during the war."





# MARKET DEVELOPMENTS



## Better Feeling Noticed In The Markets

### Business is Still Placed Sparingly, but Many Firms are Now at The Point Where They Will Have to Take on Supplies Very Shortly—Prices Remain Firm in Steel.

IF indications, opinions and summaries are any indication of trade, then there should be an improvement in the near future. Any one who is spending much time calling on the trade can hardly help but notice a more hopeful feeling. Not that any larger orders are being put through, but there is as much trade as there was a month ago. Things are not getting worse in the iron, steel and machine tool business. Occasionally the dealer is met who says plainly that he is doing more business than he was a month ago. Orders for the most part are small, but they are coming in.

Stocks in warehouses and in manufacturing establishments are light. There are only a few exceptions to this and some places still appeal to their dealers to relieve their account by taking back some of this over-stock. This is not being done for the very good reason that the average warehouse is pretty well engaged right now getting rid of all the stock it can in order to take advantage of any better buying opportunities that may open up.

Steel prices hold firm and there seems to be little chance of any break, in fact many of those in the trade go so far as to say that any decided buying movement starting in now would cause a stiffening of prices above present values.

Pig iron is now quoted at $43.64 per ton, being a drop of about $8 per ton from the last figure named. Even at the lower price buying is light in most cases and users will take on just what they have use for in the very immediate future. There has been hardly a start made yet in the old practice of placing order for a year's supply.

The scrap metal market is very weak yet, but some of the dealers can see where they are going to make a start very soon in getting back to more active business. Canadian prices for nearly every grade are higher than those offered at United States points.

## MONTREAL IS LOOKING FOR A BETTER TRADE IN NEAR FUTURE

Special to CANADIAN MACHINERY.

MONTREAL, Que., Jan. 20. — Trade conditions in this district are unchanged although industrial activities in some of the large metal plants have been resumed after a short period of suspension. Little departure from the conservative buying policy of purchasing agents has been noted and, in consequence, trade has not increased. Some little inconvenience has been experienced in the non-delivery of material that has been expected from the Sydney steel mills, but it is hoped that this condition will be rectified very shortly, when the embargo on shipments has been removed. Machine tool business is slow in picking up, slight increase being reported in supply movement. Old materials are still inactive.

**Buying Restricted But Prospects Brighter**

While there is every reason to suppose that the situation in general is less tense than formerly, there is still the attitude of conservatism on the part of the consumer in the purchasing of material and equipment. Buying, of course, is still going on, but in such a way as to emphasize the fact that nothing but what is required for immediate needs is being disposed of by the dealers. The latter, in turn, adopts the same policy, so that the mills are receiving comparatively few orders for future delivery. Some of the producers are kept busy in getting out unfilled orders, and the volume in this respect is becoming appreciably less, a condition which in time will influence the market to such an extent that further inducement, in the nature of lower prices, may be offered to the trade. The stock-taking period of many dealers is now over and some find that they still have considerable quantities of material on hand that were purchased on a rising market and which keeps them from adding further to their stocks even though they were assured that prices were at the low level—a condition that few are willing to accept. Few dealers will deny the possibility of lower quotations, but in face of the continued high cost of production, they cannot see just how a speedy return to "near normal" can be brought about without serious loss to manufacturers and disorganization in many lines of activity.

"We look for a gradual return to more active business but feel that consumers will remain out of the market until the last minute, in the hope that better prices will obtain. Industrial activity will undoubtedly be accelerated from now on, but until labor conditions are definitely adjusted it is next to impossible to expect a resumption of normal operations when everyone is looking for lower prices on all commodities."

Dealers state that business is not brisk but is of a character to encourage renewed interest, as it is thought that much buying is held off only in the hope of easier prices. Should anything develop to give the assurance of a stronger market, buying would naturally follow. Prices here have continued steady but with a weakening tendency. Predictions tend to show that price quotations may be slightly reduced before long.

**Gradual Betterment Expected**

Despite the renewal of operations in many plants, closed for holidays or stock-taking, the call for machine tools has not shown any increase to speak of over past weeks. Some little improvement has developed in the sale of supplies and small equipment, but the volume of business is still below normal. However, we are too likely to accept the term "normal" as meaning the condition prevailing throughout the past several years. As

stated by one dealer in machine tools: "We cannot deny that trade just now is considerably below what it has been during corresponding periods of the past few years, but if the situation is compared with pre-war times, we will undoubtedly find that we have nothing to complain of. We have been so accustomed to heavy turnover that an interval of quiet trading appears like excessive dullness. True, the present is quieter than usual, but it is only the reaction of industrial extravagance. What we need is faith in the future and a realization that the trade is ready to take advantage of the opportunity when the occasion arises." Asked as to the outlook for the year, the dealer stated that it would be exceedingly good and that after a short period of featureless activity, the return would be more marked.

### No Developments in Scrap

"Reports from the outside claim that business is slowly improving but, as far as we are concerned, there has been nothing to show that the old material dealers are sharing in this improvement. We are still on the waiting list." This statement by a scrap merchant goes to show the listless condition still existing in this market, and although they look forward to renewed movement early in the spring, the immediate future does not promise anything but the quietness of the past few months. Quotations are inclined to weaken, but under present conditions prices are not an influencing factor.

## WORKING HARD FOR BUSINESS

### And Some of the Firms Are Getting Results—May See Change for Better in Scrap Market

TORONTO.—Firms are going after business with renewed activity now. In some cases they are getting results. There are cases where the selling arrangements were changed at the first of the year. Salesmen were put on a salary with a chance to make much more on commission if they turned in the business. Salesmen have their own way of looking at these things, and one old timer put it this way: "I have a new contract for this year with a smaller salary but a chance to make it up or more on commission. The only grounds on which I took the contract was that it would be good for a year and a half, and before the end of that time I should be able to cash in on it even if things are none too good at the start."

In small tools as well, agents are working harder than ever before to get business.

There has been a certain amount of business placed by the railroads, but they have not taken on anything like the amount of equipment they are supposed to be contemplating. Complaint still comes from some of the dealers that they are not very particular about some of the railroad business because of the time that elapses between the filling of the order and the forwarding of the money.

Some of the larger machine tool and supply houses, with agencies at several points throughout the Dominion, are more optimistic in their outlook now, as reports from many of the outlying offices indicate that there is a better tone in many districts. Some of the cities where the manufacturing is of a diversified nature, and where little depends on the automobile business, are having good business. The auto industry has not yet reopened to any great extent, although some of the shops have made a start in a small way, but just now will not commit themselves as to the extent to which they hope to increase the force.

### Reports Improvement

Sales of small tools are improving, but the improvement is coming as the result of two things, viz., hard work and the fact that users of small tools have nothing in stock. One of the dealers told Machinery this week, "We have done more business in small tools this week than we did last month. There were no very large orders, but a lot of small ones. There must be some good buying done as soon as things start to get busy again because none of the shops have anything much on hand. Usually they have stock that will take care of their operations and it is to the interest to keep a good line ahead, especially on sizes that are much used. We look to see a good deal of business inside the next few months."

### The Steel Market

Apart from boiler tubes there is no brisk buying in the steel trade this week. There is always the usual orders to be attended to, but there is nothing apart from this. Some of the manufacturers continue to appeal to the warehouses to relieve their account by taking back certain material they have in stock, and for which they have no immediate use. In many cases this has been placed in stock at a figure above the present market price, and dealers are not inclined to take anything back in the present market.

Some of the independent mills have men over in Canada now looking for business, with a view of getting enough tonnage on their books to start operations. One rather noticeable thing is that a salesman from one of the smaller tube mills was in this district calling on the trade. "Why for the last five years that chap has gone around hardly on speaking terms with us," stated one of the steel trade men to-day, "but now he is quite willing to drop around and talk business with us looking to securing an order."

Most of the steel warehouses do not look for much business for the next few weeks. "As far as we can see the first quarter of the year will be a dull one," was the comment of one dealer. "After that, from what we can gather, there should be much better going."

Pig iron is down from the last quotation, foundry iron being quoted now at $43.64. Buying is not very free now, and users are taking on just such amounts as they consider necessary to get along with.

### May Improve Shortly

The scrap metal market shows nothing on the surface that would lead one to see any improvement, but dealers believe that things are going to get better before long, and the average scrap metal man is not a confirmed optimist. One of the dealers has just returned from a trip through quite a section of United

## POINTS IN WEEK'S MARKETING NOTES

**The new price announced for pig iron in this district is $43.64 per ton for No. 1 foundry iron. Buying for iron is not particularly active at the present time, most firms taking on only what they need for immediate use.**

—

**A representative of the largest scrap metal concern in the country has just made a trip to a district in the United States where considerable scrap from this country is disposed of. He believes that there is going to be an improvement in the scrap metal situation very shortly.**

—

**One dealer in small tools reports that business is much better. In fact he claims that he has done more business in the last week than in a month previously.**

—

**Some manufacturers continue to appeal to warehouses to take back some of the material they have in stock. This is not being done as warehouses generally are trying to reduce their stocks so that they may take advantage of any better buying opportunities that may develop.**

—

**Reports from the New York machine tool market say that there is more inquiries although most of these are for single machines. Makers have so far adhered to their old selling prices.**

—

**Pittsburgh reports that there is more price cutting going on at times, but for the most part each cut represents a single sale and cannot be taken as meaning that the practice of price cutting has become general.**

—

**Stell mills in Chicago district announce reduction in wages of 20 per cent. at two of the largest establishments.**

States where a great deal of scrap metal is usually disposed of. He believes conditions there are going to improve quickly, and there should be a chance, if there is no improvement here, to send Canadian metals across the line. At present Canada is paying more for nearly every grade of scrap material than United States. Yards are still operating on a very low basis.

## NEW YORK LOOKS FOR IMPROVEMENT

**Conditions in General Favor Renewed Trade—No Change Made in the Selling Prices**

NEW YORK, Jan. 20.—While there is no noticeable improvement in machine-tool business, sentiment is somewhat more cheerful as a result of the apparent turning of the tide in the business depression.

Since the first of the year the developments in certain industries, notably textiles, have been of an encouraging nature, and a better tone has been reflected in the security markets, all of which has its effect on sentiment.

Inquiries are slightly greater in number, although mostly for single machines. There is nothing tangible upon which the machine-tool trade can base expectation of a revival in tool buying, but some expect a very gradual improvement from now on. Many manufacturers are still engaged in taking inventories and when these are completed they may give their attention to machine-tool requirements for this year. The demand for used tools, particularly large types, is better.

While there have been a few price reductions by machine-tool manufacturers, the majority have taken no action and probably will not do so for the present. The attitude of the trade is that reductions would not stimulate buying and are not justified, according to present costs of production.

## PRICE REDUCTIONS HAVE BEEN MADE BY MANY INDEPENDENTS

Special to CANADIAN MACHINERY.

PITTSBURGH, January 20.—The iron and steel trade very generally approves Judge Gary's statement made to the newspapers last week. The statement, as is always the case with Judge Gary's utterances, is temperate and at the same time it is hopeful. It is interesting to note that in less than three months Judge Gary will round out 20 years of active service as chairman of the United States Steel Corporation. He does not claim that the steel business has improved of late, but he insists that general sentiment is better and more hopeful. Prices of some commodities must come down farther, he says, the public being in a waiting mood and being ready to take hold when it is convinced that prices are right. Judge Gary does not say that steel prices will not decline from the present level, and probably believes that eventually they will, particularly as costs are going to decrease.

### Production

There has been no material change in the rate of steel production since the first of the year, the rate being slightly over 90 per cent. for the Steel Corporation and about 25 per cent. for the independents, representing in ingots about 21,000,000 tons a year for the corporation and 7,000,000 tons for the independents, or 28,000,000 tons altogether. This is two-thirds the rate at which steel was made during the first nine months of last year, but it is only about 53 per cent. of the capacity. On account of various difficulties, chiefly the insufficiency of rail transportation facilities, steel production during the first nine months of last year averaged only 80 per cent. of capacity.

It will be noted that according to the above estimates the Steel Corporation is producing about three times as much steel as the independents, whereas it does not have more than 44 per cent. of the capacity. The condition is, of course, the aftermath of the divergent price policies pursued in 1920 by the Steel Corporation and independents respectively, the corporation holding its prices down to the Industrial Board schedule of March 21, 1919, while the independents advanced their prices by various amounts, some to the highest figure that could be obtained from anxious buyers for prompt shipment, others to various intermediate levels. Naturally at the windup the Steel Corporation found itself with a well filled order book, while the independents had relatively little on order books, and some of that business was cancelled or suspended, even though eventually the independents marked down the prices in their contracts to the Steel Corporation level.

All this has been well understood, but what is developing now is of particular interest. It might have been thought that when the independents got down to the corporation price level a good bit of the Steel Corporation business would be cancelled, and the independents, by making slight cuts in prices, would be able to get some of that business. The outcome, however, is proving quite the reverse. The corporation has had some cancellations, but it is not of business that is being transferred to independents. On the other hand, some buyers who have not heretofore been customers of the Steel Corporation at all have been making an effort to get on the Steel Corporation's books, feeling that that will be a safe place, in view of th probability that steel will at some futu time become scarce again, whereupon th experiences of 1920 may be repeate though of course in milder form.

### Prices Remain Steady

There is scarcely any actually ne business developing, and as a result th independents have no business offere them of sufficient importance to justif their doing much price cutting. Price are only cut, of course, when there is a incentive. Thus the finished steel ma ket may be described as steady, being a the same time very far from active.

No doubt in some lines there is occa sional price cutting, say by from $1 t $3 a ton, but each instance represent a separate case. A cut price sale doe not reduce the market to the lower leve In a regularly declining market that what occurs. A few sales are made a a certain cut, then to effect addition sales the mills have to make fresh cut and so on. There is no such proce now. Eventually, no doubt, this wi come, but there are two pre-requisite a larger volume of new business offere making price cutting worth while, ar a reduction in costs.

### Wages and Costs

The latest reports are that the Inlar Steel Company and the Steel & Tul Company of America, both in the Ch cago district, have cut wages 20 per cen effective January 16. Previously, redu tions had been announced by the Whee ing Steel Corporation, Bethlehem Ste Company, Midvale Steel & Ordnan Company and some minor steel interest There have been no wage reductions consequence in the immediate Pittsburg district or in the Youngstown distric On the whole less than half the indepen ent steel capacity has reduced wage while the Steel Corporation does n seem to have considered the matter ar it is not expected to make any reductio for a long time.

The independents that have not r duced wages are keeping their counse but it is a fair assumption that the attitude is about as follows: A wag reduction at this time would do litt good in reducing costs, when mills a operating so lightly. It would encourag buyers to look for lower prices, or eve demand lower prices. The men wou not accept wage reductions as willing as after a period of idleness, such a they have lately begun to experienc while at the same time the continue decline in the cost of living will help make wage reductions acceptable.

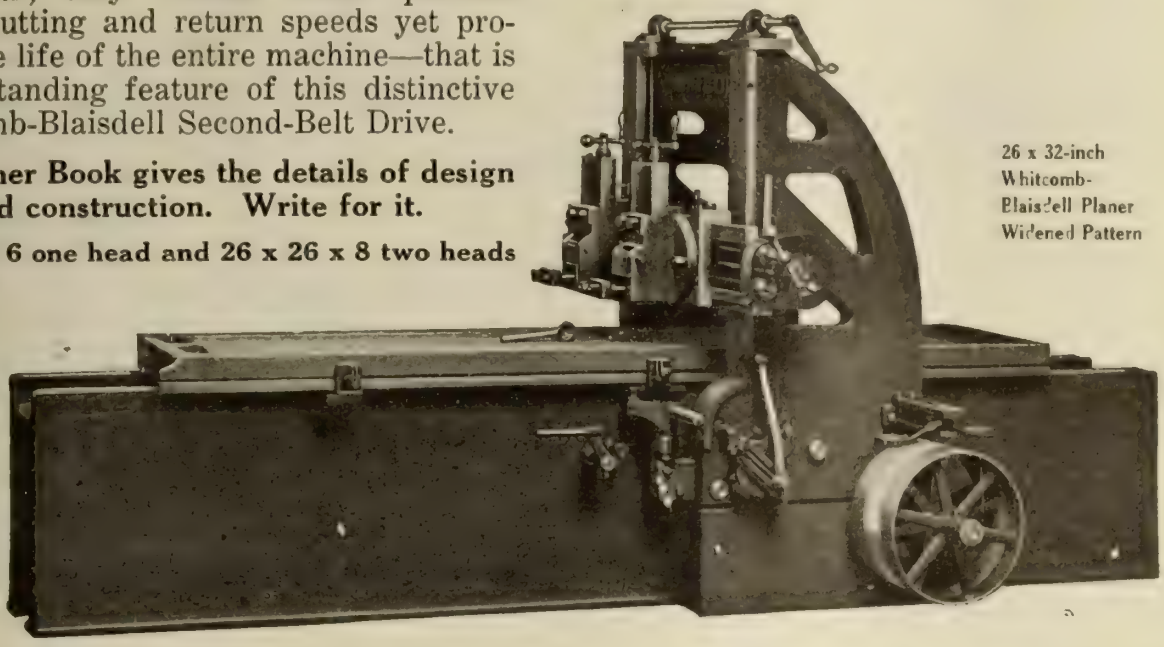
Another consideration of importance this, that there are various methods getting down costs, apart from the mak ing of a horizontal wage reduction, tha should naturally be practised first. Le efficient men can be let go and the mo efficient retained. Bonus rates can b discontinued, men being let go and r

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**Pig Iron**

The $33, valley, price on foundry iron has yielded, as it was to be expected it would when actual buying developed, particularly since basic had been voluntarily marked down by furnaces to $30. Several furnaces have sold in lots averaging about 500 tons each at $31.50, valley. They had quoted $33 but buyers would not take hold, and the $31.50 sales were probably made by furnaces accepting a bid at that figure. Nothing has occurred in Bessemer or basic. The market is now quotable at $32 for Bessemer and malleable, $30 for basic and $31.50 for foundry, valley basis.

# CANADIAN WAR MECHANICS ASK CONSIDERATION FOR THEIR CLAIMS

Many Canadian mechanics who went to Britain to work in war shops have appealed to Premier Meighen for relief from the discrimination they have encountered and for the loss they sustained while working in the British shops.

Some of the experiences are set forth as follows:—

When the urgent call for experienced munitions workers came to Canada from Great Britain, the statement sets forth, members of the association responded. A large percentage were married men who entered into the proposal from high patriotic motives, and, forgetful of the financial aspect of the matter, failed to make proper provision for their dependents left behind. These dependents, it is stated, received no benefits under the Patriotic Fund, and, in a number of cases, mechanics returned home after four years' service to find their families destitute.

Believing it would be economy, many of the married mechanics took their families to England with them, at their own expense.

Shortly after arriving, it was learned that British munition workers in shops ten miles or more away from home, received $4.20 a week subsistence allowance. Canadian mechanics, working under British government contract, applied for the allowance, finding wages paid them were insufficient to meet the cost of living.

After some negotiation, the allowance was granted, but only to such men whose families were still in Canada. No subsistence was allowed men with families in England.

**Allege Unfair Pay**

The Canadian mechanics were paid on the basis of pre-war rates for skilled British workers. They received increases as granted to the British workers, but these did not come until 1918, and for at least three years, $10 a week, it was asserted by the delegates, was a common wage for a married man. When the "Dilutee" system was inaugurated, British factories and shipyards were throng-

ed with unskilled women and young men who were allowed to work on the piece work system. The Canadian mechanics were given the task of training these dilutees, and it fell out, in a short time, that many of these new workers were making as high as $15 a day shift. Efforts by the Canadian mechanics to obtain piece work privileges proved fruitless, and it soon became common that the worst student worker in a shop was getting as much or more per day as the skilled mechanic teacher was getting a week.

After the armistice, the statement continues, British munition workers were given benefit under the unemployment insurance plan—to which Canadian mechanics also had paid weekly. The benefit amounted to $6.96 a week for 26 weeks. Canadians were shipped home and given a total amount of $23.75 "resettlement money" to take care of the period of unemployment in Canada.

The statement concludes with a summary of claims, to which Mr. Meighen promised to give close attention at an early meeting of the cabinet.

Here is a synopsis of the claims:—

That the Canadian government give the mechanics status as returned soldiers and eliminate discrimination against them.

That subsistence equal to that paid British munitions workers be paid for the entire period during which it was withheld.

That the same unemployment benefit given British mechanics be accorded Canadians who paid into the insurance fund.

That 50 cents a day for every day of service be awarded each overseas mechanic resident in Canada, toward re-establishment.

That overseas mechanics be brought under the Soldier Settlement scheme.

That repatriation expenses be allowed such as were compelled to return to Canada, before the armistice was signed, through ill-health.

# STEEL OF CANADA SALES FORCE HOLD SESSION IN MONTREAL

THE ninth annual sales conference of the Steel Co. of Canada was held at Montreal on January 13, 14 and 15, the sessions taking place at the Windsor Hotel. The gathering was representative of the entire organization, and a number of the executives and factory heads were also there, including the works manager and superintendents from the plants at Montreal, Brantford, Hamilton, Toronto and Belleville.

The Thursday morning gathering was largely of the get-together order, when the incoming visitors were welcomed by the committee in charge. Mr. Robert Hobson, president of the Steel Co. of Canada, presided at this gathering, assisted by Mr. R. H. McMaster, vice-president, both of them dealing with several matters of interest to the company. The secretary-treasurer, Mr. H. H. Champ, went extensively into figures dealing with the sales of the organization, and also with the exchange rate during the year 1920, pointing out that the average against Canadian money during that period had been 13 per cent. One point was brought out that was of special interest, and which by the way reflected no small credit on the collection department and the sales force, viz., that the losses through non-payments of accounts had amounted to only a small fraction of one per cent.

Mr. Lloyd Harris, a director of the company, was also one of the speakers at this session, having only a day or so before attended a meeting of the automobile manufacturers in Detroit, where the whole position had been thoroughly discussed. Mr. Harris made it clear that there was need for more aggressive selling now than for some time past. For a long time everything had been in favor of the seller, the real salesmanship had been allowed to lapse in many cases. The market was in favor of the buyer now, and salesmen ought to adjust themselves to these changed conditions. The meeting in Detroit had felt that things were definitely on the mend now, although the start might have to be made in a small way, but a better buying movement was looked for, and it should take on definite form early in April, and perhaps in some measure before.

The sales conferences themselves were presided over by Mr. H. T. Diplock, eastern sales manager, Montreal, and Mr. George Spence, western sales manager, Hamilton, able assistance being given by Mr. D. J. Black, assistant sales manager at Montreal, and Mr. Charles E. Harrison, assistant sales manager at Hamilton. Reports given by a number of the men from various parts of the Dominion dealt with many phases of trade and problems of salesmanship. The consensus of opinion was that trade was going to be better early in the year. Stocks in nearly every centre are low, and manufacturing concerns are not putting in their accustomed supplies of raw material, so when business does start to move there will be purchasing done on a fairly good basis.

Some of those who are accustomed to be present at the sales conferences, but who were not able to be there this year, through various causes, were Charles S. Wilcox, chairman of the Board of Directors, Cyrus A. Birge, one of the directors, George A. Simpson, special representative, Hamilton, Thomas Moore, assistant sales manager, Hamilton, and D. B. McCoy, of Vancouver.

The annual banquet at the Canada Club proved to be a thoroughly enjoyable affair, and the entire company stands ready to vote Mr. Hobson the one and only chairman for such an occasion. The toast to "our officers" was proposed by J. Orr Callaghan, works manager of the Canada Works, Hamilton, the response being given by Mr. Robert Hobson, president, Mr. R. H. McMaster, and Mr. H. H. Champ. "Our works," was responded to by Mr. Jaquays, works managed at Montreal, and Mr. R. G. Wells, works manager at Hamilton, also superintendents McEwen and John L. Smith of Hamilton, and Flaherty and Johnson of Montreal. "The Sales Organization" drew responses from Messrs. Spence and Diplock, sales managers of west and east respectively, Fred Perego and Stuart Kell. One of the most impressive incidents of the gathering was the response by Mr. Fesserton, of Montreal, to the toast of the "Visitors." Mr. Fesserton, who has retired from active life, was for fifty years connected with the Steel Co. of Canada and its predecessor, the Montreal Rolling Mills, which was taken in at the time of the amalgamation Mr. Hobson issued a special invitation to him to be present at the banquet in Hamton next year to the sales force.

The committee in charge of the conference and banquet earned the thanks of the whole organization. They attended to every detail and left nothing undone that would make the affair a success. They were Messrs. H. T. Diplock, J. D. Black, A. Y. Paxton, S. N. Colcomb and E. M. Russell. About 150 attended the conference.

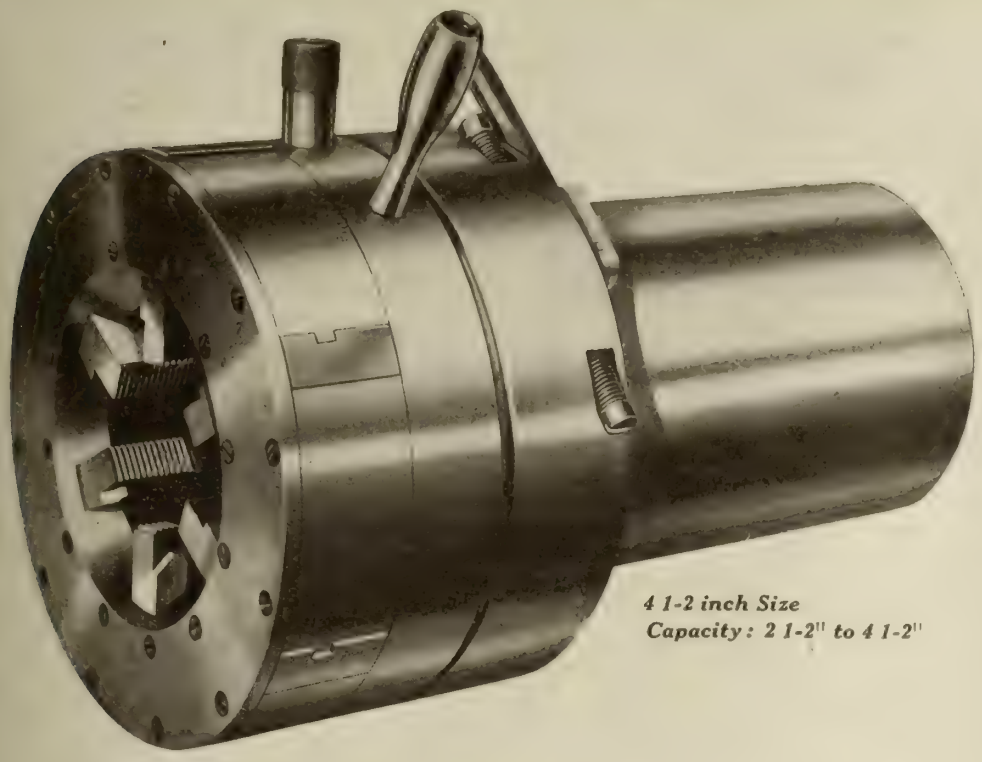
### The Steel Poet Sings

The Steel Co. of Canada harbors in its Montreal branch a bit of a poet, in the person of H. E. Skeats. On top of the menu card used at the banquet of the sales organization were several verses from Mr. Skeat's quill.

Looking back over the restricted diets of war years the Montrealer lifts his voice and chants thusly:—

Good evening, gentlemen—take your seats,
And run your eye o'er this list of eats,
Food censors have vanished in ambient air,
So hew your way through the bill of fare,
Nor trouble yourselves with the awful thought
That you're putting away what you didn't ought!

I suppose you remember the days gone by
When on bacon, and butter, and beef you were shy,
When you dare not consume a succulent steak!
For fear that a Food Commandment you'd break
When the grub you ate, as it sank to rest,
Seemed to your sensitive souls to protest
That you had no right to devour, by gee,
The food that should nourish a refugee!



*4 1-2 inch Size*
*Capacity: 2 1-2" to 4 1-2"*



*5-16 inch size*
*Capacity:*
*3-32" to 5-16"*

# *The Screw Machine Man Says:*

**"Everybody recommends Geometric Die Heads. Better Threads in Quicker Time is the reason."**

**It doesn't matter how strenuous the job is, a Geometric is built to handle it easily.**

***Make Screw Thread-Cutting the Most Satisfactory Operation in Your Shop***

**——Write——**

## THE GEOMETRIC TOOL COMPANY
## NEW HAVEN CONNECTICUT

***Canadian Agents:***

Williams & Wilson, Ltd., Montreal.
The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B., Halifax, N.S.
Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

*If interested tear out this page and place with letters to be answered.*

# SELECTED MARKET QUOTATIONS

**Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.**

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $33 96 |
| Lake Superior, charcoal, Chicago | 48 50 |
| Standard low phos., Philadelphia | 44 79 |
| Bessemer, Pittsburgh | 33 96 |
| Basic, Valley furnace | 30 00 |
| Toronto price:— | |
| Silicon, 2.25% to 2.75% | 43.64 |

## IRON AND STEEL

| Per lb. to Large Buyers | Cents |
|---|---|
| Iron bars, base, Toronto | $ 4 75 |
| Steel bars, base, Toronto | 4 75 |
| Iron bars, base, Montreal | 4 50 |
| Steel bars, base, Montreal | 4 50 |
| Reinforcing bars, base | 5 50 |
| Steel hoops | 6 00 |
| Tire steel | 5 00 |
| Spring steel | 8 00 |
| Band steel, No. 10 gauge and 3-16 in. base | 5 50 |
| Chequered floor plate, 3-16 in. | 8 50 |
| Chequered floor plate, ¼ in. | 8 00 |
| Bessemer rails, heavy, at mill | .... |
| Steel bars, Pittsburgh | 3 00-4 00 |
| Tank plates, Pittsburgh | 3 50 |
| Structural shapes, Pittsburgh | 3 00 |
| Steel hoops, Pittsburgh | 3 50-3 75 |
| F.O.B., Toronto Warehouse | |
| Small shapes | 5 50 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 3 62 |
| Structural shapes | 3 72 |
| Plates | 3 67 to 5 50 |
| Small shapes under 3" | 3 62 |

## FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

| | C.L. | L.C.L. |
|---|---|---|
| Montreal | 58½ | 73 |
| St. John, N.B. | 84½ | 106½ |
| Halifax | 86 | 108 |
| Toronto | 38 | 54 |
| Guelph | 38 | 54 |
| London | 38 | 54 |
| Windsor | 35 | 50½ |

## METALS

| | Gross. Montreal | Toronto |
|---|---|---|
| Lake copper | $19 00 | $19 50 |
| Electric copper | 18 50 | 19 00 |
| Castings, copper | 18 00 | 19 00 |
| Tin | 44 00 | 46 00 |
| Spelter | 8 00 | 9 00 |
| Lead | 7 25 | 8 00 |
| Antimony | 8 00 | 9 00 |
| Aluminum | 34 00 | 35 00 |

Prices per 100 lbs.

## PLATES

| | | |
|---|---|---|
| Plates, 3-16 in. | $ 5 50 | $ 5 50 |
| Plates, ¼ up | 5 00 | 5 50 |

### PIPE—WROUGHT

Standard Buttweld Pipe

Per 100 Ft.

| | Steel Blk. | Steel Galv. | Gen. Wrought Iron Blk. | Gen. Wrought Iron Galv. |
|---|---|---|---|---|
| ⅛ | $ 6 50 | $ 8 50 | $.... | $.... |
| ¼ | 5 31 | 7 41 | 5 91 | 8 01 |
| ⅜ | 5 31 | 7 41 | 6 91 | 8 01 |
| ½ | 7 10 | 8 63 | 7 95 | 9 48 |
| ¾ | 8 80 | 10 87 | 9 95 | 12 02 |
| 1 | 13 01 | 16 07 | 14 71 | 17 77 |
| 1¼ | 17 60 | 21 74 | 19 90 | 24 04 |
| 1½ | 21 04 | 25 99 | 23 79 | 28 74 |
| 2 | 28 31 | 34 97 | 32 01 | 38 67 |
| 2½ | 44 75 | 55 28 | .... | .... |
| 3 | 58 52 | 72 29 | .... | .... |
| 3½ | 74 06 | 90 62 | .... | .... |
| 4 | 87 75 | 107 37 | .... | .... |

Standard Lapweld Pipe

Per 100 Ft.

| | Steel Blk. | Steel Galv. | Gen. Wrought Iron Blk. | Gen. Wrought Iron Galv. |
|---|---|---|---|---|
| 2 | $32 01 | $ 38 67 | $35 71 | $42 37 |
| 2½ | 48 26 | 58 79 | 54 11 | 64 64 |
| 3 | 63 11 | 76 88 | 70 76 | 84 53 |
| 3½ | 75 90 | 92 46 | 85 10 | 101 66 |
| 4 | 89 93 | 107 55 | 100 83 | 120 45 |
| 4½ | 1 05 | 1 29 | 1 30 | 1 54 |
| 5 | 1 22 | 1 50 | 1 52 | 1 80 |
| 6 | 1 58 | 1 95 | 1 97 | 2 33 |
| 7 | 2 06 | 2 53 | 2 53 | 3 01 |
| 8L | 2 16 | 2 66 | 2 66 | 3 16 |
| 8 | 2 49 | 3 07 | 3 07 | 3 64 |
| 9 | 2 98 | 3 67 | 3 67 | 4 36 |
| 10L | 2 77 | 3 41 | 3 41 | 4 05 |
| 10 | 3 56 | 4 39 | 4 39 | 5 21 |

**Prices—Ontario, Quebec and Maritime Provinces**

## WROUGHT NIPPLES

4" and under, 60%.
4½" and larger, 50%.
4" and under, running thread, 30%.
Standard couplings, 4-in. and under, 30%.
Do., 4½-in. and larger, 10%.

## OLD MATERIAL

Dealers' Average Buying Prices.

| | Per 100 Pounds. Montreal | Toronto |
|---|---|---|
| Copper, light | $10 50 | $10 50 |
| Copper, crucible | 13 00 | 12 00 |
| Copper, heavy | 12 50 | 12 00 |
| Copper wire | 12 50 | 12 00 |
| No. 1 machine composition | 13 00 | 12 00 |
| New brass cuttings | 7 00 | 9 00 |
| Red brass turnings | 10 00 | 10 00 |
| Yellow brass turnings | 7 00 | 7 50 |
| Light brass | 5 00 | 5 00 |
| Medium brass | 6 50 | 6 00 |
| Scrap zinc | 5 00 | 4 00 |
| Heavy lead | 5 25 | 4 00 |
| Tea lead | 2 50 | 2 00 |
| Aluminum | 16 00 | 13 00 |

| | Per Ton | Gross |
|---|---|---|
| Boiler plate | $11 00 | $12 00 |
| Heavy melting steel | 18 00 | 16 00 |
| Axles (wrought iron) | 25 00 | 20 00 |
| Rails (scrap) | 18 00 | 18 00 |
| Malleable scrap | 20 00 | 20 00 |
| No. 1 machine cast iron | 32 00 | 28 00 |
| Pipe, wrought | 8 50 | 10 00 |
| Car wheel | 30 00 | 30 00 |
| Steel axles | 20 00 | 18 00 |
| Mach. shop turnings | 8 00 | 7 00 |
| Stove plate | 23 00 | 23 50 |
| Cast boring | 8 00 | 10 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, 7-16 and up | Net list |
| Carriage bolts, ⅜-in. and less | Net |
| Coach and lag screws | —20 |
| Stove bolts | 55 |
| Wrought washers | —25 |
| Elevator bolts | Net |
| Machine bolts, 7-16 and over | —5 |
| Machine bolts, ⅜-in. and less | —30 |
| Blank bolts | Net |
| Bolt ends | —5 |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | +25 |
| Machine screws, fl. and rd. hd., brass | net |
| Machine screws, o. and fil. hd., brass | net |
| Nuts, square, blank | +25 add $2 0 |
| Nuts, square, tapped | add 2 2 |
| Nuts, hex., blank | add 2 5 |
| Nuts, hex., tapped | add 3 0 |
| Copper rivets and burrs, list less | 15 |
| Burrs only, list plus | 25 |
| Iron rivets and burrs | 40 and |
| Boiler rivets, base ¾" and larger | $8 5 |
| Structural rivets, as above | 8 4 |
| Wood screws, O. & R., bright | 75 |
| Wood screws, flat, bright | 77½ |
| Wood screws, flat, brass | 55 |
| Wood screws, O. & R., brass | 55½ |
| Wood screws, flat, bronze | 50 |
| Wood screws, O. & R., bronze | 47½ |

## MILLED PRODUCTS

(Prices on unbroken packages)

| | Per Cent. |
|---|---|
| Set screws —20%, 25 and | 5 |
| Sq. and hex. hd. cap screws | 12½ |
| Rd. and fil. hd. cap screws | plus 25 |
| Flat but. hd. cap screws | plus 50 |
| Fin. and semi-fin. nuts up to 1-in. | 12½ |
| Fin. and Semi-fin. nuts, over 1 in., up to 1½-in. | —5 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2-in. | +12½ |
| Studs | +5 |
| Taper pins | —12½ |
| Coupling bolts | +40 |
| Planer head bolts, without fillet, list | +45 |
| Planer head bolts, with fillet, list plus 10 and | +55 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | +60 |
| Collar screws | list plus 20, 30 |
| Thumb screws | 40 |
| Thumb nuts | 75 |
| Patch bolts | add +8 |
| Cold pressed nuts to 1½ in. | add $1 0 |
| Cold pressed nuts over 1½ in. | add 2 0 |

## BILLETS

| | Per gross to |
|---|---|
| Bessemer billets | $60 0 |
| Open-hearth billets | 60 0 |
| O.H. sheet bars | 76 0 |
| Forging billets | 56 00-75 0 |
| Wire rods | 52 00-70 0 |

Government prices.

F.O.B. Pittsburgh.

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails, base | $5 7 |
| Cut nails, vase | 6 7 |
| Miscellaneous wire nails | 50 |

## ROPE AND PACKINGS

| | |
|---|---|
| Plumbers' oakum, per lb. | 0 10½ |
| Packing, square braided | 0 38 |
| Packing, No. 1 Italian | 0 44 |
| Packing, No. 2 Italian | 0 36 |
| Pure Manila rope | 0 29 |
| British Manila rope | 0 28 |
| New Zealand hemp | 0 23 |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | net |

# ATKINS

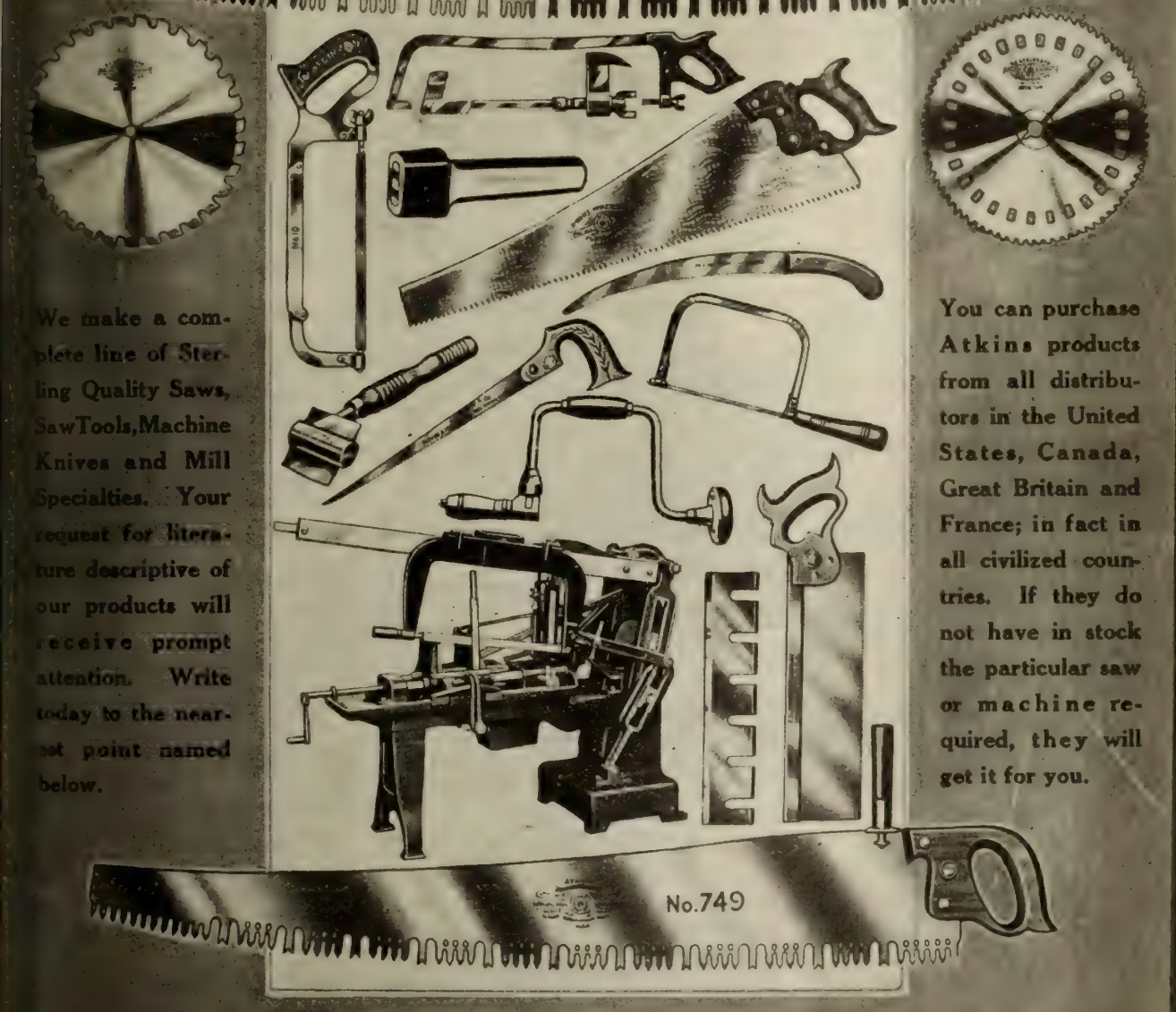
STERLING QUALITY

SAWS and TOOLS

A Perfect Saw for every Purpose

"Finest on Earth"

"Finest on Earth"




We make a complete line of Sterling Quality Saws, SawTools, Machine Knives and Mill Specialties. Your request for literature descriptive of our products will receive prompt attention. Write today to the nearest point named below.

You can purchase Atkins products from all distributors in the United States, Canada, Great Britain and France; in fact in all civilized countries. If they do not have in stock the particular saw or machine required, they will get it for you.

*If you have difficulty in obtaining Atkins Saws and other products through your regular service, write*

## E. C. Atkins & Company

Established 1857

*Canadian Factory:* HAMILTON, ONTARIO *Branch:* VANCOUVER, B. C.

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | $ 0 27½ |
| Solder, guaranteed | 0 29½ |
| Soldering coppers, lb. | 0 62½ |
| White lead, pure, cwt. | 20 35 |
| Red dry lead, 100-lb. kegs, per cwt. | 15 00 |
| Gasoline, per gal., bulk | 0 42 |
| Pure turp., single bbls., gal. | 3 15 |
| Linseed oil, raw, single bbls. | 2 37 |
| Linseed oil, boiled, single bbls. | 2 40 |
| Wood alcohol, per gal. | 4 00 |
| Whiting, plain, per 100 lbs. | 3 00 |

### CARBON DRILLS AND REAMERS

| | |
|---|---|
| S.S. drills, wire size | 40 and 5 |
| Can. carbon cutters, plus | 10 |
| Standard drills, all sizes | 40 and 5 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 and 5 |
| Bit stock | 50 |
| Ratchet drills | 10 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 50 |
| Sleeves | 50 |
| Taper pin reamers | 25 off |
| Drills and countersinks | net |
| Bridge reamers, carbon | 50 |
| Centre reamers | 5 |
| Chucking reamers | net |
| Hand reamers | 10 |
| High speed drills, list net to plus | 20 |
| Can. high speed cutters, net to plus | 10 |
| American | plus 40 |

### COLD ROLLED STEEL

[At warehouse]

| | |
|---|---|
| Rounds and squares | $7.50 base |
| Hexagons and flats | 7.50 base |

### IRON PIPE FITTINGS

| | Black | Galv. |
|---|---|---|
| Class A | 70 | 80 |
| Class B | 24 | 34 |
| Class C | 16 | 24 |

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 8 50 | $ 9 00 |
| Sheets, blue ann., No. 10 | 7 00 | 7 50 |
| Canada plates, dull, 52 sheets | 13 00 | 13 00 |
| Can. plates, all bright | 14 00 | ..... |
| Apollo brand, 10¾ oz. galvanized | .... | .... |
| Queen's Head, 28 B.W.G. | 13 00 | ..... |
| Fleur-de-Lis, 28 B.W.G. | 12 50 | ..... |
| Gorbal's Best, No. 28 | .... | .... |
| Colborne Crown, No. 28 | .... | .... |
| Premier, No. 28, U.S. | 10 00 | 11 00 |
| Premier, 10¾-oz. | 10 50 | 11 40 |
| Zinc sheets | 16 50 | 20 00 |

### PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

### ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

### FILES AND RASPS

| | Per Cent. |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 32½ |
| Black Diamond | 27½ |
| J. Barton Smith, Eagle | 50 |
| McClelland, Globe | 50 |
| Delta Files | 20 |
| Disston | 40 |
| Whitman & Barnes | 50 |
| Great Western-American | 50 |
| Kearney & Foot, Arcade | 50 |

### BOILER TUBES.

| Size. | Seamless | Lapwelded |
|---|---|---|
| 1 in. | $27 00 | $..... |
| 1¼ in. | 29 50 | ..... |
| 1½ in. | 31 50 | 29 50 |
| 1¾ in. | 31 50 | 30 00 |
| 2 in. | 35 00 | 30 00 |
| 2¼ in. | 35 00 | 29 00 |
| 2½ in. | 42 00 | 37 00 |
| 3 in. | 50 00 | 48 00 |
| 3¼ in. | .. .. | 48 50 |
| 3½ in. | 63 00 | 51 50 |
| 4 in. | 85 00 | 65 50 |

Prices per 100 ft., Montreal and Toronto

### OILS AND COMPOUNDS.

| | |
|---|---|
| Castor oil, per lb. | |
| Royalite, per gal., bulk | 28 |
| Palacine | 31 |
| Machine oil, per gal. | 58 |
| Black oil, per gal. | 27 |
| Cylinder oil, Capital | 1.01 |
| Petroleum fuel oil, bbls., net | 19 |

### BELTING—No 1 OAK TANNED

| | |
|---|---|
| Extra heavy, single and double | 6½ |
| Standard | 6½ |
| Cut leather lacing, No. 1 | 2 00 |
| Leather in side | 2 40 3 00 |

### TAPES

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES

| | |
|---|---|
| Polishing wheels, felt | $4 50 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, Turkish | 8¾ |
| Pumice, ground | 06 |
| Emery glue | 30 |
| Tripoli composition | 9½ |
| Crocus composition | 12 |
| Emery composition | 11 |
| Rouge, silver | 64 |
| Rouge, powder, nickel | 38 |

Prices per lb.

### ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | .08½ |
| Grits, 80 and finer | .6 |

BRASS—Warehouse Price

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 0 30 |
| Brass sheets, 24 gauge and heavier, base | 0 38 |
| Brass tubing, seamless | 0 42 |
| Copper tubing, seamless | 0 44 |

### WASTE

| | | | |
|---|---|---|---|
| XXX Extra | .23 | Atlas | .19 |
| Peerless | .22 | X Empire | .18½ |
| Grand | .21½ | Ideal | .18 |
| Superior | .21½ | X Press | .17 |
| X L C R | .20 | | |

**Colored**

| | | | |
|---|---|---|---|
| Lion | .16 | Popular | .12 |
| Standard | .14 | Keen | .10 |
| No. 1 | .14 | | |

**Wool Packing**

| | | | |
|---|---|---|---|
| Arrow | .35 | Anvil | .22 |
| Axle | .28 | Anchor | .17 |

**Washed Wipers**

| | |
|---|---|
| Select White | .20 |
| Dark colored | .09 |
| Mixed colored | .10 |

This list subject to trade discount fo quantity.

### RUBBER BELTING

Standard ... 10% Best grades... 15%

### ANODES

| | |
|---|---|
| Nickel | .55 to .6 |
| Copper | .38 to .4 |
| Tin | .70 to .7 |
| Zinc | .16 to .1 |

Prices per lb.

### COPPER PRODUCTS

| | Montreal | Toron |
|---|---|---|
| Bars, ½ to 2 in. | $35 00 | $37 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 40 00 | 44 |
| Copper sheet, tinned, 14x60, 14 oz. | 43 00 | 46 |
| Copper sheet, planished, 16 oz. base | 47 00 | 50 |
| Braziers', in sheets, 6 x 4 base | 39 00 | 42 |

### LEAD SHEETS

| | Montreal | Toror |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $10 50 | $14 |
| Sheets, 3½ lbs. sq. ft. | 10 25 | 14 |
| Sheets, 4 to 6 lbs. sq. ft. | 10 00 | 13 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

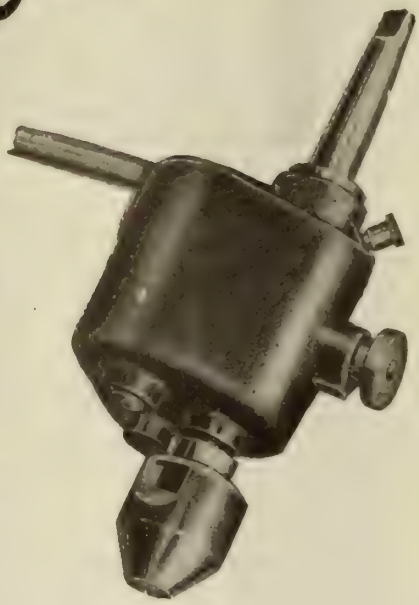
### PLATING CHEMICALS

| | |
|---|---|
| Acid, boracic | $ .23 |
| Acid, hydrochloric | .04 |
| Acid, nitric | .11 |
| Acid, sulphuric | .04 |
| Ammonia, aqua | .15 |
| Ammonium, carbonate | .23 |
| Ammonium, chloride | .22 |
| Ammonium hydrosulphuret | .75 |
| Ammonium sulphate | .30 |
| Arsenic, white | .16 |
| Copper, carbonate, annhy | .41 |
| Copper, sulphate | .13 |
| Cobalt, sulphate | .20 |
| Iron perchloride | .62 |
| Lead acetate | .30 |
| Nickel ammonium sulphate | .20 |
| Nickel carbonate | .32 |
| Nickel sulphate | .20 |
| Potassium sulphide (substitute) | .40 |
| Silver Chloride (per oz.) | 1.15 |
| Silver nitrate (per oz.) | 1.10 |
| Sodium bisulphate | .13 |
| Sodium carbonate crystals | .04 |
| Sodium cyanide, 127-130% | .39 |
| Sodium hyposulphite per 100 lbs | 9.00 |
| Sodium phosphate | .15 |
| Tin chloride | .30 |
| Zinc chloride, C.P. | .30 |
| Zinc sulphate | .08 |

Prices per lb. unless otherwise state

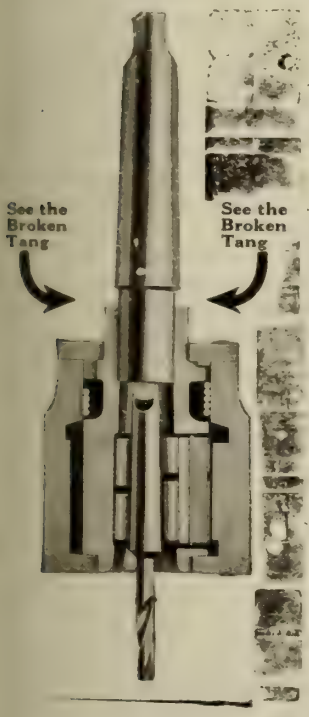
# Aikenhead's

## Wahlstrom Automatic Tapping Attachment



Tap breakage becomes a thing of the past when you use the Wahlstrom Tapping Attachment. The tap is prevented from jamming in the hole by keeping the lands free from chips. The chips are freed by an oscillating motion which duplicates the simple to-and-fro motion of hand tapping. For tapping in soft materials the oscillating motion can be changed to a continuous revolution.

The Wahlstrom fits any drill press. Made in two sizes. No. 1 takes taps of all sizes from 5-40 to ½ inch; No. 2 takes taps from ¼ inch to ¾ inch.



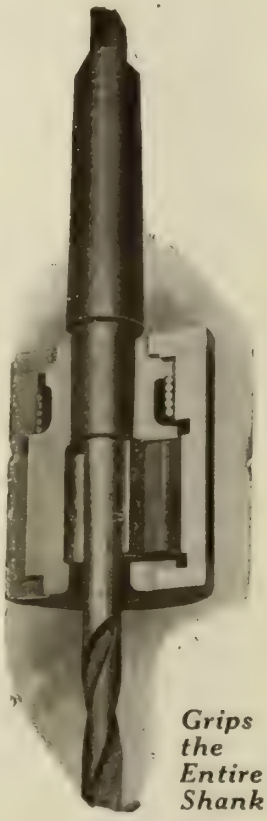

## Wahlstrom Chuck

### *Holds Tools with or without Tangs*

The instant-acting jaws of the Wahlstrom close on the entire shank with a grip which becomes firmer and firmer as the resistance of the tool increases. The clutch positively cannot slip and the jaws never break or mark a tool.

Two seconds is all you need with a Wahlstrom to change from drilling to reaming, counterboring, or tapping. Don't stop the spindle—just grasp the chuck with one hand and change tools.

Made in two different styles. One style holds Nos. 1, 2, or 3 Morse Taper Shank Drills—with or without a tang. The other style is made in three sizes, which hold all sizes of straight-shank tools from ¼ to 1 inch.



*Grips the Entire Shank*

***Buy them at Aikenhead's***
***"Canada's Leading Tool Supply House"***

**Aikenhead Hardware, Limited**
**17 Temperance Street, Toronto, Ont.**


*If interested tear out this page and place with letters to be answered.*

# The Week's Events in Montreal Industry

Lieut.-Col. Gardiner of Robt. Gardiner & Sons, Montreal, who has been confined to his home for the past three weeks by illness, is now reported to be progressing favorably and it is hoped that he will soon be able to make his usual appearance at the office.

---

Following the fire that occurred at the foundry of W. R. Cuthbert and Company, 41 Duke street, last week, it has been announced that immediate plans have been made for the reconstruction of the building and the acquiring of equipment and machinery that will make this plant equal to any in this locality. No time will be lost in clearing away the debris and starting work on the new foundry.

---

J. W. Norcross, president of the Canada Steamships, who has been in England and Europe since October last, with the exception of one week that he spent in Montreal, is expected back about the end of February or the beginning of March, at which time it is estimated that there will be further developments to announce in connection with the Canada Steamships' part in the proposed British Empire Steel Corporation merger.

---

It has been stated that final arrangements have been made for the commencement of work in connection with the large hotel to be constructed by the Mount Royal Hotel Company, on the site of the old Peel Street barracks, near the corner of Peel and St. Catherine streets. The cost of the structure when completed will be in the neighborhood of $9,000,000, and it is anticipated that actual operations will be started by the first of April.

---

The Sheffield Engineering Supplies, Limited, formerly Forrest, Jackson and Forrest, of 230 Craig street west, Montreal, have acquired the Canadian selling agency for Michael and Joseph Wing Ltd., of Sheffield, England. This firm are large manufacturers of commercial iron and steel products, specializing in bar stocks for a wide and varied range of purposes. The lines include the best grades of carbon, tool, crucible and high speed steels.

---

The Shaughnessy shield for Eastern Canada for first-aid work in connection with the St. John Ambulance Association, was, last week, presented to the police team of the C. P. R. of Montreal. The presentation was made by Lord Shaughnessy, who emphasized the value of such training, especially for those associated with railroad work. The shields and medals have been won several times by C. P. R. teams. The team was in charge of Inspector Logan, and the members were: Capt. Wilfred Mansell, Acting Sergeant George Curtis, and Constables Arthur Hart, Percival Hawley and Jesse Holmes.

---

Owing to the abnormal rise in the level of the River St. Lawrence during the past week, it has been found necessary to close some of the sewer outlets, and pump the sewage through the special outlets, as there is danger of flooding by using the regular channels when the water is exceptionally high as it is at present. Officials of the city state that it is unusual to operate the pumps in January although it is frequently done during the month of December. The cause of the present rise is the blocking of the ice at the foot of the island, but precautions taken will avoid any serious flooding to streets and cellars in the vicinity.

---

W. D. Robb, operating vice-president of the Grand Trunk Railway, has announced the appointment of G. A. Kell, to the position of safety engineer of the system, with headquarters at Montreal. Mr. Kell has been associated with the motive power department of the Grand Trunk since his boyhood, acting in the capacity of travelling engineer for the past ten years, and is thoroughly conversant with the safety requirements of the entire system, and a large part of his new duties will be the supervision of the "Safety First" campaign among the railway employees.

---

Canadian Northern officials at Moncton, N.B., have been instructed to lift the embargo that has existed against the steel company, at Sydney, for the past few weeks. It is not known whether this relief is of a permanent character or only a temporary one, but the advices state that the freight will be accepted as formerly. In this connection it may be stated that reports from Sydney indicate an early settlement of the trouble between the freight handlers of the Dominion Iron and Steel Company and the officials is looked for. Owing to threatened action on the part of the Railroad Brotherhood, the situation became so serious that the steel company refrained to call upon the railway company to accept material for shipment. The atmosphere is now clearing and it is hoped that things will again be normal before the close of the month.

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At the regular monthly meeting of the Canadian Railway Club, held in the Windsor Hotel on the night of January 11, a highly interesting paper was read by Capt. A. H. Kendall, M. C., O. C. 58th Broad Gague Operating Company, C.E.F. (now master mechanic of the C.P.R. at Montreal.) The title of the paper was "Operating Broad Gauge Railways in France Under War Conditions," and the large number of members attending showed quite clearly, the extreme interest taken in this interesting and instructive paper. The annual dinner of the Railway Club will be held in the Windsor Hotel on the night of the 29th of January, when it is expected that W. H. Taft, ex-president of the United States, will be the principal speaker. The Hon. F. B. Carvell, chairman of the Board of Railway Commissioners, has accepted the invitation to respond to the toast of the railways. Stephen Leacock will be on hand to reply to the toast of our guests.

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A movement is on foot in certain quarters to secure the Foundrymen's Convention for Canada next year. The matter was discussed at the last convention in Columbus and Montreal mentioned, and as is usual when the name of a city is put forward as a possible meeting place for some future convention, the suggestion was favorably received at the time. Mayor Martin of Montreal has been approached on the subject and has promised his hearty co-operation, and it is understood that he is taking the matter up with the Prime Minister personally, to arrange for the elimination of red tape on custom duties etc., in getting American exhibits over the border. The question of securing a suitable hall for exhibition purposes is also under consideration. The Arena has been suggested but it is probably too small for the purpose. It is thought that the drill hall on Craig street can offer the largest amount of floor space available in the city for the necessary exhibit of foundry equipment. We understand that Mayor Martin, once these difficulties have been removed, will extend an official invitation in the name of the city of Montreal to the officers of the Foundryman's Association in Chicago. The possibility of the Convention being held in Montreal has aroused considerable interest, and all-around approval in Canadian foundry circles, and they promise to extend the good hand of fellowship to their American brothers if the convention is held in their city and further assure them that they will find many of their compatriots here, if one can judge by what occurred last summer when the streets of Montreal were filled with visiting American tourists and convention delegates drawn there by reasons which are said to be not entirely unconnected with the 18th Amendment to the Constitution of the United States.

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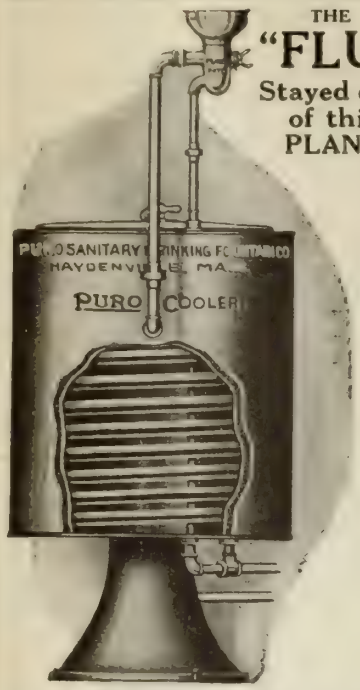
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# INGERSOLL


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(MADE IN CANADA)

The only fountain with a bowl that prevents lips touching the bubbler paid its moderate cost over and over in all those well-ordered plants whose precautionary measures successfully barred the Spanish influenza. PURO saves lives, time and water. Write

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Japanning and Varnishing Ovens heated by Gas, Electricity, Steam or Coal. Kernchen Siphonage Ventilators, Bakers' Ovens, trucks, casters, etc. Write for Booklet.

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Tools, Jigs, Fixtures and Special Machinery. Let us shoulder your problems.

17 MAIN ST. EAST, HAMILTON

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Send us your blueprints and specifications. Entrust your requirements to experienced workmen and up-to-date equipment. Have your dies made in Canada. First-class workmanship guaranteed.

THE KIMBER & HILLIER MFG. CO.,
Thorold Road, - St. Catharines, Ont.

**Unique Order.**—Eleven vessels, ranging in size from gas boats to big stern wheelers over 200 feet in length, with a total value of well over $200,000, will be built in Vancouver for the Hudson's Bay Company for operation on the Mackenzie River during the coming spring and summer months, according to information given by an official of the company who is making arrangements for the commencement of the work.

## Engineering

The H. Mueller Mfg. Co., Sarnia, are contemplating a large extension to their plant.

The erection of a steam heating plant is planned by the Chatham Steam Heating Co.

Erection of a warehouse is being planned at Regina, Sask., by the McColl Bros., Ltd., Toronto.

The Dyrob-Steel Co., Orillia, Ont., has decided to proceed at once with the erection of a factory.

Arrangements are being made to enlarge the plant of the Tuttle-Bailey Mfg. Co., of Bridgeburg.

The London Concrete Machinery Co., London, Ont., are erecting a $50,000 addition to their factory.

The erection of a paper mill is being planned by the Provincial Paper Mills, Ltd., Port Arthur, Ont.

A storage shed will be built by the Warren Bituminous Paving Co., Ltd., 19 Melinda Street, Toronto.

A new memorial hospital is to be erected in Whitby next year on the site of the Perry Castle Block.

Plans are being made by the Canada Cement Co. to erect a large office building on Phillips Square, Montreal.

The Government Telephone Commission, Ochre River, Man., are about to erect a telephone exchange building.

The Transparent Rubber Co., 1555 Danforth Ave., Toronto, was gutted by fire on Saturday, January 15. The loss is estimated at $24,000.

The Bell Telephone Co. plans to expend $10,424,412 this year on new plants, including $3,535,518 in Toronto, $228,200 in Hamilton and $453,000 in Ottawa.

Plans are being made by the General Public Hospital Commissioners at St. John, N.B., to alter and build an addition to the hospital at a cost of $500,000.

The Brantford Computing Scales, Ltd., Brantford, Ont., have erected a new factory with foundry attached. Operation will begin in about two months' time.

The Corbet Foundry & Machine Co., 1064 First Ave. West, Owen Sound, Ont., intend enlarging their plant by an addition to cost $25,000. Tenders will be called in the spring.

The plant of the Woodstock Worsted Knitting Co. has been acquired by the American Ironing Board Co. for a Canadian branch. A twelve months' lease has been taken with the option to buy at the end of that time.

J. R. Royer, 118 Murray Street, has been awarded the general contract for the erection of three-story factory for Goupil Ltee, 9 Alexandre Street, Sherbrooke, Que., at a cost of $30,000.

New tenders will be called in the spring by F. J. Wolfe, district representative of the Imperial Oil Co., for erection of warehouse, garage and stables at Riviere du Loup, Que.

The general contract for the erection of a factory costing $20,000 for the Dominion Canners, Ltd., Niagara Falls, has been awarded to J. D. Nichols, 116 Sumner Street.

Preliminary operations for the erection of the new station, train shed and viaduct for St. John, N.B., for the Canadian National Railways have been recently commenced.

S. R. Cound, general manager of the Baldwin Canadian Steel Corporation, left on January 17 for New York en route to England for three months' leave. The departure of the general manager follows close upon the first production of tin plate in the big plant. Mr. Cound has been devoting his energies to this work for some time.

## Trade Gossip

**Morden Retires?**—The retirement of Col. W. Grant Morden, M.P., from the nominal position of chairman of the board of directors of the British Empire Steel Corporation will, it is expected, shortly be announced by Roy M. Wolvin, president of the Dominion Steel Corporation, who went to England recently with D. H. McDougall, president of the Nova Scotia Steel & Coal Corporation, in connection with the merger reported to have dwindled down to these two concerns. It is stated, in fact, that Col. Morden's connection ceased some time ago, although there has been no official confirmation of this.

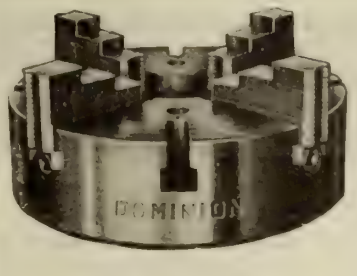
## Personals

I. Swales has been appointed to the position of general manager of the Chapman Double Ball Bearing Co., Ltd., Toronto.

Thos. Southworth, managing director of the Deloro Smelting & Refining Co., Ltd., together with F. A. Bapty, secretary-treasurer of the same company, spent several days this week in New York city on company business.

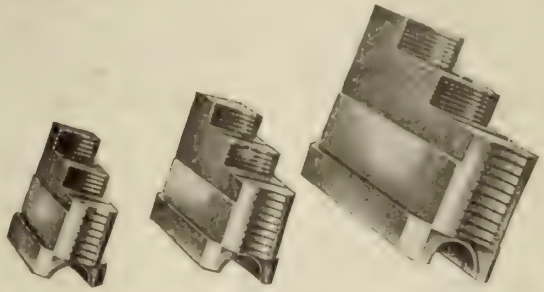
E. W. Sawyer has resigned his position as general manager of the Dominion Abrasive Co., Ltd., Mimico. Mr. Sawyer has held the position since the inception of this concern in 1920. Their plant was also located in New Toronto.

**Steel Tenders Wanted.**—W. A. McLean, Deputy Minister of Highways for Ontario, is advertising for tenders for reinforcing steel. Sealed tenders, marked "Tender for Contract No. 309," will be received by him until 12 o'clock noon on Tuesday, February 1st, 1921, for the supply of approximately 250 tons of round steel, reinforcing bars for culverts, and of expanded metal for bridge floors. Delivery will be required prior to May 1st, 1921. Specifications may be seen on and after Friday, January 14th, 1921, at the office of Mr. McLean, Parliament Buildings, Toronto.


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STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY



The Jaws Are Extra Strong

THEY are drop forgings, made of best quality steel, heat-treated and hardened. The threaded portion of jaws form a half nut for the setting-up screws. Have stood the test of heavy duty work in our own shops where accuracy was the only accepted standard.

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3


## MADE ADVANCES AFTER CLOSE STUDY

**John J. Main Was Inventor of Note—Passed Away in Toronto Recently**

John J. Main, inventor of the Heine boiler, and one of the outstanding figures in Canadian foundry circles, died at his home, 40 Prince Arthur Avenue. He had been ill a long time, and death folloewd a stroke, the fifth of its kind.

Mr. Main was born on the island of Jersey 70 years ago. He came to Canada as a young man, and for years worked at his trade as a boilermaker. It was the invention of the Heine boiler which gave him his real start in life. He became connected with the Polson Iron Works, rose rapidly, and when he retired three or four years ago was vice-president and general manager.

During the war Mr. Main served on the Imperial Munitions Board. Free of charge, he turned over to the military authorities his patents on boilers fed with crude oil, which were used extensively in many branches of the service.

Mr. Main was president of the Canadian Incinerator Company, president of the Policy Holders' Mutual Life Insurance Company, and a director of the Dominion Radiator Company. He was superintendent of the Doty Engine Company, John Inglis & Sons and the Bertram Engine Works at various times during his career.

## WILL FIGHT THE DECREASED WAGE

**Twenty Per Cent. Reduction Is Cause of Trouble in the Sydney Field**

That they will fight by every legitimate means in their power the 20 per cent. wage reduction ordered by the Dominion Iron & Steel Corporation was the decision reached at a mass meeting of Steel Workers' Union, Sydney, N.S. Speaker after Speaker took the floor and declared that there was nothing in either the cost or price of steel or in the trend of the cost of living to justify the drastic wage cut proposed by the Steel Corporation.

An effort will first be made, it is said, to induce the company to change its announced purpose of making the 20 per cent. cut, but if negotiations in this direction fail, then an appeal will be made direct to the Federal Government.

# Classified Opportunities

## MACHINERY WANTED

WANTED—ONE PORTABLE FLOOR CRANE and hoist lift, 7 feet or over. W. G. Utley, Yarmouth, N.S. (c2m)

WANTED—NEW AND RE-MANUFACTURED gas and gasoline engines, boilers, saw-mill machinery, planing mill and sash and door factory machinery. New and manufactured iron and wood-working machinery. Electric motors, dynamos, direct connected steam operated generators, portable electric tools. Builders' hoists, elevators. Box 739F, Canadian Machinery.

IF YOU HAVE IRON-WORKING OR WOOD-working machines for sale, or idle machine shop equipment, call or write Canada's largest dealers in new and used machinery. H. W. Petrie Limited, Toronto, Ont. (cfm)

WANTED — WOODWORKING MACHINERY and mining machinery, machine tools, boilers and steam pumps, alternating or direct current motors. Contractors' equipment. Apply Box 737F, Canadian Machinery.

WANTED FOR CASH — MACHINE TOOLS, woodworking machinery of every description. The A. R. Williams Machinery Co., Toronto. (cfm)

## MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (etfm)

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### What can we do for YOU?

Through these columns thousands of dollars of equipment are disposed of each year. If you are not using Canadian Machinery now, let us tell you what others have done—are doing.

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*Classified Advertising Section*
**143 University Ave., Toronto**

## FOR SALE

ENCLOSED LIQUID FUEL COMBUSTION APparatus capable of generating intense heat in pipes and confined passages for heating parts of internal combustion engines and for other uses; spark ignited; blower operated. Patented October 8th, 1918. Can be inspected at and for sale by H. W. Petrie, Limited, 131 Front St. W., Toronto.

H. R. T. BOILERS—
1—125 H.P., 72" x 16', 125 LBS.
2—100 H.P., 66" x 16', 125 LBS.
2—100 H.P., 66" x 16', 80 LBS.
2—70 H.P., 60" x 14', 120 LBS.
1—45 H.P. 42" x 14', 130 LBS.
COMPLETE PARTICULARS AND PRICES ON application.
WILSON-McGOVERN, LIMITED, LUMSDEN Building, Toronto. (cfm)

CANADA MACHINERY CORPORATION, LTD., manufacturers of machine tools for wood and iron. Call at our Toronto showrooms, Brock Ave. subway. Telephone Parkdale 3558. Head office and works, Galt, Ont. Canada Machinery Corporation, Ltd. (cfm)

### CASTINGS

Medium and light, grey iron castings for manufacturing purposes. We carry bushings, solid and cored, from 1 in. to 6 in., or larger.

**TORONTO FOUNDRY CO.**
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Light and Medium-Bench and Floor Repetition Castings; Capacity 15 tons per day.
Expert Metal and Wood Pattern Work. Our advice and estimates will save you money.
Semi-finishing operations on Lathe or Grill on Castings supplied if required.
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### Modern Marine Machinery

Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

### Used Machinery For Sale

1 24" Smith & Mills Shaper
1 3' Bickford Radial Drill.
1—36" x 36" x 10' Bertram Planer
3—3" x 36" Jones & Lamson Turret Lathes
1—" x 24" Jones & Lamson Turret Lathe
1—15" x 6' South Bend Lathe.
1—18" x 8' Stevens Lathe.
1—18" x 8' Mueller Lathe, Q.C.G.
1—18" x 8' Cincinnati Lathe, Q.C.G.
1—26" x 12' C.M.C. Lathe, Q.C.G.
1—26" x 48" x 14' McCabe Double Spindle Lathe.
We are offering the above machines at attractive prices for quick sale.

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*Machinery and Supplies*
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## PATTERNS

TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (etfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (etfm

## HELP WANTED

GENERAL MANAGER REQUIRED IMMEDIately for small engineering works in Ontario employing about 100 men and comprising machine shops and grey iron foundry manufacturing machine moulded castings; must be thoroughly experienced in this class of work and competent to take entire charge, including office and sales end of the business; preference given to one having experience in agricultural machinery; good prospect for energetic man; apply, stating age and salary required and give references; applications will be treated in confidence. Box 745, Canadian Machinery. (c4m

## POSITIONS WANTED

DRAUGHTSMAN (PERTH COUNTY) DESIRES change. Have had general experience of ten years. Am first-class practical shop mechanic age 30. Married. If you are in need of a young man of ability, who has risen by merit only, let us arrange an interview. Address Box 747, Canadian Machinery. (c6m

### PATTERNS

**Wragge's Pattern Works, 10 George St. South, Galt, Ont.,** Phone 1105 W. Equipped for best service in wood or metal patterns to any specification. Most reasonable prices. Expert workmanship. "Nothing ragged but the name." (cxxvi3m)

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Will handle medium Specialty Line — Manufacturing and Selling

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## Machinery Agencies Wanted

A well established machinery supply house in Nova Scotia, covering the entire province, which has been handling American machinery, would like to hear from Canadian manufacturers of the following lines:—

**Woodworking Machinery**
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**MACHINERY**
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**HALIFAX**

## An Unusual Lot of Rebuilt Machines of the Better Kind at a Saving of Fifty Cents on the Dollar

**LATHES**

3 28″ x 12′ Boye & Emmes, 3 step cone, D.B.G. -G.C.G.
6 24″ x 12′ Boye & Emmes, 3 step cone, D.B.G.—G.C.G.
3 24″ x 10′ Boye & Emmes, 3 step cone, D.B.G.—G.C.G.
1- 24″ x 8′ Boye & Emmes, 3 step cone, D.B.G.—G.C.G.
2 20″ x 8′ Boye & Emmes, 3 step cone, D.B.G.—G.C.G.
3 26″ x 12′ C.M.C., 3 step cone, D.B.G.—G.C.G.
2 26″ x 10′ C.M.C., 3 step cone, D.B.G.—G.C.G.
1—24″ x 12′ C.M.C., 3 step cone, D.B.G.—G.C.G.
1 20″ x 10′ C.M.C., 3 step cone, D.B.G.—G.C.G.
1—18″ x 8′ C.M.C., 3 step cone, D.B.G.—G.C.G.
1 14″ x 6′ American, 3 step cone, S.G.G.—G.C.G.
2- 18″ x 8′ Mueller, 3 step cone, D.B.G. -G.C.G.

**MILLING MACHINES**

1 - No. 2 Kempsmith, full universal with dividing head, complete and in first-class condition.
1 - No. 1½ Cincinnati Universal, complete with regular equipment.
1 No. 2 Ford Smith, complete with dividing head and vice.

**DRILLS**

1 Barnes 15″ Drill, lever feed with countershaft.

**TURRET LATHES**

1—No. 4 Wood tilted, power feed, 1½″ capacity.

The above are only a few items from our large stock, which consists of boilers, engines, pumps, motors, compressors, in fact everything in machinery.

What are your requirements? They interest us give us the opportunity to quote you will save fifty cents on the dollar.

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12″ Pond Car Wheel Lathe, Motor Drive
26″ x 22′ Bridgeford, g. h. Motor Drive.
36 x 16′ Sidney, D. B. G., Q. C., new
27 x 14′ Sidney, D. B. G., Q. C., new
14″ to 21″ x 6′ to 12′ Sidney
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Large Stock-used Lathes

40 x 40 x 10′ Powell, 2H Planer
24 x 24 x 5′ Pease 1H Planer
16 x 16 x 42″ Walter, 1H Planer
14″ Steptoe Shaper
16″ x 20″ x 24″ Steptoe, B.G., new Shaper
7″ Rhodes, Precision, new Shaper
16″ Used Smith-Mills Shaper
16″ Used Kelley, B. G. Shaper
No. 4 Brown and Sharpe, Plain Miller
No. 24 Osterlein, Plain Miller
No. 22 Garvin, Vertical Miller
No. 2 M. U. Garvin, Universal, new Miller
No. 1 Dow, Plain, new Miller
No. 3 Burk Hand Miller
No. 3½ Fox Hand Miller
6′ Western Universal Radial Drill
8′ Mueller, Plain, Radial Drill
42″ Canedy-Otto Plain, new Drill
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No. 1 Caplin Keyseater
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10″ x 36″ Norton Plain Grinder

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**FRANK TOOMEY INC.**
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LATHES

Alfred Herbert Hexagon Turret Lathes for bar work for 1⅝″ and 2¾″ dia. bar.
Alfred Herbert Combination Turret Lathes, 13″, 20″, 22″ swing.
Springfield 16″, 18″, 20″ cone pulley and geared head Engine Lathes.
48″ x 24′ bed Tangye Geared Head Lathe.

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12″ Pollard Bench Drills.
1, 2, 3 and 4-spindle Herbert Ball Bearing Drills.
20″, 22″, 24″, 27″ Pollard Upright Drills.
36″ Pollard Sensitive Radial Drill.
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SHAPERS

16″ Milwaukee.

PLANERS

24″ x 24″ x 6′ Stirk Planing Machine.
60″ x 60″ x 16′ Stirk Planing Machine.

MILLING MACHINES

No. 3 Herbert Horizontal Cone Pulley, 21″ x 7″ x 16″.
No. 16 Herbert Horizontal Single Pulley, 34″ x 13½″ x 20″.
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No. 16 Herbert Vertical Single Pulley, 34″ x 13½″ x 21″.
No. 8 Herbert Vertical Cone Pulley, 62″ x 38″ x 28½″.

*We solicit your enquiries for Machine Shop Equipment*

**ALFRED HERBERT, LIMITED**
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### If You Want Machine Equipment, Send Us Your Enquiries

**We have one of the largest stocks of new and used metal and woodworking machines in Canada.**
**Many machines only very slightly used and all absolutely guaranteed.**
**A few machines from our Toronto stock at exceptionally attractive prices are:**

**AIR COMPRESSORS**

1—3" x 1½" x 3 American Steam Pump Co., motor driven (used).
1—8" x 8" Sullivan Class "W.G. 3." Belt driven (used).
1—12" x 12" Bury Class "L." Belt driven (used).
1—8" x 8" x 10" Bury, steam driven (used).

**DRILLS**

1—10" Burke Sensitive, bench type (new).
20" "Sibley" Champions, Rockwell, and Silvers (new and used).
1—36" C.M.C. Heavy Duty (used).
1—3-spindle 20" Silver Gang Drill (used).
1—4-spindle W. & R. Sensitive (used).
A number of smaller sizes in bench and column type.

**BORING MACHINES**

1—66" Bement-Niles Vertical, 2 head, 24" under rail (used).
1—Universal No. 2½, Horizontal, table 42" x 22" (used).
1—Bullard "New Era" 36", complete equipment (new).

**GRINDERS**

1—"Landis" No. 4 Universal (used).
1—"Landis" Plain, self contained 36" x 12" (used).
1—"Norton" Plain, No. 434 (used).
1—"Fitchburg" Cylindrical, 8" x 36" (new).
Several "Globe," "Stevens," "LeBlond" and "Cincinnati" Cutter Grinders (new and used).

**SHAPERS**

1—14" "Mackenzie" B.G. Crank Shaper (used).
1—16" "Rae" B.G. Crank Shaper (used).
1—24" "MacGregor G" B.G. Crank Shaper (used).

**LATHES**

1—7" Cataract Precision (used and new).
1—12" x 8' "LeBlond" Tool Room (used).
1—16" x 6' "Reed" (used).
1—18" x 8' "Rae" Q.C.G. (new and used).
1—24" x 10' "Milwaukee" (new).
1—30" x 12' "Blaisdell" (used).

**GAP LATHES**

1—12" x 17½" x 6' Perfect (used).
1—20" x 38" x 12' C.M.C. (used).
1—21" x 30" x 7' South Bend (used).
1—22" x 40" x 16' McDougall (used).
1—38" x 54" x 12' Bertram (used).

**TURRET LATHES**

No. 4 Millhollands, capacity 1⅝" (used).
Several Oliver & Davis Turrets, various capacities (used).

**PLANERS**

1—42" x 42" x 20' Putnam, 1 head (used).
1—30" x 30" x 10' Pond, 1 head (used).
1—24" x 24" x 6' Powell, 1 head (new).

**MILLING MACHINES**

1—Whitney Hand Miller, 18" x 6" table (used).
1—Briggs High Duty Type "A," 22" Traverse (new).
1—Briggs High Duty Type "B," "42" Traverse (new).

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1—No. 10 Racine 8" x 8" cap. (new).
1—Peerless 6" x 6" cap. (used).
1—No. 7 Watkins 9" cap. 18" blade (used).

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1—Arbor Press No. 4 "Greenard" (new).
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1—Riveting Machine No. 81-A, "Grant" (used).
1—High Speed Hammer No. 3-A (used).
1—Rotary Bevel Shear, "Lennox," 1" cap. (new).

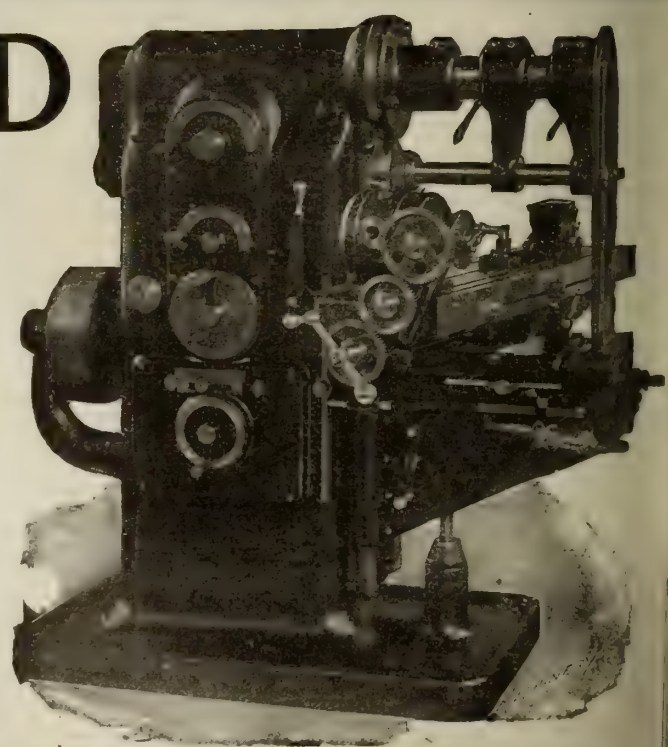
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**Its speed, simplicity of operation and great utility Assures Big Profits in whatever work it is used.**

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In the tool room, in the shop, in the manufacturing or jobbing establishment this "Miller" is beyond comparison.

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Put the power of the "Rockford" to the severest tests. It's built to more than meet the demands likely to be made upon it. It is the pace-maker of the machine shop.

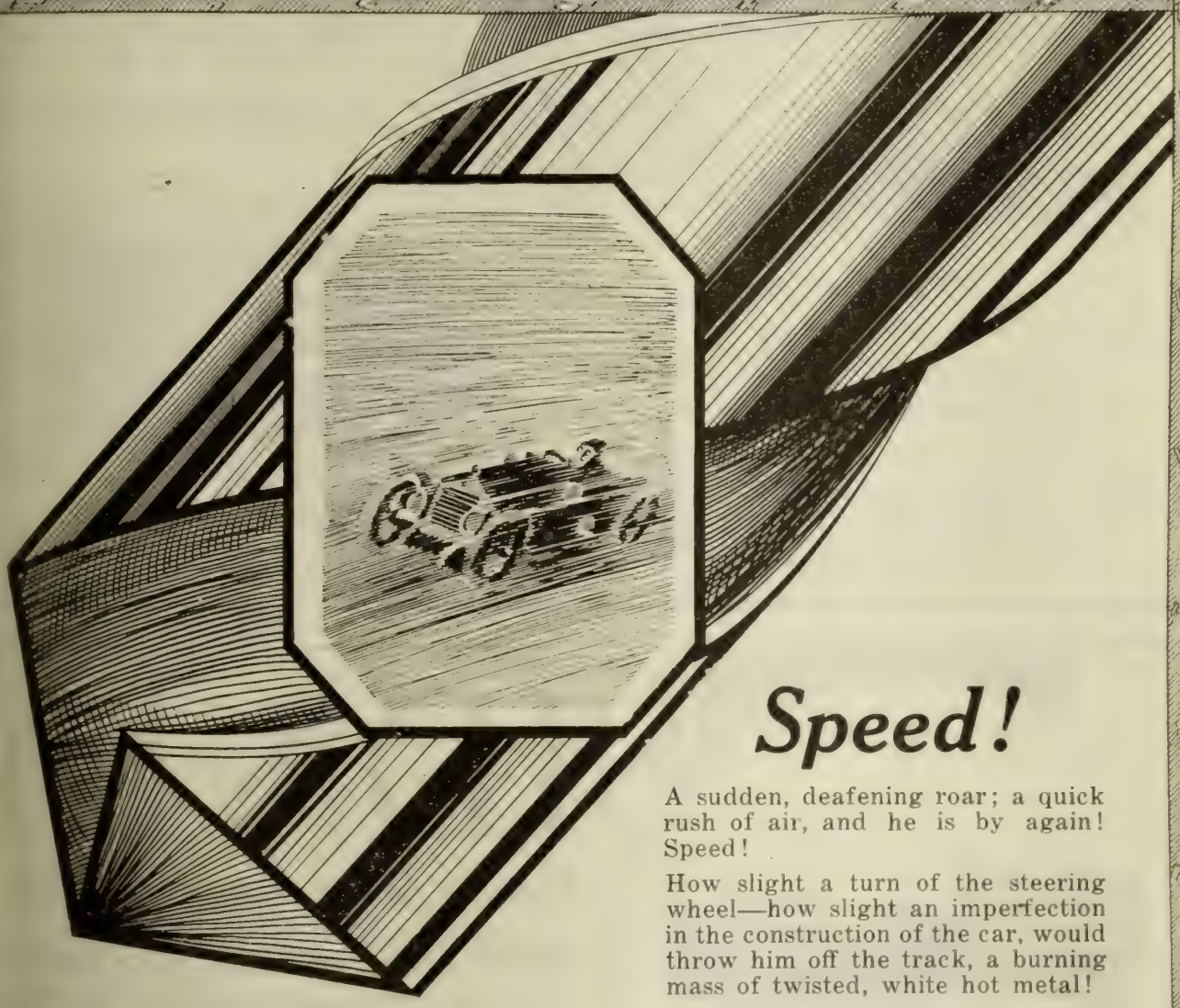
**Look into the merits of this machine. Write to us without delay.**

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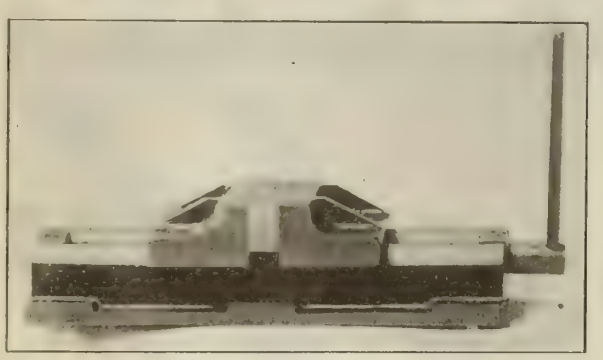
How slight a turn of the steering wheel—how slight an imperfection in the construction of the car, would throw him off the track, a burning mass of twisted, white hot metal!

Makers of good cars use "Imco" Tools in their construction. Experience has taught them that "Imco" is the sure way of getting precision cutting.

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# THE VISE YOU HAVE BEEN LOOKING FOR—

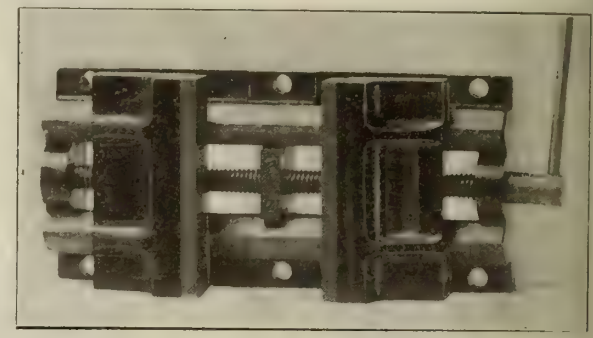
## For LATHE, SHAPER, MILLER and DRILL PRESS



**VISE** can be used flat or on side as shown, allowing holes to be drilled at right angles without removing work from vise.

Can be used on lathe face plate as chuck.

***NOTE***—Jaw slides being angled on both sides, which allows cutting to fall off and not get ground into slides.



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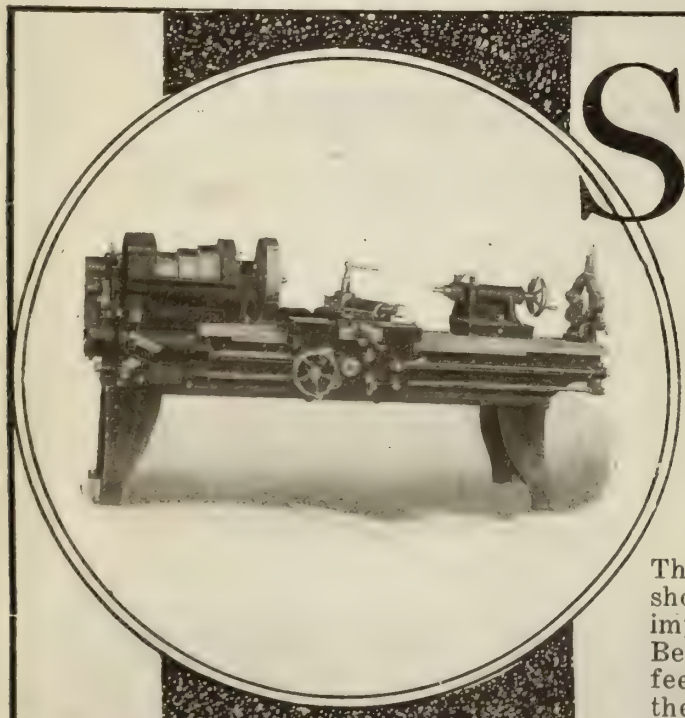
**JAWS** always centrally located on body, independent of size of work held.

**LIVE GRIP** on both jaws, and no loss of power through thrust collars.

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GUELPH, ONTARIO

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"Sidney for Service"

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### Noted for Their Power and Rigidity

One of the outstanding features of the Sidney is the manner in which it takes deep cuts through tough metals. Clean cuts without chatter, without pause. The Sidney is so designed that rigidity is maintained under severe conditions, and, in normal service.

The 25-inch Heavy Duty Quick Change Sidney here shown is the last word in lathe construction. Every improvement will be found in this, the latest model. Bed lengths available are: 10, 12, 14, 16, 18 and 20 feet. 27-inch swing design can also be supplied in these lengths.

The specific details of the Sidney are given in our new Bulletin. Write for your copy to-day.

## The Sidney Tool Co., Sidney, Ohio

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1—BERTRAM 6-SPINDLE INDEPENDENT-FEED DRILL. Spindles 2¼″ dia. Feed 13″. Table 12′ 3″ x 24″. Nearly new.

1—1,500-lb. BEMENT DOUBLE FRAME STEAM HAMMER. Complete with operating valve, anvil, etc.

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1—5-TON REVOLVING LOCO CRANE. Standard gauge. Boom 25′ long. Engine 7″ x 10″, double cyl. Truck frame 9′ 6″ x 6′ 6″, on 4 wheels.

1—42″ STYLE "A" WEST SIDE POWER FEED BAND RIP SAW. Table 52″ x 42″. Like new.

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# PETRIE

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# Snagging on a Norton

What the foundryman needs for rough work like snagging is a sturdy floor stand which can resist the vibrations set up by the grinding wheel.

The Norton floor stand has this sturdiness combined with points of safety and adaptability for foundry grinding.

The operator is not put to any strain. Work-rests of ample dimensions relieve him of holding the work.

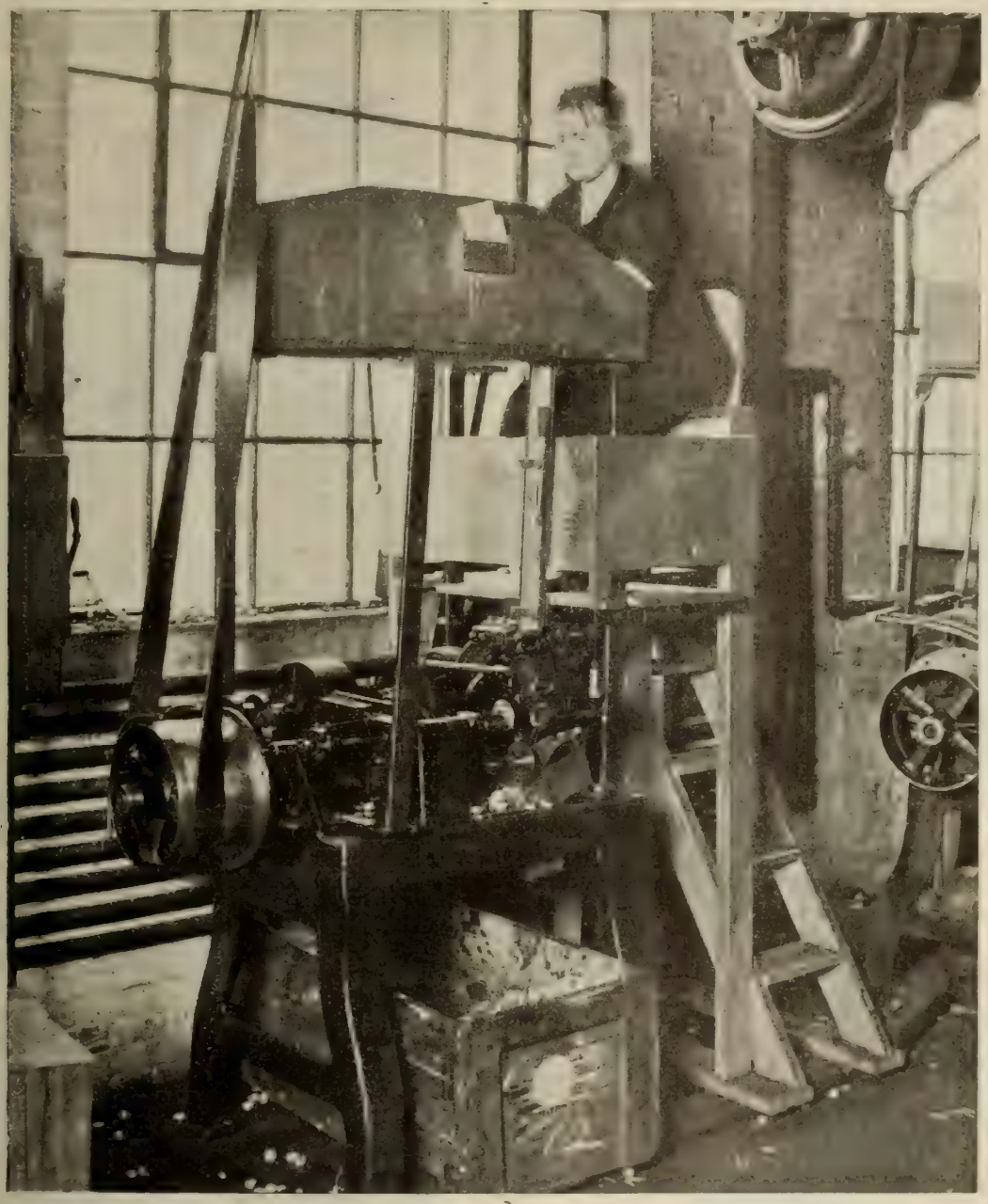
With a Norton wheel the working combination is ideal. "Alundum" for materials of high tensile strength, all kinds of steel. "Crystolon" for cast iron, bronze, brass and aluminum.

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Gravity is put to work in order to keep pace with this "Bliss" No. 118 Automatic Thread Rolling Machine, threading screw can tops. Approximately 35,000 pieces are turned out daily on this machine by this arrangement. "BLISS" Thread Rolling Machines are equipped to handle shells from ½-in. to 3-in. diameter.

BLISS 1857

# E. W. Bliss Company

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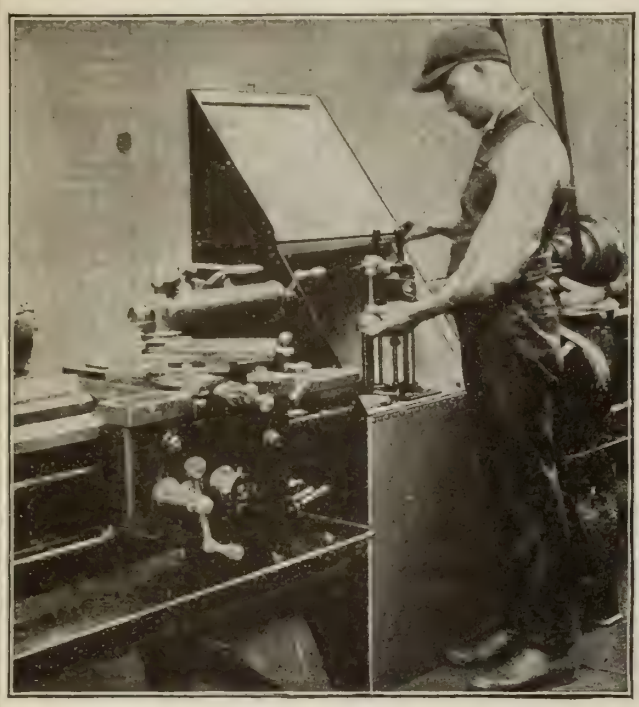
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No. 192

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By placing Bowser Lubricating Oil Cabinets in departments where oil is used.

There is no going back and forth to the oil room, no spilling, no wasted oil, no fire risk from the oil storage.

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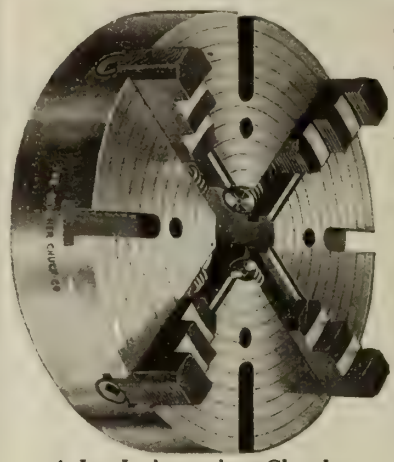
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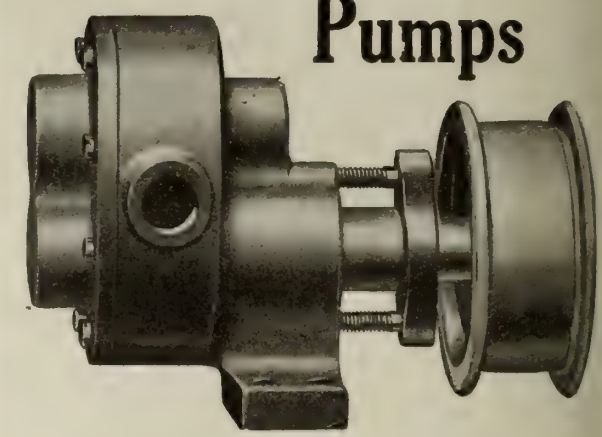
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NEW BRITAIN, CONN U S A
ESTABLISHED 1887

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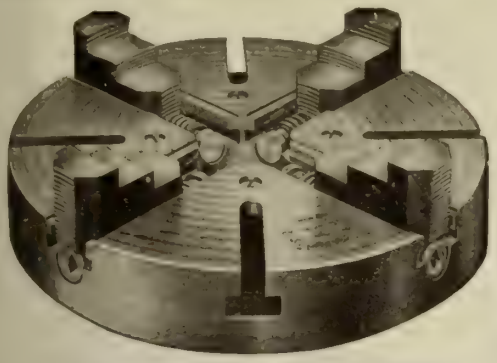
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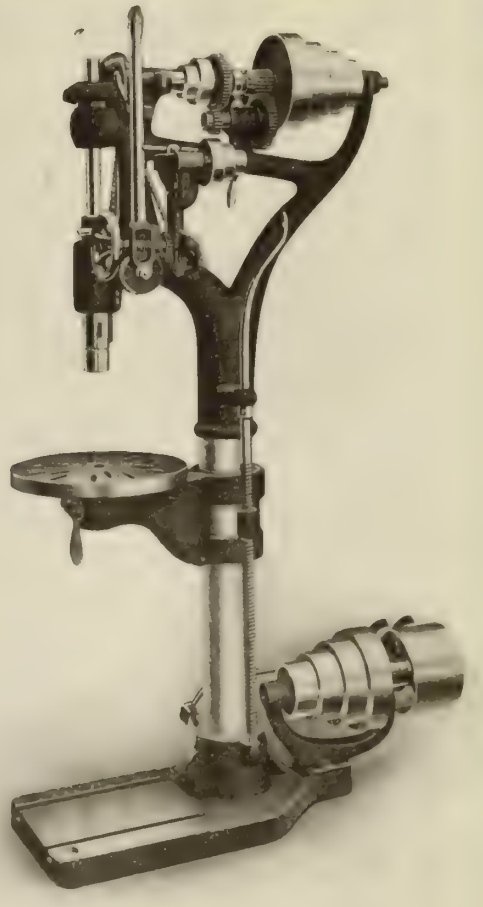
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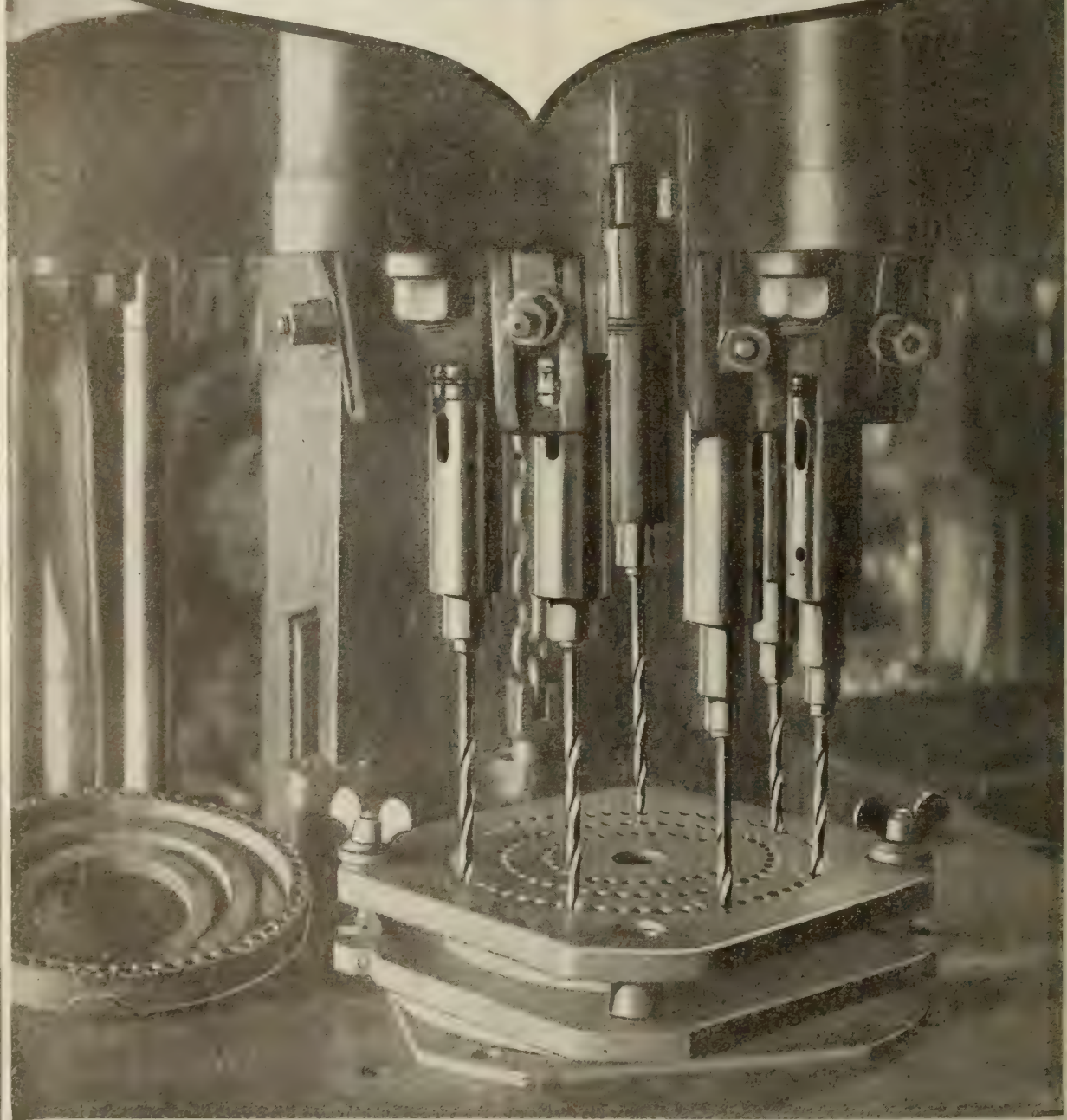
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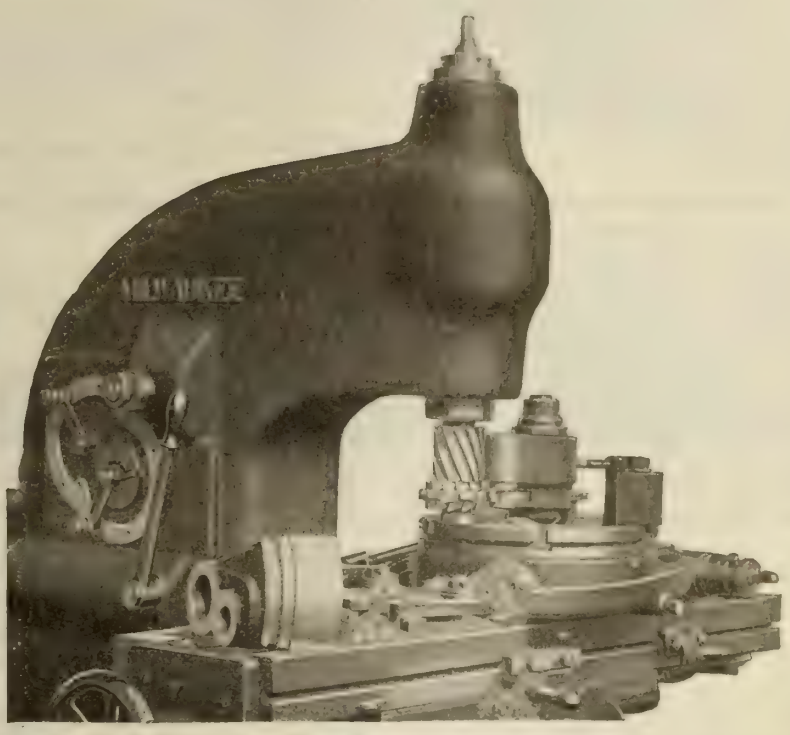
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# MILWAUKEE MILLING MACHINES



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THE scientific construction of Milwaukee Vertical Milling Machines, with correct distribution of the metal to the column, knee, saddle and table, forms a harmonious unit. The spindle is non-adjustable except for wear, the knee alone being adjustable. This rigid construction gives these machines a degree of strength and power that enables them to efficiently handle the most difficult milling jobs.

### A good, rugged machine with abundant power

The operation shown above is but one of the severe tests to which Milwaukee Milling Machines are constantly put. Four cutters, 2½" wide x 3" diameter, ½" wide x 3⅝" diameter, 7-16" wide x 3⅝" diameter, ⅝" wide x 4⅜" diameter remove ⅛", 1-16", 1-16" stock and cut a slot ⅝" deep out of solid metal, respectively. The length of each cut is 6". The floor-to-floor rate for each piece is 5½ minutes. This work is done with the aid of the rotary table. In order to show the depth of the cuts, part of the casting has been milled and then the cutter was moved back to show this milled section. The balance of the segment is still in the rough.

Milwaukee Milling Machines possess exceptional ruggedness, abundant power and accuracy, making them capable of performing milling jobs of this kind with ease and rapidity. They assure milling satisfaction under all conditions.

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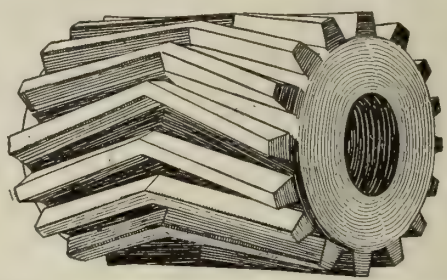
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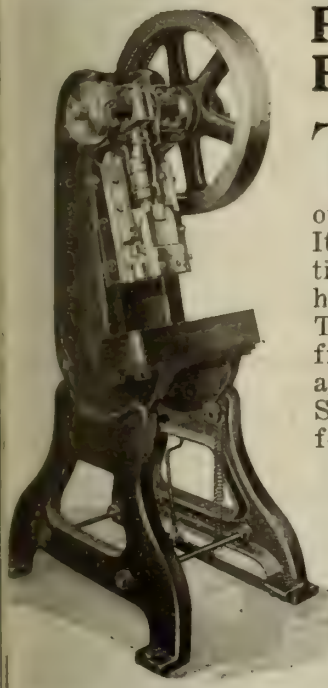
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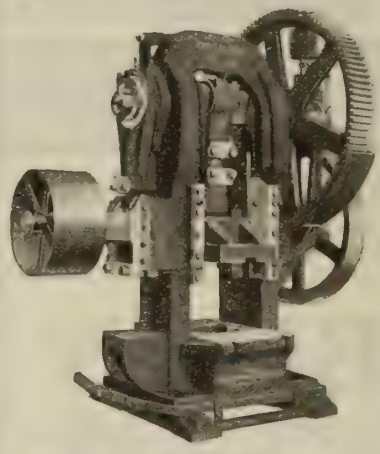
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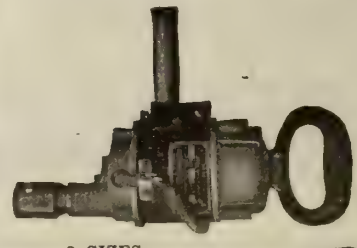
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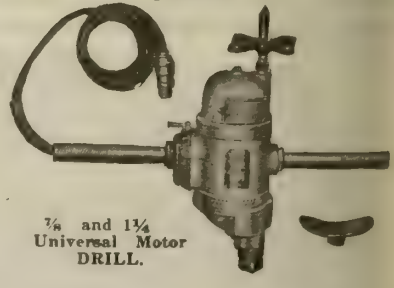
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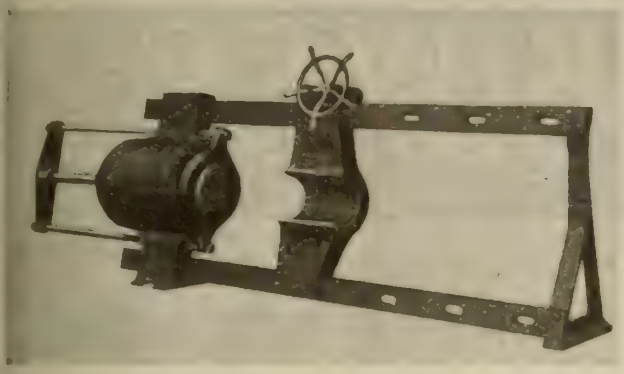
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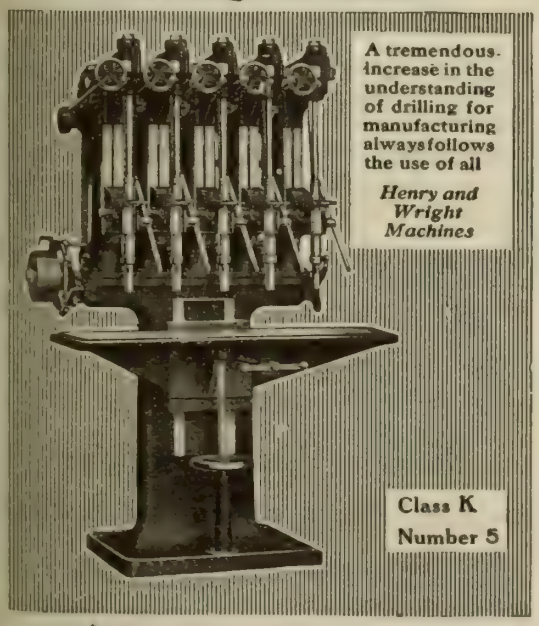
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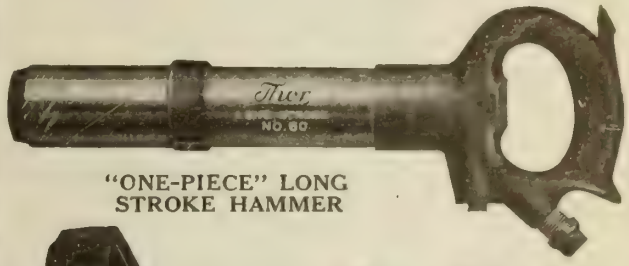

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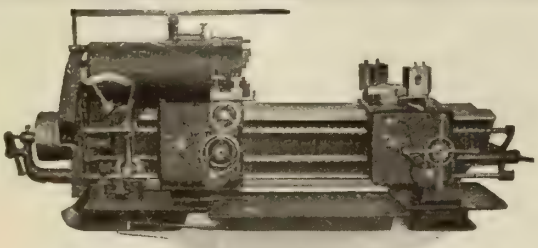
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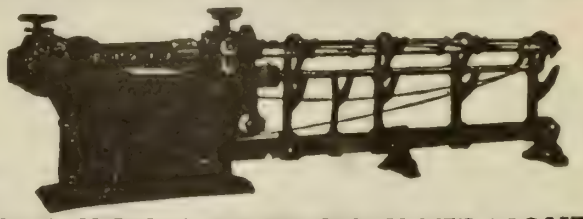
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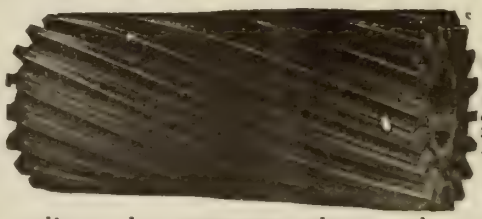
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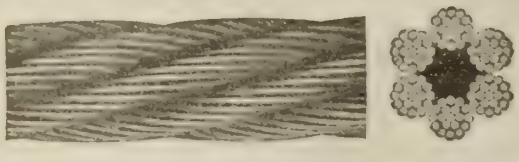

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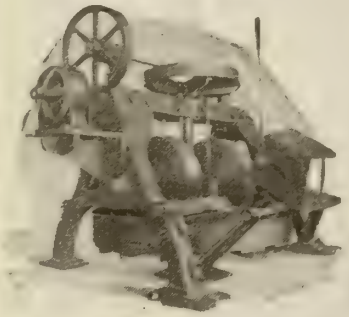
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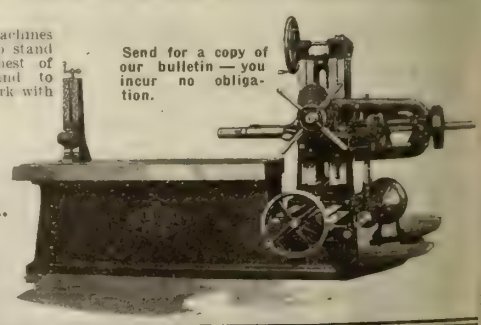
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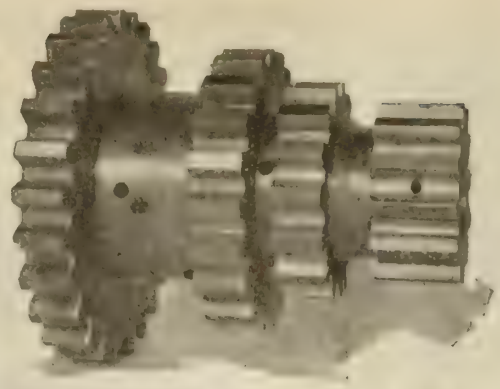
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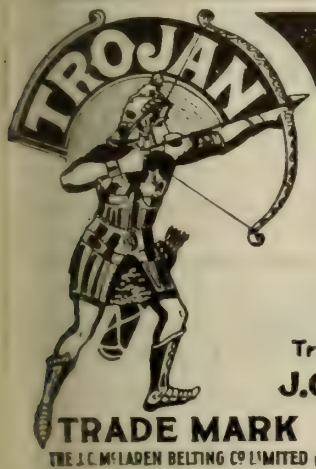
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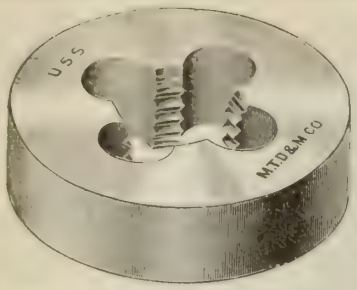
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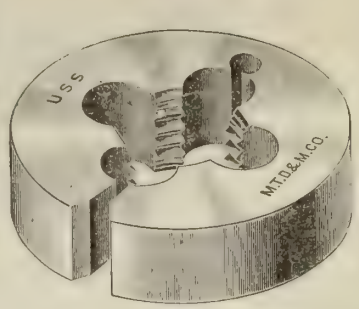
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HE adds, further: "The first aim of the Liberal party in Canada to-day is to bring about such co-operation and co-ordination of effort among men and women of liberal aims"—(a small "l" please note)—"and aspirations as will ensure defeat of the combined forces of a reactionary Government, and make possible, in matters of Government, the re-assertion and ultimate triumph of liberal" — (still a small "l")—"principles and policies."

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The story of a Canadian who "times" race-horses as a profession.

**"The Hat"** By Frederick Niven.
A vivid word-picture of a feature of our West which strikes this war correspondent.

**"My Flirtation Ends"**
By Mrs. "Margot" Asquith.
Wife of former Premier of Great Britain tells how her eight years' dalliance with Peter ends.

**"Our Lost Immigrants"** By Miss Agnes C. Laut.
She tells some cold, hard facts, and explains why hundreds of thousands left Canada.

**"Scarlet and Gold"**
By Colonel George Ham.
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By Ethel M. Chapman.
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**"A Canadian Child Poet"**
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By Arthur Stringer.
A romantic, Bolshevistic serial.

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**"Which Labor Policy?"**—Wm. B. Dickson.

**"How Militarist is Japan?"**—Quarterly Review.

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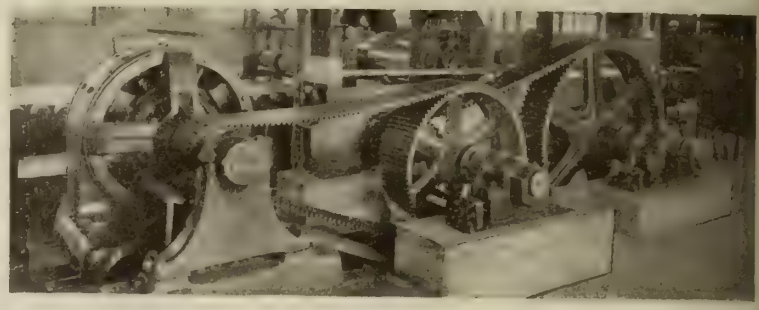
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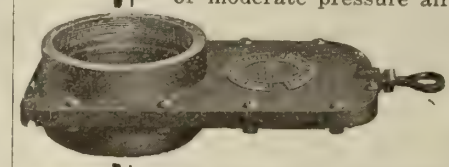
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**Chucks, Drill and Tap**
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Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
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Cushman Chuck Co., Hartford, Conn.
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Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Magnetic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**
Columbia Hdwe. Division, Cleveland, O
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

**Cleaners, Metal, Waste, General**
Oakley Chemical Co., New York, N.Y.

**Clocks, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Clutches, Friction**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**
Can. Link-Belt Co., Toronto, Ont.

**Collars, Shaft or Set**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont

**Collets**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y

**Compressors, Air**
Curtis Pneumatic Machinery Co., St. Louis, Mo.

**Compressors, Air and Gas**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**
Ford-Smith Machine Co., Hamilton, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Copper**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Cored Bronze Bars**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Cotter Pins**
Morrow Screw & Nut Co., Ltd., Ingersoll, Ont.

**Counterbores**
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Countershafts**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Couplers, Car and Locomotive**
Can. Steel Foundries, Montreal, Que.

**Couplings, Flexible**
Holden Co., Ltd., Montreal, Que.

**Couplings, Rigid**
Bernard Industrial Co., A., Fortierville, Que.

**Couplings, Shaft**
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

**Cranes, Electric**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Cranes, Hand (See Hoists, Hand)**
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

**Cranes, Locomotive**
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Cranes, Traveling**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Crank Pin Turning Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia, Pa.

**Cutters, Flue**
Holden Co., Ltd., Montreal, Que.

**Cutters, Gear**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**
Atkins & Co., Inc., E. C., Indianapolis, I.
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.

**Cutters, Milling**
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence R.I.
Butterfield & Co., Inc., Rock Island, Qu
Cleveland Milling Machine Co., Clevelan
Elliott & Whitehall Tool Co., Galt, On
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wi
Morse Twist Drill & Machine Co., Ne Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Wilt Twist Drill Co. of Canada, Ltd Walkerville, Ont.

**Cutters, Stay Bolt**
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, P
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.

**Cutters, Thread**
Butterfield & Co., Inc., Rock Island, Qu
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, P

**Cutting-Off Machines**
Bertram & Son Co., Ltd., The Joh Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R
Garlock-Walker Mchy. Co., Toronto, On
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Cutting-Off Machines, Pipe (See Pi Cutting and Threading Machine**
Landis Machine Co., Inc., Waynesboro, P
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Cutting-Off Tools**
Armstrong Bros. Tool Co., Chicago, I
Pilot Steel & Tool Co., Montreal, Que

**Cutting Oil Filters (See Oil Filterin Systems)**
Bowser & Co., Inc., S. F., Fort Wayne
Cataract Refining Co., Toronto, Ont.

**Cutting, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, On

**Dealers, Machinery (See Searchlig Section)**
Ford-Smith Machine Co., Hamilton, On
Petrie, Ltd., H. W., Toronto, Ont.

**Deckle Straps**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Diamonds, Black and Rough**
Joyce-Koebel Co., Inc., New York, N.Y

**Diamond, Carbon and Bortz**
Joyce-Koebel Co., Inc., New York, N.Y

**Diamond Tools**
Aikenhead Hardware Ltd., Toronto, Ont
Can. Desmond-Stephan Co., Hamilto Ont.
Ford-Smith Machine Co., Hamilton, On
Wheel Trueing Tool Co., Detroit, Mich.

**Diamond Crossings**
Can. Steel Foundries, Montreal, Que.

**Die-Castings**
Tallman Brass & Metal, Ltd., Hamilto Ont.

**Die Sinking Machines, Automatic**
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

**Die Sinkers**
Kimber & Hillier, St. Catharines, Ont

**Dies, Screw and Thread Cutting**
Ackworthie, Ltd., John, Birmingham, En
Butterfield & Co., Inc., Rock Island, Qu
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, I
Murchey Machine & Tool Co., Detro Mich.
National Acme Co., Cleveland, Ohio.

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**
Brown, Boggs & Co., Ltd., Hamilton, On
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, On
Toledo Machine & Tool Co., Toledo, Oh

**Dies, Forging**
Brown, Boggs & Co., Ltd., Hamilton, On
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

**Dies, Hammer**
Kimber & Hillier, St. Catharines, Ont.

# BUYERS' DIRECTORY

**Drills, Self-Opening, Adjustable**
...ometric Tool Co., New Haven, Conn.
...rbert Ltd., Alfred, Toronto, Ont.
...es & Lamson Machine Co., Springfield, Vt.
...ndis Machine Co., Inc., Waynesboro, Pa.
...chey Machine & Tool Co., Detroit, Mich.
...ional Acme Co., Cleveland, Ohio.
...t O-Lite Co. of Can., Toronto, Ont.
...tt & Whitney Co., of Canada, Ltd., Dundas, Ont.
...tor Tool Co., Waynesboro, Pa.

**Drills, Threading-Opening**
...ndis & Co., A. B., Hespeler, Ont.
...es & Lamson Machine Co., Springfield, Vt.
...ndis Machine Co., Inc., Waynesboro, Pa.
...rse Twist Drill & Machine Co., New Bedford, Mass.
...chey Machine & Tool Co., Detroit, Mich.
...tional Acme Co., Cleveland, Ohio.
...ratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
...apid Tool & Machine Co., Lachine, Que.

**Drills, Cement**
...ckley Supply Co., Toronto, Ont.
...Lassen Abrasives Co., Chicago, Ill.

**Drilling Heads**
...Ainsworth, Ltd., John, Birmingham, Eng.
...ckow Fred. C., Machinery Co., Chicago, Ill.
...ond Smith Machine Co., Hamilton, Ont.
...ndley Machine Co., Torrington, Conn.
...earney & Trecker Co., Milwaukee, Wis.
...ctric Ltd., H. W., Toronto, Ont.

**Drills, Lathe and Milling Machine**
...rmstrong Bros. Tool Co., Chicago, Ill.

**Drafting Boards and Tables**
...arling Bros. Ltd., Montreal, Que.
...conomy Drawing Table & Mfg. Co., Adrian, Mich.
...Hughes Owens Co., Ltd., Montreal, Que.

**Drafting Materials**
...American Lead Pencil Co., New York City, N.Y.
...arling Bros. Ltd., Montreal, Que.
...conomy Drawing Table & Mfg. Co., Adrian, Mich.
...Hughes Owens Co., Ltd., Montreal, Que.

**Dressers, Grinding Wheel**
...Carborundum Co., Niagara Falls, N.Y.
...Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
...D. Smith Machine Co., Hamilton, Ont.
...Koebel Co., Inc., New York, N.Y.
...Norton Co. of Can., Ltd., Hamilton, Ont.

**Drill Holders**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drill Rods**
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Drill Speeders**
...anada Machinery Corp., Galt, Ont.

**Drilling Machine Heads**
...Henry & Wright Mfg. Co., Hartford, Conn.
...Hoefer Mfg. Co., Freeport, Ill.
...United States Machine Tool Co., Cincinnati, Ohio.

**Drilling Machines, Automatic**
...Hoosier Drilling Mach. Co., Goshen, Ind.
...National Automatic Tool Co., Richmond, Ind.

**Drilling Machines, Bench**
...Beacon Engineering Co., Tipton, England.
...Can. Blower & Forge Co., Ltd., Kitchener.
...Darling & Pratt Co., Greenfield, Mass.
...Henry & Wright Mfg. Co., Hartford, Conn.
...High Speed Hammer Co., Rochester, N.Y.
...Hoefer Ltd., H. W., Toronto, Ont.
...Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
...Penn & Co., John C., Birmingham, Eng.
...Electrical Tool Co., Cincinnati, O.
...Robertson Electric Co., Racine, Wis.

**Drilling Machines, Electric and Hand**
...Aikenhead Hardware Ltd., Toronto, Ont.
...Cincinnati Electrical Tool Co., Cincinnati, Ohio.
...Geo. Machinery & Supply Co., Geo. F., Montreal, Que.
...Garlock-Walker Mchy. Co., Toronto, Ont.
...High Speed Hammer Co., Rochester, N.Y.
...Holden Co., Ltd., Montreal, Que.
...Independent Pneumatic Tool, Chicago, Ill.
...Jardine & Co., A. B., Hespeler, Ont.
...Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Gang**
...Bertram & Son Co., Ltd., The John, Dundas, Ont.
...Bilton Machine Co., Bridgeport, Conn.
...Garlock-Walker Mchy. Co., Toronto, Ont.
...Hoefer Mfg. Co., Freeport, Ill.
...Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drilling Machines, Heavy Duty**
...Bertram & Son Co., Ltd., The John, Dundas, Ont.
...Canada Machinery Corp., Galt, Ont.
...Garlock-Walker Mchy. Co., Toronto, Ont.
...Hoosier Drilling Mach. Co., Goshen, Ind.
...Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Multiple Spindle**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond Ind.
Terry & Co., John C., Birmingham, Eng.

**Drilling Machines, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Drilling Machines, Portable**
Haskins Co., R. G., Chicago, Ill.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Radial**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Toomey Inc., Frank, Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Drilling Machines, Sensitive**
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
High Speed Hammer Co., Rochester, N.Y.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Turret**
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

**Drilling Machines, Vertical**
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng.
Streiffinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Drills, Center**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Drills, High Speed Twist**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co., Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.
Taylor Tool Co., J. A. M., Toronto, Ont.
Wilt Twist Drill Co of Canada, Ltd., Walkerville, Ont.

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Drills, Twist and Flat**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Wilt Twist Drill Co. of Canada, Ltd Walkerville, Ont.

**Dust Handling Equipment**
Can. Blower & Forge Co., Ltd., Kitchener
Sturtevant Co., B. F., Boston, Mass.

**Electrical Instruments**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Electrical Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O.

**Elevating Trucks (See Trucks)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Elevators and Conveyors**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Emery Cloth**
Wausau Abrasives Co., Chicago, Ill.

**Emery Wheels (See Grinding Wheels)**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Carborundum Co., Niagara Falls, N.Y.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
International Machinery & Supply Co., Montreal, Que.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Engines, Capstan**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Engineers, Mechanical**
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.

**Expanders, Tube**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Eyeglasses, Safety (See Goggles, Safety)**
Prest-O-Lite Co. of Can., Toronto, Ont.
Willson Goggles, Inc., Reading, Pa.

**Fans, Electric**
Can. Blower & Forge Co., Ltd., Kitchener
Northern Electric Co., Montreal, Que.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Exhaust**
Can. Blower & Forge Co., Ltd., Kitchener
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Ventilating**
Can. Blower & Forge Co., Ltd., Kitchener
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Fibre**
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**File Handles**
Ingersoll File Co., Ltd., Ingersoll, Ont.

**Files and Rasps**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Filing Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Filler, Iron (See Cements, Iron)**
Smooth Mfg. Co., Jersey City, N.J.

**Fire Extinguishers**
Can. Consolidated Rubber Co., Ltd Montreal, Que.

**Fittings, Pipe**
International Malleable Iron Co., Guelph, Ont.

**Flexible Shafts**
Aikenhead Hardware Ltd., Toronto, Ont.
Haskins Co., R. G., Chicago, Ill.

**Flux, Galvanizing**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Fluxes, Welding**
L'Air Liquide Society, Toronto, Ont.

**Forging Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.

**Forgings, Drop**
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd Toronto, Ont.

**Forgings, Hammer**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.

**Foundry Equipment**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Foundry Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Frogs, Spring or Rigid**
Can. Steel Foundries, Montreal, Que.

**Fuel Oil Burning System**
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Heat Treating Coal**
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Oil and Gas**
Bellevue Industrial Furnace Co., Detroit
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces and Ovens, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces, Tempering and Annealing**
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furniture, Machine Shop**
Garlock-Walker Mchy. Co., Toronto, Ont.
Ministry of Munitions, London, Eng.
National Engineering Co., Sarnia, Ont.

**Gages, Dial**
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont.
Perdue, W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass.

**Gages, Measuring (See Tool Work)**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Q.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Gages, Recording**
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.

# BUYERS' DIRECTORY

**Gages, Snap, Thread and Cylindrical**
Ackworthie, Ltd., John, Birmingham, Eng.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Standard**
Armstrong Whitworth Co. of Can., Lt Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis,
Elliott & Whitehall Tool Co., Galt, O:
Johansson Inc., C. E., Windsor, Ont.

**Gages, Thread**
Ackworthie, Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Garnet, Emery and Flint Paper and Cloth**
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Gas, Coal Compressed**
L'Air Liquide Society, Toronto, Ont.

**Gas, Compressed**
Prest-O-Lite Co. of Can., Toronto, Ont.

**Gaskets**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montréal, Que.
Smooth Mfg. Co., Jersey City, N.J.

**Gear Blanks**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear-Cutting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

**Gear Testing Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Gears, Cast**
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

**Gears, Cut**
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q
Diamond State Fibre Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Gears, Dressed**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Gears, Forged**
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Gears, Herringbone**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

**Gears, Machine Moulded**
Can. Steel Foundries, Montreal, Que.

**Gears, Rawhide (See Gears, Cut)**
Philadelphia Gear Works, Philadelphia, Pa.

**Gear, Silent Chain**
Gardner & Son, Robt., Montreal, Que
Morse Chain Co., Ithaca, N.Y.

**Gears, Worm**
Dom. Steel Products Co., Brantford, Ont.

**Generators, Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Generators, Electric**
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Goggles, Safety**
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa

**Grab Buckets**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Grease Cups, Pressed Steel and Brass**
Can. Winkley Co., Ltd., Windsor, Ont.

**Greases, Lubricating**
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

**Grinding Discs**
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Grinding Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Grinding Machines, Abrasive Belt**
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Automatic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Bench**
Aikenhead Hardware Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Goodell & Pratt Co., Greenfield, Mass.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co., Waltham, Mass.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Grinding Machines, Center**
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines Chaser**

**Grinding Machines, Cutter and Reamer**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Cylindrical**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Die**
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

**Grinding Machines, Disc**
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Drill**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Face**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Floor and Tool**
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.
Wilkinson & Kompass, Hamilton, Ont.

**Grinding Machines, Internal**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Manhattan Machine & Tool Works, Grand Rapids, Mich.

**Grinding Machines, Portable**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Carborundum Co., Niagara Falls, N.Y.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Haskins Co., R. G., Chicago, Ill.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wilkinson & Kompass, Hamilton, Ont.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Power Oscillating Tool**
Herbert Ltd., Alfred, Toronto, Ont.

**Grinding Machines, Ring Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Snagging**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Surface**
Garlock-Walker Mchy. Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machinery, Tool Post**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wilkinson & Kompass, Hamilton, Ont.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Universal**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Machine Co., Greenfield, Mass.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co., Waltham, Mass.

**Grinding Wheels**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Carborundum Co., Niagara Falls, N.Y.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
International Machinery & Supply Co., Montreal, Que.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Guards, Machinery and Window**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Gun-Barrel Machinery**
Steinle Turret Machine Co., Madison, Wis.

**Hack Saws, Power**
Ackworthie, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Garlock-Walker Mchy. Co., Toronto, Ont.
Goodell & Pratt Co., Greenfield, Mass.
Lyman Tube & Supply Co., Montreal, Que.
McKenzie Machinery Co., Guelph, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hammers, Chipping**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hammers, Drop**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

**Hammers, Electric**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Hammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Ryerson & Son, Jos. T., Chicago, Ill.

**Hammers, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
**Bradley & Son, Inc., C. C.**, Syracuse, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
High Speed Hammer Co., Rochester, N.Y.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.

**Hammers, Rivetting**
Cleveland Pneumatic Tool Co., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.

**Hangers, Shafting**
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F. Montreal, Que.
Terry & Co., John C., Birmingham, Eng.
Williams Machinery & Supply Co., A. R. Montreal, Que.

**Hardening, Case-Hardening and Tempering**
Hamilton Gear & Machine Co., Toronto Ont.

**Hardness Testing Apparatus**
Shore Instrument Co., Jamaica, N.Y.

**Hobbing Machines**
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hobs**
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.

**Hoists, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Morris Crane & Hoist Co., Ltd., Niagar Falls, Ont.
Northern Crane Works, Walkerville, Ont
Volta Mfg. Co., Welland, Ont.

**Hoists, Hand**
Lyman Tube & Supply Co., Montreal, Que
Morris Crane & Hoist Co., Ltd., Niagar Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Hoists, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Il
Morris Crane & Hoist Co., Ltd., Niagar Falls, Ont.
Northern Crane Works, Walkerville, Ont

**Holders-On, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Cleveland Pneumatic Tool Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Il

**Hose, All Kinds**
Quaker City Rubber Co., Philadelphia, Pa

**Hose, Flexible**
Gutta Percha & Rubber, Toronto, Ont.

**Hose, Industrial**
Dunlop Tire & Rubber Goods Co., Ltd Toronto, Ont.
Goodyear Tire & Rubber Co. of Can Ltd., Toronto, Ont.

**Hose, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Foamite Firefoam Co., Hamilton Ont.

**Hose, Steam, Suction, Water**
Quaker City Rubber Co., Philadelphia, Pa

**Hose, Steel**
International Machinery & Supply Co Montreal, Que.

**Hydraulic Leather**
Graton & Knight Mfg. Co., Worceste Mass.

**Hydraulic Machinery**
Bertram & Son Co., Ltd., The John Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrook Que.
Garlock-Walker Mchy. Co., Toronto, On
Stewart & Co., Duncan, Glasgow, Sco

**Index Centers**
Dickow, Fred. C., Machinery Co., Ch cago, Ill.

**Igniters, Gas Engine**
Canada Foundries & Forgings Co., We land, Ont.

**Indicators, Speed and Test**
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis,
Brown & Sharpe Mfg. Co., Providence, R

**Insultion**
Diamond State Fibre Co. of Can., Lt Toronto, Ont.

**Jacks, Hydraulic**
International Machinery & Supply Co Montreal, Que.
Norton, A. O., Boston, Mass.

**Jacks, Planer**
Armstrong Bros. Tool Co., Chicago, I
Starrett Co., L. S., Athol, Mass.

**Jigs and Fixtures (See Tool Work)**
Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que.
Crescent Machine Co., Ltd., Montreal,

# BUYERS' DIRECTORY

'isher Motor Co., Ltd., Orillia, Ont.
'ord-Smith Machine Co., Hamilton, Ont
'isholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**yseating Machines**
[illegible] Machine Co., Bridgeport, Conn.
[illegible] & Whitehall Tool Co., Galt, Ont.
[illegible] Walker Mchy. Co., Toronto, Ont.
[illegible] Mfg. Co., Muskegon, Mich.
[illegible] Ltd., H. W., Toronto, Ont.
[illegible] & Whitney Co., of Canada, Ltd., Dundas, Ont.
[illegible]ney Inc., Frank, Philadelphia, Pa

**ys, Machine**
[illegible] Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

**aives, Machine**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Simonds Canada Saw Co., Montreal, Que.

**aurl Holders**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**acing Leather**
Upper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

**amps, Electric**
Federal Engraving Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**ather Attachments**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.

**ather Pans, Portable**
Canada Machinery Corp., Galt, Ont.

**ather Tools**
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

**athes, Automatic and Semi-Automatic**
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**athes, Bench**
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**athes, Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

**athes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)**
Acme Machine Tool Co., Cincinnati, Ohio
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
McDougall Co., Ltd., R., Galt, Ont.
McKenzie Machinery Co., Guelph, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**athes, Engine**
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Geo. Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock Walker Mchy. Co., Toronto, Ont.
Landis Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Lodge & Shipley Machine Co., Cincinnati, Ohio.
Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Ministry of Munitions, London, Eng.
Monarch Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.

**Roelofson Machine & Tool Co., Toronto, Ont.**
Ryerson & Son, Jos. T., Chicago, Ill.
Sidney Machine Tool Co., Sidney, Ohio
Standard Machine Co. of Can., Ltd., Chas. A., Windsor, Ont.
Victoria Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**athes, Extension and Gap**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**athes, Heavy Duty Projectile Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blaskill Wire Machy. Co., Ltd., Montreal

Sidney Machine Tool Co., Sidney, Ohio.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio
Blount Co., J. G., Everett, Mass
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Polishing (See Polishing and Buffing Machines)**
Ford-Smith Machine Co., Hamilton, Ont

**Lathes, Relieving**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Lathe, Universal Hand**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Lathe, Speed and Hand**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.

**Lathes, Spinning**
Terry & Co., John C., Birmingham, Eng.

**Lathes, Threading**
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

**Lathes, Vertical Turret**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelofson Machine & Tool Co., Toronto, Ont.

**Lathes, Wood Turning**
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Lighting Fixtures**
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

**Linoleum Mill Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Liquid Air Plants**
L'Air Liquide Society, Toronto, Ont.

**Lockers, Clothes**
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

**Lubricants**
Cateract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Lubricating Systems**
Bowser & Co., Inc., S. F., Fort Wayne, I

**Machinists' Small Tools**
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Goodell & Pratt Co., Greenfield, Mass
Ker & Goodwin Machine Co., Brantford, Ont.
Ministry of Munitions, London, Eng.
National Machine Tool Co., Racine, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Ryerson & Son, Jos. T., Chicago, Ill.
Starrett Co., L. S., Athol, Mass
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Manganese Steel**
Can. Steel Foundries, Montreal, Que

**Mandrels, Expanding**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Mandrels, Solid**
Atkins & Co., Inc., E. C., Indianapolis, I
Cleveland Twist Drill Co., Cleveland, O
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Measuring Machines**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Metals, Alloy**
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont
Hoyt Metal Co., Toronto, Ont
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Ministry of Munitions, London, Eng.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Metalite Cloth**
Ritchey Supply Co., Toronto, Ont

**Micrometer Calipers**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont

**Milling Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Milling Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Milling Machines, Automatic**
Bilton Machine Co., Bridgeport, Conn
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng

**Milling Machines, Bench**
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng

**Milling Machines, Hand**
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng
United States Machine Tool Co., Cincinnati, Ohio.

**Milling Machines, Horizontal and Planer Type**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Rockford Milling Machine Co., Rockford, Ill.
Roelofson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Milling Machines, Plain**
Bilton Machine Co., Bridgeport, Conn
Cincinnati Milling Machine Co., Cincinnati, Ohio
Cleveland Milling Machine Co., Cleveland
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng
Toomey Inc., Frank, Philadelphia, Pa

**Milling Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Milling Machines, Universal**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont
Garlock Walker Mchy. Co., Toronto, Ont
Hendey Machine Co., Torrington, Conn
Hoyt, R. S., Toronto, Ont
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Oliver Machinery Co., Grand Rapids, Mich
Petrie, Ltd., H. W., Toronto, Ont
Rockford Milling Machine Co., Rockford, Ill.
Roelofson Machine & Tool Co., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Toomey Inc., Frank, Philadelphia, Pa
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Milling Machines, Vertical**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock Walker Mchy. Co., Toronto, Ont
Herbert Ltd., Alfred, Toronto, Ont
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

**Monel Metal**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Motors, Electric**
Atkins & Co., Inc., E. C., Indianapolis, I
Garlock Walker Mchy. Co., Toronto, Ont
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Moulded Rubber Goods**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Nickel, Bars, Sheets, Wire, Etc.**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Nickel Plating Outfits**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont

**Nickel Silver**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Nitrogen**
L'Air Liquide Society, Toronto, Ont

**Nut Tappers (See Bolt and Nut Machinery)**
Acme Machinery Co., Cleveland, Ohio
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Greenfield Tap & Die Corp., Galt, Ont
National Acme Co., Cleveland, Ohio

**Nuts, Finished and Semi-finished**
Galt Machine Screw Co., Galt, Ont.

**Nuts, S.A.E., Plain and Castellated**
Galt Machine Screw Co., Galt, Ont.

**Oil Filtering and Storage Systems**
Bowser & Co., Inc., S. F., Fort Wayne, I

**Oil Storage Engineers**
Bowser & Co., Inc., S. F., Fort Wayne, I.

**Oils**
Canadian Oil Companies, Ltd., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Hole Covers**
Can. Winkley Co., Ltd., Windsor, Ont

**Oils, Soluble**
Cateract Refining Co., Toronto, Ont
Imperial Oil Ltd., Toronto, Ont.

**Oil Stones**
Carborundum Co., Niagara Falls, N.Y.

**Oxygen**
Carter Welding Co., Toronto, Ont
Dominion Oxygen Co., Toronto, Ont
L'Air Liquide Society, Toronto, Ont

**Oxy-Acetylene Apparatus**
L'Air Liquide Society, Toronto, Ont

**Packing, Hydraulic**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guilford & Sons, Ltd., Halifax, N.S.
Gutta Percha & Rubber, Toronto, Ont
International Machinery & Supply Co., Montreal, Que.

**Packing, Rod and Steam**
Quaker City Rubber Co., Philadelphia, Pa

**Packing, Steam**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guilford & Sons, Ltd., Halifax, N.S.
Gutta Percha & Rubber, Toronto, Ont
International Machinery & Supply Co., Montreal, Que.

**Paper Mill Conveyors**
Bertrams Ltd., Edinburgh, Scotland

**Patents**
Fetherstonhaugh & Co., Ottawa, Ont
Marion & Marion, Montreal, Que.

**Pans, Wet and Dry**
Dunn Mfg. Co., Grand Rapids, Mich

**Pattern-Shop Machinery (See Woodworking Machinery)**
Canada Machinery Corp., Galt, Ont
Oliver Machinery Co., Grand Rapids, Mich

**Patterns, Wood and Metal**
Canada Machinery Corp., Ltd., Montreal, Q
Valentine Lumber Co., Ltd., Ottawa, Ont
Wood's Planing Works, Ltd., Ont

**Penstocks, Steel**
MacKinnon Steel Co., Sherbrooke, Que

# BUYERS' DIRECTORY

**Phosphor Tin**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Photographic Duplicating Machines**
Commercial Camera Co., Providence, R.I.

**Pipe Bending Machines**
American Pipe Bending Machine Co., Boston, Mass.
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

**Pipe Cutting and Threading Machines**
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**
Landis Machine Co., Inc., Waynesboro, Pa.

**Pipe Fitters' Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa.

**Piston-Ring Machines**
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**...aners, Parallels**
...& P. Mfg. Co., Niagara Falls, Ont.

**...ning Machines**
...ertram & Son Co., Ltd., The John, Dundas, Ont.
...anada Machinery Corp., Galt, Ont.
...oss Machinery & Supply Co., Geo. F., Montreal, Que.
...arlock-Walker Mchy. Co., Toronto, Ont.
...epburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Toomey Inc., Frank, Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

**Planing Machines, Rotary**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Pneumatic Tools**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
International Machinery & Supply Co., Montreal, Que.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Pressed Steel Parts**
Ackworthie, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Presses, Drop and Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Toledo Machine & Tool Co., Toledo, Ohio

**Presses, Foot and Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

**Presses, Forcing**
Atlas Press Co., Kalamazoo, Mich.
Niagara Machine & Tool Works, Buffalo, N.Y.
Stewart & Co., Duncan, Glasgow, Scot.

**Presses, Hydraulic**
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Niagara Machine & Tool Works, Buffalo, N.Y.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

**Presses, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**...otractors**
Brown & Sharpe Mfg. Co., Providence, R.I.

**...opellers**
Kennedy & Sons, Wm., Owen Sound, Ont.

**...lleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal and Fibre**
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Pulp and Paper Mill Equipment**
MacKinnon Steel Co., Sherbrooke, Que.

**Pumps, Automobile Tire**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Pumps, Barrel and Boiler-feed**
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coalant**
Trahern Pump Co., Rockford, Ill

**Pumps, Geared and Hand**
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

**Pumps, Lubricant and Oil**
Bowser & Co., Inc., S. F., Fort Wayne, I.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**
Bowser & Co., Inc., S. F., Fort Wayne, I.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener
Jardine & Co., A. B., Hespeler, Ont.

**Punches, Power**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rverson & Son, Jos. T., Chicago, Ill.
Toledo Machine & Tool Co., Toledo, Ohio.

**Punching Machines, Horizontal**
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Racks, Cut**
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**
Holden Co., Ltd., Montreal, Que.

**Reamer Holders**
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

**Reamers, Expanding**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Reamers, Solid**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co., Montreal, Que.
Morse Twist Drill & Machine Co., New Redford, Mass.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Reamers, Taper**
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Taylor Tool Co., J. A. M., Toronto, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Recorders, Temperature**
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Recorders, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Rheostats**
Northern Electric Co., Montreal, Que.

**Resistance Materials**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Respirators**
Willson Goggles, Inc., Reading, Pa.

**Rivets**
Parmenter & Bulloch Co., Gananoque, Ont.

**Rivet Heaters**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.
Ryerson & Son, Jos. T., Chicago, Ill.

**Riveting Machines**
Bilton Machine Co., Bridgeport, Conn.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**
Stewart & Co., Duncan, Glasgow, Scot.

**Rolls (Rubber Covered)**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rudder Frames, Steel**
Can. Steel Foundries, Montreal, Que.

**Rubber Goods, Mechanical**
Quaker City Rubber Co., Philadelphia, Pa.

**Rules, Steel**
Chesterman & Co., Ltd., J., Sheffield, En

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R

**Rust Preventatives**
Oakley Chemical Co., New York, N.Y.

**Sand Paper**
Wausau Abrasives Co., Chicago, Ill.

**Sand Equipment**
Can. Link-Belt Co., Toronto, Ont

**Sand Mills**
Frost Mfg. Co., Chicago, Ill.

**Sand Rammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrook Que
Cleveland Pneumatic Tool Co., Toront Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, I
Keller Pneumatic Tool Co., Grand Have Mich.

**Saw Frames and Blades, Hack**
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis,
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Bu falo, N.Y.
Foss Machinery & Supply Co., Geo. F Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Qu

**Sawing Machines, Metal**
Atkins & Co., Inc., E. C., Indianapolis.
Foss Machinery & Supply Co., Geo. F Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Qu
Ryerson & Son, Jos. T., Chicago, Ill.

**Sawing Machines, Power Hack**
Ackworthie, Ltd., John, Birmingham, En
Atkins & Co., Inc., E. C., Indianapolis.
Williams Machinery & Supply Co., A. R Montreal, Que.

**Saw Sharpening Machines**
Atkins & Co., Inc., E. C., Indianapolis,
Oliver Machinery Co., Grand Rapids, Mic

**Saw Tables, Universal**
Atkins & Co., Inc., E. C., Indianapolis,
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, On
McKenzie Machinery Co., Guelph, Ont.
Oliver Machinery Co., Grand Rapids, Mic
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**
Atkins & Co., Inc., E. C., Indianapolis.
Simonds Canada Saw Co., Montreal, Qu
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis,
Simonds Canada Saw Co., Montreal, Qu

**Saws, Hot and Cold**
Atkins & Co., Inc., E. C., Indianapolis.
Simonds Canada Saw Co., Montreal, Qu
Stewart & Co., Duncan, Glasgow, Sco

**Saws, High Speed Steel**
Atkins & Co., Inc., E. C., Indianapolis.
Butterfield & Co., Inc., Rock Island, Qu
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.
Simonds Canada Saw Co., Montreal, Qu

**Saws, Metal Band**
Atkins & Co., Inc., E. C., Indianapolis,
Oliver Machinery Co., Grand Rapids, Mic

**Saws, Metal, Power**
Clemson Bros., Inc., Hamilton, Ont.

**Saws, Metal Cutting**
Atkins & Co., Inc., E. C., Indianapolis,
Brown & Sharpe Mfg. Co., Providence, R.I
Butterfield & Co., Inc., Rock Island, Que
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que
Starrett Co., L. S., Athol, Mass.

**Saws, Milling**
Atkins & Co., Inc., E. C., Indianapolis, I
Butterfield & Co., Inc., Rock Island, Que
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd. Dundas, Ont.

**Saws, Screw Slotting**
Atkins & Co., Inc., E. C., Indianapolis, I
Butterfield & Co., Inc., Rock Island, Que
Pratt & Whitney Co., of Canada, Ltd. Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que

**Saws, Swing Cut-off**
Oliver Machinery Co., Grand Rapids, Mich

**Scales**
Brown & Sharpe Mfg. Co., Providence, R.I
Can. Fairbanks-Morse Ltd., Montreal, Q

**Screens**
Can. Wire & Iron Goods Co., Hamilton Ont.

**Screw Driving Machine**
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill

**Screw Extractors**
Cleveland Twist Drill Co., Cleveland, O.

# BUYERS' DIRECTORY

**rew Machine Work**
...ares Co., Wallace, Bristol, Conn.
...ck Co., Asa S., Hartford, Conn.
...ional Acme Co., Cleveland, Ohio
...ellman Brass & Metal Co., Hamilton Ont.

**rew Machinery, Wood and Lag**
...ck Co., Asa S., Hartford, Conn.

**rew Machines**
...ers & Sharpe Mfg. Co., Providence, R.I.

**rew Machines, Automatic**
...E. Walker Mchy. Co., Toronto, Ont.
...ert Ltd., Alfred, Toronto, Ont.
...ional Acme Co., Cleveland, Ohio

**rew Machines, Plain or Hand**
Acme Machine Tool Co., Cincinnati, Ohio
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont
Pratt & Whitney Co., of Canada, Ltd., Dundas Ont.
Warner & Swasey Co., Cleveland, Ohio

**rew Plates**
Alkenhead, Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

**rews, Cap and Set**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll Ont.
National Acme Co., Cleveland, Ohio.

**rews, Machine**
Barnes Co., Wallace, Bristol, Conn.

**rews, Safety Set**
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll Ont.

**Second-Hand Machinery**
**(See Searchlight Section)**
...Ltd., H. W., Toronto, Ont.

**Separators, Moisture and Oil**
...& Co., Inc., S. F., Fort Wayne, I.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Separators, Oil and Waste**
...& Co., Inc., S. F., Fort Wayne, I.

**Shafting**
...Foundries & Forgings Co., Welland Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co. Ltd., New Glasgow, N.S.
Waterous & Kompass, Hamilton, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Shapes, Cold-Drawn Special Steel**
...Drawn Steel Co., Hamilton, Ont.

**Shaping Machines**
...da Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Hobb R. S., Toronto, Ont.
Marine Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., E., Galt, Ont.
Mackenzie Machinery Co., Guelph, Ont.
Rodefson Machine & Tool Co., Toronto, Ont.
...& Mills Co., Cincinnati, Ohio
...ney Inc., Frank, Philadelphia, Pa.
Wolcott Lathe Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Shapers, Wood**
...Machinery Co., Grand Rapids, Mich.

**Shears, Hand**
...Bower & Forge Co., Ltd., Kitchener.

**Shears, Power**
...Co., E. W., Brooklyn, N.Y.
...Boggs & Co., Ltd., Hamilton, Ont.
...da Machinery Corp., Galt, Ont.
...Bower & Forge Co., Ltd., Kitchener.
...Co., Inc., D. H., Buffalo, N.Y.
...& Co., Duncan, Glasgow, Scot.
...Machine & Tool Co., Toledo, Ohio
...Machinery Co., A. R., Toronto, Ont.

**Shearing Machines, Angle, Iron Bar and Gate**
...Ltd., Edinburgh, Scotland

**Sheet Metal Working Machinery**
...Co., E. W., Brooklyn, N.Y.
...Boggs & Co., Ltd., Hamilton, Ont.
Garlock Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
...Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio.

**Sheets, Nickel, Resist, Alloy**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Sheets, Nickel, Monel and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Side Frames, Locomotive**
Can. Steel Foundries, Montreal, Que.

**Slotting Attachments**
Ford-Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

**Slotting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

**Solders**
British Smelting & Refining Co., Ltd Montreal, Que.

**Special Machinery and Tools**
Brown Engineering Corp., Ltd., Toronto
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Spectacles, Industrial**
Willson Goggles, Inc., Reading, Pa.

**Springs**
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

**Sprockets and Chains**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glasseo, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Squares**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Stamping, Metal**
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Elliott & Whitehall Tool Co., Galt, Ont
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Stamps, Steel**
Diamond Saw & Stamping Works, Buffalo, N.Y.

**Stairways, Wrought Iron**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Steam Specialties**
Crane Ltd., Montreal, Que

**Steel Plate**
Dom. Foundries & Steel, Hamilton, Ont

**Steels, Tool**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa

**Steel, Cold-Rolled Strip**
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn
Can. Driver-Harris Co., Walkerville, Ont
Firth & Sons, Ltd., Thos., Montreal, Q

**Steel Castings**
Dom. Foundries & Steel, Hamilton, Ont

**Steel Forgings**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Steel, Shafting and Free Cutting Screw**
Barnes Co., Wallace, Bristol, Conn
Can. Drawn Steel Co., Hamilton, Ont
Union Drawn Steel Co., Hamilton, Ont

**Steel, Sheet**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q
Illingsworth Steel Co., John, New York City, N.Y.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont
Toronto Iron Works, Toronto, Ont.

**Steel, Tanks**
Can. John Wood Mfg. Co., Toronto, Ont

**Steel, Stainless**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont
Vanadium Alloys Steel, Latrobe, Pa.

**Steels, Alloy, Open Hearth and Electric**
United Alloy Steel Corp., Canton, Ohio

**Steels, Alloy and Carbon**
Algoma Steel Corp., Ltd., Sault Ste Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont
Firth & Sons, Ltd., Thos., Montreal, Q
Illingsworth Steel Co., John, New York City, N.Y.
Pilot Steel & Tool Co., Montreal, Que
Rice Lewis & Son, Ltd., Toronto, Ont
Steel Co. of Can., Ltd., Hamilton, Ont
United Alloy Steel Corp., Canton, Ohio
Vanadium Alloys Steel, Latrobe, Pa
Vulcan Crucible Steel Co., Aliquippa, Pa

**Steels, High-Speed**
Armstrong Bros. Tool Co., Chicago, Ill
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que
Atkins & Co., Ltd., Wm., Sheffield, Eng
Baines & David, Ltd., Toronto, Ont
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que
Firth & Sons, Ltd., Thos., Montreal, Q
Illingsworth Steel Co., John, New York City, N.Y.
Pilot Steel & Tool Co., Montreal, Que
Rice Lewis & Son, Ltd., Toronto, Ont
Steel Co. of Can., Ltd., Hamilton, Ont
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel, Magnet**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel, Structural**
MacKinnon Steel Co., Sherbrooke, Que.

**Steel Tubing, Close Joint and Welded**
Standard Tube & Fence Co., Ltd., Woodstock Ont.

**Stern Frames, Cast Steel**
Can. Steel Foundries, Montreal, Que

**Stools, Shop**
Ministry of Munitions, London, Eng

**Straightening Machinery**
Bertrams Ltd., Edinburgh, Scotland
Ryerson & Son, Jos. T., Chicago, Ill

**Studs**
Galt Machine Screw Co., Galt, Ont.

**Surface Plates**
Bilton Machine Co., Bridgeport, Conn

**Swaging Machines**
Atkins & Co., Inc., E. C., Indianapolis, I

**Switches, Railway**
Can. Steel Foundries, Montreal, Que

**Switches and Switchboards**
Northern Electric Co., Montreal, Que

**Tablets, Bronze, Memorial**
Tallman Brass & Metal, Ltd., Hamilton Ont.

**Tachometers**
Alkenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

**Tanks, Steel**
MacKinnon Steel Co., Sherbrooke, Que
Can. John Wood Mfg. Co., Ltd., Toronto, Ont.

**Tanks and Pumps, Oil**
Bowser & Co., Inc., S. F., Fort Wayne I
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

**Tap Holders**
Greenfield Tap & Die Corp., Galt, Ont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont

**Taper Pins**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Tapes, Measuring**
Chesterman & Co., Ltd., J., Sheffield, Eng
Starrett Co., L. S., Athol, Mass

**Tapping Machines and Attachments**
Ackworthie, Ltd., John, Birmingham, Eng
Archibald & Co., Chas. P., Montreal, Q
Burke Machine Tool Co., Cowansville, Que
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass

**Taps and Dies**
Ackworthie, Ltd., John, Birmingham, Eng
Butterfield & Co., Inc., Rock Island, Que
Geometric Tool Co., New Haven, Conn
Greenfield Tap & Die Corp., Galt, Ont
International Machinery & Supply Co., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Taylor Tool Co., J. A. M., Toronto, Ont

**Taps, Collapsing**
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont.
Murchey Machine & Tool Co., Detroit Mich.
National Acme Co., Cleveland, Ohio
Victor Tool Co., Waynesboro, Pa

**Teeth, Dredge Bucket**
Kennedy & Sons, Wm., Owen Sound, Ont

**Testing Metals and Materials**
Fuels to Testing Laboratories, Toronto, Ont

**Thermometers**
Bristol Co., Waterbury, Conn

**Thread-Cutting Tools**
Butterfield & Co., Inc., Rock Island Que
Greenfield Tap & Die Corp., Galt, Ont
Jones & Lamson Machine Co., Springfield Vermont
Murchey Machine & Tool Co., Detroit Mich
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd Dundas Ont.
Victor Tool Co., Waynesboro, Pa.

**Thread Cutting Machines**
Jones & Lamson Machine Co., Springfield Vermont
Landis Machine Co., Inc., Waynesboro, Pa

**Threading Machines**
Acme Machinery Co., Cleveland, Ohio
Geometric Tool Co., New Haven, Conn
Greenfield Tap & Die Corp., Galt, Ont
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio
National Machinery Co., Tiffin, Ohio
Williams Tool Corp. of Can., Ltd., Brantford Ont

**Thread Lead Testing Machines**
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas Ont.

**Thread-Rolling Machines**
Bliss Co., E. W., Brooklyn, N.Y.

**Tongs**
Peacock Ltd., John T., Toronto, Ont.

**Tool Cases**
Rice Lewis & Son, Ltd., Toronto, Ont.

**Tool Holders**
Armstrong Bros. Tool Co., Chicago, Ill
Bilton Machine Co., Bridgeport, Conn
Gisholt Machine Co., Madison, Wis
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Markers, Electric**
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que

**Tool Posts, Lathe**
Bertram & Son Co., Ltd., The John, Dundas Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Steels for all Purposes**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Tools, Small (See Machinists' Small Tools)**
Armstrong Bros. Tool Co., Chicago, Ill
Bertrams Ltd., Edinburgh, Scotland
Burgess & Marchand, Montreal Que
Chesterman & Co., Ltd., J., Sheffield, Eng
Elliott & Whitehall Tool Co., Galt, Ont
Foss Machinery & Supply Co., Geo. F. Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich
Kimber & Hillier Mfg. Co., St. Catharines, Ont
Ministry of Munitions, London, Eng
National Machine Tool Co., Racine, Wis
Rapid Tool & Machine Co., Lachine, Que
Rice Lewis & Son, Ltd., Toronto, Ont
Rockford Milling Machine Co., Rockford Ill
Starrett Co., L. S., Athol, Mass.
**Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.**
Wood Freeing Tool Co., Detroit, Mich
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que

**Tool Work**
Brown Engineering Corp., Ltd., Toronto
Crescent Machine Co., Ltd., Montreal, Q
Ford-Smith Machine Co., Hamilton, Ont

**Torches, Blow**
Can. Hanek Burner Co., Port Hope, Ont.
International Machinery & Supply Co., Montreal, Que
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Rice Lewis & Son, Ltd., Toronto, Ont

**Trackwork, Railway**
Can. Steel Foundries, Montreal, Que

**Trackwork, Manganese Steel**
Can. Steel Foundries, Montreal, Que

**Transformers**
Northern Electric Co., Montreal, Que

**Transmission Machinery**
Bernard Industrial Co., A., Fortierville, Que
Can. Link Belt Co., Toronto, Ont
Garlock-Walker Mchy. Co., Toronto, Ont
Jones & Glasseo, Montreal, Que
Kennedy & Sons, Wm., Owen Sound, Ont
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Toronto, Ont.
Renold (Hans) of Canada, Ltd., Montreal, Que

# BUYERS' DIRECTORY

**Transportation Systems (See Trucks)**
Mathews Gravity Carrier Co., Port Hope, Ont

**Treated Bits**
Can Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa

**Trolleys and Tramways**
Can Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg Co., Lisbon, Ohio.

**Trucks**
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cowan Truck Co. (R. B. Smiley), Toronto Ont.
Diamond State Fibre Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Maple Leaf Mfg. Co., Montreal, Que.
Ministry of Munitions, London, Eng.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Trucks, Industrial Motor**
Maple Leaf Mfg. Co., Montreal, Que.
Ministry of Munitions, London, Eng.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Tube, Products**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Electric Welded or Oxy-Acetylene Welded**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Flexible**
Dunlop Tire & Rubber Goods Co., Ltd Toronto, Ont.
Goodyear Tire & Rubber Co of Can., Ltd., Toronto, Ont.

**Tubing, Seamless Steel**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Seamless Steel, Brass and Copper and Fibre**
Diamond State Fibre Co of Can., Ltd., Toronto, Ont.
Dom. Steel Products Co., Brantford, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

**Tubing, Welded**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Tubing, Welded Steel**
Tube Co. of Canada, Toronto, Ont.

**Turbines, Water**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Turret Heads**
Ackworthie, Ltd., John, Birmingham, Eng.
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Turret Machines (See Lathes, Horizontal Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Cook Co., Asa S., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steptk Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Turrets, Tool Post**
Gisholt Machine Co., Madison, Wis.

**Unions, Pipe**
Crane Ltd., Montreal, Que.

**Universal Joints**
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Valves**
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Crane Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.

**Valves, Rubber Pump**
Quaker City Rubber Co., Philadelphia, Pa.

**Vises, Drilling Machine**
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.

**Vises, Metal Workers'**
Aikenhead Hardware, Ltd., Toronto, Ont.
Columbia Hdwe. Division, Cleveland, O.

**Vises, Milling Machine**
Brown & Sharpe Mfg. Co., Providence, R.I.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg Co., Milwaukee, Wis.

**Vises, Pipe**
Columbia Hdwe. Division, Cleveland, O.
Greenfield Tap & Die Corp., Galt, Ont.

**Vises, Planer and Shaper**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Superior Machine Co., London, Ont.

**Vises, Wood Workers'**
Columbia Hdwe. Division, Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Victor Tool Co., Waynesboro, Pa.
Parmenter & Bulloch Co., Gananoque, Ont.

**Washers, Rubber**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Welding Apparatus, Oxy-Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Welding, Electric**
Carter Welding Co., Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.

**Voltmeters**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Wagon Loaders**
Can. Link-Belt Co., Toronto, Ont.

**Washers**
Barnes Co., Wallace, Bristol, Conn.
Diamond State Fibre Co., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

**Welding Filler Rods**
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

**Welding Machines, Oxy-Acetylene**
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

**Welding, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

**Welding Rod, Tobin, Manganese Bronze and Aluminum**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Welding Supplies**
British Smelting & Refining Co., Ltd., Montreal, Que.
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Canada, Ltd., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

**Wheels, Industrial**
American Pulley Co., Philadelphia, Pa
Hull Iron & Steel Foundries, Hull, Que
Kennedy & Sons, Wm., Owen Sound, Ont

**Winches, Electric**
Volta Mfg. Co., Welland, Ont.

**Winches, Headgate**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Winches, Stoplog**
Kennedy & Sons, Wm., Owen Sound, Ont

**Wire**
Barnes Co., Wallace, Bristol, Conn
Canada Metal Co., Ltd., Toronto, Ont.
Dennis Wire & Iron Works, London, Ont
Greening Wire Co., B., Hamilton, Ont.
Northern Electric Co., Montreal, Que.

**Wire Cloth**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Wire Rope**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Wire Straightening and Cutting Machinery**
Baird Machine Co., Bridgeport, Conn
Brown, Boggs & Co., Ltd., Hamilton, Ont
Schuster Co., F. B., New Haven, Conn

**Wire, Welding**
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif
Prest-O-Lite Co. of Can., Toronto, Ont
Tallman Brass & Metal Co., Hamilton Ont.

**Wires, Special**
Dennis Wire & Iron Works, London, Ont
Greening Wire Co., B., Hamilton, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Woodworking Machinery**
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Oliver Machinery Co., Grand Rapids, Mich
Williams Machinery Co., A. R., Toronto, Ont.

**Wrenches, Drop Forged**
Armstrong Bros. Tool Co., Chicago, Ill
Canada Foundries & Forgings Co., Welland, Ont.

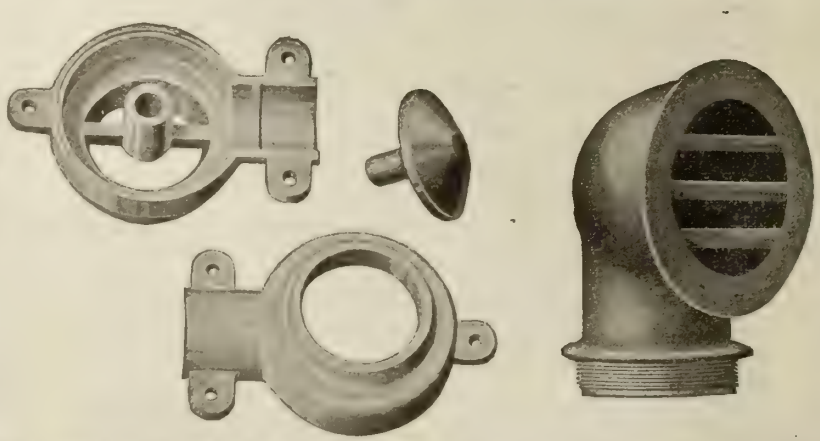
**Wrenches, Machinists'**
Armstrong Bros. Tool Co., Chicago, Ill
Canada Foundries & Forgings Co., Welland, Ont.

**Wrenches, Pipe**
Canada Foundries & Forgings Co., Welland, Ont.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.

**Wrenches, Tap**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont


# DIE-CASTINGS

DOEHLER PROCESS

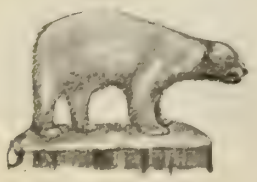


MADE IN CANADA

Note the smooth appearance of the Die-Castings in the illustration. No burrs—no rough spots. Cored holes are perfectly round and centred. Require practically no machining

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HAMILTON, ONT.



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*Made in Canada by*

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BRITISH WORKS
MANCHESTER
ENGLAND


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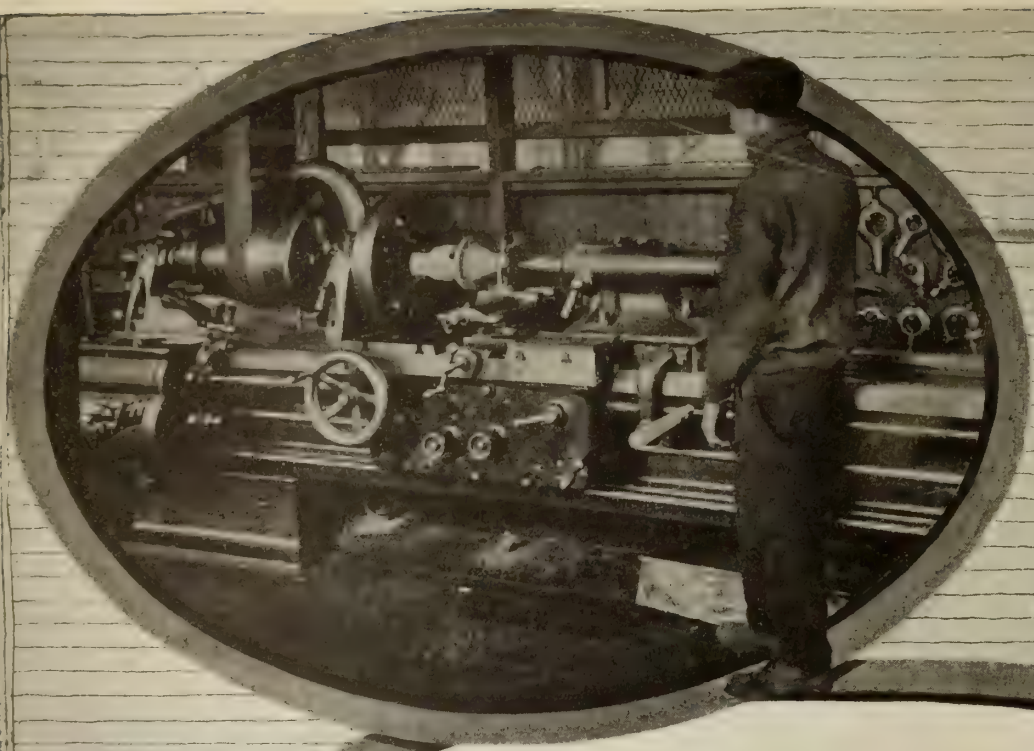
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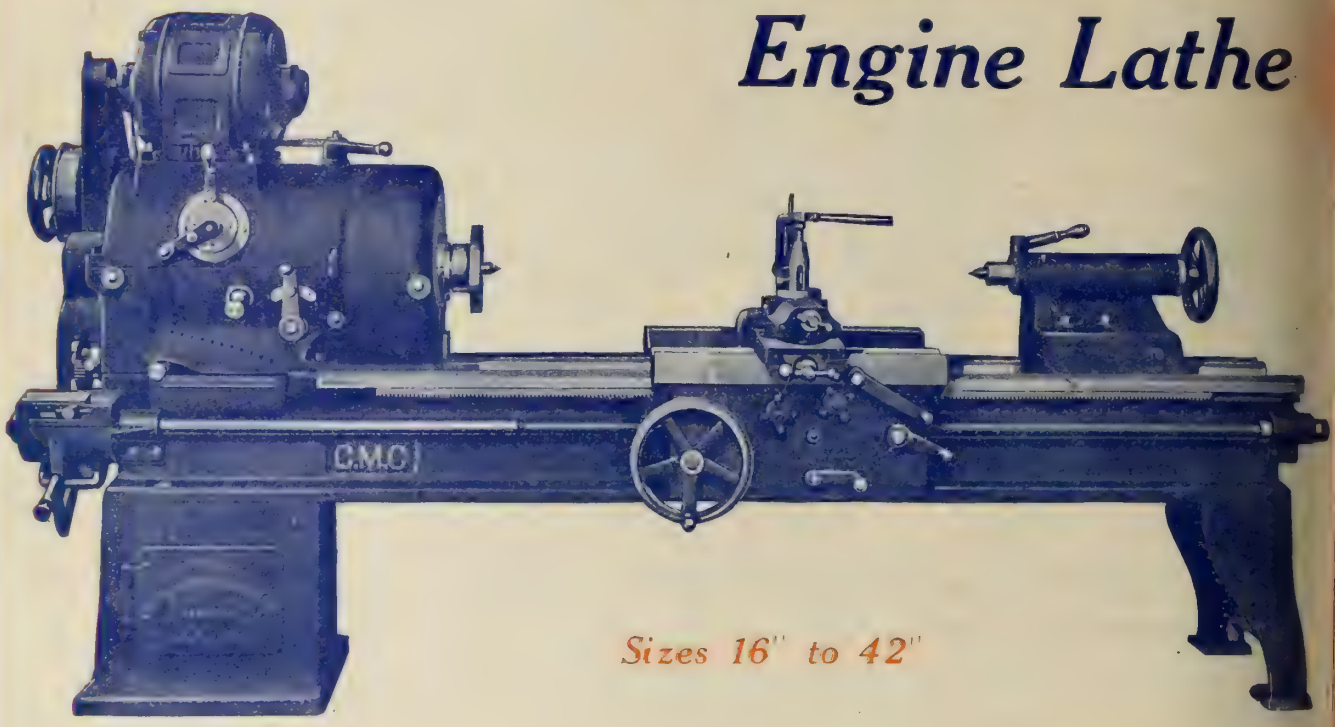
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Vol. XXV., No. 4 Published by the MacLean Publishing Company, Limited, Toronto January 27, 1921 $4.00 a Year Subscription Price


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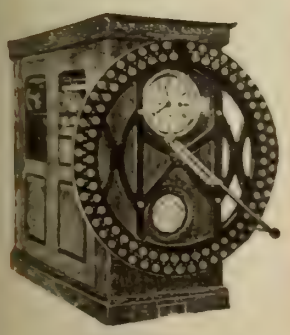



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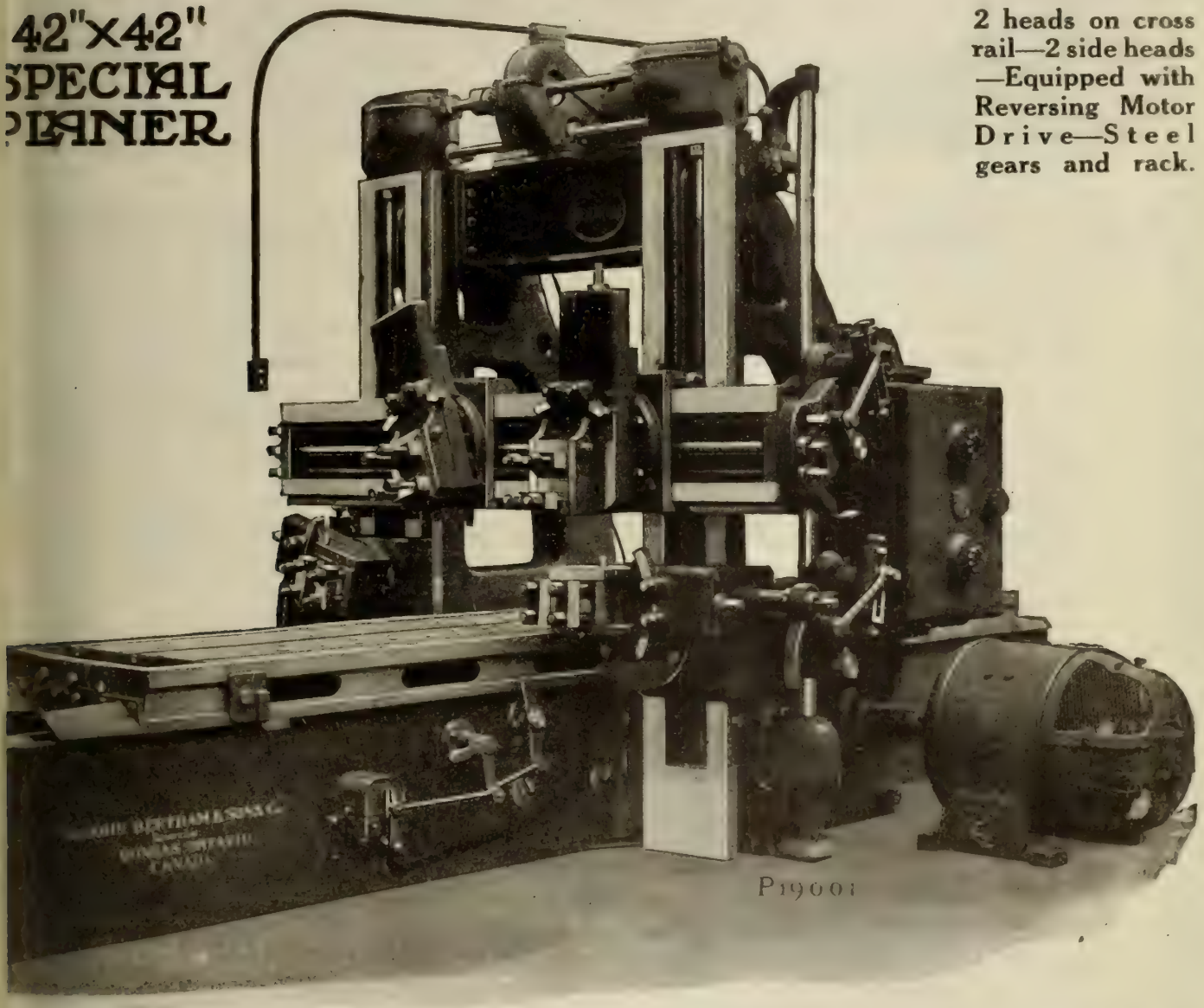
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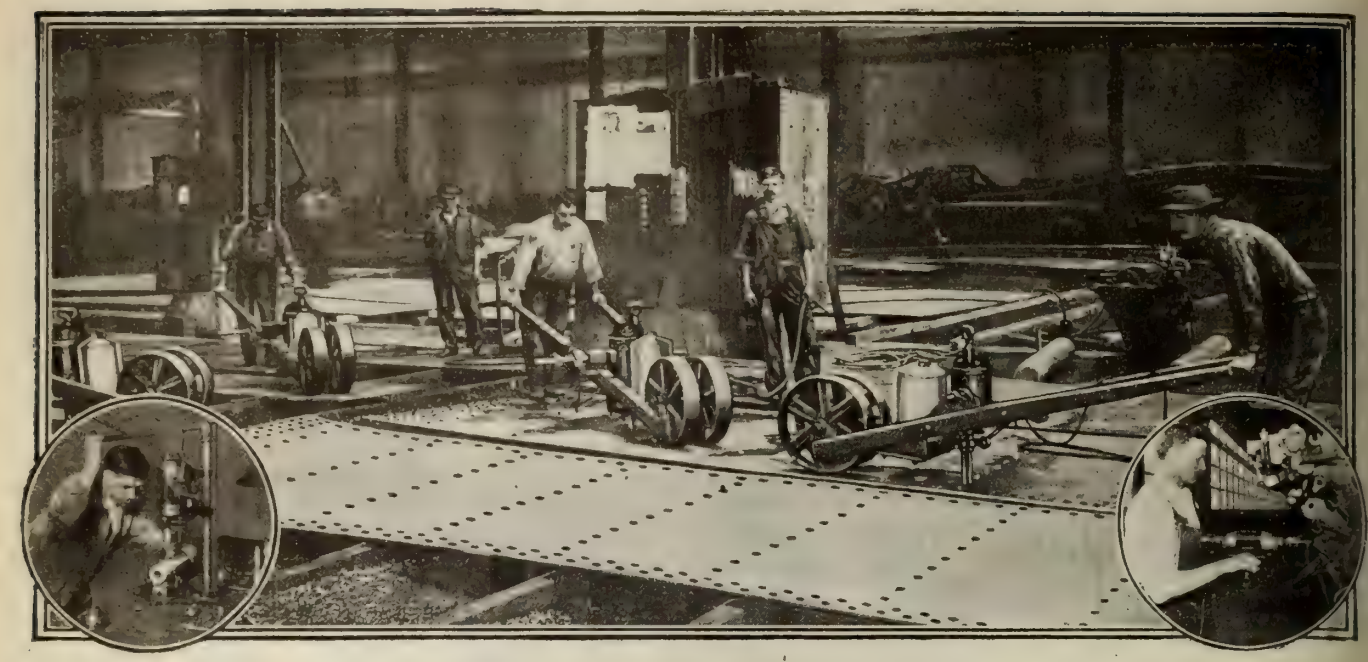



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Write for Electric Tool Booklet 397

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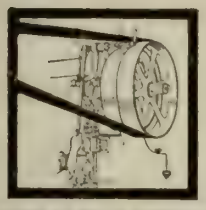
**LITTLE** *Electric* **GIANT** *Tools*

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For Transmission

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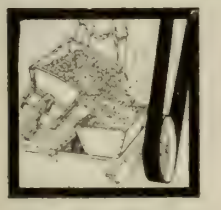
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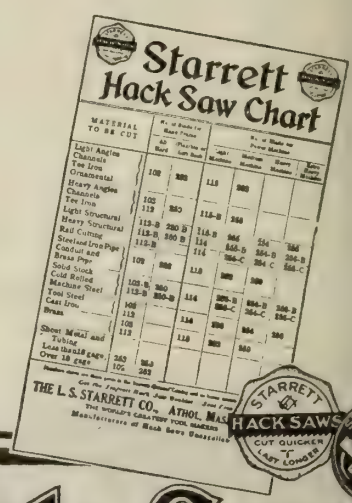



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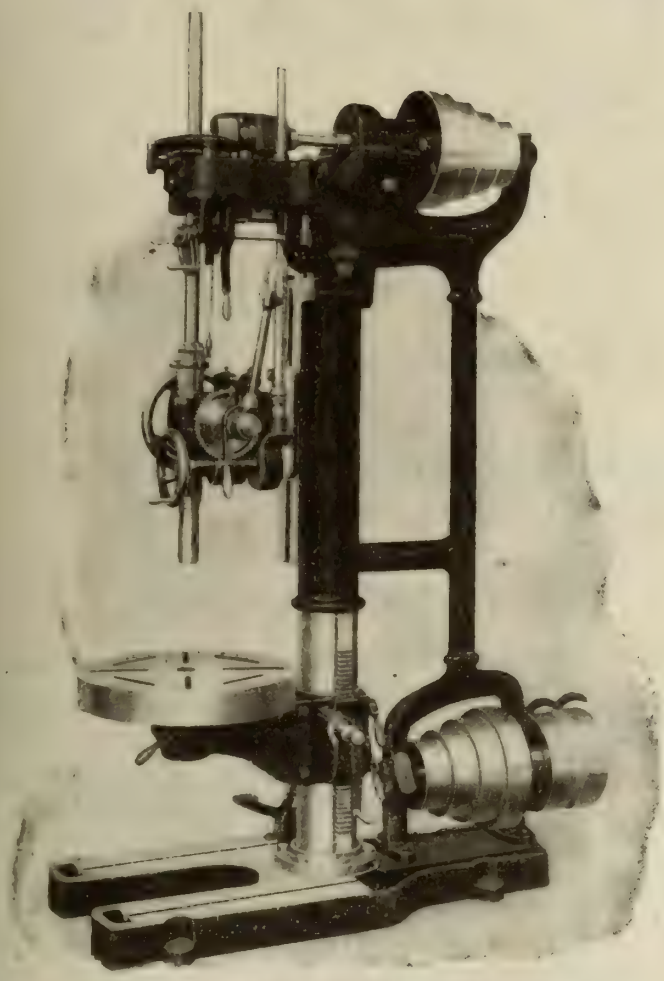

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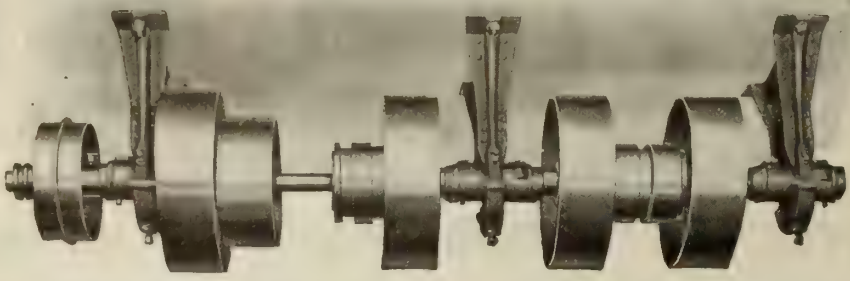
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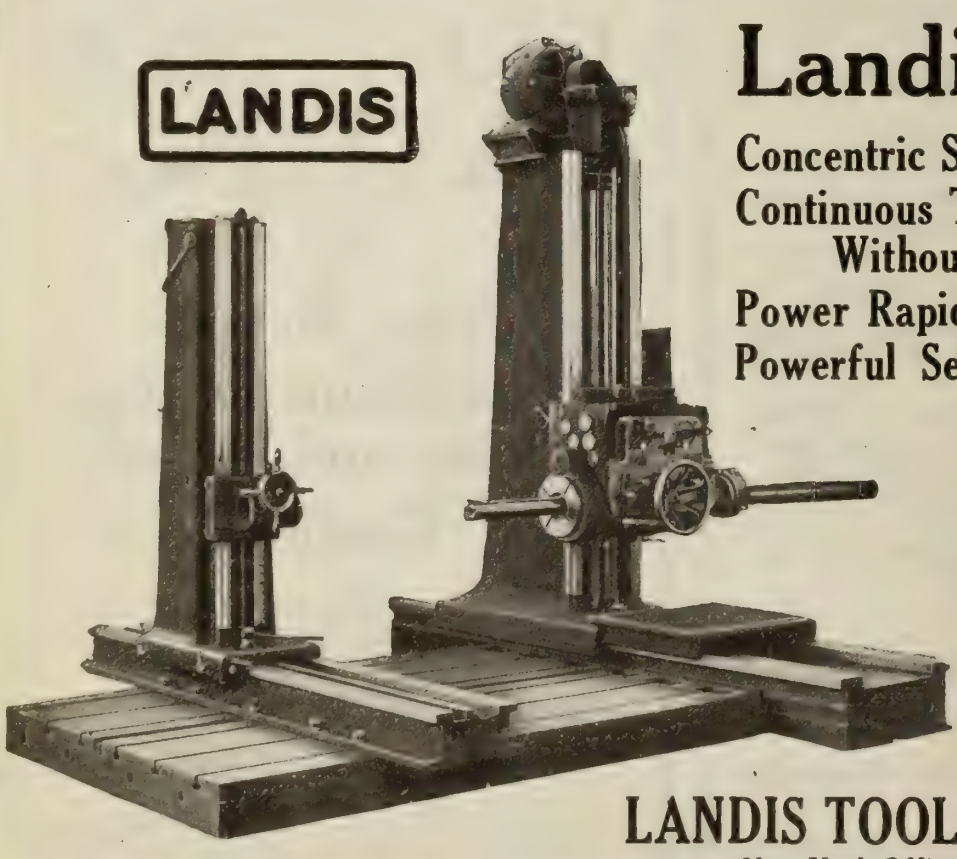
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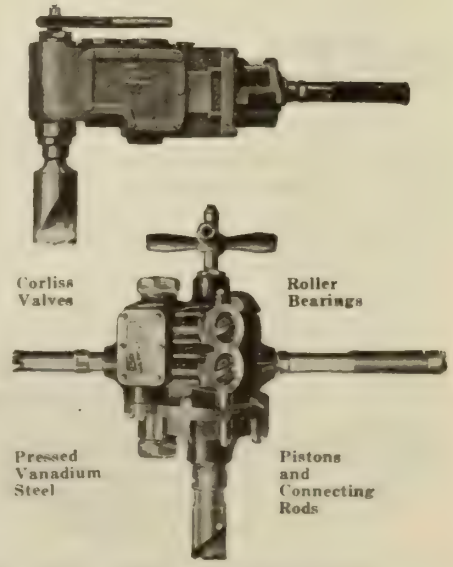
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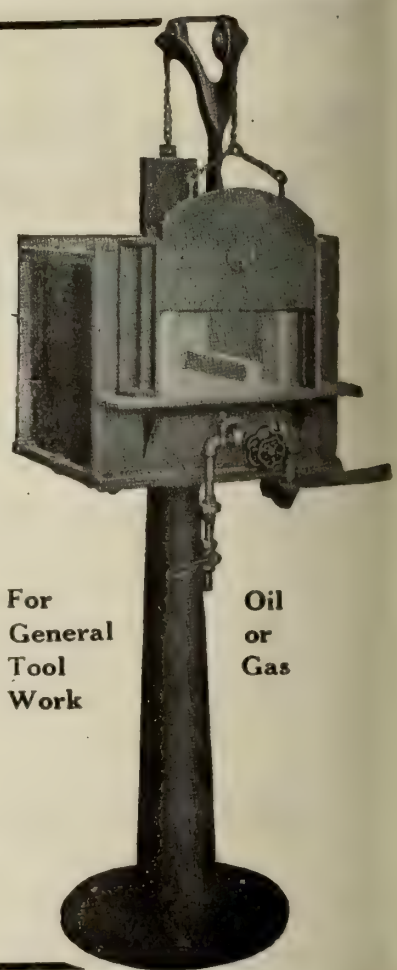
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***The following advantages are secured by the Continuous Method of Heat-Treatment:***

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Utilizing heat in spent gases to preheat material.
Exposing each piece to heat in same manner, to same temperature, for same length of time.
Uniformity not only of the individual piece but of the sections thereof as compared with the corresponding sections of other pieces.

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***Write for Bulletin 217-T and learn whether the continuous method is adaptable to your product and manufacturing conditions.***

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*Furnace Engineers and Contractors*
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| Steel Castings | Lithographed Ware |
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Made by the Acid Electric process up to fifteen tons. Castings made by this process are free from blow holes, easy to machine, and superior in every way to ordinary Steel Castings.

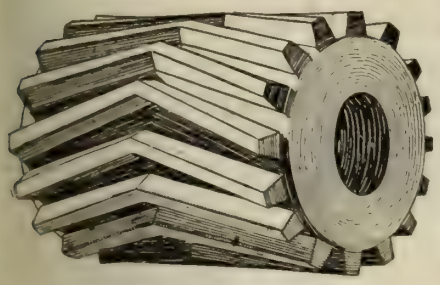
Castings supplied for shipbuilding, cars, locomotives, all classes of machinery, etc

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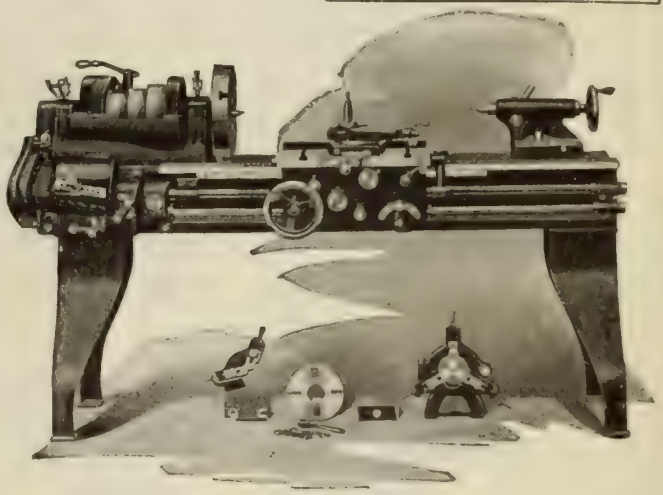
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A small, powerful, Double Backed Geared, Quick Change Engine Lathe of extreme precision. Made in 14", 18" and 22" swing.

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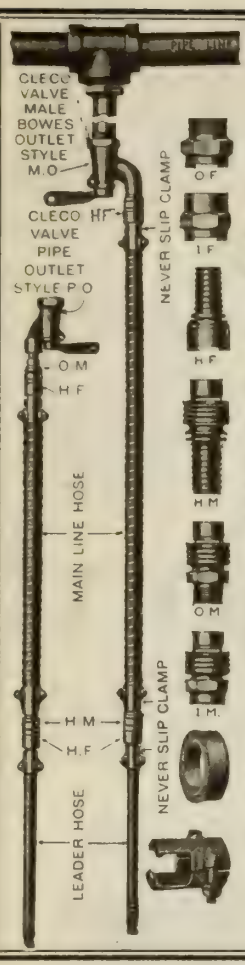



*MANUFACTURED BY*
DIAMOND SAW & STAMPING WORKS -:- BUFFALO, N.Y., U.S.A.


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# Cleco Pressure-Seated Air Valves

## Bowes Air Hose Couplings—Cleco Never Slip Hose Clamps and Cleco Grooved Hose Nipples and Hose Clamp Tool




**STYLE O.F.** is an Outside Thread Female Pipe End. Made in sizes ⅜-inch to 1½-inch.

**STYLE I.F.** is an Inside Thread Female Pipe End. Made in sizes ¼-inch to 1½-inch.

**STYLE H.F.** is a Female Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-inch to 1½-inch.

**STYLE H.M.** is a Male Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-inch to 1½-inch.

**STYLE O.M.** is an Inside Thread Male Pipe End. Made in sizes ¼-inch to 1½-inch.

**STYLE I.M.** is an Inside Thread Male Pipe End. Made in sizes ⅜-inch to 1½-inch.

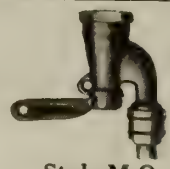
The Male and Female Ends of Bowes Couplings interchange in sizes ¼-inch to ¾-inch. Sizes 1-inch and 1¼-inch interchange. The 1½-inch ends interchange only with themselves.

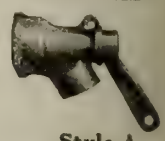
### BOWES COUPLINGS

Are instantly connected or disconnected.
They are absolutely air-tight under all pressures.
They quickly pay for themselves by stopping costly leaks.
They interchange in sizes most commonly used.
They have no loose parts to be mislaid or lost.
They are made of brass and will not rust.
The U-shaped Gasket interchanges in couplings ¼-inch to ¾-inch.

### CLECO VALVES


Style P.O.


Style M.O.


Style A.

Style P.O.—Made in sizes ¼ in., ⅜ in., ½ in., ¾ in., 1 in., 1¼ in., 1½ in., 1¾ in., and 2 in. Pipe Outlets. Inlets are one pipe size larger.
Style A—30° Angle Valves, are made in sizes ½ in., and ¾ in.
Style M.O. Valve—Has 1 in. Inlet and Bowes Coupling Outlet. Connects with Bowes sizes ¼ in. to ¾ in.

### CLECO GROOVED HOSE NIPPLES




Grooved Nipples when attached to the Hose with Wire Clamps as illustrated cannot "blow out." Wire clamp tool shown below applies the wires to hose.

**The Lightening Hose Clamp Tool** illustrated applies wire clamps at a cost of 1½ cents each.




**In stock:** Riveting and Chipping Hammers, Air Drills, Emery Grinders, Sand Rammers, etc.

**Use Annealed Wire No. 14**

**IMPORTANT:—The Small Leaks in your "AIR LINE" mean serious loss in DOLLARS. Have you any idea of the amount of "Air" wasted in small leaks at your connections? Air Leakage through 1-16 in. opening equals 5.32 cu. ft. per minute at 80 lbs. It will pay you to install Bowes Couplings and Cleco Valves, which will stop costly leaks.**

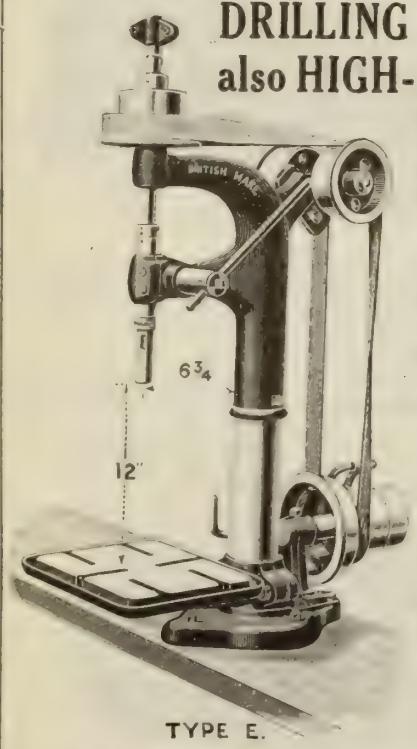
**Bulletins Nos. 43, 44, 46 and 47 mailed on request.**

**THE MODEL HOSE LINE** illustrated shows correct styles of couplings and valve to use and proper way to attach the Cleco Never Slip Hose Clamps to Bowes Couplings. No "blow-offs" can occur when "Cleco" Clamps are used.

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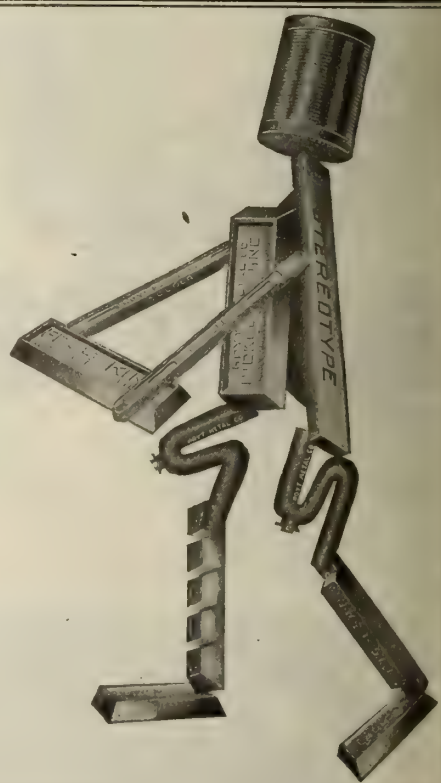
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will withstand heavy pressure without increasing its temperature.

For general machinery bearings it is without a peer.

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## HARTNESS AUTOMATIC DIES

### FOR REVOLVING SPINDLES

The No. 4 Type R Hartness Automatic Die has been designed for use on revolving spindles, either Vertical or Horizontal.

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Outside button coming into contact with some set stop on the machine.

Regular knock-off by carriage coming to a stop while chasers, which are carried along by the revolving thread, pull the body away from the latch pin.

Sleeve control enable chasers to be released or locked at any time.

**The Hartness Automatic Dies are the only automatic dies made that will, without the aid of lead screws, cut threads rivaling in lead accuracy those cut by the best engine lathes.**

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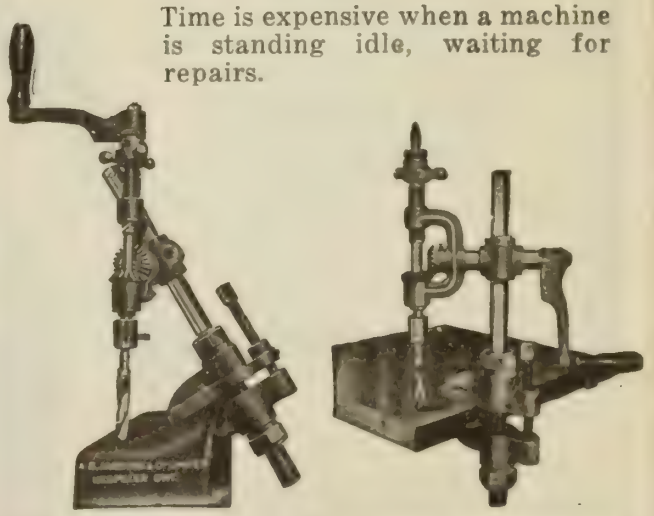
This BLOUNT Motor-driven Lathe is well adapted to all speed lathe uses. It is of late design, and has a number of features in which you will be interested. Provided with constant-speed motor. Lathe spindle made of hollow, high-carbon steel, ground to size and bored for Morse taper. Runs in self-oiling bronze bearings.

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Time is expensive when a machine is standing idle, waiting for repairs.



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Screw machine product up to 2¼" diameter to customers' specifications. Hardened and ground product to specifications.

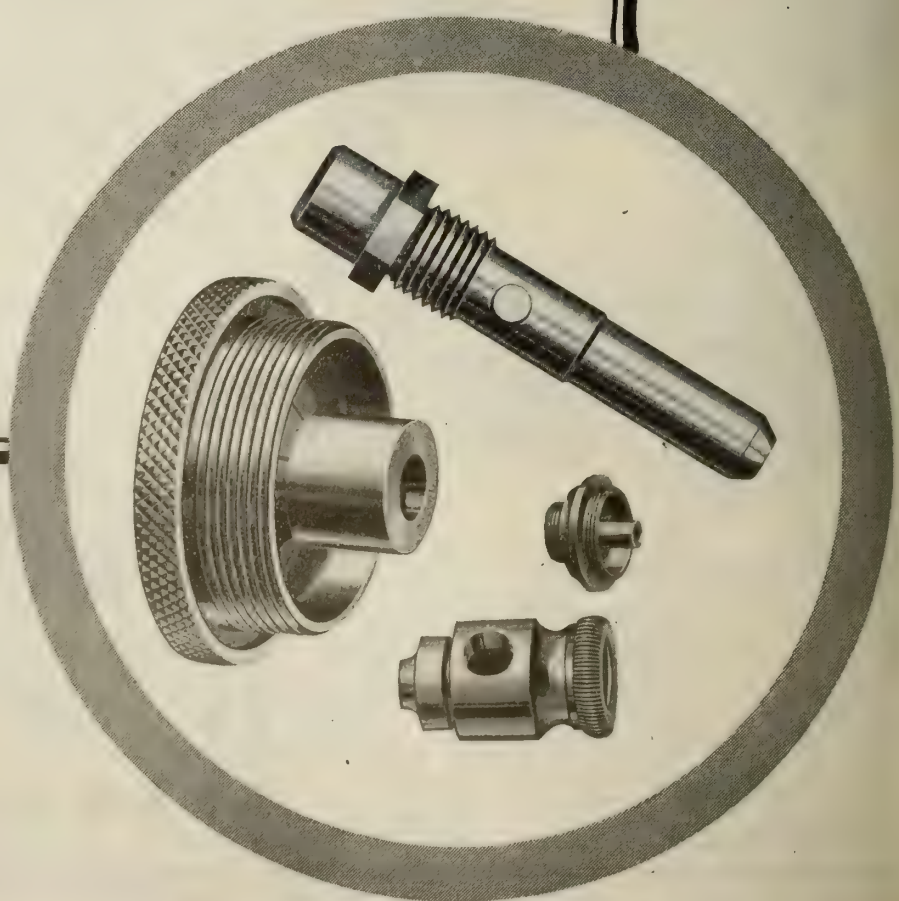
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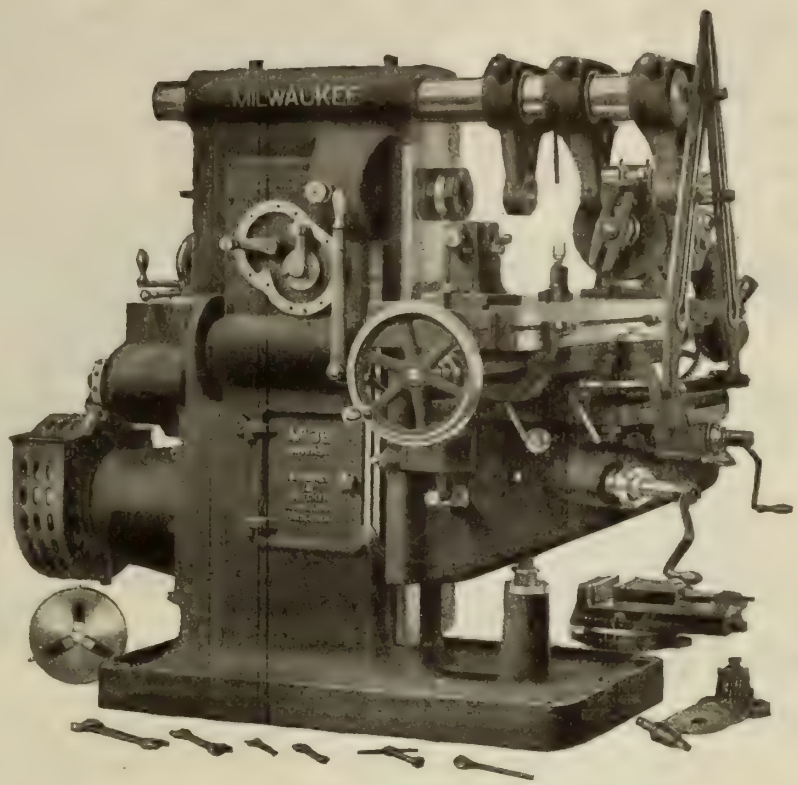
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## Superior Service in the Tool-Room

MILWAUKEE Universal Milling Machines are accurate, rigid and flexible and are distinguished for their efficiency on all kinds of milling done in the tool-room. Light or heavy operations are as one to the "Milwaukee".

A really scientific construction with all parts of the machine properly proportioned so as to form practically a single unit; features to reduce supervision, maximize ease of operation and increase the accuracy, rigidity and entire efficiency of the machines, make Milwaukee Universal Milling Machines the choice for the tool-room.

Firms that seek the certainty of tool-room milling satisfaction, find their hopes realized in the "Milwaukee".

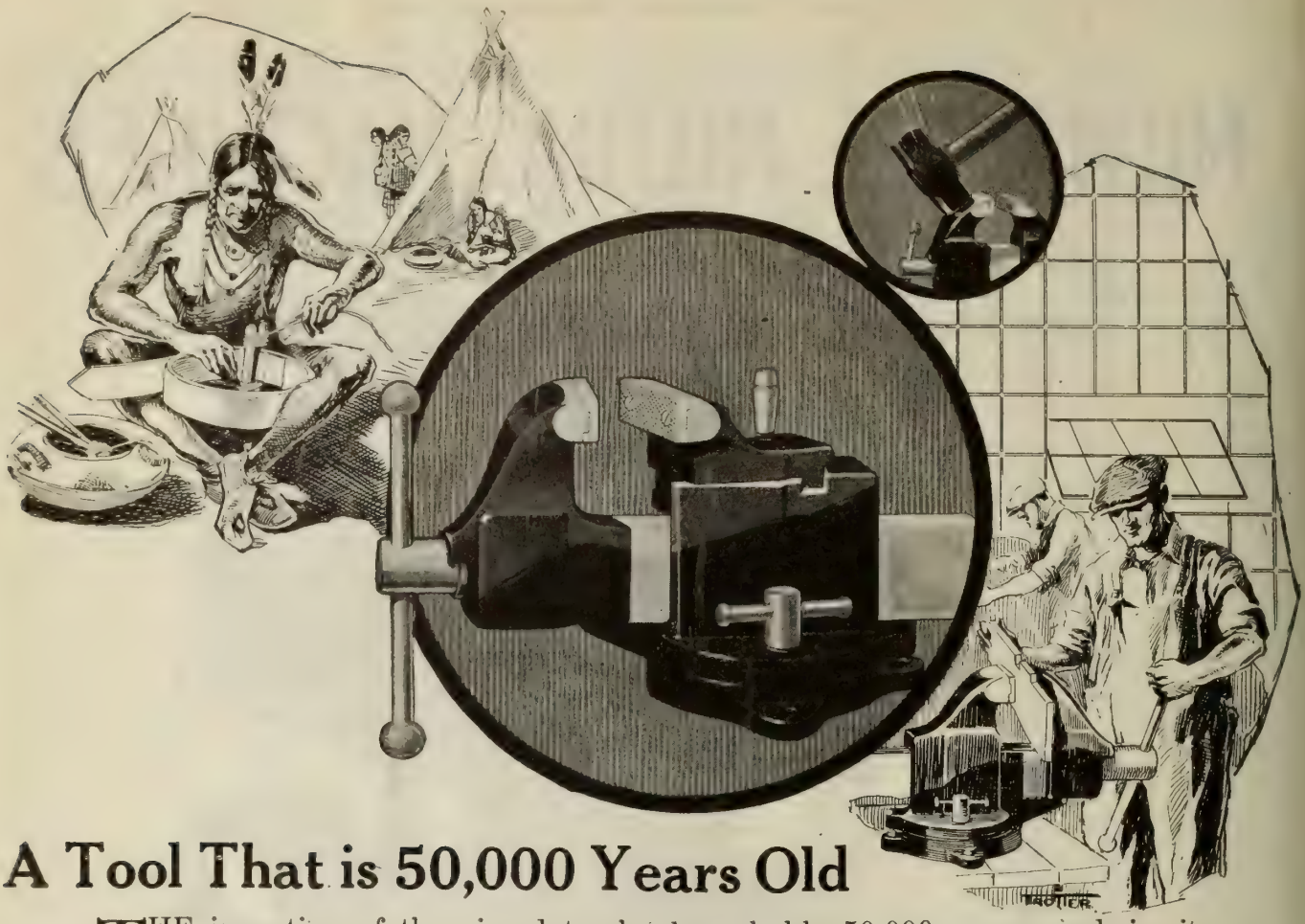
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# A Tool That is 50,000 Years Old

THE invention of the vise dates back probably 50,000 years, and in its most primitive form was made of a forked branch bound with wet root or bark, which contracted as it dried.

From the very earliest times the vise has been one of the fundamental tools of industry—but it is only within a very recent time that industry has realized that every possible improvement in vises was of far reaching importance.

Columbian Sledge-Tested Vises are the most highly improved vises made today. They are the only machinists' vises that are made of malleable iron—and the use of malleable iron instead of cast iron is the greatest single improvement made in vises in hundreds of years.

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The screw is self-aligning by means of a cone bearing. The depth and width of the beam and its accurately machined bearing surfaces insure absolutely parallel jaws, yet the front jaw works freely all the time.

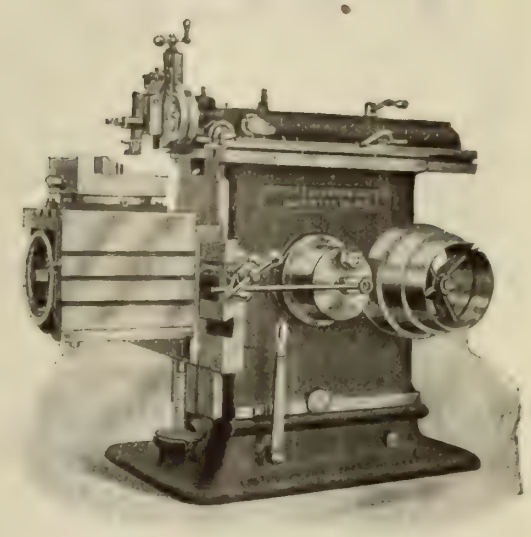
Columbian Sledge-Tested Vises are sturdy, rugged and durable. Yet they are so carefully made that they are the best vises for fine work. When you order vises specify "Columbian."

**Columbian Hardware Division**
**of The Consolidated Iron-Steel Manufacturing Co.**
*World's Largest Makers of Vises and Anvils*
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**COLUMBIAN**
**Sledge-Tested VISES**

# UNIVERSAL

## SHAPING MACHINES

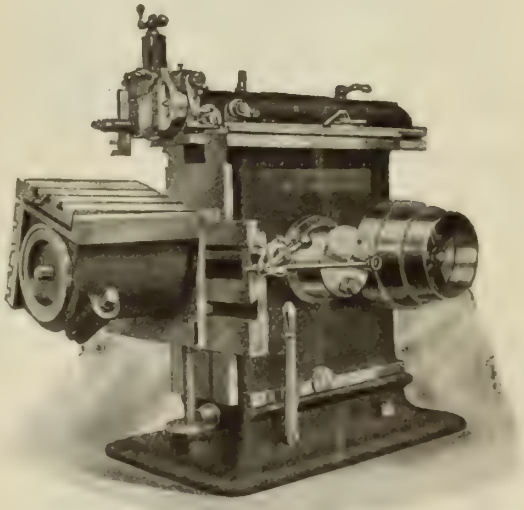


No special vises or fixtures needed; the Universal features of these machines take care of everything, making them particularly adapted to—

Die Work
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Machines regularly furnished with—

Swivelling Graduated Table
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*Canadian Offices:* POTTER & JOHNSTON MACHINE CO.

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The tests we apply to a file before it is passed are so exacting that there is no possibility of flaws.

Weight, balance, sharpness, temper of steel—all are carefully checked.

It is this painstaking accuracy that has made the following brands the standard:

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There is some outstanding feature of all La Salle Grinding Machines that lends it exceptional productive ability.
The American Drill Grinder is especially adaptable for grinding twist, flat and three-lipped drills, because it has automatic lip rest and caliper jaw device, which assures proper clearance on all sizes of drills automatically. Send for descriptive matter covering our entire line of grinding machinery.

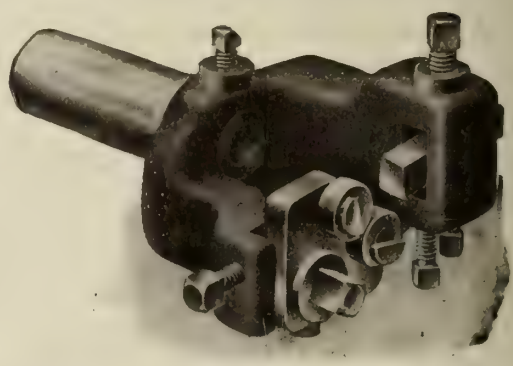


**American Drill Grinder**
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National Electro Products Limited is the largest manufacturer of Electrolytic (pure) Oxygen and Hydrogen in Canada.

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Our entire organization—technical and sales—is always at your service.

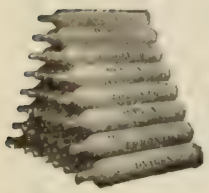
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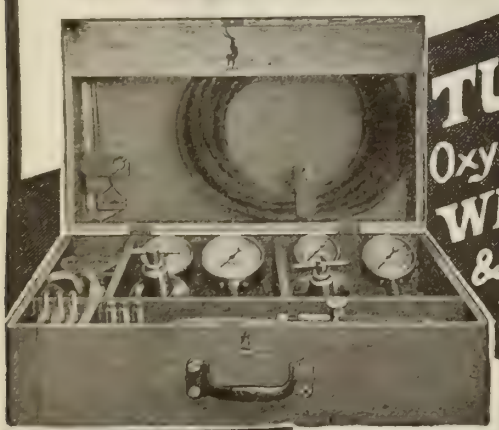
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For full particulars write

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Additional Factories in course of Erection



**"Liquid Air" Oxygen Means a Saving in Transportation**

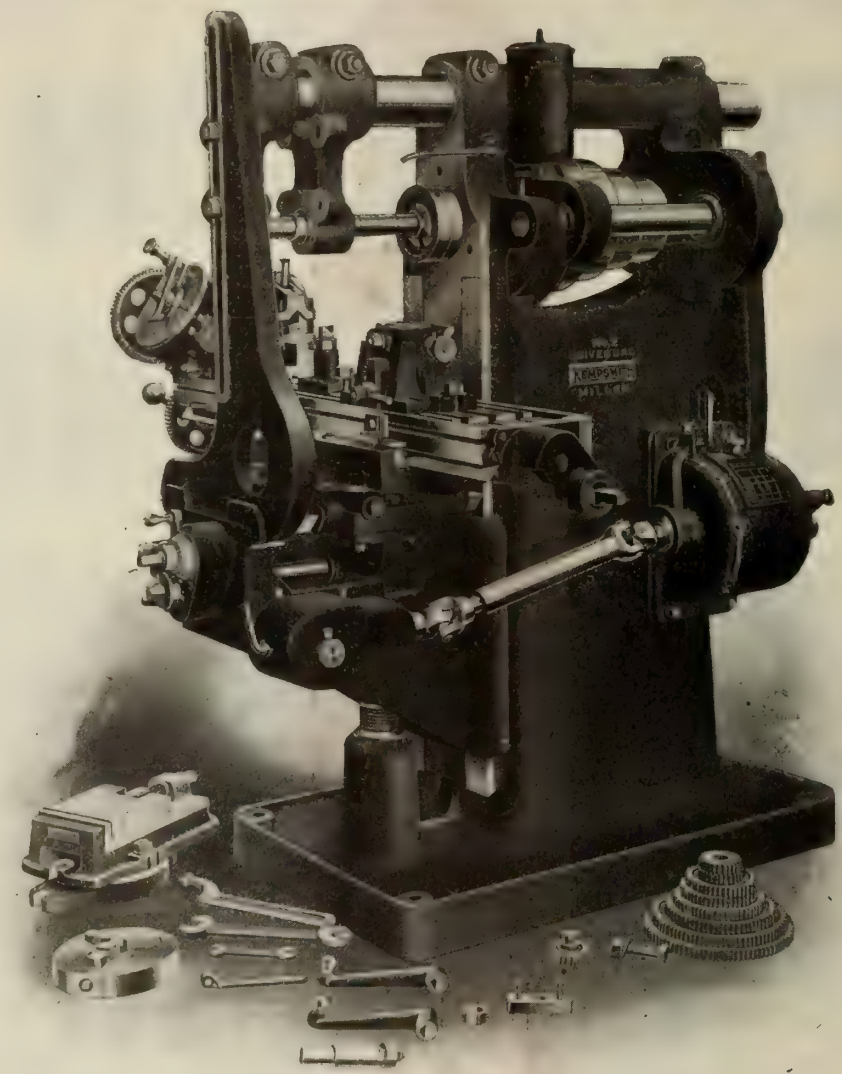
With a network of Factories, not only planned but in actual operation, and a number of Distribution Stations situated at all large centres all over Canada, Purchasers of Oxygen can obtain their supplies at a point very near to the point of consumption. This completely obviates heavy freight charges on cylinders and assures an immediate supply at any time within a few hours and even minutes after the orders are placed.

All cylinders conform to the specifications of the Canadian Railroad Board and are made to ensure safety without unnecessary weight. When purchasing "Liquid Air" Oxygen, you not only save on freight, but in very many cases this expense is almost eliminated.



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# KEMPSMITH



## No. 2 UNIVERSAL

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It has always been, and will continue to be, a purpose of the Kempsmith Company to produce machines of the highest quality only, suited to the most advanced practice.

Every machine, whatever size or type, is put to test under cuts and conditions purposely more severe than it will encounter in even the most progressive shops and when it leaves our factory it has our positive and definite guarantee back of it.

*Literature will be gladly sent upon request*

## THE KEMPSMITH MANUFACTURING CO.

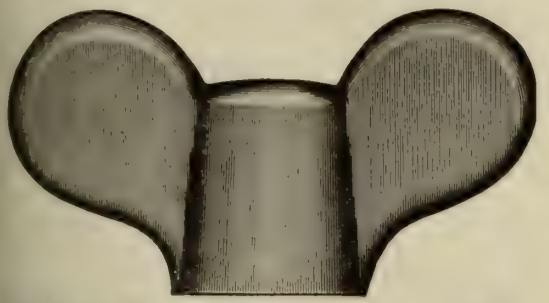
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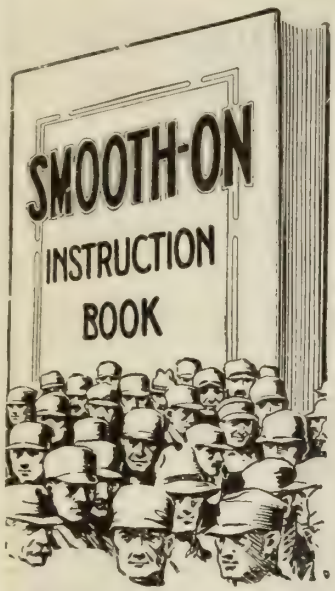
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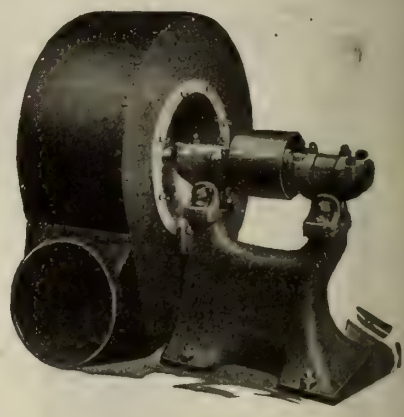
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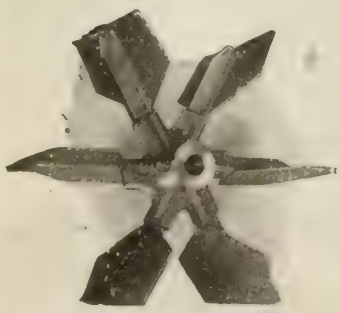


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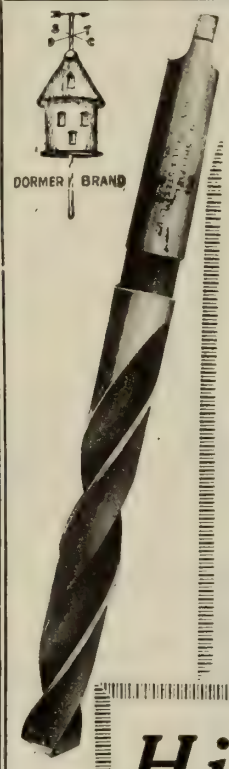
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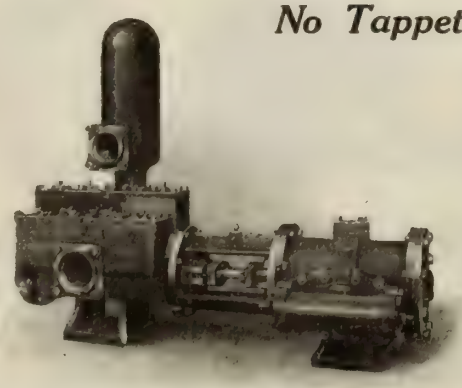
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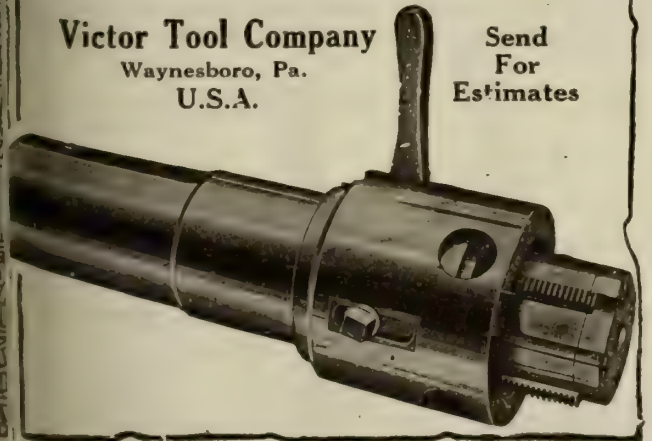
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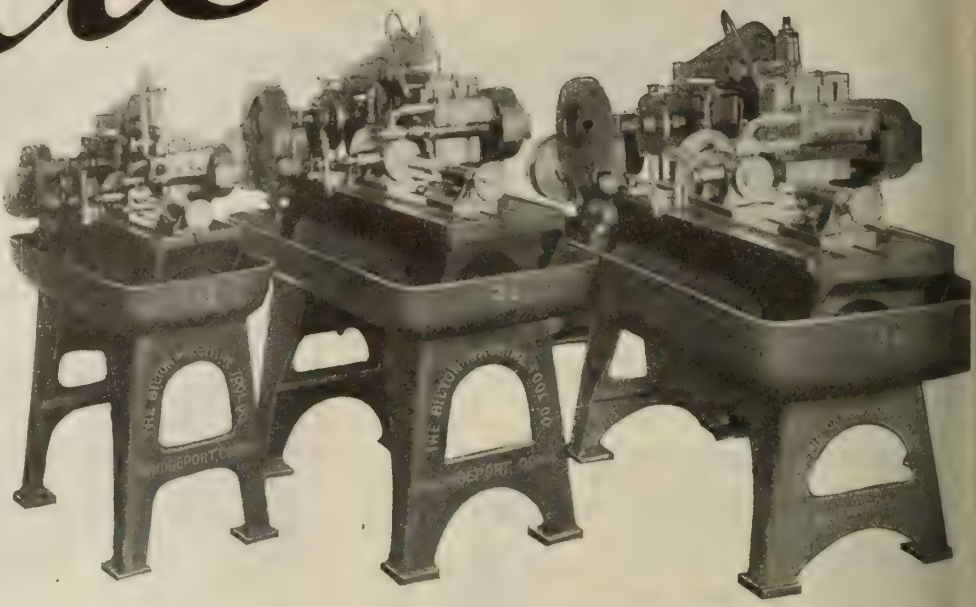
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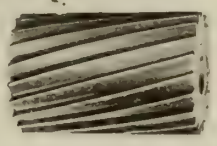
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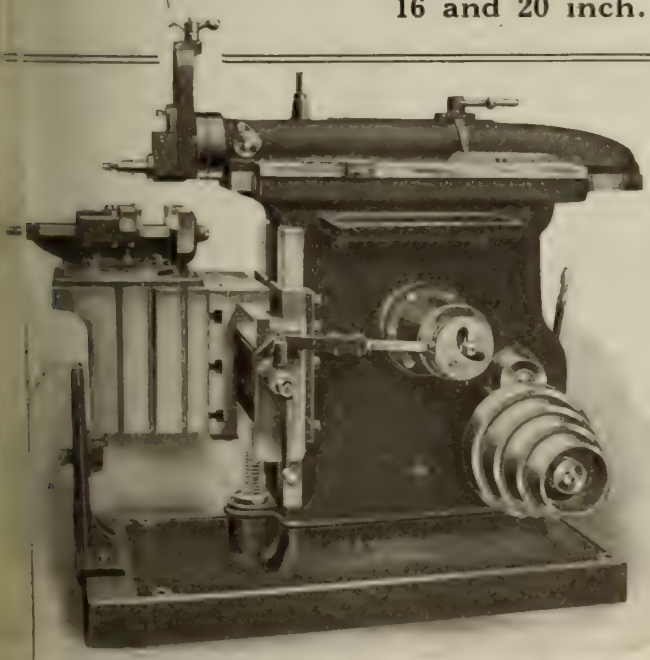
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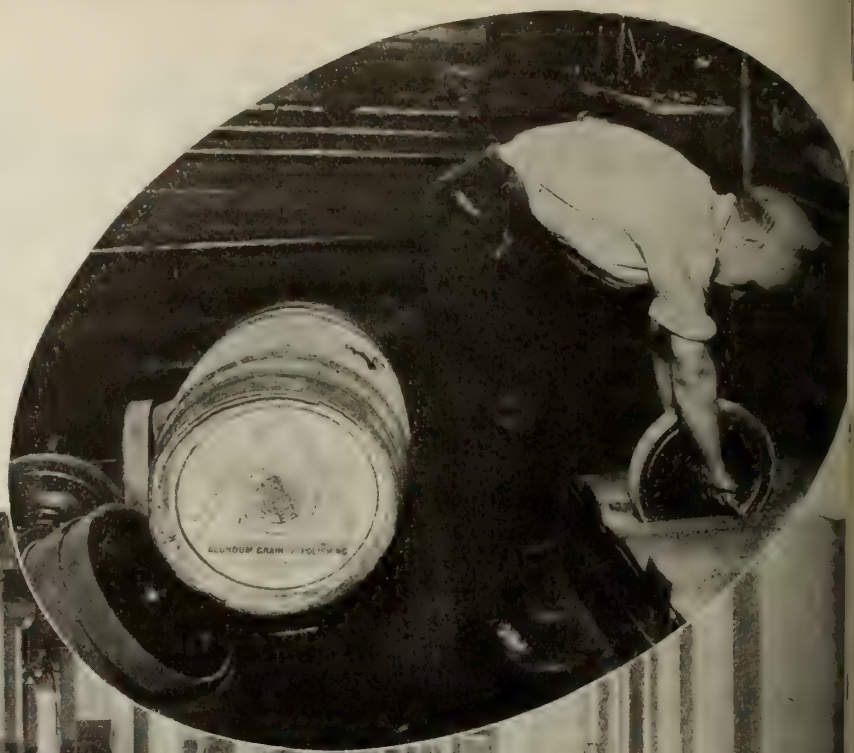
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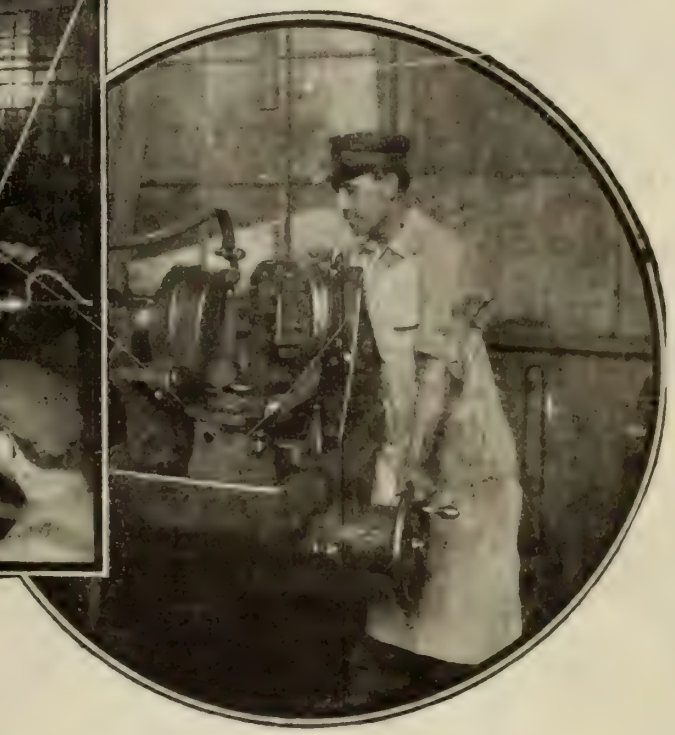
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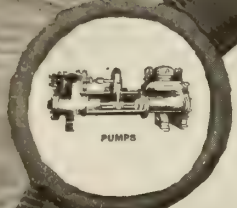
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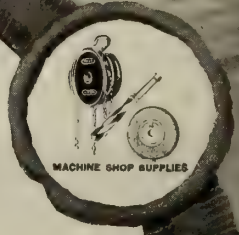
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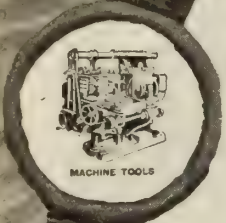
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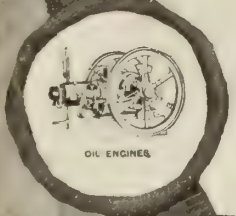
















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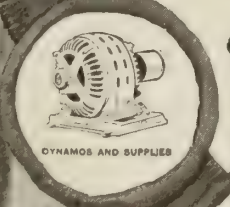
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CANADIAN MACHINERY
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VOL. XXV. No. 4 January 27, 1921

# Correcting the Alignment of Machine Tools

## Various Methods of Correcting the Alignment of Spindles, Slides, Heads, Cylindrical Bearings, Clamping Devices, Turrets, and Other Parts of Machine Tools

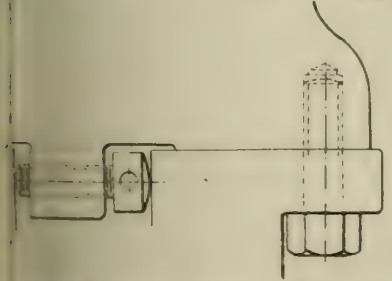
By F. HORNER

THERE are numerous forms of adjustment and correction necessary in machine tool construction and operation, comprising such things as the initial setting up, the finer corrections for alignment and squareness, the taking up required before, and sometimes after, trial runs, and the rectification of bearing and slide fits.

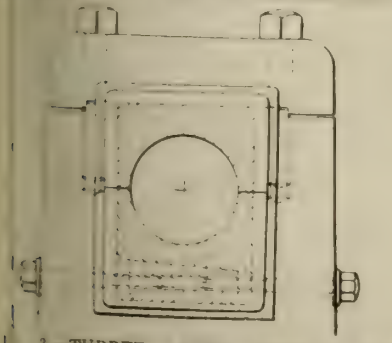
In this article we will consider yet another feature, comprising a certain form of correction which is only made at comparatively rare intervals, once at the time of assembling or testing the machine, and subsequently at periods ranging from weeks to months or years, dependent on various considerations. These particular corrections are for putting right the alignments of spindles, slides, head, and various holding devices, and for absorbing backlash which develops through the wear of the parts.

With all the precautions in manufacture, opportunities still creep in for little inaccuracies to arise, partly due to the results of wear, partly to over-strain, and partly to misuse of the machines, or defective corrections in other ways. Cylindrical bearings, for instance, can easily be thrown out of alignment by improper taking up of the wear. So may slides and heads of various sorts, clamping devices, turrets, etc. The most important factor in regard to maintenance of alignment is undoubtedly rigidity, which refers not only to the fixed portions of frames, bases, etc., but to the stiffness of moving parts; if the latter can be sustained with firmness, and are in themselves stiff and rigid, the machine will wear for years in an accurate manner. But if the walls of the framing are weak, easily buckled, and liable to permit of vibration, the chances of retaining perfection of alignment are small.

The effects of heavy loads, including the mass of the slides or tables, the weight of jigs, fixtures, and work, and the pressure due to cutting, are such that the deflections arising from weakness of support tend to wear the parts cornerwise, as it were, instead of in a straight unswerving path. The amount of error produced in a given time may depend upon the line of pressure resulting from the cuts. For example, a good deal of side pressure or localised cutting at one end of a traverse, will more rapidly accentuate errors. Tables will even bend under the influence of weights too severe for their strength, or because a piece of uneven shape is bolted on, and the bolts strain the table up into a slight curve. Here is another cause of alignments getting rapidly out of truth, and this is why so much stress is laid upon the efficient ribbing, bracing, and thickening up of bases, columns, tables, and supports of numerous kinds. In order to secure inertia of a sufficient amount to withstand vibrations, with all their



SCREW FOR ALIGNING LATHE HEAD



3.—TURRET LATHE SPINDLE BOX WITH VERTICAL ADJUSTMENT.

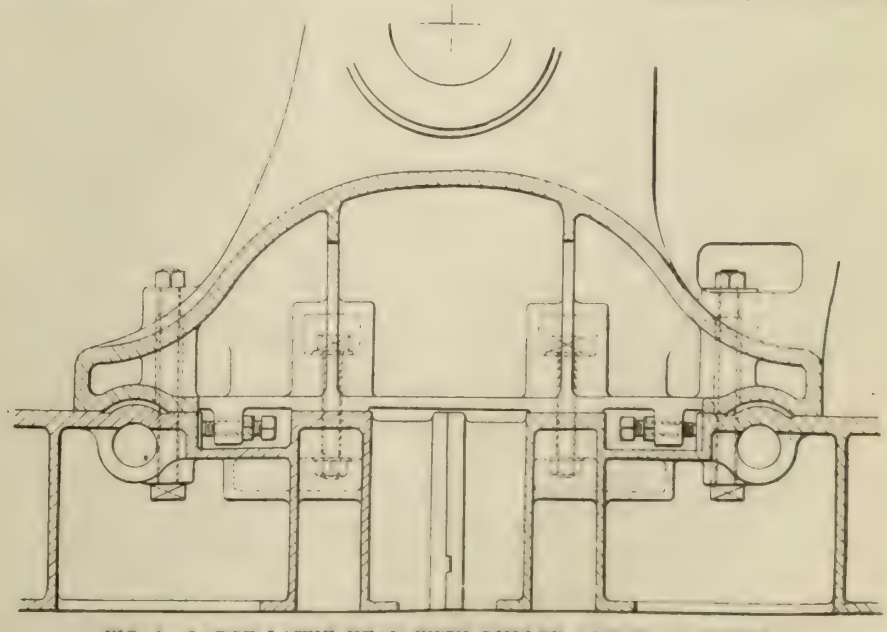


FIG. 2.—LARGE LATHE HEAD WITH DUPLEX ALIGNING SCREWS.

destructive effects upon work and machine, the mass of knees, slides, tables, and spindles must be enough to resist the vibratory influences. The thing, however, must be done properly and consistently, since the strengthening and massing up of one portion will fail to afford proper protection unless the companion elements are also treated properly. Vibration extends to several adjacent parts, and becomes cumulative, hence the necessity for intelligent interrelation of design, and of adequate proportioning also of driving mechanisms, comprising screws, racks, shafts, and of clamping devices.

### Watch the Cutting Pressure

Vibrations, as well as deflected direction of movement, causing unequal wear, are made worse by unbalanced conditions of cutting, and the endeavor should always be made to equalize cutting pressures on opposite sides, along edges, and to provide resisting media in the shape of supports, pilots, steadies and other details. Then the machine will have a better chance of keeping in an accurate condition, while the work will give less trouble in regard to parallelism, even thicknessing, and general alignment and squareness. These important requirements tend to become more and more exacting as pieces have to be tooled to close limits, and guarantees have to be given of the state of accuracy of the machine, or of pieces machined.

Certain occurrences affect the working of machine tools in an irregular and sometimes rather subtle way. The usual line of pressure of a tool may wear bearings and slides in a nearly constant direction, so that the designer is able to anticipate the path of such wear, and provide suitable recompenses. But under some classes of working the wear may turn out to be of an uncertain character, and what is rather awkward, of a local

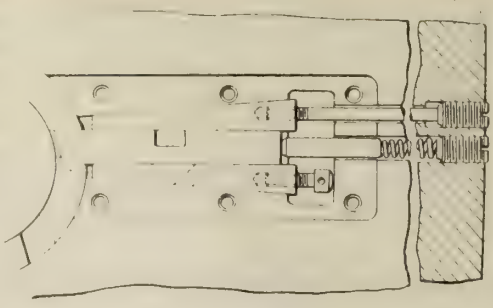


FIG. 3. TAKE UP AND CORRECTIVE STRIPS FOR TURRET LOCKING BOLT.

nature. In the latter event, it may not be feasible to provide anything in the way of an easy corrective method, and the only thing is to properly overhaul the machine at a certain interval of time, and reface or scrape a whole bed or slide so as to restore the pristine accuracy.

Neglect to take up slackness at a sufficiently early period is responsible for some of the faults found in machines while in use. They may proceed with their operations satisfactorily, notwithstanding the slacknesses which have developed to a slight extent, but damage is being done all the time because the contacts are more localized (both in round bearings, and in flat sideways) and wear occurs correspondingly, at sides or on corners instead of over a larger area. And as these restricted areas revolve or rub together they naturally wear faster than if the whole designed bearing surfaces made contact.

### Eliminate Backlash

Many of these remarks apply equally to alignment and to backlash conditions. The presence of backlash in movements has not always such a decisive effect upon the work, but is frequently more of a time-wasting character. But if accurate reversals are desired, backlash need to be strictly eliminated, either by absorbing all of it by adjustments, or by appropriate hand correction before making a fresh movement. It is proposed to consider alignment adjustments first

In the course of manufacturing a machine, the mode of rectifying the alignment as the building proceeds often depends upon certain features in the design. There may or may not be simple way of diverting the alignment of heads, for instance, this depending on how they are attached to the bed Heads resting on vee ways, as a case in point, are automatically aligned, and cannot be re-adjusted by the simple process of swivelling them or pushing them over bodily, which method is easy with heads set on flat surfaces. Sometimes, therefore the latter advantage obtained by discontinuing the vees after the spot where a saddle or slide moves and clamping the head on a flat area Or the vees are still carried along, but special provision is added to the bearing arrangements to permit the spindle to be thrown slightly to bring it in line

In recent years the American or v design of bed has come in for some notice because of the alleged rapid rate of wear that occurs, by comparison with the English, or flat lathe bed. Endeavors have been made to delay the wear the vee bed by chilling the ways, and by modifying the profile in such a manner that an increased width of bearing surface is secured at the place where the principal thrust takes place.

Wear of a bed is both downward and lateral, with the result that work cannot be turned parallel. In the case turret lathes further complication arises because of the several concentric surfaces that require to be turned, bored threaded, etc., and the fact that numerous tools have to be brought into action Any defects in alignment of spindles slides, or in the indexing mechanism are soon released in testing the product. To a certain extent compensations may be made in the operation a few of the tools, which overcome defects present in the machine, but this does not apply to all, nor can it make for all the deficiencies of action. English practice, a favored mode of correcting the alignment of a lathe head through cross-setting screws. The head is tongued loosely into the bed, and either one or two screws set into tongue at each end of the head provide a method of cross setting (and of swivelling) before the holding-down bolts tightened. Subsequent rectifications may be therefore made with ease.

A single-screw lug is illustrated Fig. 1, alternative of two screws be often practised, each screw starting from the opposite sides of the hole, pressing with its head against the tongue. This takes some of the strain off the holding-down screws point not so certain with the one-screw method. On massive lathe heads e

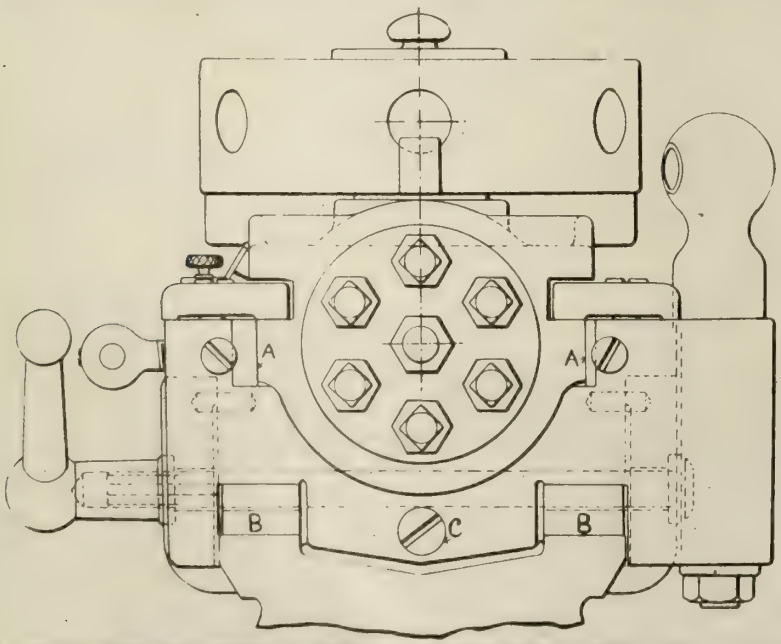



FIG. 4. REAR VIEW OF BROWN & SHARPE TURRET WITH STRIPS FOR LATERAL AND VERTICAL ALIGNING.

...ls are necessarily duplicated, and spead well apart, so as to increase the re...stance to twisting. An example of th... may be seen in Fig. 2.

### Cause for Anxiety

The fit of the loose head is a cause for a...iety on the flat bed lathes because th...re is no automatic aligning feature p...sent, as in the vee top. The tongue o... the poppet must be a trifle slack in the bed to allow of easy sliding, so t...t the groove cannot be depended on f... aligning purposes. The best thing t... do consists in making use of one e...e constantly for every re-alignment, k...ing the tongue fit very freely, so that th...re will be no friction and wear against th... edge. The clamping device is then con...ucted in such a manner that the head is invariably drawn over against this g...ding edge, a guarantee of accuracy, p...vided it is not burred or otherwise d...aged.

A fresh set of circumstances arises w...en heads are cast solidly with their b...s. The opportunity for lateral cor...tion, or for vertical adjustment by s...aping the head is not present. The a...rnative is that of modifying the s...dle position by moving the bearing l...es, or by correcting the path of move...nt of a turret or other tool slide. Both p...ctices are followed by various design...s, preference being given generally to th... latter procedure. If only a vertical a...stment is afforded the spindle, com...sation for the lateral defects of a...nment is arranged in the form of d...ble gibs flanking the turret slide. F... 3 is an instance of height correction f... divided bearings of a head cast in o... with the bed.

Both boxes are machined at an angle u...derneath, to coincide with the wedge s..., and the adjustment of this in e...er direction by means of the pair of s...ws elevates or lowers the spindle n...e. An exceptional practice, of w...ch only one or two examples are ap...ent, is that of fitting the head to a s...bing face on the end of the bed, so th... it can be slid up or down this to b...g the centre height correct.

The lateral alignment of a turret slide, if the headstock possesses no corrective fe...ng, is a matter of furnishing a gib on e...h side and setting these up relatively u...l the turret holes are found to be in alignment with the spindle axis. The g...s are either of the direct lateral closi...g pattern, forced against the edge b... a row of screws, or—which is a better c...struction — they are tapered, and p...ed endwise, giving metal-to-metal c...act all along. An end view of the B...wn & Sharpe turret for the firm's n...w screw machines is shown by Fig. 4; the lateral alignment correcting st...s, of relatively reversed tapers, are le...ered A,A, while vertical adjustments ar... practicable by a one-piece sole or fr...e, tapered from front to back, the p...s which rest on the bed and sustain th... turret saddle being marked B,B.

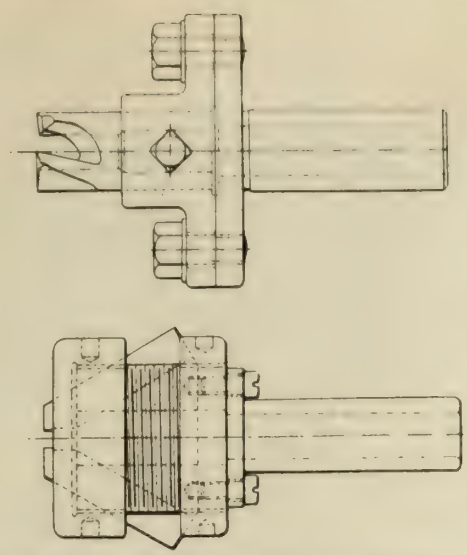


FIG. 6. SET OVER FLANGES FOR HOLLOW MILLS.

There is a screw C located at each end for the function of drawing the frame to or fro.

Given a corrected movement of a turret slide, it does not follow that every tool hole will line up truly. The holes may have been pulled somewhat out of shape, or the indexing bolt may be defective in action. In the latter case the results are uncertain every time the turret is swung around and locked. The correct thing is to have no slackness in the fitting of the bolt, and to be sure that no grit or dirt is present to prevent it from fitting properly into the turret locking ring. Prevention of slackness as regards the bolt can only be ensured by fitting a gib alongside it, so as to press it constantly against the same face all the time, the taper nose of the bolt taking care of the turret position after that. But it should be noted that the application of one gib only has a tendency in time to let the side of the bolt and its contact face wear to one side, hence the double gibbing system, like that in the Bardons & Oliver turrets, Fig. 5, is to be preferred, from the point of view of centralizing.

### Watch the Details With Care

Notwithstanding all the care which may be exercised in putting right such alignments, very small discrepancies are likely to be present, and means are luckily available for introducing a further adjustment in connection with the tools themselves, after they have been placed in the turret. This adjustment assumes the form either of a cross and vertical setting, of such magnitude and direction as may be found necessary, or of a floating hold that constantly accommodates itself to the faint inaccuracies present in the lining up of the turret holes. The first device generally consists of a flanged union with set-screw fastening allowing sufficient freedom before tightening up. This is represented in Fig. 6, showing a holder for a solid hollow mill, and an adjustable ditto. The floating class of holder, employed for such tools as reamers, taps, and dies, has a small degree of looseness in the connection between the parts, so that the tool will adjust itself automatically to the work. This principle, of course, is only applicable to such operations as those of a following nature, on parts already turned or bored, or for such tools as will automatically centre themselves by the effect of the centrifugal force of rotation. Some amount of discretion is required in applying these adjustable and floating holders, otherwise the work may suffer in accuracy or finish from neglect to keep the main alignmehts of the lathe up to a good pitch.

The adjustment of certain other ma-

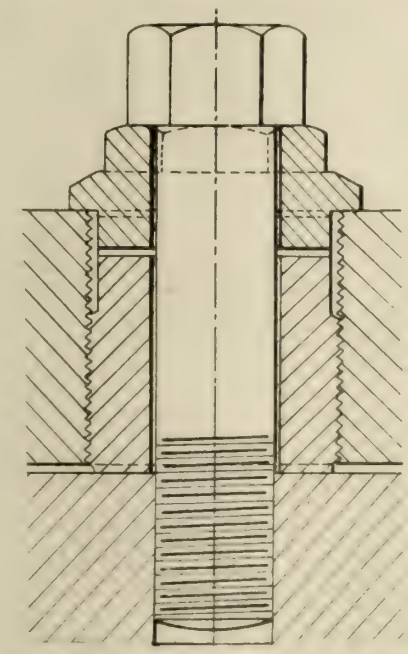


FIG. 7. BUSH AND SCREW FOR CORRECTING AND FASTENING BLANCHARD GRINDER COLUMN.

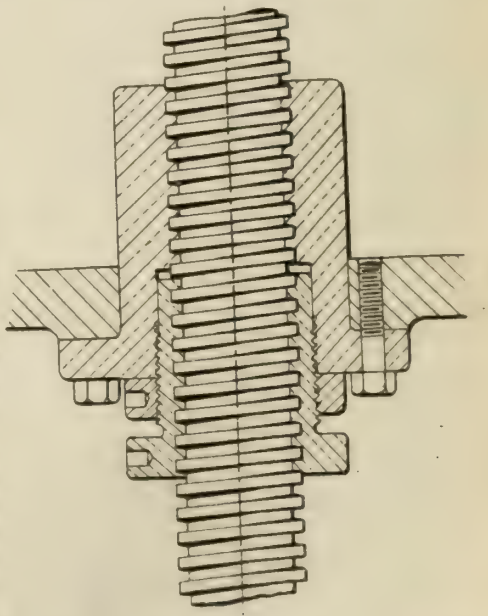


FIG. 8. FEED SCREW PROVIDED WITH TAKE UP FOR WEAR.

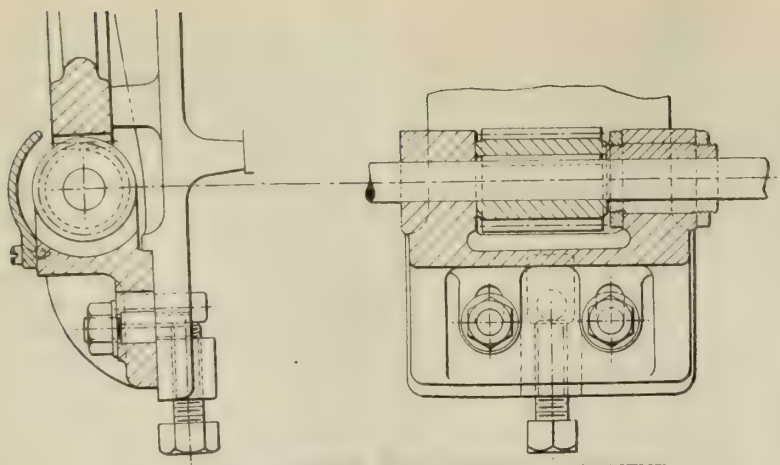


FIG. 9. WORM BRACKET WITH DEPTH ADJUSTMENT.

chine parts is effected in various ways, as may be demanded from the special shape of the machine. If vertical faces are joined, and it is desired to produce a small degree of modification in their mutual relationship, a good method is that of the three-screw principle; a centrally-situated screw or bolt pulls the faces together, and two others flanking it allow for tilting the relative parts. Further locking may be accomplished by other fastenings after making use of these adjusting screws. In such manner a standard or head can be thrown one way or the other to align a spindle or slide, or a table can be levelled in relation to a spindle above it. Some of the lighter type surface grinders require provision for tilting the table to permit concave or convex grinding to be performed; in these examples the tilting arrangement also furnishes a mode of adjusting for level, a distinct construction from that just specified.

The Blanchard surface grinder is built with a peculiar type of alignment correction, by means of which the massive head carrying the spindle may be tilted in the direction necessary to make the wheel produce flat surfaces. The head does not rest upon the bed, but contact only depends upon three bushings threaded into the base of the column. The state of this three-point support is capable of alteration by suitably manipulating the bushings, so as to raise or lower the head at one or other of the supporting spots. A washer above each bushing connects to it loosely by slot and tongue fitting, so that when the washer is turned by a spanner on its hexagon head the bushing screws its way in or out of the column hole. Then binding is done by tightening the set-screw which passes freely through washer and bushing. The parts are seen in Fig. 7. It may be mentioned that two of the bushings are located at the front end of the head, flanking the spindle head slides, and the other at the rear. The washer on the latter is graduated in order that tilting may be done, and settings duplicated for concave or convex grinding.

In designs of grinding and other machines where rapid change from parallel to tapered working is wanted, a swivel construction is often incorporated by which the slewing of the head or of the wheel spindle base may be accomplished. The return to normal, that is, parallel setting must be accurate, if time is to be saved in trial cuts and measurement, and the change also ought to be rapid. Hence the method of returning to position by reference to graduations does not always commend itself, and a better way is to fix a dead stop, which if kept clean, answers admirably. This must be made with some device for adjustments to make up for wear and other faults which develop. For the very finest class of work even such a provision does not avail any more than setting to graduations, and the only course open is that of trial cuts, a fact which those accustomed to doing long parallel grinding upon machines made with swivel tables will be acquainted with.

### Reversal of Motion

The disadvantages which accrue from the presence of backlash are chiefly concerned with reversals. So long as a pressure is steadily maintained in one direction the effects of looseness in fitting parts usually has no ill result. But such is not the case when a reversal of the motion happens, and undesirable or serious occurrences are liable to arise, together with shock, and destructive action. Two principal situations may be mentioned where backlash is of the greatest disadvantage; one where a screw is used for driving a heavy table, with periodic reversals, the other when a worm pitches round a worm-wheel for indexing purposes. In the first, the looseness of the threads would afford an appreciable interval before the screw commenced to reverse the table, and a sudden and severe shock would come upon the parts and the driving gear, while in the second the accuracy of indexing would be open to question. Some other kinds of backlash are merely annoying, by reason of the interval which elapses before the reversal of a handle or wheel takes any effect, and in regard to others, one needs to be careful to take up the slackness before starting, say a micrometer reading.

A practicable device for the removal or rather absorption of backlash in certain specimens of feeds or drives is that

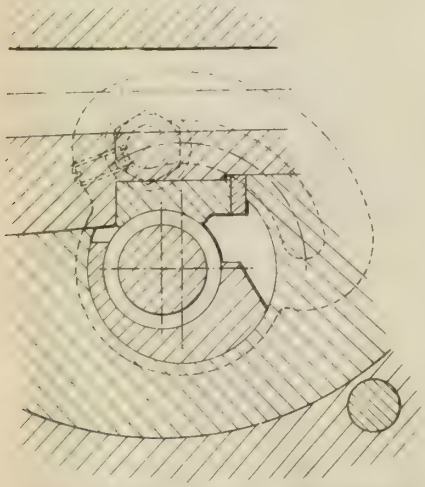
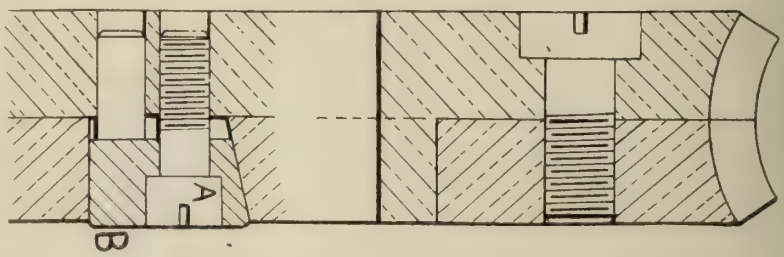


FIG. 10.—THROW OUT AND DEPTH ADJUSTMENT FOR WORM.



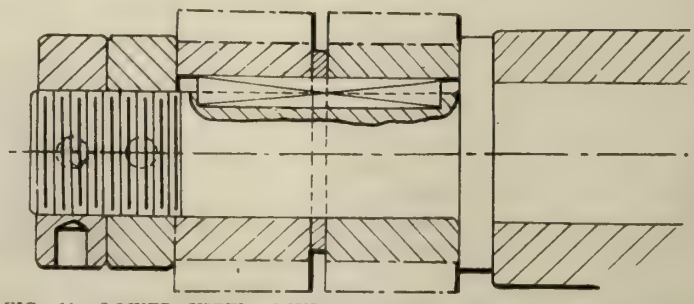



FIG. 11.—LOWER VIEW. DIVIDED WORM FOR TAKE UP.
FIG. 12. TOP VIEW, SHOWING METHOD OF ADJUSTING AND CLAMPING SPLIT WORM WHEEL.

of a counter weight disposed to exercise a continual pull and thus prevent a slide from slacking off. But in the ordinary way the most effectual plan lies in the actual absorption of play between the related elements, as the threads of a screw and its nut, a worm and its wheel teeth, or a block and its link. The take up for threads depends on the diameter, and the type of nut used.

A common fitting is the gland style, (such as in Fig. 8) about half the nut length being bored out, threaded with a fine screw, and fitted with a loose nut. This is turned slightly to consume the slackness and then locked. When a nut is cast in bracket shape, to go alongside a knee or other portion, the dodge of simply splitting the casting and of contracting it with a screw suffices. This does not answer for big nuts, and a suitable form to make these is in halves, one half being bolted fixedly to the under side of the table or other element, and the other half to a short facing, adjusting screws affording the means of forcing this loose section along until the contact with the thread flanks is perfect.

The taking up of backlash in worm teeth can be carried out in either of three ways: (1) Pushing the worm directly in towards the worm-wheel; (2) dividing the worm into halves and drawing them together; (3) making the wheel in halves in a plane parallel to the flanks and twisting one part upon the other.

Construction (1) often requires to be incorporated along with a throw-out motion, for the purpose of spinning the wheel, and it is then necessary to include a dead stop to arrest the inward setting of the worm box after each throw-out has occurred. This stop being finely adjustable gives facility for rendering the degree of backlash nil. Fig. 9 depicts a plain worm box (for a dividing wheel) with the worm adjusted up to the limit; the pressure of the bottom screw against the pin let into the worm box flange forces the latter up, and the two studs and nuts provide for clamping. Dividing heads for milling machines are so constructed that the space available for the worm adjustment device is rather limited. This is the reason for the choice of an eccentric sleeve in many designs, the worm being carried in a casing the outside of which is eccentric in relation to the worm axis. The disposition thus provided allows of withdrawing the worm when its services are not wanted, and of giving a nearly straight line adjustment for backlash absorption. The quadrant, see Fig. 10, on the outside of the head permits of the throw-out, and the stop screw at the one end regulates the entry of worm.

Fig. 11 shows the divided worm, a useful idea if it is not convenient to set into the wheel for take-up, or the worm is employed in conjunction with a long straight segmental nut. The washer between the halves is slightly thinned to enable them to be drawn together a trifle, and correct inter-relation of the worm threads is rendered certain always by the single key fitting the bores. The split wheel may be noted in Fig. 12, showing one of the types of adjustment. Here the halves are united by screws passing through slots and the rotational effect occurs when these are loosened, and the screw A turned in, causing the wedge B to twist the half disc. An alternative adjustment is to screw a peg into one half, bring it up through a slot in the other half, and set by a screw passing through the head of the peg.

## CUTTING A WORM WHEEL OF METRIC PITCH

By G. Barrett

A few months ago I had an accident to a gear cutting machine of German make. The accident caused the breaking of the large worm wheel which revolves the table of the machine.

After carefully measuring the pitch of worm, and the best part of the worm wheel, I decided they were 9 millimetre pitch. This proved to be correct. This wheel was cast and turned in the usual manner, then gashed out in a miller. It was next placed in a horizontal position so as to generate with the special hob which had to be made to get the desired pitch.

In making this hob we had to gear the lathe to cut the metric lead. Here is how we figured it out. There are 25.4 millimetres to one inch, and a metre is 39.37079 inches, which is approximately 39⅜ inches. As there are 1,000 millimetres to the metre, the error is only about 1-200 part less than 39⅜. As the length of the work decreases, so will the error in measurement.

The next step is to bring 39⅜ to an equal number. Since there are 1,000 millimetres to a metre, there are 8,000 in 39⅜ × 8 or 315 inches. The lead screw of the lathe was 2 threads per inch, so we multiplied 315 by 2, making the answer 630 threads in 315 inches, this equalling 8,000 millimetres.

If the screw of one millimetre pitch was required, the ratio between the screw and lead screw of lathe would be 630 : 8,000, or 63 : 800.

As the millimetre pitch is less than that of the lead screw, the small pinion drives the larger gear in the change wheels. In working out the change wheels for any screw of millimetre pitch this fraction is a constant number, and a special wheel had to be cut, having 63 teeth. To find the change wheels required you multiply the constant by the pitch of the screw desired. For example:

Hob to be cut 9 millimetres.

$$\text{Pitch } \frac{63}{800} \times 9.$$

Resolved into fractions we have

$$\frac{63 \times 9}{80 \times 10}$$

By adding a cipher to the 9 and another to the 10 we get the wheels required

$$\text{Driver, } \frac{63 \times 90}{\text{Driven, } 80 \times 100}$$

Very accurate results could be obtained by using a special wheel having 127 teeth with a lead screw of ½ inch pitch.

There are 25.4 millimetres to one inch, and with a lead screw of one inch, pitch and change wheel of 10 and 254, a screw of one millimetre could be cut. This is simplified by a lead screw of ½ inch pitch, and a change wheel of 127 teeth. The result is that a 10 tooth wheel on the change wheel shaft will cut 1 millimetre, and an 11 tooth wheel 1.1 millimetre pitch, a 15 tooth wheel 1.5 millimetres, and so on. For example:

Find change wheels to cut thread 5 millimetres pitch with lead screw of ½ inch pitch.

$$\frac{\text{Drivers}}{\text{Driven}} \quad \frac{5}{127} \times \frac{2}{1} \times \frac{5}{1} = \frac{50}{127} = \frac{25}{127} \times \frac{80}{40}$$

The ratio of these wheels

$$\frac{50}{127} = 39370 \text{ to } 1 \text{ inch,}$$

which would be considered very accurate in relation to our knowledge of the metre and the inch.

## ADVANTAGE OF STEEL FENCES

The day of the wooden fence about the plant is gone. Wooden fences have outlived their usefulness. They never were highly satisfactory, but for want of something better they continued in use until the advent of the present steel-post, wire-netting and barbed-wire fences.

The various systems of steel fencing are more or less designed along the same general lines. They consist of various styles of steel posts, which are set directly in the ground or are imbedded in concrete, and stout steel netting. Fences of this kind protect the plant against trespassers, thieves, firebugs and other undesirables. Indeed, the steel fence is so secure that it virtually extends the storage space of the plant buildings beyond their walls, since the yard becomes just as secure as the store rooms, so far as theft and fire are concerned. It also protects the workmen against accident by preventing their crossing dangerous railroad tracks, taking reckless short cuts, and so on. It simplifies the handling of workmen, since it limits their entry and departure from the works to certain definite gates. All in all, the steel fence marks a big step forward in plant efficiency, both from within and without.

# Adopting Mechanical Ideas in Toy Making

*By J. H. Moore*

"TOY making." The subject does not sound very much like a machine shop article, does it? And yet there is such an amount of machine shop experience embodied in the work accomplished at the school for disabled soldiers at Hamilton, Canada, that the tale is worth the telling.

In this school are manufactured all sorts of toys, but before going into the actual making, perhaps we had better explain the purpose of the school itself. The workers are all returned soldiers who are so disabled that they are unemployable in the open labor market.

When the government came up against the problem of supplying these men with congenial work, they realized that whatever was started must not be run on any hard and fast hours of labor, as the disabled condition of some of the men would prevent their working more than a few hours at a time. This ticklish point was successfully overcome, as will be found out later on in the article.

Having decided on toys as the product the next thing was to start a school where the men could be instructed in the art of toy making. This was done in a humble way in an ordinary dwelling house, but the demand for the toys made became so great that larger quantities were necessary, so the school was moved to the present quarters in the Hamilton Collegiate building. Having thus explained briefly the history of the school, let us see how the men fare in the matter of wages.

### Vocational Wages

The workers all receive their pensions, this amount depending upon their disablement. In addition to the pension, the government supplement this to the vocational standard. The amount is made up irrespective of the worker's productive ability. Suppose a man is so disabled that he can only work a few hours per day. This makes no difference to his wages as it is the condition of the worker, not the amount of work produced that counts.

The regular hours of work are from 9 a.m. to 12 a.m., and from 1.30 p.m. to 5 p.m., but should the medical adviser decide that a man is not capable of working these regular hours, he issues instructions to this effect. These instructions are of course subject to change as the worker improves in health. The medical adviser is at all times the judge of a man's capabilities.

Mr. Harold Saville, the manager of this school, gave us some very interesting facts regarding the method of handling the men.

"You see," he commenced, "the men we have here are really those who cannot get a job elsewhere. Sometimes their body is at fault. Perhaps their mind, or shall we say their perceptive powers are by no means bright. Our task is self-apparent. We must make their work interesting, yet simple. We must so arrange the steps of manufacture that a man cannot very well make a mistake. Some of these men come to us in very bad shape, but it is surprising what interesting work plus easy hours will do for them. The men are never rushed. In fact we would never think of hurrying a man. They can take it easy. A rest room is provided for their comfort, and they have a rest period of 15 minutes both morning and afternoon, so that taken in all it is small wonder that the workers are satisfied."

"I should imagine," I ventured, "that a man would stick around here as long as he could." "You're quite correct," came the answer, "but they don't get a chance except they are still not fit for the open market. You see the men are reboarded every two months, that is, they are brought before a board and examined. This board consists of a doctor, an industrial man, and a vocational officer. After examining the man, this board decides whether he is fit for outside work, or should be re-admitted for a further period to the school. Should a man be pronounced fit for outside labor, every effort is made to place him in a congenial position."

"Do many men improve sufficiently to go out into the open labor market?" I asked. "A great number have been successful in so doing," was the answer. "In fact more than we had reasonably hoped for ourselves. Indeed, if it doesn't sound too much like a boost for ourselves I might say that we have had visitors from all parts of the country looking into our system of training, even to some vocational training officers from Wash-

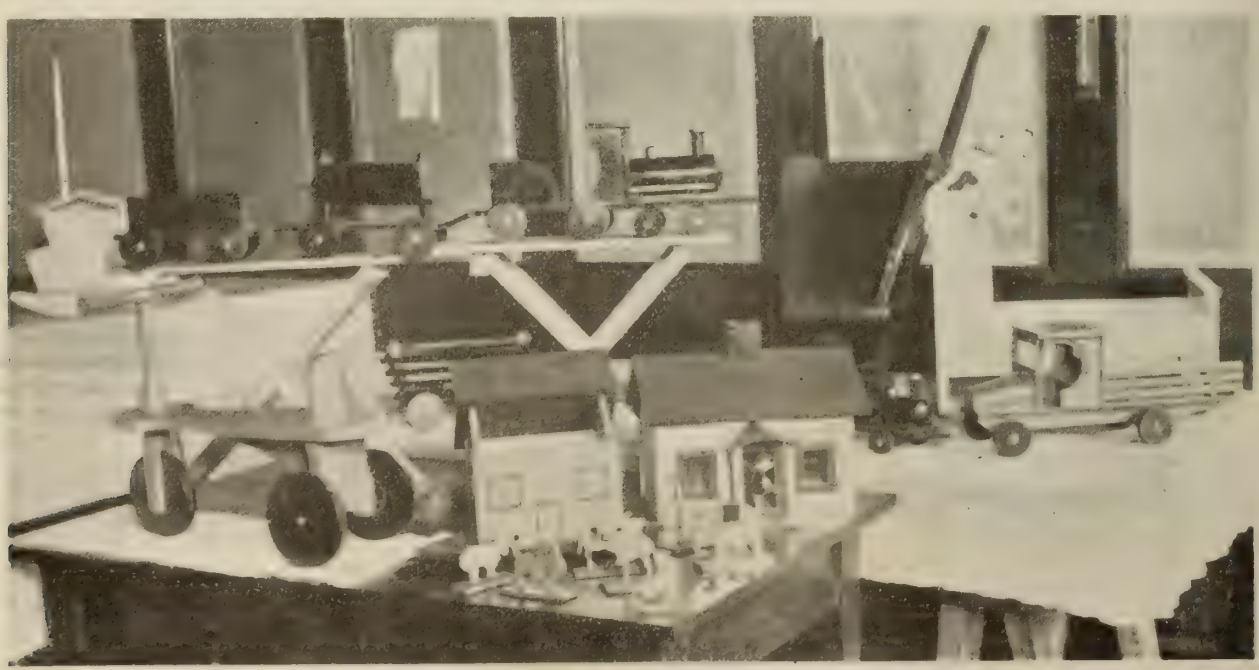


FIG. 1 VIEW OF A CORNER OF THE TOY DISPLAY ROOM.

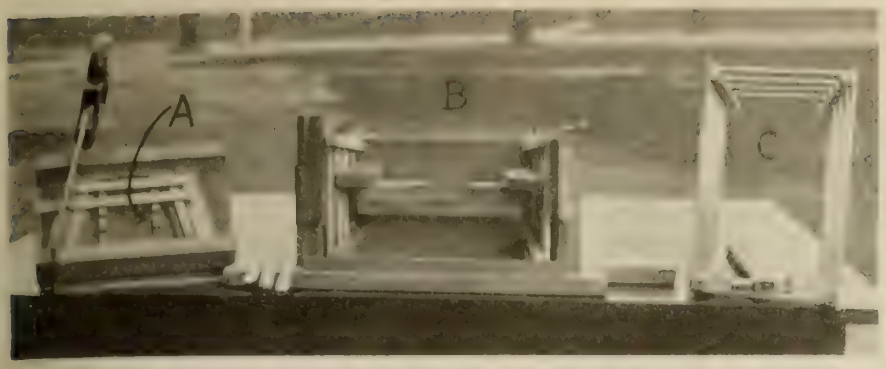



FIG. 2—THE VARIOUS JIGS USED IN THE MAKING OF A HAY RACK BODY

ington, D. C. One thing I would like to emphasize is this. In no case do we work up sympathy. We do not go after business in the way to follow 'buy our toys, as they are made by disabled soldiers.' What we do is this. We place our toys on the open market, employ competent salesmen to sell them, and take our chance. In other words, we make it, as near as possible, a commercial proposition. So far, we have been far from able to supply the demand. Our stock rooms never have a chance to get filled.

"Were you represented at the toy exhibit in the recent Toronto Exhibition?" I asked. "We sure were," was the reply. "In fact we landed second prize for our work. The toys we have made have been sold in all parts of Ontario between London and Niagara Falls, and we hope to still widen this territory."

"What happens to the money you make from the toys?" I asked. "It goes back to the government to help pay for the material and the men's wages." This information having covered in a brief and general way the working of the school itself, let us proceed to the actual making of the toys.

### The Actual Manufacture

The first thought that struck the writer on viewing the school was the system employed. Every toy, no matter what its shape, had a jig of its own. The toy was made in the jig. There was no chance of error, and production was brought up to as good a figure as possible, allowing of course for the condition of the men working on them. A great variety of toys are made, these including hay rakes, kiddie kars, wagons of all sizes, auto trucks, aeroplanes, cats, wheelbarrows, cradles of different designs, ironing boards, engines, dumping carts, dogs, Noah's arks, dolls' houses, etc., etc. A fair idea can be gleaned from Fig. 1 which shows merely a few of the toys produced. The work is not thrown together but made in a good substantial manner, and being made in jigs every toy is alike.

It was realized early in the game that standardization was essential. It was the coming to this decision that caused the making of a jig for every toy. Take for example Fig. 2. Here we see the various jigs used in the making of the body for a hay rack. First let us look at the view to the left of the picture. This is the jig for making the ends of the rack. Note that all the worker need do is place the strips of wood in the slots, one of which is shown at A. After placing these in position he nails them to the braces, saws them even by means of saw shown in bevelled slot, and the end is complete.

After two sides are completed, they are placed in the jig shown at B. Two quick action eccentric clamps hold the ends in place while the side strips are being nailed in proper position. On one side being completed, the work is reversed, and the same procedure gone through. A completed body is shown at C.

### Making an Engine

Next let us consider the making of an engine of similar nature to that shown in Fig. 1. First let us start at the boiler. On referring to Fig. 3, we see a few of the jigs used in the making of such an engine. A shows the first jig used. To make the purpose of this jig clear, we have reversed the piece of wood in the jig. At the bottom of the fixture are two holes, these being of the same size as the holes shown in the boiler (see B and C). On placing the boiler in the jig, the worker turns the jig over, and drills through the two guide holes, which are not shown in the photograph. These holes are drilled with a brace and bit, which has a depth gauge attached.

The next jig, D, is used to fasten the boiler supports. At bottom of this jig are two pins of the same diameter as the two holes already drilled. The boiler sets on these pins, therefore the supports are always in proper location to the holes.

The support being fastened in position, the funnel and dome are placed in position. E shows this stage of manufacture. The axles are next placed in proper position by means of the jig shown at F. Every part must go in a certain place, and must be of correct length, width, etc., to go into position. The axles are fastened to what is known as the bottom of the locomotive.

The coal box and cab are now placed in position, the locating jig G being used. Previous to this another workman has been busy making coal boxes in the jig H. It is unnecessary to go further into the various operations in the making of a toy locomotive. Enough has been given to show the careful thought that has been embodied in its making. All toys are the same. They are made in a strictly mechanical manner. Nothing is left to guess work, and every jig is made as fool proof as possible.

The painting of the tops is accomplished in a separate department set aside for the purpose. When necessary, various colored paints are used. The machine tool equipment consists of a band saw, circular saw, two lathes, a sander, and a jointer.

The toys are not made haphazard. Manufacturing costs are kept just the same as in any other factory. They charge the usual overhead expenses so that this item also figures in the cost of the toys. A system is kept that allows them to tell how many toys they have completed since the start, what balance has been left, and so on.

"What is your limit as far as style of toy is concerned?" I asked. "Give us sufficient quantity to make, and we'll make them, no matter what they are," was the answer received.

One cannot help but admire the work these instructors are doing, and it is perfectly safe to say that the results obtained have more than justified the idea.

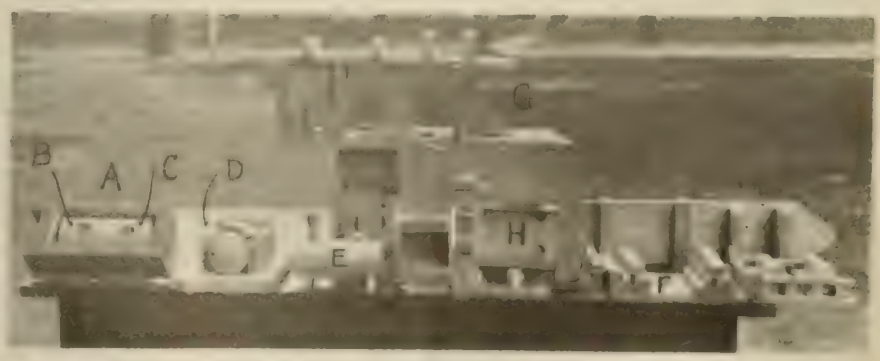



FIG. 3—SOME OF THE JIGS USED IN THE MAKING OF A TOY ENGINE.

# The Machining of Monel Metal Castings

## Cast Monel, Due to Its Extreme Toughness, Requires Tools With Keen Cutting Edges—Methods of Grinding Tools, Hardening and Tempering, Also Lubricants Suggested Are Given

By A. J. HANLON, Technical Department International Nickel Co.

MONEL metal is an individual alloy possessing distinctive machining qualities. Castings, when machined on the lathe, require tools with rounded cutting edges, pronounced back slope, or top rake, and keen cutting angles also a first-class quality of high-speed steel properly hardened and tempered, and comparatively low cutting speeds. Ease of machining is a function of the physical properties of a metal. Experiments made in our own laboratory indicate that cast monel requires more power to machine than mild steel. This power comparison should not be confused with machining methods for these two metals as they are entirely dissimilar.

### Angular Shapes of Tools

Cast monel, due to its extreme toughness, requires tools with keen cutting angles. This necessary keenness may be best obtained without weakness of cutting edges by grinding the lathe tools with certain angular shapes. Tools so shaped permit the use of higher cutting speeds with a minimum of regrindings, both factors of extreme importance in economical shop production practice.

In Figs. 1 to 4 the important angles for roughing and threading tools (both solid tools and tool bits) are specified. The use of a tool holder with ⅜-inch and ⅝-inch bits in itself furnishes sufficient top rake without grinding. The toolholder, for example, holds the bit at a 30-degree angle.

The roughing tool (Fig. 1) is ground with a 13-degree clearance angle and 23-degree top rake. The nose is tapered gradually at an angle of 9 degrees from a plane parallel to the side of the tool and the cutting edge is rounded, with 3-16 inch radius. The sides on the nose are ground with gentle slope from top to bottom to obtain the 9 and 12-degree angles shown. Both angles are measured from a plane parallel to the side of the body of tool. Cast monel metal when turned, gives a long, tough chip. The large rake or back slope ground in the roughing tool helps materially to get rid of this chip by curling it. In that way it is prevented from concentrating the heat generated over the least sectional area (the lip surface), resulting in greater life under working conditions. The clearance angle is made small for the purpose of strengthening the tool, in fact, just large enough to preclude any possibility of rubbing the flank of the tool against the work. When machining a casting with a particularly hard outer skin, the cutting edge may be more blunt with beneficial result. This is secured by grinding the flank of the tool. A tool of this description has less tendency to cut cleanly but is stronger, better withstanding the hard knocks encountered in cutting the skin of any casting, due to sand holes or surface defects.

*The number of uses to which monel metal is being put is constantly increasing. For this reason the present article will be a help to those who have not as yet used this particular metal. The material herein furnishes specifications for lathe tools for turning and threading, also some information regarding lubricants used.*

For either ⅜ or ⅝ inch bits, Figs. 2 and 3, the clearance angle must of necessity be larger than that for bar stock tools, due to the position in which these are held in the tool holder. As no top rake is ground in the tool, this larger clearance angle of 25 degrees does not weaken it. With a ⅝-inch bit, 4-degree side slope should be ground back from the cutting edge in order that the chip may better free itself.

The threading tool, Fig. 4, on account of its pointed cutting edge, has a greater tendency to crumble. For this reason, rake and clearance angles are decreased to 9 degrees and 12 degrees respectively. Side rake, 17 degrees and 18 degrees, is measured from a plane parallel to the side of the body of the tool and is obtained by grinding the side of the nose on a gentle slope from top to bottom. The point of the tool may be ground for any standard thread desired.

The best method of dressing the tool is to turn up the nose or point ⅛ inch above the body of the tool. By so doing the maximum number of regrindings with one dressing may be obtained. The roughing tool shown in Fig. 1 is correctly dressed. The threading tool shown in Fig. 4 has been ground a number of times. With an equal number of grindings the roughing tool would assume a similar shape, in the relation of the nose of the tool to the body. Tools should leave the smithshop with approximately the same angles as the finished tools are to have, to avoid waste on the emery wheel. Forging temperatures for most high-speed steels lie between 1,750 and 1,850 degree F. (yellow heat). During forging operations the temperature should not be allowed to drop to less than 1,600 degrees F. (light cherry or red). In Figs. 1 and 4 the noses are shown dressed straight with the body of the tool. For greater facility, when machining small castings, it is good practice to turn the nose of the tool to the right through an angle of 45 degrees from a plane parallel to the side of the body of the tool.

### Hardening and Tempering

On account of the toughness of cast monel, it is very essential that the high-speed tool steels used in machining should be tempered or toughened after initial hardening. With one particular steel, namely Maximum 000L, excellent results were obtained with the following heat treatment. The temperature was slowly raised to 1,800 degrees F. (yellow heat) and then quickly to 2,300 degrees F. (white heat) and the tool cooled by

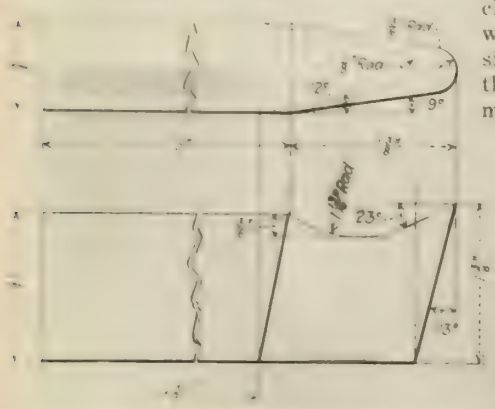



FIG. 1.—DETAIL OF LATHE TURNING TOOL.

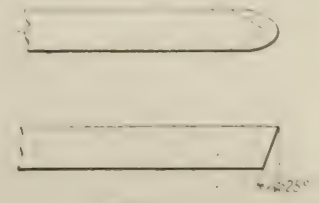



FIG. 2

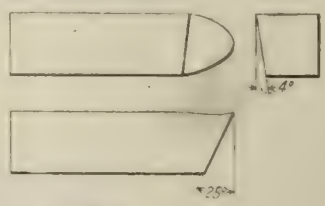



FIG. 3

FIG. 2. A ⅜-IN. ROUGHING TOOLBIT.
FIG. 3. A ⅝-IN. ROUGHING TOOLBIT.

lunging it into fish oil. The temper was then drawn at 1,000 degrees F. (dark red), the tool being allowed to cool slowly in a closed box. Tempering the tool relieves the strains in the metal, giving it a tough rather than a hard cutting surface and materially lessens the number of regrindings necessary for a given amount of work. This hardening procedure follows the general course as laid down for the majority of high-speed steels.

Among the high-speed steels which have given satisfaction in cutting cast monel metal are the Maximum 000L, Peter A. Frassee and Co.; Triple Mushet, B. M. Jones and Co., and Rex AA, Crucible Steel Co. of America.

### Grinding Tools

The tool should first be ground on a dry emery wheel, not being held firmly against the wheel but moved over its surface. The wire edge should be removed on either a common wet grindstone or an oilstone. Care should be taken not to burn the cutting edges. The sides of the flank should be ground first, then the tip or rake angle, and finally the edge should be rounded. On subsequent grindings, approximately the same angles should be retained.

Feeds as shown in the table are recommended. These figures are based on the experiences of a large number of firms. They are for dry cutting. Cooling solution permits the use of higher surface speeds. It will be noticed that a good average speed of 60 inches per minute, ⅛-inch cut and 1-32-inch feed should be used. To secure a better finished surface, a light cut may be taken with small feed and high speed.

The tool should have a true solid bearing on the tool support, which should extend as nearly as possible to a point directly beneath the cutting edge. The body of the tool should be greater in height than in width. The cutting edge should be set slightly higher than the center of the work to obtain the greatest

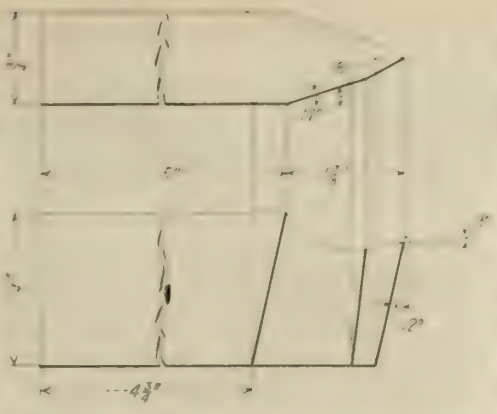



FIG. 4.—DETAIL OF THREADING TOOL SHAPE

shearing effect. No hard-and-fast rule can be laid down, as this height will differ with varying diameters. On small work where a full cut must be taken, with the danger of a dog or chuck interfering with tool carriage before its completion, the roughing tool may be set on an angle up to 30 degrees. For threading all the way to chuck or dog, a threading tool dressed with nose offset should be used.

**Feeds and Speeds for Turning**

| Cut-inches | Feed-inches | Cutting speed Feet per minute |
|---|---|---|
| 1/64 | 1/64 | 150 |
| | 1/32 | 120 |
| 1/32 | 1/64 | 100 |
| | 1/32 | 90 |
| | 1/16 | 75 |
| 1/16 | 1/64 | 85 |
| | 1/32 | 70 |
| | 1/16 | 50 |
| 1/8 | 1/64 | 75 |
| | 1/32 | 60 |
| | 1/16 | 45 |
| | 1/8 | 40 |
| 1/4 | 1/32 | 50 |
| | 1/16 | 40 |
| | 1/8 | 30 |

### Lubricants

For ordinary lathe work, cast monel metal may be cut dry very satisfactorily. The use of a lubricant is sometimes preferable. Among those on the market that have been found to give excellent results are: For cutting, Houghtons' Soluble Oil, 1 gallon to 10 gallons of water, E. F. Houghton & Co.; Equinox No. 1, Lindsay McMillan Co.; Oakite, Oakley Chemical Co. For threading, Cresol No. 1 Soluble Oil, emulsion of 15 parts water to 1 part Cresol No. 1. For cutting and threading, Top Cutting Oil, Frontier Manufacturing Co. For general work, machine oil.

### Examples of Work Done

In Figs. 5 and 6 are illustrated the turning operation on monel metal plugs which have successfully replaced bronze plugs, in connection with Burton's gasoline stills used in the petroleum refining process. The two machining operations necessary, turning to size and threading, are done on an engine lathe. The plug casting is gripped on the square head by a 4-jaw chuck. The tool is turned sidewise at an angle of 30 degrees to prevent interference of chuck and carriage. There is little tendency to dig in, and a wide, tapered chip is removed, thinnest at the finishing point.

A ⅛-inch cut is taken with 1-32-inch feed at 60 surface feet per minute. The point of the tool is set ⅛ inch higher than the center of the work, to obtain the maximum shearing effect. A cut of this size is, in most cases, sufficient to allow the cutting edge of the tool to penetrate under the tough skin of the casting, into the more uniform metal underneath.

The great advantage of the top rake in the lip surface of tools is clearly shown in Figs. 5 and 6. The chip is curled and thrown to one side with the least injury to the cutting edge. Keenness of the cutting edge is thus retained over the longest period of time with resultant good surfacing.

For the threading operation a tool with the nose turned to the right at an angle of 45 degrees is used. The finished thread is completed in three or four passes. The chip curls up very much as does the chip from the roughing tool.

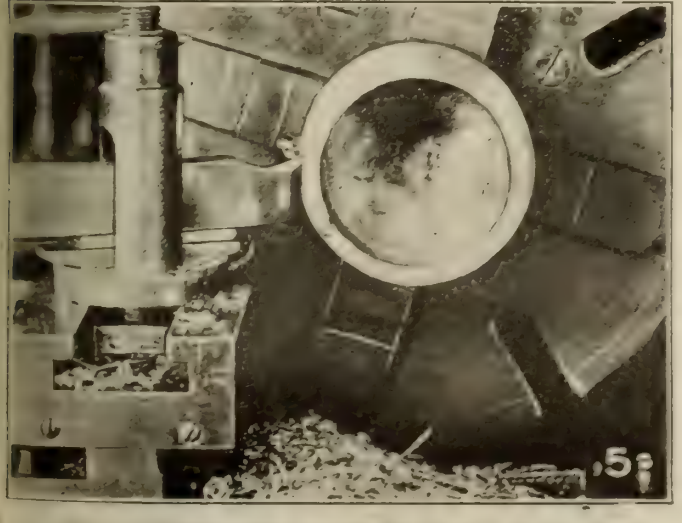



FIG. 5.—FRONT VIEW OF MONEL METAL PLUG BEING MACHINED ON ENGINE LATHE.

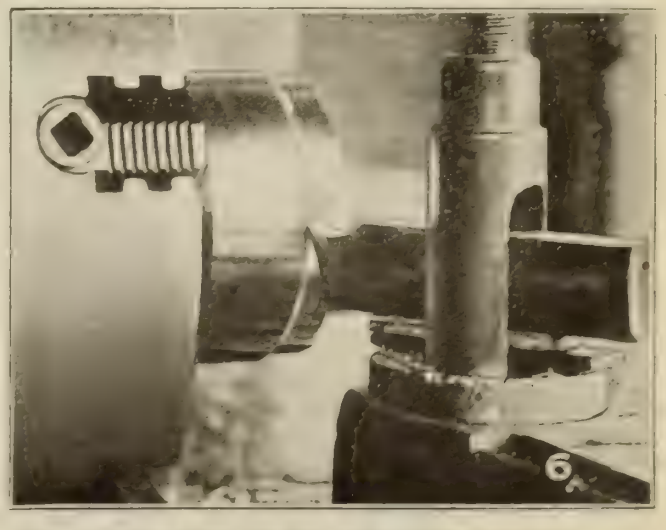



FIG. 6.—SIDE VIEW OF THE PLUG BEING TURNED

# Renewal of Cylinder Parts on Locomotives

## Various Mechanical Tests Made on Cast Iron Such as Used for the Various Cylinder Parts—Traverse, Tension and Brinell Tests, With Their Results

By C. H. STRAND

THE RENEWAL of cylinder parts on locomotives has always been a sore spot in the side of railroad executives. The maintenance cost has been a considerable item. For this reason, if for no other, this portion of Technologic Paper No. 172 of the Bureau of Standards, Washington, D. C., should be interesting.

At the request of the former U. S. railroad administration, the bureau of standards has investigated the mechanical, chemical and microscopical properties of a number of packing rings furnished with service-mileage records, as well as arbitration-test bars, chill-test specimens, and miscellaneous samples from different manufacturers. All of this material was cast iron such as used for the various cylinder parts. It was desired at the same time to review the previous work and specifications on this subject, to ascertain as far as possible the practices of the different foundries and to suggest such revision of existing specifications as would be warranted by the results of the present and of earlier investigations.

The samples, 131 in number, were furnished to the Bureau of Standards by the U. S. Railroad Administration. The first samples were received April 2, 1919, and the last September 26, 1919, nine foundries supplying specimens.

### Mechanical Tests

The mechanical tests made at the Bureau of Standards consisted of transverse, tension, hardness, and fracture tests of chill-test specimens.

Transverse Tests.—Thirty-four arbitration bars, ordered made in accordance with the standards of the American Society for Testing Materials, from six different manufacturers, were tested.

When the packing rings furnished were sufficiently large in size, specimens for small transverse tests were machined from them also. It is not to be expected that these results will be similar to those on unmachined arbitration bars, because of the absence of skin or surface hardness.

Tension Tests.—After breaking the arbitration bars in the transverse tests, the broken pieces were used to determine the tensile strength of the material. Tension tests were made from packing rings furnished by four foundries. From the tension tests, at least, there appears to be some more or less definite relation between laboratory and service tests.

Brinell Hardness Tests.—Brinell hardness tests, using a 10-mm. ball with a pressure of 3,000 kg., sustained for 30 seconds, were made on flat, longitudinal sections of the arbitration bars. Approximately ¼ in. of material was removed by the shaper to obtain a surface for the Brinell tests. As there is a variation of only 10 points from the maximum to minimum hardness, it is concluded that, in view of the widely varying quality of the irons as indicated by other tests, the Brinell test does not satisfactorily measure the quality of iron for cylinder parts.

The Brinell hardness tests of packing rings and bushings indicate that the castings themselves are considerably softer than the arbitration bars. This is undoubtedly due to the fact that the slower rate of cooling of the former results in a higher graphitic carbon content.

Chill Tests.—Chill-test specimens were received from four foundries and broken at the Bureau of Standards, four to six samples of the product of each foundry having been submitted.

### Chemical Analysis

Chemical analyses were made of one of each of the arbitration bars from each of six foundries. The various bars were quite uniform in total, graphitic, and combined carbon content. The silicon and sulphur contents, however, varied within rather wide limits, the former from 1 per cent. to 1.47 per cent. and the latter from 0.051 per cent. to 0.167 per cent. The phosphorus content varied from 0.37 to 0.56 per cent.; manganese from 0.36 to 0.90 per cent. It is generally recognized that there should be at least three times the percentage of manganese as sulphur present; otherwise, sulphur will combine with iron instead of manganese, and brittle material will result.

In general, the silicon, and naturally the graphitic carbon is higher in the packing rings, bushings, and similar castings than in the arbitration bars. A ring which gave 93,000 miles in service showed no unusual characteristics in chemical composition.

### Metallographic Examination

The samples were polished and examined microscopically both before and after etching. Heat tinting was found to be very suitable for revealing the irregularly shaped masses of phosphide eutectic and at the same time allowing the black flakes of graphite to stand out clearly. Micrographs were taken only of typical samples selected for purposes of illustration.

Some attempt was made to correlate the microstructure with the endurance in service, but, due to the many variable factors, it was realized that any very close comparisons were apt to be misleading. The inhomogeneity of cast iron made it somewhat doubtful that the small sample used for metallographic examination was representative of the whole. In some instances, however, with the aid of the principles governing the constitution of gray cast iron, the samples could be approximately classified, and the service records bore out fairly well the predictions that could be made of mechanical qualities from a study of the microstructure.

The microscope is most useful in determining the size, amount and distribution of graphite flakes, amount of combined carbon, and to some extent the physical soundness of the castings.

Conclusions are drawn and recommendations made as follows:

On the basis of test made by inspectors of the U. S. Railroad Administration and of the Bureau, which were substantially in agreement, it is concluded that air furnace or so-called "gun iron" is more uniform in character and on the average of somewhat better mechanical properties than cupola iron. The latter, however, often equals or even excels in mechanical properties the specimens of air furnace iron tested in this investigation. The sulphur content of the air furnace iron examined seldom exceeded 0.06 per cent., while the cupola iron varied in sulphur content from 0.10 to 0.17 per cent.

It was impossible, except in a very general way, to find any correlation between the quality of the iron as developed by laboratory tests and the mileage obtained in service. This is explained by the fact that many other factors besides the quality of the iron enter into consideration in the service results, namely, design, lubrication, method of handling the locomotive, topography of the country, character of water used in the locomotive, etc. It is for the reasons cited above that the conclusions and recommendations of this paper are based essentially upon the results of laboratory tests.

The present specifications of the American Railway Master Mechanics' Association are somewhat lax in the requirements for mechanical properties. It

is recommended that the transverse-strength requirements of a 1¼-in. arbitration bar on supports 12 in. apart be increased from 3,200 to 3,500 lb. for castings ½ in. or less in thickness, and from 3,500 to 3,800 pounds for castings over ½ in. in thickness. It is further recommended that the minimum deflection requirements for both cases be increased from 0.09 to 0.11 in. The rate of application of the load shall be from 20 to 40 seconds for a deflection of 0.01 in. The division line of the casting thickness is changed from ⅝ in. of the American Railway Master Mechanics' Association, to ½ in. in order to conform to the recognized standards of the American Society for Testing Materials. Two arbitration-test bars, cast as specified, should be poured from each ladle used for one or more castings.

**Composition Recommendations**

It is preferable to leave the chemical composition and the melting process used to the manufacturer, depending for the most part on the mechanical tests, and of these primarily upon the transverse test. The existing specifications allow a maximum of 0.70 per cent. phosphorus and 0.12 per cent. sulphur; there are no developments in this investigation which would warrant a revision of the maximum permissible amounts of these elements.

For the chill test a sample of the iron shall be taken before pouring and chilled in a cast-iron mold. The sample shall be allowed to cool in the mold until it is dark red or almost black, when it may be knocked out and quenched in water. On being broken, it must show a close-grained gray iron, with a well-defined border of white iron at the bottom of the fracture. The depth of the white iron must not be less than 1-16 in. as measured at the center line, for castings ½ in. or less in thickness, nor less than ⅛ in. for castings over ½ in. in thickness. One chill test shall be poured from each ladle of metal used for one or more castings. The specimens may be cast in adjacent molds, but in such cases a space must be provided between the molds.

Castings shall, of course, be smooth, well cleaned, free from shrinkage cracks and from other defects sufficiently extensive to impair their value, and must finish to blueprint size.

The purchaser, or his inspector, shall be given a reasonable opportunity to witness the pouring of the castings and test specimens, as well as to be present when the mechanical tests are made. Inspection shall be made at the place of manufacture, and the manufacturer shall also furnish the facilities for making the mechanical tests, if desired.

## SUBSTITUTES FOR BRONZES

The shortage of many metals in Germany during the war period forced German manufacturers to adopt various substitutes. These are discussed in an article in a recent issue of "Stahl und Eisen," and translated in the "Journal of the American Society of Mechanical Engineers."

Crankshaft housings for submarine engines have to be built of a special bronze having very high mechanical qualities, such as high tensile strength and high percentage of elongation. Since the beginning of 1915, due to the shortage of metals, these crankshaft housings were made of cast steel, which did not lead to any particular difficulties, and, indeed, with the construction of larger sizes of submarine engines, proved to be an advantage, as it gave to the housing a greater rigidity. On the other hand, the machinability of the material was not so good as that of bronze.

All the screws, bushings, etc., which before the war were made of bronze or copper castings, had to be of iron and tin-coated in order to protect them against rust. This was done by the Schoop process. On the other hand, parts which used to be made of aluminum castings were during the war made of thin sheet iron and then galvanized.

Considerable trouble was experienced with piping. The former copper piping was replaced by steel piping, galvanized inside and out. The zinc coating did not prove satisfactory, however, as it was rapidly eaten away by sea-water and salty sea air. The pipes then were protected by lead, which, however, did not adhere well to the steel, and chipped off easily under mechanical influences. It therefore proved necessary to protect the piping by two coats of metal—zinc first and lead afterwards. This required great skill in manufacture, and a close control of the temperatures at which the metals were applied, and was therefore not wholly successful.

Vigorous efforts were made to conserve tin. Bronze bushings or parts under heavy stress (such as steering gears) used to be made of a bronze with a 15.5% tin content. During the war these bronze bushings were made of an alloy containing about one-third less tin and were not cast in sand, but in a metal mold so as to give them a greater hardness. This was based on investigations made in 1910 by Heyn and Bauer, which indicated that the hardness of a copper-tin alloy is really a matter that may be controlled either by variation in tin content, or by the proper control of temperature conditions during cooling, and, in particular, by the velocity of cooling. It should clearly be borne in mind that this hardening by rapid cooling is possible only with bronze, and not with brasses.

Bronze bushings with a tin content of 10% were machined, and after having been set in their seats were hardened on their surfaces by having a mandrel driven in under high hydraulic pressure. Parts not subject to heavy stresses were made of zinc castings, and it appears that the strength of such parts was materially affected by the heat treatment to which they were subjected.

An effort was made to produce a bearing metal containing 42% tin, 42% lead, 2% copper, and 14% antimony, but it has not as yet been carried to a successful conclusion.

Considerable trouble was experienced in attempts to find suitable metals for use in nozzles through which water, steam, gases, or acids are discharged under pressure. Here, in addition to other conditions, the tendency to corrosion and erosion had to be met. In particular, in injectors attempts were made to substitute cast-iron nozzles for bronze, but it was found that the former did not stand up well when used with either steam or hot water. The inner wall of the nozzle was strongly corroded, which interfered with the efficiency of the apparatus.

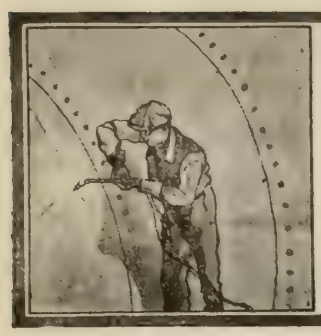
## GRADUATES TAKE NOTICE

A rather interesting booklet entitled "A Few Brown & Sharpe Graduates" has just been issued by the Brown & Sharpe Manufacturing Company, Providence, R.I. The contents are especially interesting because an attempt has been made to compile a list of names of men who have served an apprenticeship at the Brown & Sharpe plant, these men having become graduates. This concern hope to make their list still more complete, and request that any man throughout the country, who served his apprenticeship with them, send in his name and address direct to their office at Providence.

This concern takes a very justifiable pride in its apprentice system, and states that out of an organization of over 7,000 people, the executives, with few exceptions, were formerly apprentices.

## DRILLING HOLES IN GLASS

You can drill small holes in glass with a diamond point resembling that used for china riveting, or with a dead hard steel drill, says Practical Engineer. Use a lubricant of turpentine or oil of spike. Large holes can be rapidly made with a piece of copper tube having a serrated edge fitted with crystals of carborundum. It is not the hardness of the glass that causes the trouble, but the heat created by the friction of the drill. It will be found preferable to leave the glass in cold water where the experiment can be carried on, the water preventing undue heating with the consequent fracture of the glass.



# WELDING AND CUTTING



## Cast Iron Cutting With the Oxweld Blowpipe

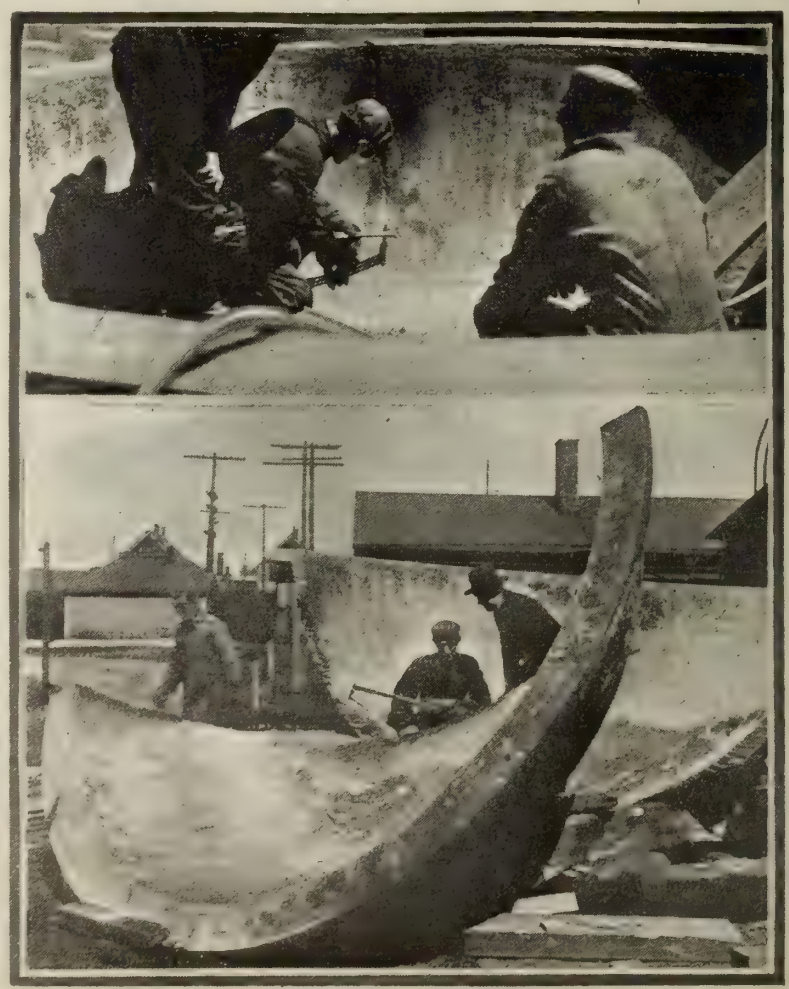
### Instructions For Cutting Cast Iron—How to Cut Poor Grades of Cast Iron, Also Good Grades—General Instructional Data for the Operator

INSOFAR as their experience has been given to the public, the findings of the investigators in the field of cast iron cutting agree in indicating that, where pressure blowpipes are employed, some supplementary or specially designed mechanical part is essential. In one instance it is an attachment for preheating the oxygen; in another, a specially constructed tip. According to the Oxweld Acetylene Company, Newark, N. J., and Chicago, their experience seems to have demonstrated to them that general service cutting blowpipes of the injector type require no special attachments, no alteration of the stock torch being necessary because of the solid stream cutting jet and the long preheating jets, which converge toward and are drawn down into the cutting by the cutting jet, thus intensifying the temperature to a point where a special device for preheating the oxygen or a special tip is not necessary to propagate the cut.

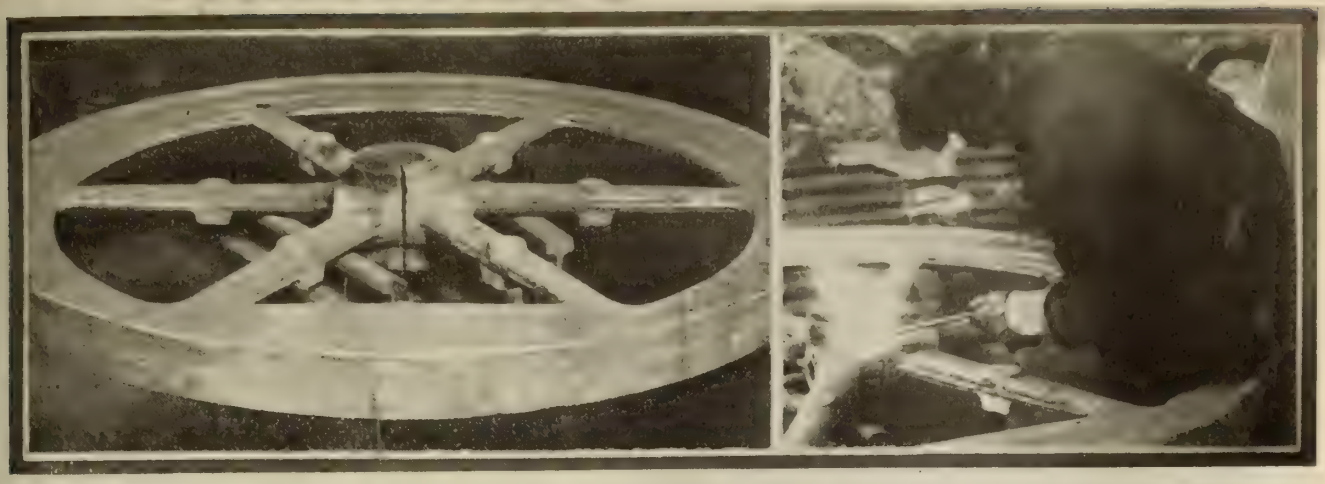
According to them the reason blowpipes have not accomplished this work, excepting where specially designed for it, is that it has been impossible to adjust general service blowpipes of that type to give strong flames carrying the necessary excess of acetylene. With some pressure blowpipes fairly good flames have been obtained, and with them it might be possible for a very skilled operator to gradually obtain a cut through the metal, but undoubtedly the operator would take a long time and a real cut would not be obtained.

The Oxweld blowpipe was not originally designed with a view to cutting cast iron, but, after exhausive experiments, a method of operating the torch in cast iron cutting was developed, and it can be mastered by the average operator almost as easily as the method employed for the cutting of steel. There is, however, a decided difference in respect to procedure. In practice, cast iron cutting with the Oxweld blowpipe differs from steel cutting in that: It is necessary to use heating flames having an excess of acetylene; second, it is necessary to hold the blowpipe nozzle farther away from the metal, and third, it is necessary to preheat for a longer period for cast iron than for steel, since the cast iron must be almost molten before the cutting reaction will start. Steel ignites at a temperature well below its melting point. Lastly, it is necessary to continually oscillate the nozzle to maintain the cut. A cast iron cut, if properly handled, and if the material is of good quality, will have an appearance about equal to that of a fair cut in steel.

The time required for cutting a given section of cast iron is about twice that



THIS SIXTEEN-TON CAST IRON MELTING POT WAS CUT IN TWO HOURS, THIRTY-FIVE MINUTES. THE POT WAS 12 FT. DIAMETER, AND HAD A FLANGE 1 FOOT. WIDE AT THE TOP. THE CUT MADE WAS SEVENTEEN FEET LONG.



TWO VIEWS OF WHAT CAN BE ACCOMPLISHED WITH THE TORCH ON FLYWHEELS.

required for cutting a similar section of steel. This makes the cost considerably higher in the instance of cast iron, and tends to restrict its application in many places where one might suppose it would be generally useful. For example, the inexpensive methods employed for removing risers from castings in iron foundries preclude the use of oxy-acetylene as an economical means of performing this class of work. Further, the cutting off of risers from chilled iron castings is usually not practical because the surfaces cut are likely to crack or check, due to local heating.

The use of cast iron cutting is, however, being appreciated in the steel mills, where it was introduced more than a year ago. In those plants its demonstration was received enthusiastically, and cast iron cutting has since been used daily in that and other industries for removing broken machinery parts such as pinions, gears, fly-wheels, housings, etc. The removal of such parts by old methods usually required several days because of frozen shafts, bolts, etc. With the cutting blowpipe the broken part, and sometimes parts adjacent to it, are cut quickly, the parts removed, repaired, or new parts installed, all within a few hours.

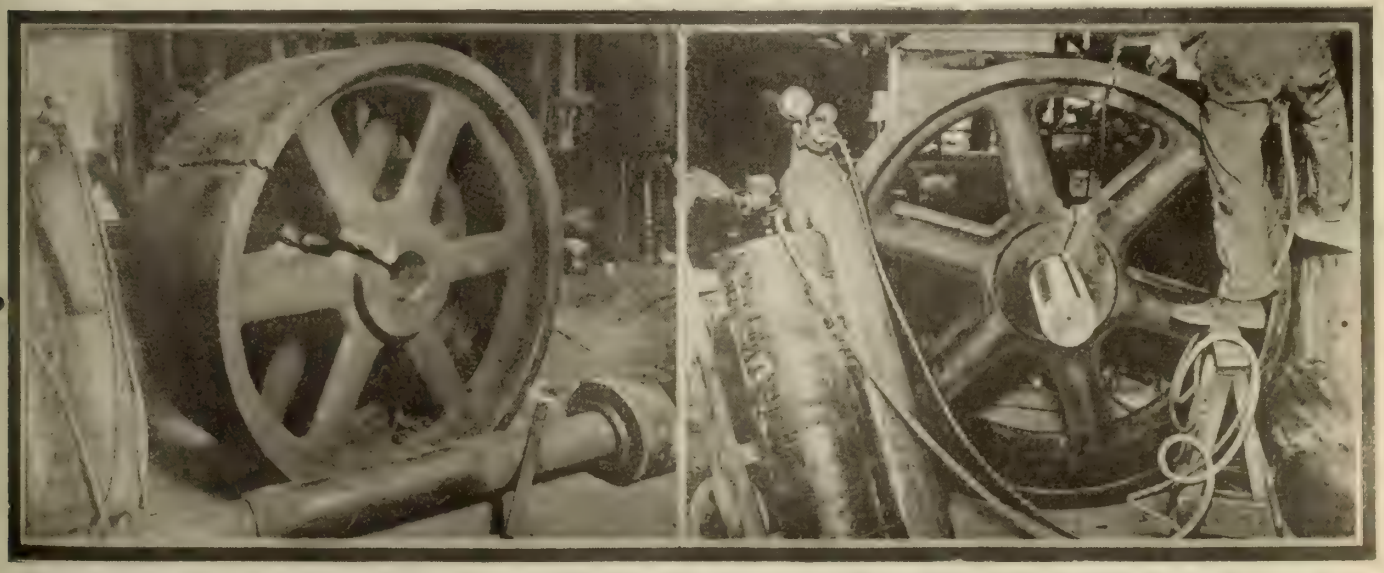
### Instructions for Cutting Cast Iron

The blowpipe manipulations for cutting good grades of cast iron and for cutting poor grades of cast iron are quite different, and are both described below. Although there is a difference in the manipulation of the blowpipe, the oxygen pressures used and the adjustment of the flame are the same for both grades of metal.

In cutting good grades of cast iron first adjust the oxygen cutting regulator to give the correct pressure as shown in the cast iron cutting chart for the work to be done, having the blowpipe cutting valve open. Then close cutting valve. Next open oxygen valve one-half turn, and acetylene valve fully, and light blowpipe. Open cutting valve and adjust acetylene valve to give flames having an excess of acetylene and of the length shown in the cutting chart. Then close cutting valve.

The third step is to hold the blowpipe so that the nozzle points backward at an angle of 45 deg., with the inner cones (not the excess cones) ⅛ inch to ¼ inch above the surface. Give the nozzle a swinging motion describing semi-circles over the end of the line of cutting and heat a semi-circular area about ½ inch to ¾ inch diameter to a bright cherry.

Next move nozzle just off the heated edge, open cutting valve quickly and move nozzle (at 45 deg.) forward along the line of the cut with the same swinging motion. While advancing the nozzle, gradually straighten it up so that it is about 75 deg. pointing backward when at the inner edge of the previously heated semi-circular area. After this advance nozzle about ¼ inch to burn off the molten surface, then quickly move it backward to burn through the comparatively dark layer and lower section, then hold it steady for a moment to heat the upper surface. This movement can be best practised by counting as follows: 1 forward, 2 back, 3 hold; 1 forward, 2 back, 3 hold, etc.,



THESE TWO VIEWS SHOW HOW A LARGE PULLEY WAS CUT IN ORDER TO REMOVE AND PRESERVE A FROZEN SHAFT. NOTE THAT THE SHAFT IS IN PERFECT CONDITION.



GENERAL VIEW OF THE POT SHOWN IN OTHER VIEWS.

etc. Continue moving nozzle in this manner at the rate of about one complete cycle per second. When the far edge is reached, carry nozzle over the edge and across the other surface, holding it at about the angle of the lag, and cut through the lag section.

### Method for Cutting Poor Grades of Cast Iron

Follow the directions given for cutting good grey iron, except that instead of using the peculiar motion explained, advance the nozzle slowly, describing semi-circles from about ¼ inch to ½ inch wide across the line of the cut, holding the blow pipe at about 75 deg. pointing backward.

In cutting cast iron, a dark layer will be found extending down from the top surface about 1 inch to 1½ inch. Below that layer the material will be bright, having an appearance about the same as steel. Be sure that the forward and backward or the semi-circular movement of the nozzle allows the blowpipe to cut almost perpendicularly through the dark layer. The lag must not start until below that section. Particular attention must be paid to this condition.

If cut is lost, move nozzle back along one edge of the kerf about ½ inch and describe semi-circles lapping that edge and that point where the cut stopped. It the cut is not readily resumed, carry the semi-circles over to include both edges of the cut and the point where the cut stopped. Always wear heavy asbestos gloves and suitable clothing to the body, face and head, because cast iron cutting is a very much hotter operation than steel cutting. Always make sure of ample protection from the heat before starting so that it will not be necessary to stop the cutting operation to take shelter or provide further protection.

There has been no more interesting recent development in the oxy-acetylene field of research than the successful application of oxygen to the cutting of cast iron. Curiously enough this old enigma of the industry appears to have been solved contemporaneously, if not concurrently, by separate investigators and in entirely different ways. Following publication of instructional data in March of the present year, the Oxweld Acetylene Company staged a demonstration of cast iron cutting for the edification of its employees. This demonstration was held in April and was intended to be a strictly private affair; but, through a betrayal of confidence on the part of a photographer, prints of pictures taken at the time were sold to the newspapers and appeared in rotogravure in the Sunday issues. A month or more after this there appeared the first of several articles on this subject. At the present stage of development cast iron cutting may be accepted as an established fact, but not as a concluded study, and the future may be looked to with every confidence that it will yield much of interest and value in the general direction of increased economy and practical utility of the process.

### CAST IRON CUTTING CHART

| Size of Nozzle | Thickness of Metal. In. | Oxygen Pressure Lbs. sq. in. | Length of Excess Acetylene In. |
|---|---|---|---|
| | ½ | 45 | |
| | ¾ | 50 | |
| | 1 | 55 | |
| No. 3 | 1¼ | 60 | 1 to 1½ |
| | 1½ | 65 | |
| | 1¾ | 70 | |
| | 2 | 75 | |
| | 3 | 85 | |
| | 4 | 95 | |
| | 5 | 105 | |
| No. 4 | 6 | 115 | 1 to 2 |
| | 8 | 125 | |
| | 10 | 155 | |
| | 12 | 175 | |

This chart shows about the same gas values recently published by other investigators in the cast iron cutting field.

### FUELS ON RAILWAYS

Important trials with pulverized coal and "colloidal fuels" have been carried on the Great Cental Railway, England. Colloidal fuel is powdered fuel suspended in thick oil, and pulverized coal is dry coal reduced to a fine dust. The trials, which were made in comparison with ordinary coal, showed that the special fuels could easily maintain a full head of steam with a high degree of superheat, even on heavy gradients and sharp curves. Locomotives adapted for burning pulverized coal or colloidal fuel show an economical freedom from ash-pan cleaning, smoke-box cleaning and repairs, fire cleaning, and so on. Further, when the locomotive is delayed in a siding there is much less waste of fuel than in the case of ordinary engines.

### ELECTRO-PERCUSSIVE WELDING

In a paper recently presented at a meeting of the Pittsburgh section of the American Welding Society, Mr. D. F. Miner, the author, discusses recent development in electro-percussive welding. This form of welding is a process which is primarily intended for manufacturing applications, where large quantities of duplicate parts are to be produced. The apparatus in its earlier form utilized the electric discharge from an electrolytic condenser consisting of aluminum plates immersed in an electrolyte of borax solution. A scheme has now been evolved for utilizing electrical energy stored in a magnetic field, thus substituting electro-magnetic energy for electro-static, and welds of the butt type up to a cross-sectional area equivalent to ½ in. diameter stock have been successfully made. The complete operation occupies about 0.1 second of time, giving no time for oxidation or excessive heating. The time sequence of events shown in an oscillogram taken during a weld between ⅜ in. copper and steel rod indicates a peak of current of 2600 amperes, an arc voltage of 30, maximum power 60 kilowatts, energy 0.00077 kilowatt-hours, and time 0.094 sec.

# Have You Tried This Contest Yet? If not--- Do so Now

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.




The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

## What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

There is no prize-winner for the January 6th contest. Although we received as many answers as before, not one list was correct. Only one reader guessed query No. 10, yet the answer to the query is found in the first paragraph in the advertisement. Two scales will be given next week, in place of one, to make up for this condition.

**CONTEST FOR JANUARY 27TH ISSUE**

**Contestants are required to write us, stating to which advertisements we refer in this number.**

1—Something that is said to always have been one of the fundamental tools of industry.
2—That if you have an idea it pays to tell about it, especially if you prepare it in a certain form.
3—How to prevent a serious loss in dollars.
4—How to save time, grinding wheels and high speed steel.
5—Something that is said to save money every day it is used.
6—How to learn details about repair work.
7—Something said to be proof against trouble.
8—How to prevent corrosion.
9—Something profitable for both parties.
10—A product said to give absolute accuracy.
11—How to determine your production.
12—A suggestion worth considering.

**These are Correct Answers for List from January 6th Issue:**

1—Heald Machine Co.
2—Brown & Sharpe Mfg. Co.
3—Gisholt Machine Co.
4—Roelofson Machine & Tool Co.
5—Clipper Belt Lacer Co.
6—Canadian Ingersoll-Rand Co.
7—Landis Machine Co.
8—Modern Tool Co.
9—Wisconsin Electric Co.
10—Canadian Driver-Harris Co.
11—Cataract Refining Co.
12—Armstrong Bros. Tool Co.

## Closing Date for This Contest is February 17th



# DEVELOPMENTS IN SHOP EQUIPMENT



## CONTINUOUS MILLER

The Davis & Thompson Co., Milwaukee, Wis., have placed on the market a continuous milling machine that is designed for milling such work as cam shafts, crank shafts, worm shafts, transmission shafts, automobile axles, and any forgings that require milling to length. The machines can also be used for milling small castings such as sad irons, tractor and automobile parts.

As can be noted by the illustration there are two gear housings.

In each gear housing are two spindles which have a micrometer adjustment endwise of 2 inches. This has a locking arrangement to lock the spindles in place after setting to the desired location. These cutter spindles have opposed cone bearings. The right-hand head is adjustable on the bed, the same as a tail-stock on a lathe, and is held by clamps on the bottom of the head, clamping the head to the ways of the machine. This permits milling to length various sizes up to the capacity of the machine. The machine has a single pulley drive and has two changes of speed.

The work mandrel which is supported in each of the gear heads, or spindle housings, is rotated by a bronze worm wheel and hardened steel worm. The different feeds are accomplished by change gears which are located at the back of the machine, and the feed is engaged by cone friction. The lower gear housing which encloses the speed gears is an oil-tight compartment and is filled with transmission oil which insures lubrication to all bearings and gears, while the lubrication is taken care of in the gear heads, or spindle housings, by a large oil reservoir inside of the housing, and the gears run in a bath of oil.

The machine is made to take any desired length within the capacity of machine between the cutters. The fixtures which are made in halves, clamped and keyed to the work mandrel, can be removed very easily. A set of fixtures is made to take each individual class of work to be done on the machine.

In some cases a set of clamps are provided, one clamp holding down two shafts, as shown in the photograph of machine arranged for milling worm shafts, while in a great many cases the machine is equipped with the automatic clamping apparatus for holding round work, small castings, etc.

This apparatus as shown in the other view consists of an endless wire cable affair, having two or more cables. The cable is kept taut by the large tension spring shown, and with this arrangement the production on machine is increased, as all the operator has to do is to drop the pieces in the notched jigs, and pick them up as they come around after being milled.

These pieces pass underneath the cable as the table rotates, bringing the work in contact with and by the cutters. This machine has a roughing and finishing cutter which allows the use of a very stiff feed, and the finishing cutter is said to give a good finish even with coarse feed.

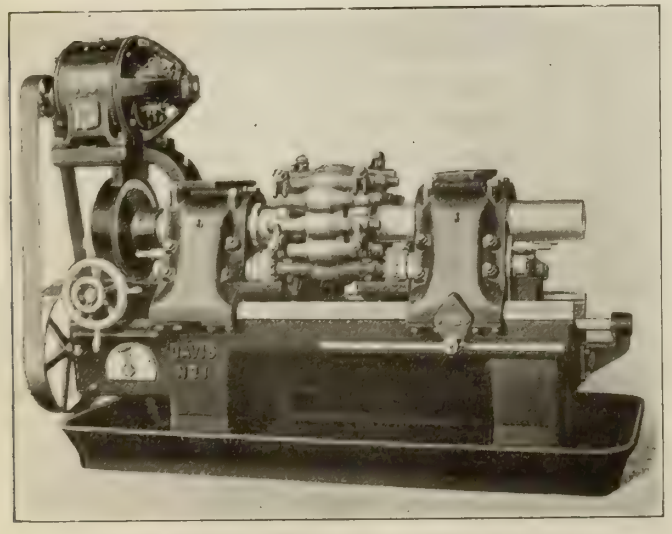
When milling castings with the cable arrangement, it is sometimes necessary to make a jaw receptacle for holding castings in place which insures a good path for the cable to travel in, and which will prevent acute bends in the cable. These cables move possibly 20 inches per minute.

## PNEUMATIC ROD CUTTER

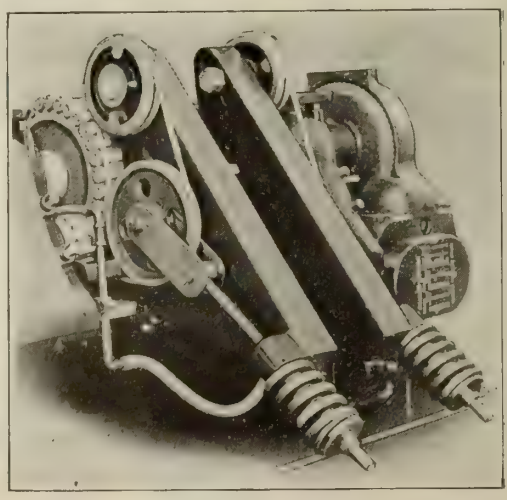
The Scully-Jones Co., Chicago, Ill, have developed a line of pneumatic rod cutters that will cut all sizes of rod within their range, without any change or adjustment. The machine is operated at a minimum of 60 pounds air pressure.

It is said to be impossible to break the machine while operating, as it is strong enough to withstand any strain put upon it in shearing rods. The only moving part is the knee-pad, so that no injury to workman is possible.

There is practically no expense of upkeep, as the only parts that can wear are the cutters. These are round ring cutters, and as they wear, they can be turned around so as to give each cutter ten new cutting edges. The amount of air consumed in operation is negligible, as travel of piston in the ⅜-inch machine is only ½-inch, and the ⅝-inch machine is only ⅞-inch. Machines can be installed on permanent benches, or



GENERAL VIEW OF THE CONTINUOUS MILLER.



REAR VIEW OF THE FEEDING APPARATUS.

on portable benches on wheels. Air hose can then be run to the machine, enabling it to be taken right to the job.

These machines are adapted for use in all places where rod are cut, such as foundry core-rooms, machine shops, blacksmith shops, bedstead factories, steel mills and bolt factories. The machine will operate without any change, as well with steam as with air. It is made in two sizes, the small machine cutting from 0 up to ⅜-inch diameter, while the larger machine cuts from 0 up to ⅝-inch diameter.

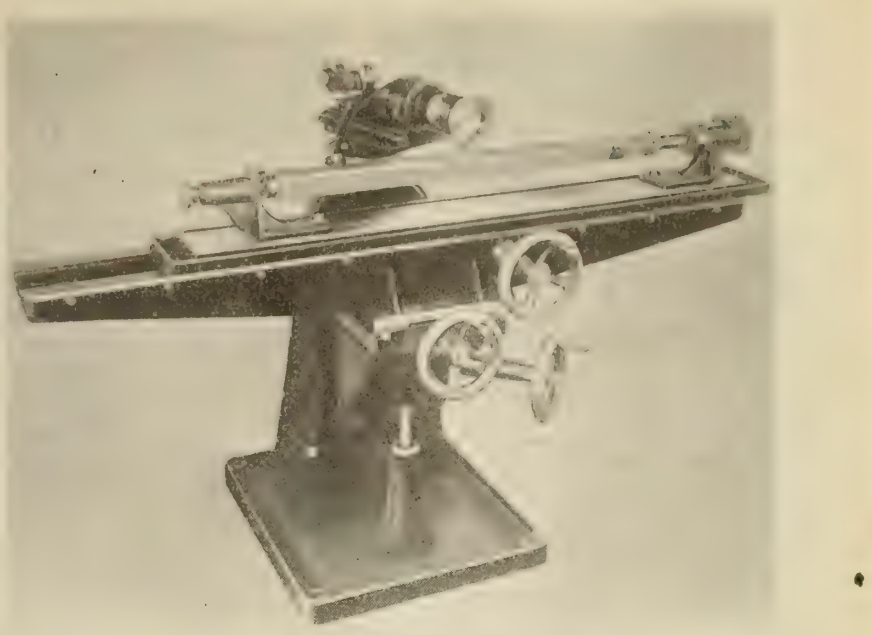
## MANUFACTURING REAMER

That the Gisholt Machine Co., Madison, Wis., have placed on the market a new solid reamer that is adjustable sounds impossible, but here are the details.

The reamer is termed a manufacturing reamer and is made in three body types; the shell reamer, straight shank machine reamer, and taper shank machine reamer. In these bodies the various style blades are interchangeable.

The reamer bodies are made of special steel heat treated. They are milled with a suitable number of blade seats which are wide and comparatively shallow. The blades are of high speed steel accurately ground on the sides and bottom so they not only fit snugly in the blade seats, but are interchangeable. The blades are supported against end thrust by the reamer body itself. The two screws shown in illustration only retain the blade in the slot, and do not take any appreciable strain of the cut.

When worn below size the blades can be packed up with the tin foil underlay stock which is furnished. This adjustment may be repeated several times, and when the blades are finally worn out they may be replaced with new ones, making the reamer as good as new. This construction gives the reamer even more strength than a solid reamer of the same size, with all the advantages and economy gained by adjusting and renewing the blades. It also eliminates the danger of inaccuracy that exists whenever reamers which can be adjusted with a wrench are used on manufacturing work. Reamers of this latter type are frequently useful in the tool room or where a few holes must be specially reamed to fit shafts of varying sizes. On manufacturing work however, duplicate holes measuring within certain fixed limits are required, and as reaming is usually the last operation, the reamer must be depended upon to produce the desired size.



GENERAL VIEW OF THE MACHINE.

## BROACH GRINDER

A single purpose grinder for the express work of sharpening broaches has recently been placed on the market by the J. N. Lapointe Company, New London, Connecticut. This grinder was originally designed and built a number of years ago for use in their own factory. Because of a demand from many users of broaching tools for a machine-tool to easily and accurately grind the small and varying angles of broach teeth, the machine is now being offered to the trade.

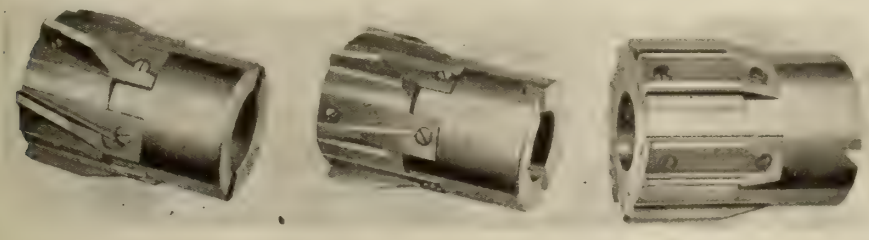
It consists of a solid column supporting a vertically adjustable knee. The knee carries a table of which both cross and longitudinal hand feeds are possible. The grinder is furnished with a head and foot-stock, which are mountable on the table for broach grinding and which are removable for the clamping of square broaches and keyway cutterbars. The head-stock is comprised of an index machanism for use when grinding spline broaches and a live center, which is belt-driven from an auxiliary countershaft. The auxiliary shaft is driven by belt off the main countershaft. A three step cone pulley on both shafts gives three possible speeds to the live center spindle on the grinder table.

The table is of sufficient dimensions to grind broaches 64″ long and 8″ in diameter. The sharpening of practically all broaching tools in industrial use is, therefore, within the capacity of the Lapointe grinder.

The grinding wheel itself is carried on a spindle supported by a swivel-head which makes it possible to both grind the rake angle on the back of the broach teeth and to undercut the faces. The head swings on the column of the machine to any horizontal angle and so permits the grinding of teeth machined to any angle to the axis of the broach as well as the grinding of teeth at the customary 90 degrees to the axis. The grinding wheel spindle is belt-driven from the main countershaft. A pair of idler pulleys change the direction of this belt for any angle of the grinding wheel spindle. The whole swivel head mechanism is moved forward and back by a hand lever to put the grinding wheel in contact with the broach teeth, and to remove it from contact. The machine occupies 39″ x 134″ of floor space when the table is extended and stands 47″ high.

## MEASURING INSIDE DIAMETERS

A method of measuring the inside diameter of plain ring gauges has been developed by the United States Bureau of Standards, employing two steel balls the sum of whose diameters is slightly larger than the nominal inside diameter of the ring to be measured. The ring is laid on a surface plate and the larger ball placed in the ring; the smaller one then rests against the inside of the ring and on the larger ball. The difference in vertical position between the upper surfaces of the two balls is determined by means of a micrometer attachment. This dimension is easily converted into the vertical distance between the centres of the two balls. The value thus obtained forms one side of a right-angled triangle whose hypotenuse is the line joining the centres of the two balls and whose base it is desired to determine. Knowing the vertical side and the hypotenuse, it is possible to calculate the length of the base, which, added to the radii of the two balls, gives the inside diameter of the ring.



ILLUSTRATIONS OF THE THREE STYLES OF BLADES.

The MacLean Publishing Company
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H. V. TYRRELL, General Manager.
PUBLISHERS OF

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## Make the Most of It

THAT employers should try to make out of the present situation in industry conclusive proof that their men do not need added protection in the way of unions is an idea brought out by J. Harvey Williams, president of the J. H. Williams & Co., Brooklyn, and known better to this country through the company's plant at St. Catharines.

Mr. Williams, in a statement regarding labor conditions, makes it plain that he considers the retailer responsible for holding back from the consumer the benefit of reductions that have been made in the prices of commodities, and in this way making it harder to readjust wages.

Mr. Williams is right when he claims that the manner in which readjustments to new levels are made now will have much to do with future industrial relations, adding "for just as it is the reactionary employer of the past century who is chiefly responsible for the origin and growth of the pernicious features of some of the trades unions in this country to-day, so the employer of to-day by a liberal and just attitude has a greater opportunity than has ever been presented to him in recent years to demonstrate to his men by his acts and by his understanding that additional self-protection in times of prosperity is merely a waste of their hard-earned money—and that is what it should be if the spirit on both sides is right."

If an employee, now that work is scarce, and the advantage rests with the factory, has cause to feel that the screws are being clamped on him to the point of oppression—as a competent worker he is finished.

Henceforth he will have two jobs, one to make enough showing to hold on to what he has, and the second will be his preparation to hit back.

He will come to the conclusion that his safety lies in his membership in a union and not in the justice of his employer.

This is a lamentably poor time for employers, superintendents or those in charge of employment to be working out a long-nursed grudge.

You have heard it—something like this: "For the last five years the men have run this shop while I financed the thing. Now I am going to show them who's running this place."

Don't work along these lines. Remember paying up a back score is also determining the future atmosphere of your shop.

If your business has been very good during the last few years, let go of some of the surplus and provide as much work as possible.

If things are still going fairly well, don't be too keen to put the axe into the wage list.

The employer has a good chance now, even in times of uncertainty, to spike the guns of the labor agitator.

## Canadian Machinery and Its Readers

CANADIAN MACHINERY has been running a series of questions recently with the idea of encouraging the reading of the advertising pages of this paper, and the results are away and beyond anything that could be hoped for. This week the first letter coming in was from Sydney, N.S., and the next was from Vancouver, B.C. Here are a list of places from which replies were received in the last few days, taken at random from the list: Villeray, Que.; Yarmouth, N.S.; Fredericton, N.B.; Welland, London, Lunenburg, N.S.; Sarnia, Chicoutimi, Que.; Edmonton, Winnipeg, St. John, N.B.; Niagara Falls, Hartford, Conn.; Euclid, Ohio; Kitchener, Prescott, New Liskeard, Copper Cliff, Guelph, Sault Ste. Marie, Port Hope, Brandon, Man.; Westville, N.S.; Toronto, Peterboro', Halifax, Sydney, Dundas, Penetanguishene, Kenora, Sycamore, Ill.; Hamilton, Montreal, Brantford, Gull Lake, Sask.; Rockford, Ill.; Woodstock, Sherbrooke, Port Arthur, Galt, St. Catharines, Cleveland, Ohio, Fergus and Elmira.

The answers show that readers are going very carefully into the matter, some of them often going to the trouble to point out that other ads. conform very closely to the ones mentioned in the list.

It proves beyond a doubt that the advertising pages of Canadian Machinery are being read very thoroughly by the mechanical world of the Dominion.

We have often been told by our readers that they found a great deal of useful information in the advertising pages, but the manner in which intelligent and carefully-worded replies are coming in from all corners of the Dominion and many times from mechanical points in United States, shows beyond doubt that readers are paying attention to the advertising pages of Canadian Machinery in an unusual way.

## A Mechanical Wonder

THE Bell Telephone Co. are putting in a new pay-phone which hands the money back if the party calling fails to get service. It is an ingenious piece of mechanism and goes to furnish further proof that the world is indebted to the skilled mechanical mind and hand for many things.

This new machine should be built with a fairly strong digestive system, as past experience in pay-phones shows a crop of punctured coins, bogus money, buttons, washers, tobacco stamps and a steel washer that was much in evidence when airplanes were being made.

If this new machine can stomach all these missiles instead of honest-to-goodness money and still courteously hand out change to dissatisfied customers, it will be nothing short of mechanical conformity to the Golden Rule.

## Just a Nasty Burn

ONLY a few days ago a workman from an outside plant was engaged to put something in order on a process where hot metal was in use.

Another workman carelessly dropped a block of metal in the melting pot. It was wet in spots with the result that a good-sized splash followed, in which the outsider had a nasty burn on his wrist.

He asked if there was a first aid box as he wanted to have the wound attended to at once. The answer was that the firm wasn't very strong on "this new-fangled stuff."

And so the mechanic had to do the best he could, working away with a nasty open burn on his wrist and in a place where he was apt to pick up something that might cause trouble afterward.

A little first-aid box is not in the "new-fangled" class.

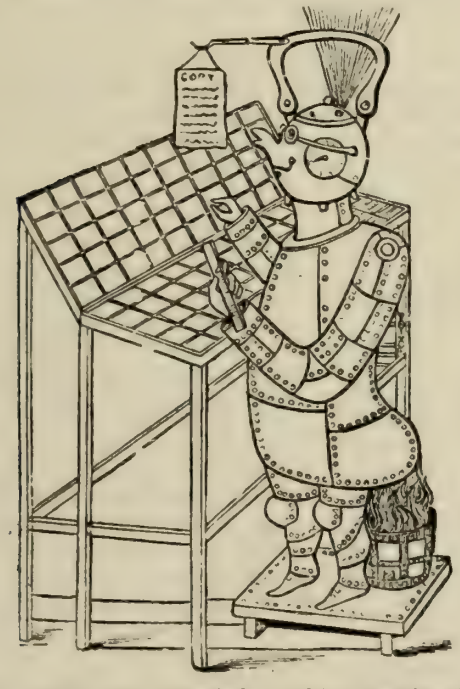
It is as necessary around the shop as an insurance policy, a cost system and a payroll.

And yet it is astounding to consider the number of fairly large firms where little attention is paid to this matter.

## It Can't Be Done

WHY is it that so often a step in advance in any mechanical contrivance is heralded by a storm of "It can't be done" comment? It may be that there is not so much of this done now as some years ago, as we are now living in an age where mechanical ingenuity knows few limits.

But take the case of continuous feeding to an automatic machine as an example. The old method was to loosen the chuck, take out one piece and insert another and so on.



The old hands that attended to this considered that at times they could attain a speed that was pretty close to continuous feeding, but in reality it was a long way from it.

But the change came. Now the automatic has its magazine. The work is loaded in the magazine and is always kept loaded the same as a repeating rifle. As one piece is completed it drops out, falls down a chute into a box, while the other piece drops into place and is gripped by the chuck and machined.

The new order of things IS, while the old way WASN'T.

On this page we have an example of so-called wit of years ago when the old-time printer was telling the world that there was no chance of any person ever building a machine that would set type. It used to run like this: "Imagine a machine that can walk around the office from one case to another and set type." There was always a good congregation for any such talkers and they would settle to their own satisfaction that the thing simply could not be done.

The artist in this case has been somewhat of a satirist and labelled his picture "The Great American Steam Type Setter." This was some fifty years ago. If this old boy could walk into any printing office to-day and watch the working of the linotype he would see where the "Impossible" chorus had been all wrong again. He would see one of the most complicated and yet one of the most possible machines ever turned out. He could at once recognize just what mechanical movements can be done with a properly timed set of cams. He would have seen also that he was on the wrong set of rails when he was spending his time in ridicule when others were spending their time in doing the thing.

This same thing is happening in every line and is not solely the child of the machine shop or of the mechanical world.

There are always plenty to view any situation, particularly if it is difficult and likely to call for extra exertion, and declare "It can't be done."

It does not require much courage to take this attitude —just a mental assent to an easily-arrived-at conclusion.

But some person is sure to come along sooner or later who has not been steeped in the "can't be done" brew and he goes ahead and does the thing.

## Eureka! I Have Found It!

THE excitement appertaining to the fearful and wonderful adventures of the heroic balloonists having somewhat subsided, the enterprising representatives of the daily press have been forced to look around for something of interest for their readers.

The search has resulted in nothing less than the discovery of what electricity actually is. This is not the first time it has been discovered, for only recently we were regaled with the story of a twelve-year-old boy who ran a four and a half horse power motor boat engine for a number of miles without any fuel except the circumambient atmosphere.

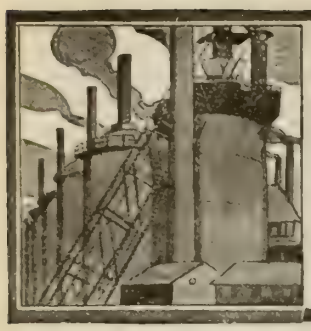
He explained that his real motive power was electricity drawn from the atmosphere.

Yes, just that. The present discoverer is said to be no less a person than Dr. Frederick Klein, a noted chemist and research worker in cancer problems. Dr. Klein explained his discovery to a reporter in the following simple language: "The average chemist and the average scientist figure on the bi-valency of oxygen and only lately has research proved that oxygen is also 4, 6 and 8 valent. It is in the valency of oxygen and its ratio that the possibilities lie for bigger things for the future."

Dr. Klein states that all that is required is for a group of varied scientific minds to be brought together and work out the remaining part of the problem and the question of light, heat and power is solved forever.

Coal will be an article only for exhibition in the museum. The ultimate consumer will have a storage tank on top of his garage, from which he will draw his supplies of power, heat and light for household use and motive power for Lizzie.

So far we have not noticed any serious drop in the price of coal, but we would advise any of our readers who have shares in collieries or the Standard Oil Company to get out while the getting is good. This is truly a wonderful age we live in.



# MARKET DEVELOPMENTS



# Very Little Change is Shown This Week

## Prices in Several Lines in the Steel Market Are Lowered in the Warehouses—New York List Withdrawn Because Prices Were Considered Too High—One Dealer Looks For a Very Good Season's Business.

NOW and then one finds a dealer who has become an optimist. It is not claimed that this class is by any means large, but it is on the increase. A dealer handling supplies, new and used, for builders and contractors, reports that he is going to have the best season in his history.

There is more consistent work being done right now in the selling business than has been witnessed in the Canadian field for months, if not in years. Wherever there is any business showing up there is certain to be a small army of salesmen. A certain amount of hanging-fire business is being closed up in this way now. Prices of machine tools remain unchanged and a New York buyer having a fairly good list in the market withdrew it because the dealers had made no change in their prices. There are no indications that makers are going to depart from their present schedule of prices.

In this district there have been some reductions in the steel and iron warehouses. Sheets are down a little and there is a tendency to give pretty close prices on this item in order to get cleared out of present stocks. It cannot be claimed that there is anything in the nature of a price-cutting policy being carried out. Buying is still being done in very small quantities and stocks are very light in manufacturers' warehouses.

A certain amount of business is being given out by the automobile makers and the volume of this is likely to increase as time goes on. The principal thing, according to the trade, is that a start shall be made toward operating the plants.

The scrap metal trade is still very flat, but there seems to be a pretty well-grounded feeling that the bottom of the price list has been reached and that any kind of a buying movement would result in prices becoming firmer almost instantly.

## LOOKING FORWARD TO BETTER CONDITIONS WHEN SPRING OPENS

Special to CANADIAN MACHINERY.

MONTREAL, Jan. 27.—The optimism that dominates nearly every phase of industrial activity is the one encouraging note that features trading at the present time. Some reports indicate a slight betterment in business carried on, but in general the different markets continue in a more or less listless condition, but with sufficient future inquiry to give the impression that early spring activities will be on a larger scale than those of the past few months. The tendency is shown in many quarters to establish new working conditions to better combat the declining prices on many staple commodities. Much of this is being done with the reluctant co-operation of workmen in the plants; yet, while realizing the necessity of meeting the manufacturers half-way, they are still confronted by the fact that many necessities of life are still at war levels, and in some cases even higher.

This fact tends to delay any marked improvement in general business conditions. "One of the essential factors," said a business man here, "in re-establishing a healthy state of commercial and industrial activity, is a more widespread recognition of the necessity of conforming with the needs of the time, in accepting some of the losses incidental to adjustment to lower levels in the cost of manufacture. Many merchants, in domestic lines, are still reluctant to dispose of stocks on a replacement basis and this attitude is extending the time when business will be returned to a normal footing. Of course, we steel interests are not affected, directly, by what transpires in the retail trade, but if individual buying is restricted, production is necessarily curtailed, and with factories operating light, their requirements are proportionately reduced."

### Hard Work Selling Steel

Statements to steel dealers here are to the effect that business is proceeding quietly but showing no marked improvement. "We do not think that prices will recede much further as those now quoted are practically rock-bottom. There may be some slight reductions by independent producers, but not sufficient to have any material influence on the general situation. Railroads have been putting off buying, but it is expected that a change in this respect will soon take place and when the buying movement does commence the market will strengthen and prices become even firmer than they are at present." Speaking on the decline that has taken place on the English market, the dealer continued:

"Prices over there have been so much higher than those in the States that they can well afford to knock off considerable without in the least affecting the market here. For some time back, steel could be shipped from Pittsburgh and laid down in England at less than it could be purchased at English mills." Salesmen are having some strenuous times in persuading purchasing agents as to the advisability of buying now. Conservatism is still the policy of many consumers.

**Special Efforts Produce Sales**

"It is only by consistent efforts on the part of our salesmen that we can report a week of fair business. It has been shown that more energetic effort has resulted in slightly better business, but this does not signify that next week will give the same results, for buying without using only means that their stocks are increased that much. What is needed is greater activity, and it is only this that will assure a steady turnover. We are selling few heavy tools, the greater number of sales being in the smaller lines." This brief statement appears to be typical of machine tool conditions here. One dealer, who remarked that business was very quiet, stated that he had not received an order nor an inquiry for two consecutive days, and it was only the compiling of the stock inventory that kept them engaged. Despite this fact, however, they are looking forward to better business before the winter closes.

**Old Material Still Inactive**

Little can be said in favor of the old material situation, as business is more or less of a nominal character, with dealers going to their offices more as a matter of habit than for the transaction of business. It has come to the point where the dealers are as anxious to learn the trend of activity as any other person, for the usual greeting on entering the office is: "How do you find things yourself?" Mutual confidences usually dispel any pessimistic tendency, but throw little light on what will develop in the immediate future. "As regards prices," said a dealer, "it is difficult to give definite quotations as these will vary according to the sale, but those you are quoting are, on the whole, equivalent to those we are paying. The non-ferrous metals might be shaded a little but steels are fairly firm."

## SOME PRICES ARE SLIGHTLY LOWER

**But Business Has Not Shown Any Improvement Since the Turn of the New Year**

TORONTO.—Those who were predicting that a business recovery was going to take place at the first of the year must know by now that they were wrong. In some lines the prediction was doomed from the very outset, as January is never a very large month.

The machine tool trade is not making many sales, but the salesmen are working harder, and are bringing in business that would not have come along in the ordinary course of events. One firm told this week of having the order for several machines ready to sign, but the buyer was holding off on a matter of price. He seemed to be positive there was going to be a reduction made in the price of machine tools, and no amount of arguing will convince him that we should stand on our price. As a matter of fact the dealer handling this sale has nothing to do with the price of the tool, but there is a nice order hung up waiting for the buyer and seller to come together and close the thing out.

A fair trade is being carried on in used machines, and a number of these have been rebuilt during the past season. The price of new tools is quite an inducement to turn to this field.

**Some Firms Starting**

Some of the automobile concerns are getting under way now, and during the last few days they have placed some very good orders for parts. Some of the salesmen who were down that way looking for a share of the business report that there was the greatest gathering of salesmen seen at one place at one time after one piece of business that had been recorded for some time.

Some of the locomotive firms have bookings that will help to keep some trade moving. The question has been raised again regarding the drawback on export of Canadian material. For instance, one firm contracts with a foreign order for a certain number of engines, or cars, or anything in that line. When these are exported the firm is entitled to receive a drawback of 99 per cent. of duty paid for the material in case it was brought into Canada. If a Canadian manufacturer supplies materials for this manufactured article he is not entitled to any consideration in having to compete with the American manufacturer. If a Canadian manufacturer, for instance, needs nuts, bolts, etc., for an article to be exported, he can bring in United States material free of duty by reason of the 99 per cent. drawback on the finished article. The explanation of the tariff department of the Canadian Manufacturers' Association is that the tariff here is arranged this way in order to allow the Canadian manufacturer access to the cheapest source of supply, otherwise he could not secure the business.

**The Steel Market Easier**

Several prices are down a little in the steel market, and there is more or less of a tendency on the part of the dealers to shade their prices in order to land the business. It cannot be charged that there is anything approaching a cut-rate business going on, but the tendency toward "bargaining" is more marked than it has been for some time past. Black sheets 28 gauge are selling at 7.50c per pound, while blue annealed have been marked at 6.50. Premium 28 galvanized sells now at $10, and 10¾ at $10.40. Quarter-inch plate is quoted at $5 base; cold rolled shafting at $7 base.

**Small Tool Sales**

There are some rumors regarding cutting of prices in the Montreal district in small tools, but nothing general is being done in this line. It is impossible to keep dealers lined up at all times to adhere to standard prices, but for the most part there is very little price shading being done in any district now.

One thing is certain, though—salesmen are working harder for a given amount of business than they have been for some time past. The sales manager

## POINTS IN WEEK'S MARKETING NOTES

**One dealer in equipment for contractors states that from inquiries in their hands at the present time they are going to have the largest years' business they have ever done.**

—

**Several reductions have been made in the last few days in the prices of some lines of steel in local warehouses, and there is a tendency at times to even do better than the quoted prices, but this has not developed into anything like a price cutting campaign.**

—

**The scrap metal market remains very inactive, although the belief seems to be fairly well established that the bottom of the market has been reached and that any buying movement will result in firmer prices.**

—

**Some of the large automobile plants expect to start work shortly, and are already placing a certain amount of business for parts.**

—

**One large list of machine tools that went to the New York market was withdrawn because the purchaser insisted on lower prices.**

—

**Dealers and salesmen generally report that there is more competition for business now than there has been for years, and every order that comes on the horizon brings forth a regular procession of salesmen.**

—

**Pittsburgh dispatches claim that there is no improvement in the steel market as far as any business is concerned, and they further point out that January is not the month to expect such a movement.**

—

**Some of the United States railroads would buy more equipment if it were not for the failure of the government to pay them their guarantee under the railroad act.**

—

**Machine tool plants in the United States are for the most part closed down, or running on very short time. Canadian makers seem to be faring better than those across the border.**

of one of Ontario's plants was telling Canadian Machinery this week that he had spent two or three days at the large auto shops trying to see what he could bring home in the way of business. He had succeeded in landing a nice share of the business, "but," he stated, "I never did see such an assortment of salesmen before, and I have been in the selling business for a good many years. Of course the orders being placed just now are not as large as usual, but in this case it looks as though the auto plant in question is getting ready for operations on a very fair scale."

Another salesman representing a small tool firm, has just made the trip through Western Canada to the coast, and reports conditions quiet in that field. "It is surprising where the business comes from in the west," stated a representative of this company, "to go through it one would never think there would be much demand for our line outside of a few industrial centres, but the figures from this field for the year just closed are well over the estimate we had set for this field."

# THE PREDICTED REVIVAL DID NOT COME WITH THE NEW YEAR

Special to CANADIAN MACHINERY.

PITTSBURGH, Jan. 27. — There are lacking even the rumors that usually spring up in a dull season that the steel market is improving, which shows that the situation is particularly unpromising. Of course, the prediction made in December, that there would be improvement immediately after the turn of the year, has gone by the boards, as anyone should have expected it would since it is not natural for the steel market to improve in January. March is a favorable month for that, and there is still a possibility that there will be improvement at that time, but this is no more than a possibility. The common prediction is that there will be no great improvement until after the summer is over, but the predictions are indefinite in that they do not assert that there really will be great improvement at that time.

It remains the common view that all that is wrong with business is that a general readjustment in commodity prices and wage rates has to be made, but if that is all that is requisite there ought to be improvement within a very few months since the deflation is already quite extensive. It is true that thus far wage reductions have been exceptional rather than general, but it does not follow that extensive wage reductions will not be made within a couple of months. Many manufacturers, convinced that wages must be reduced, have simply been waiting until there has been a spell of idleness, in order to make wage reductions more acceptable. In the steel industry the latest reductions are those of the Inland Steel Company and the Steel & Tube Company of America, both in the Chicago district, the reductions amounting to about 20 per cent. The Pittsburgh and Youngstown districts have seen scarcely any reductions. The independent ore interests in the Lake Superior ore region are reducing wages 15 per cent. This, of course, is in anticipation of the expected reduction in Lake Superior iron ores for the season of 1921, the common guess being that there will be a decline of $1 a ton from the 1920 season prices. This would put ore prices back to the level of the 1919 season, making Mesabi non-Bessemer ore $5.55 at Lake Erie docks.

The Steel Corporation shows no signs of contemplating any wage reductions in any of its operations, and the trade believes that while the corporation will eventually reduce wages it will only do so after all the independents have taken action.

In some quarters a feeling is now arising that there may be something more wrong with the business than merely the need of price and wage readjustment. Increasing attention is being paid to the fact that many large business interests, supposedly in sound condition and believed to have made very large profits in the past few years, are borrowing money at high rates of interest, equivalent to between 7 and 8 per cent., on notes or on short term bonds, and the question is why this should be necessary if things are as they seem to be. There is satisfaction, of course, that there have been so few business failures. At the same time great credit is given to the operation of the Federal Reserve Act, and it is said that if this system had not been established there would have been many failures. However, the proper analysis of the facts seems to be that even though failures and a regular panic have been averted the fundamental conditions must be bad, more or less, or there would have been nothing to avert. It must be understood that when borrowings at high interest rates are mentioned the iron and steel industry is not referred to. This industry is perfectly sound financially and has no occasion to borrow money. It does a cash business and really got the profits it was making. Its inventories of raw and partly manufactured material are relatively low and it has no finished goods in stock.

### Production

The rate of steel production has a generally declining tendency but the rate is very slow, because the Steel Corporation maintains its rate and the independent mills reached such a low operating rate in December that further decreases in their rate cannot make much difference. As noted in last report the Steel Corporation is producing steel ingots at about 21,000,000 tons a year and the independents at about 7,000,000 tons, which makes a rate for the whole industry of about 53 per cent. If the independent rate should be cut in half that would merely bring the rate of the whole industry down from 53 per cent to 47 per cent.

The independents are operating intermittently. A mill closes for a week or two and then resumes in part on an accumulation of orders, while another mill may close to enable orders to accumulate. The next important change will occur by the Steel Corporation's production decreasing. The Steel Corporation entered this year with a large volume of business on books. It is not remarkable that the corporation's customers should "stick" but it is remarkable that they should continue to take shipments from week to week at such a high rate. How long the present operation will last is problematical. Many customers may say that they want the material eventually, but desire that shipments be made at say one-half the former rate. If there is no change in this respect it may be said that the specifications now on books would enable the corporation to continue at practically its present rate for a couple of months without the aid of new business while if new specifications and orders should keep up at the present rate the time would be prolonged. Afterwards the corporation's production would gradually taper off. As to the independents there is no indication that they will be able to run much better than at present until there is a general buying movement, and that is not expected for the near future.

### Prices

There are the usual rumors of price cutting of steel products, in most cases quite indefinite. The condition is worse than that of orders being booked at cut prices, the fact being that orders are not booked at all. The mills are getting only a little business and what they are getting is chiefly, in the case of independents, in the form of releases on instructions previously given to suspend shipments. In the case of the Steel Corporation, the business being booked is either from regular customers or, in a few cases, from consumers who were not corporation customers during the 1920 flight of prices, and resolved that whenever the opportunity should occur for them to get on the corporation books they would embrace it.

Eventually a buying demand will develop and then there will be real price cutting to find the bottom, or basis on which business can proceed. That time may be far in the future.

## REFUSED TO BUY WHEN SHOWN PRICES

**New York Machine Tool Market Is Not Experiencing Any Recovery Yet**

Special to CANADIAN MACHINERY.

NEW YORK, January 27.—No tangible improvement in the machine-tool situation is to be noted. It is true that there have been more inquiries in the past week, but orders are not being placed. The reason for lack of buying in some instances is the expectation of buyers that prices are coming down. The Otis Elevator Company, which about ten days ago issued an inquiry for about twenty machines, informed sellers after quotations had been received that it would await "better prices." Similar action was taken by one of the railroads, which had inquired for about a half-dozen machines.

Some of the railroads are in a mood to buy a moderate quantity of new shop equipment, but are held up by the failure of the government to pay them their guarantee under the railroad act. In fact, some of the roads are having difficulty in meeting their current bills. It is not regarded as likely that they will be able to do much buying before the middle of the year.

Many of the machine-tool plants remain closed down, or virtually so, while even those in the best position are operating at only a small percentage of their normal rate.

The meagre amount of buying in the new year has been a source of disappointment to those in the trade who quite confidently expected that an improvement in conditions would begin to make itself evident about this time. A disturbing element is the number of new machines which are being offered for sale at prices less than the manufacturers' selling prices. Some of these machines so offered were originally purchased for export and the orders were cancelled before the machines left New York. Consequently the export companies are trying to get rid of them, even at a loss.

## CUTTING PRICES IN BRITAIN NOW

**London—The steel makers along the northeast coast adopted a policy of drastic price-cutting, the reductions ranging from £2 per ton for rails and ship plates to £4 for billets.**

**It is stated in steel circles that the reductions bring a majority of the selling prices below the actual cost of production. The action of the northeast coast men follows that of the Scottish steelmakers in making a reduction of from 20 to 27 shillings per ton.**

**The drastic cutting in prices is said to have been necessitated by increased foreign competition, which has virtually stopped demand for the dearer home-made articles.**

## PLANTS LIKELY TO START AGAIN

There are some indications that plants in the automobile industry are not going to remain closed much longer. In this district there is little improvement and very few employees are working in the plants.

Car makers are begining to realize that if they are going to be in the running for this year's business they must get going in the very near future.

Speaking to a representative of a company handling sprinkler insurance, Canadian Machinery learned that several of the largest companies in the automobile business, which have been closed for some time, are not taking advantage of the shut down clauses in their policies. Some of these automatically allow a thirty-day shut-down, after which it is necessary to make application and take advantage of special provisions in the policy. This representative had been visiting a number of these places, and found that in the case of the larger ones there was no intention to take up the clauses regarding a shut-down of the plant for more than thirty days. There can be only one meaning to this, viz., that the plant is going to operate.

## TRYING TO PUSH BRITISH GOODS IN CANADIAN MARKET

THE Montreal branch of the Canadian Association of British Manufacturers held their annual meeting at Freeman's Hotel on January 21. Following the luncheon the business was opened by the address of the retiring president, H. W. Weller, who outlined the work accomplished during the past twelve months, emphasizing the better progress that had been made as a result of the closer co-operation of the two branches, and the added interest that had developed in all activities of the association. Through the personal efforts of G. T. Milne, H. M. Trade Commissioner during the early part of 1919, and the enthusiasm of the officers and members since that time, much has already been achieved by the organization for the furtherance of British trade in the Dominion of Canada. Considerations have been obtained from the Government at Ottawa, regarding the customs valuation of invoices, that has simplified the work of importers and exporters. Recognition has also been given to the request for tariff modifications and steamship concessions — conditions that have assisted materially in promoting British trade. It was stated that negotiations were under way with kindred associations in other British Dominions for a permanent representative in London, with an office for the use of the members of the different associations.

Brief addresses were given by G. A. Marshall, Capt. John Harris and W. E. Bunny, president, vice-president and secretary, respectively, of the Toronto branch of the association. Emphasis was laid upon the necessity of every member working in accord with each other, and also co-operation with the branch officers, and likewise between the two branches, so that the work of the entire organization would be co-ordinated and maximum efficiency and benefit attained.

Owing to the fact that, henceforth, the government of the association shall be vested in the Supreme Council, the constitution has been revised, and the proposed draft was read to the members for their criticism and approval. Without a dissenting voice the draft, as prepared by the committee in charge, met with the unanimous approval of those present, and its adoption was decided on, pending the favorable consideration of the members of the Toronto branch, the annual meeting of which will be held on January 28.

The Montreal branch, at present, has two well organized trade sections, that of textile and steel, and it is expected that other sections will shortly be formed to accelerate the interest in other branches of trade development. It was likewise proposed that regular monthly meetings be held, as it was felt that, in this way, greater progress could be made and a more friendly spirit amongst the members in general created.

The local council for the ensuing year was elected at this meeting, and is as follows:

1st vice-president—F. I. Spielman.

2nd vice-president—J. E. Ritchie.

Executive Council—Allan S. Bain, St. Clair Tilley, Harold Brooke, W. T. Evans, H. W. Smythe, D. W. Clarke.

**Want Material.**—This paper can furnish the name of a firm wanting to get information about a supply of strip steel ¾-inch x 12 gauge, 1½ inch x 10 gauge, 15 carbon.

Ray W. Wolvin, president of the Dominion Iron and Steel Company, returned from London on January 24, where has been conferring with the directors of the British Empire Steel Corporation in connection with the consolidation of Canadian steel and shipping interests.

C. H. Handerson, advertising manager of Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, has gone to the Union Trust Company as advertising manager. Mr. P. C. Handerson, his brother, has replaced him at the Cleveland Twist Drill Company. The Union Trust Company is a consolidation of six large Cleveland banks and is the largest banking unit in Ohio.

# SELECTED MARKET QUOTATIONS

**Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.**

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $33 96 |
| Lake Superior, charcoal, Chicago | 48 50 |
| Standard low phos., Philadelphia | 44 79 |
| Bessemer, Pittsburgh | 33 96 |
| Basic, Valley furnace | 30 00 |
| Toronto price:— | |
| Silicon, 2.25% to 2.75% | 43.64 |

## IRON AND STEEL

| Per lb. to Large Buyers | Cents |
|---|---|
| Iron bars, base, Toronto | $ 4 75 |
| Steel bars, base, Toronto | 4 75 |
| Iron bars, base, Montreal | 4 50 |
| Steel bars, base, Montreal | 4 50 |
| Reinforcing bars, base | 4 75 |
| Steel hoops | 6 00 |
| Tire steel | 5 00 |
| Spring steel | 8 00 |
| Band steel, No. 10 gauge and 3-16 in. base | 5 50 |
| Chequered floor plate 3-16 aud heavier | 7 50 |
| Bessemer rails, heavy, at mill | .... |
| Steel bars, Pittsburgh | 3 00-4 00 |
| Tank plates, Pittsburgh | 3 50 |
| Structural shapes, Pittsburgh | 3 00 |
| Steel hoops, Pittsburgh | 3 50-3 75 |
| F.O.B., Toronto Warehouse | |
| Small shapes | 5 00 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 3 62 |
| Structural shapes | 3 72 |
| Plates | 3 67 to 5 50 |
| Small shapes under 3″ | 3 62 |

## FREIGHT RATES

Per 100 Pounds.

| Pittsburgh to Following Points | C.L. | L.C.L. |
|---|---|---|
| Montreal | 58½ | 73 |
| St. John, N.B. | 84½ | 106½ |
| Halifax | 86 | 108 |
| Toronto | 38 | 54 |
| Guelph | 38 | 54 |
| London | 38 | 54 |
| Windsor | 35 | 50½ |

## METALS

| | Gross. Montreal | Toronto |
|---|---|---|
| Lake copper | $19 00 | $19 50 |
| Electric copper | 18 50 | 19 00 |
| Castings, copper | 18 00 | 19 00 |
| Tin | 44 00 | 46 00 |
| Spelter | 8 00 | 9 00 |
| Lead | 7 25 | 8 00 |
| Antimony | 8 00 | 9 00 |
| Aluminum | 34 00 | 35 00 |

Prices per 100 lbs.

## PLATES

| | | |
|---|---|---|
| Plates, 3-16 in. | $ 5 50 | $ 5 50 |
| Plates, ¼ up | 5 00 | 5 50 |

### PIPE—WROUGHT

Standard Buttweld Pipe

Per 100 Ft.

| | Steel Blk. | Steel Galv. | Gen. Wrought Iron Blk. | Gen. Wrought Iron Galv. |
|---|---|---|---|---|
| ⅛ | $ 6 50 | $ 8 50 | $..... | $..... |
| ¼ | 5 31 | 7 41 | 5 91 | 8 01 |
| ⅜ | 5 31 | 7 41 | 5 91 | 8 01 |
| ½ | 7 10 | 8 63 | 7 95 | 9 48 |
| ¾ | 8 80 | 10 87 | 9 95 | 12 02 |
| 1 | 13 01 | 16 07 | 14 71 | 17 77 |
| 1¼ | 17 60 | 21 74 | 19 90 | 24 04 |
| 1½ | 21 04 | 25 99 | 23 79 | 27 84 |
| 2 | 28 31 | 34 97 | 32 01 | 38 67 |
| 2½ | 44 75 | 55 28 | .... | .... |
| 3 | 58 52 | 72 29 | .... | .... |
| 3½ | 74 06 | 90 62 | .... | .... |
| 4 | 87 75 | 107 37 | .... | .... |

Standard Lapweld Pipe

Per 100 Ft.

| | Steel Blk. | Steel Galv. | Gen. Wrought Iron Blk. | Gen. Wrought Iron Galv. |
|---|---|---|---|---|
| 2 | $32 01 | $ 38 67 | $35 71 | $42 37 |
| 2½ | 48 26 | 58 79 | 54 11 | 64 64 |
| 3 | 63 11 | 76 88 | 70 76 | 84 53 |
| 3½ | 75 90 | 92 46 | 85 10 | 101 66 |
| 4 | 89 93 | 107 55 | 100 83 | 120 45 |
| 4½ | 1 05 | 1 29 | 1 30 | 1 54 |
| 5 | 1 22 | 1 50 | 1 52 | 1 80 |
| 6 | 1 58 | 1 95 | 1 97 | 2 33 |
| 7 | 2 06 | 2 53 | 2 53 | 3 01 |
| 8L | 2 16 | 2 66 | 2 66 | 3 16 |
| 8 | 2 49 | 3 07 | 3 07 | 3 64 |
| 9 | 2 98 | 3 67 | 3 67 | 4 36 |
| 10L | 2 77 | 3 41 | 3 41 | 4 05 |
| 10 | 3 56 | 4 39 | 4 39 | 5 21 |

**Prices—Ontario, Quebec and Maritime Provinces**

## WROUGHT NIPPLES

4″ and under, 60%.
4½″ and larger, 50%.
4″ and under, running thread, 30%.
Standard couplings, 4-in. and under, 30%.
Do., 4½″ and larger, 10%.

## OLD MATERIAL

Dealers' Average Buying Prices

Per 100 Pounds.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $10 50 | $10 50 |
| Copper, crucible | 13 00 | 12 00 |
| Copper, heavy | 12 50 | 12 00 |
| Copper wire | 12 50 | 12 00 |
| No. 1 machine composition | 13 00 | 12 00 |
| New brass cuttings | 7 00 | 9 00 |
| Red brass turnings | 10 00 | 10 00 |
| Yellow brass turnings | 7 00 | 7 50 |
| Light brass | 5 00 | 5 00 |
| Medium brass | 6 50 | 6 00 |
| Scrap zinc | 5 00 | 4 00 |
| Heavy lead | 5 25 | 4 00 |
| Tea lead | 2 50 | 2 00 |
| Aluminum | 16 00 | 13 00 |

| | Per Ton | Gross |
|---|---|---|
| Boiler plate | $11 00 | $12 00 |
| Heavy melting steel | 18 00 | 16 00 |
| Axles (wrought iron) | 25 00 | 20 00 |
| Rails (scrap) | 18 00 | 18 00 |
| Malleable scrap | 20 00 | 20 00 |
| No. 1 machine cast iron | 32 00 | 28 00 |
| Pipe, wrought | 8 50 | 10 00 |
| Car wheel | 30 00 | 30 00 |
| Steel axles | 20 00 | 18 00 |
| Mach. shop turnings | 8 00 | 7 00 |
| Stove plate | 23 00 | 23 50 |
| Cast boring | 8 00 | 10 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, 7-16 and up | Net list |
| Carriage bolts, ⅜″ and less | Net |
| Coach and lag screws | —20 |
| Stove bolts | 55 |
| Wrought washers | —25 |
| Elevator bolts | Net |
| Machine bolts, 7-16 and over | —5 |
| Machine bolts, ⅜-in. and less | —30 |
| Blank bolts | Net |
| Bolt ends | —5 |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | +25 |
| Machine screws, fl. and rd. hd., brass | Net |
| Machine screws, o. and fil. hd., brass | Net |
| Nuts, square, blank | +25 add $2 00 |
| Nuts, square, tapped | add 2 25 |
| Nuts, hex., blank | add 2 50 |
| Nuts, hex., tapped | add 3 00 |
| Copper rivets and burrs, list less | 15 |
| Burrs only, list plus | 25 |
| Iron rivets and burrs | 40 and 5 |
| Boiler rivets, base ¾″ and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, O. & R., bright | 75 |
| Wood screws, flat, bright | 77½ |
| Wood screws, flat, brass | 55 |
| Wood screws, O. & R., brass | 55½ |
| Wood screws, flat, bronze | 50 |
| Wood screws, O. & R., bronze | 47½ |

## MILLED PRODUCTS

(Prices on unbroken packages)

| | Per Cent |
|---|---|
| Set screws —20% 25 and | 5 |
| Sq. and hex. hd. cap screws | 12½ |
| Rd. and fil. hd. cap screws | plus 25 |
| Flat but. hd. cap screws | plus 50 |
| Fin. and semi-fin. nuts up to 1-in. | 12½ |
| Fin. and Semi-fin. nuts, over 1 in., up to 1½-in. | —5 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2-in. | +12½ |
| Studs | +5 |
| Taper pins | —12½ |
| Coupling bolts | +40 |
| Planer head bolts, without fillet, list | +45 |
| Planer head bolts, with fillet, list plus 10 and | +55 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | +60 |
| Collar screws | list plus 20, 30 |
| Thumb screws | 40 |
| Thumb nuts | 75 |
| Patch bolts | add +85 |
| Cold pressed nuts to 1½ in. | add $1 00 |
| Cold pressed nuts over 1½ in. | add 2 00 |

## BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $60 00 |
| Open-hearth billets | 60 00 |
| O.H. sheet bars | 76 00 |
| Forging billets | 56 00-75 00 |
| Wire rods | 52 00-70 00 |

Government prices.

F.O.B. Pittsburgh.

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails, base | $5 75 |
| Cut nails, base | 6 70 |
| Miscellaneous wire nails | 50% |

## ROPE AND PACKING

| | |
|---|---|
| Plumbers' oakum, per lb. | 0 10¼ |
| Packing, square braided | 0 38 |
| Packing, No. 1 Italian | 0 44 |
| Packing, No. 2 Italian | 0 36 |
| Pure Manila rope | 0 29 |
| British Manila rope | 0 28 |
| New Zealand hemp | 0 23 |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | Net |

# LeBLOND
## HEAVY DUTY
## Universal Millers

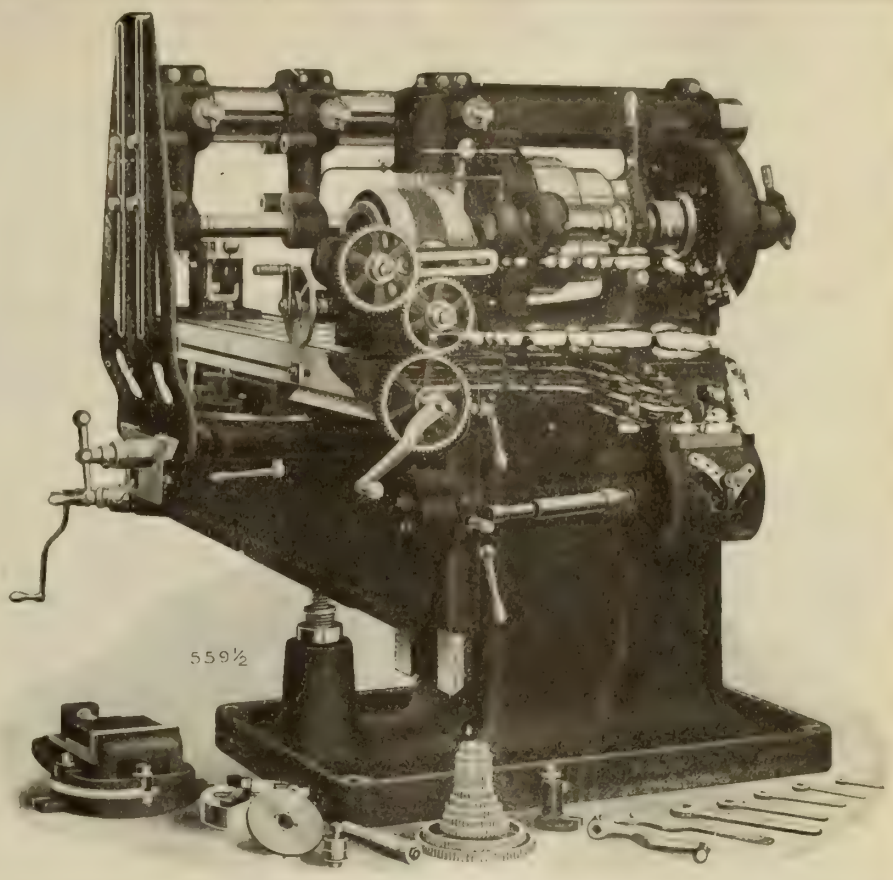
Are not only Tool Room Machines, but as a manufacturing proposition appeal to the careful buyer.

Their long life insures ample returns for the investment made.

May we explain to you their many advantages and the convenience of their control?

**Carried in stock by**

**The A. R. Williams Machinery Co.**
LIMITED
TORONTO





## Pig Iron Markets

The trend of the pig iron market is toward still lower levels. Valley No. 2 Foundry has been offered at $30 and Basic at $29. Pig iron buying has improved to some extent in the Philadelphia district. About 5,000 tons were sold during the past week.

The Chicago market is exteremely dull with melters disinterested and only occasional purchases being made of carloads. Little new business is being done on the Cleveland market, although inquiries are declining and one lot of 1,000 tons for the next 30 days has been quoted at $30 base Valley.

Altogether the sales during the past week on the New York were not greatly in excess of 1,000 tons.

The pig iron market at Pittsburgh has been more active than for several weeks past. It is understood that one sale has been made of 1,000 tons of No. 2 foundry at $30 valley.

The Boston market shows practically no business. Many of the stacks of furnace interests supplying this district have blown out.

The Buffalo market shows a wide range of prices. Sales of No. 2 foundry 1.75 to 2.25 silicon are recorded all the way from $32 to $35. It has been stated on reliable authority that considerable amounts of No. 2 have been sold at $30. A maker that has figured prominently in the resale market reports last week as the heaviest in about three months. About 4,000 tons of foundry of all grades were sold. No. 2 plain sold at $32; No. 2x 2.25 to 2.75 silicon at $35.25 and No. 1x 2.75 to 3.25 at $35.

The St. Louis market reports a total absence of business and the attitude of consumers is discouraging, as they will not do business until prices are reduced.

## Scrap Metal Market

Some dealers believe that the scrap metal market has at last reached bottom.

The Chicago market during the past week has shown very little change. Actual prices are difficult to quote at present. Scrap consumers for the most part are remaining out of the market. Rail road offerings are moderate. Prices which last week were considered as being rock bottom have been lowered several dollars and the demand is so light that even the low prices fail to move much tonnage. Heavy melting steel is down to $9 and mixed borings and turnings have dropped from $7 to $5.50.

The New York scrap dealers report a better inquiry for wrought material. More interest is being shown by the rolling mills and this has resulted in a greater firmness in prices.

The Pittsburgh market is exceedingly quiet. The usual industrial sources of supply are not operating so there is very little tonnage appearing. One of these sources is the automobile industry, which furnished large tonnages of turnings and borings for the Pittsburgh and valley territories.

On the Buffalo market one local mill is taking tonnages of scrap on suspended old orders, and is contracting for several new lots in small quantities. They are offering $15 for heavy melting steel.

Dealers in the St. Louis market are beginning to purchase scrap, and the heavy railroad offerings have brought forth better bids. Heavy melting steel and shoveling steel were marked up 50 cents, the former being quoted at $14 to $14.50. Rerolling rails have risen from $15 to $16.50 to $17.

The scrap market continues to lag in the south. Hope is expressed at Birmingham that a turn for the better will take place soon. Quotations remain practically unchanged.

---

What is claimed to be the most powerful wireless transmission station in the world was opened recently at Croix-d'Hins, eighteen miles from Bordeaux. The station, the aerial of which has eight pylons 850 ft. high, is designed to reach, in normal circumstances, any point in the world, including New Zealand, while North and South America will be within its effective radius, however bad the atmospheric conditions.

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | $ 0 27½ |
| Solder, guaranteed | 0 29½ |
| Soldering coppers, lb. | 0 62½ |
| White lead, pure, cwt. | 20 35 |
| Red dry lead, 100-lb. kegs, per cwt. | 15 00 |
| Gasoline, per gal., bulk | 0 42 |
| Pure turp., single bbls., gal. | 3 15 |
| Linseed oil, raw, single bbls. | 2 37 |
| Linseed oil, boiled, single bbls. | 2 40 |
| Wood alcohol, per gal. | 4 00 |
| Whiting, plain, per 100 lbs. | 3 00 |

### CARBON DRILLS AND REAMERS

| | |
|---|---|
| S.S. drills, wire size | 40 and 5 |
| Can. carbon cutters, plus | 10 |
| Standard drills, all sizes | 40 and 5 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 and 5 |
| Bit stock | 50 |
| Ratchet drills | 10 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 50 |
| Sleeves | 50 |
| Taper pin reamers | 25 off |
| Drills and countersinks | Net |
| Bridge reamers, carbon | 50 |
| Centre reamers | 5 |
| Chucking reamers | Net |
| Hand reamers | 10 |
| High speed drills, list net to plus | 20 |
| Can. high speed cutters, net to plus | 10 |
| American | plus 40 |

### COLD ROLLED STEEL

[At Warehouse]

| | |
|---|---|
| Rounds and squares | $7.00 base |
| Hexagons and flats | 7.00 base |

### IRON PIPE FITTINGS

| | Black | Galv. |
|---|---|---|
| Class A | 70 | 80 |
| Class B | 24 | 34 |
| Class C | 16 | 24 |

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 8 50 | $ 7 50 |
| Sheets, blue ann., No. 10 | 7 00 | 6 50 |
| Canada plates, dull, 52 sheets | 13 00 | 13 00 |
| Can. plates, all bright | 14 00 | ..... |
| Apollo brand, 10¾ oz., galvanized | ..... | ..... |
| Queen's Head, 28 B.W.G. | 13 00 | ..... |
| Fleur-de-Lis, 28 B.W.G. | 12 50 | ..... |
| Gorbal's Best, No. 28 | ..... | ..... |
| Colborne Crown, No. 28. | ..... | ..... |
| Premier, No. 28, U.S. | 10 00 | 10 00 |
| Premier, 10¾-oz. | 10 50 | 10 40 |
| Zinc sheets | 16 50 | 20 00 |

### PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13; 5-16, $11; ⅜ in., $10; 7-16 in., $9.80; ¼ in., $9.75; ⅞ in., $9.20; ¾ in., $9.30; ⅝ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

### ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13; 5-16 in., $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

**Prices per 100 lbs.**

### FILES AND RASPS

| | Per Cent. |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 32½ |
| Black Diamond | 27½ |
| J. Barton Smith, Eagle | 50 |
| McClennand, Globe | 50 |
| Delta Files | 20 |
| Disston | 40 |
| Whitman & Barnes | 50 |
| Great Western-American | 50 |
| Kearney & Foot, Arcade | 50 |

### BOILER TUBES

| Size | Seamless | Lapweld |
|---|---|---|
| 1 in. | $27 00 | $..... |
| 1¼ in. | 29 50 | ..... |
| 1½ in. | 31 50 | 29 50 |
| 1¾ in. | 31 50 | 30 00 |
| 2 in. | 35 00 | 30 00 |
| 2¼ in. | 35 00 | 29 00 |
| 2½ in. | 42 00 | 37 00 |
| 3 in. | 50 00 | 48 00 |
| 3¼ in. | ..... | 48 50 |
| 3½ in. | 63 00 | 51 50 |
| 4 in. | 85 00 | 65 50 |

Prices per 100 ft., Montreal and Toronto

### OILS AND COMPOUNDS

| | |
|---|---|
| Castor oil, per lb. | — |
| Royalite, per gal., bulk | 28 |
| Palacine | 31 |
| Machine oil, per gal. | 58 |
| Black oil, per gal. | 27 |
| Cylinder oil, Capital | 1.01 |
| Petroleum fuel oil, bbls., net | 19 |

### BELTING—No. 1 OAK TANNED

| | |
|---|---|
| Extra heavy, single and double | 6½ |
| Standard | 6½ |
| Cut leather lacing, No. 1 | 2 00 |
| Leather in side | 2 40 3 00 |

### TAPES

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES

| | |
|---|---|
| Polishing wheels, felt | $4 50 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, Turkish | 8¾ |
| Pumice, ground | 06 |
| Emery glue | 30 |
| Tripoli composition | 9½ |
| Crocus composition | 12 |
| Emery composition | 11 |
| Rouge, silver | 64 |
| Rouge, powder, nickel | 38 |

**Prices per lb.**

### ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | 8½ |
| Grits, 80 and finer | 6 |

### BRASS—Warehouse Price

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 30 |
| Brass sheets, 24 gauge and heavier, base | 38 |
| Brass tubing, seamless | 42 |
| Copper tubing, seamless | 44 |

### WASTE

| | | | |
|---|---|---|---|
| XXX Extra | 23 | Atlas | 19 |
| Peerless | 22 | X Empire | 18½ |
| Grand | 21½ | Ideal | 18 |
| Superior | 21½ | X Press | 17 |
| X L C R | 20 | | |

**Colored**

| | | | |
|---|---|---|---|
| Lion | 16 | Popular | 12 |
| Standard | 14 | Keen | 10 |
| No. 1 | 14 | | |

**Wool Packing**

| | | | |
|---|---|---|---|
| Arrow | 35 | Anvil | 22 |
| Axle | 28 | Anchor | 17 |

**Washed Wipers**

| | | | |
|---|---|---|---|
| Select White | 20 | Dark colored | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

### RUBBER BELTING

| | | | |
|---|---|---|---|
| Standard | 10% | Best grades | 15% |

### ANODES

| | |
|---|---|
| Nickel | .55 to .60 |
| Copper | .38 to .40 |
| Tin | .70 to .70 |
| Zinc | .16 to .17 |

**Prices per lb.**

### COPPER PRODUCTS

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | $35 00 | $37 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 40 00 | 44 00 |
| Copper sheet, tinned, 14 x 60, 14 oz. | 43 00 | 46 00 |
| Copper sheet, planished, 16 oz. base | 47 00 | 50 00 |
| Braziers', in sheets, 6 x 4 base | 39 00 | 42 00 |

### LEAD SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $10 50 | $14 50 |
| Sheets, 3½ lbs. sq. ft. | 10 25 | 14 00 |
| Sheets, 4 to 6 lbs. sq. ft. | 10 00 | 13 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

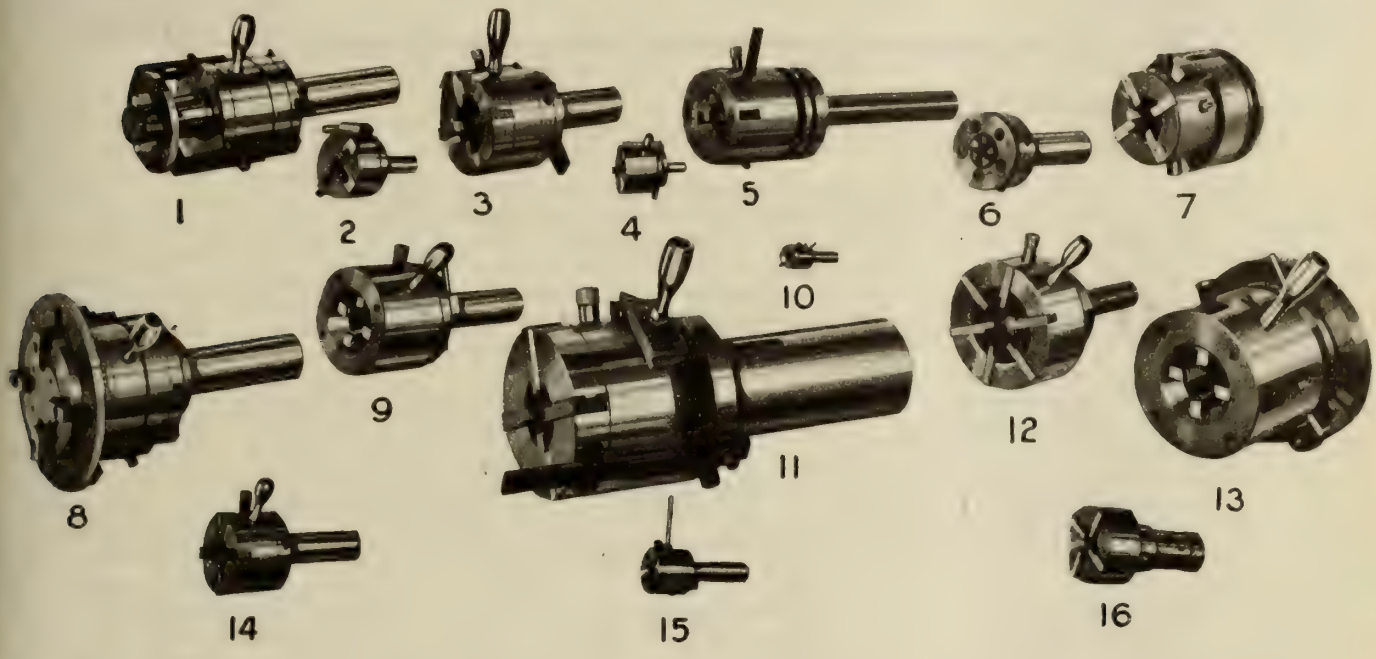
### PLATING CHEMICALS

| | |
|---|---|
| Acid, boracic | $ .23 |
| Acid, hydrochloric | .04¾ |
| Acid, nitric | .11 |
| Acid, sulphuric | .04½ |
| Ammonia, aqua | .15¾ |
| Ammonium, carbonate | .23 |
| Ammonium, chloride | .22 |
| Ammonium, hydrosulphuret | .75 |
| Ammonium sulphate | .30 |
| Arsenic, white | .16 |
| Copper, carbonate, annhy. | .41 |
| Copper, sulphate | .13 |
| Cobalt, sulphate | .20 |
| Iron perchloride | .62 |
| Lead acetate | .30 |
| Nickel ammonium sulphate | .20 |
| Nickel carbonate | .32 |
| Nickel sulphate | .20 |
| Potassium sulphide (substitute) | .40 |
| Silver Chloride (per oz.) | 1.15 |
| Silver nitrate (per oz.) | 1.10 |
| Sodium bisulphate | .13 |
| Sodium carbonate crystals | .04 |
| Sodium cyanide, 127-130% | .39 |
| Sodium hyposulphite per 100 lbs. | 9.00 |
| Sodium phosphate | .15 |
| Tin chloride | .30 |
| Zinc chloride, C.P. | .30 |
| Zinc sulphate | .08 |

**Prices per lb. unless otherwise stated**

# GET THEIR NUMBER

Numbers 1 to 16 represent one of the Geometric Self-opening and Adjustable Screw Cutting Die Heads, Solid Adjustable Die Heads and Adjustable Collapsing Taps.




No. 1—Class N-L Pipe Tap. Made in sizes from ¾" to 10" inclusive. Represents tapped diameters of 1-1/16" to 13-1/2" straight threads, and 3/4" to 12" standard pipe threads.

No. 2—A Geometric Brown & Sharpe Taper Turning Tool.

No. 3—Style C Die Head, Lever Trip Type. Recommended for cutting threads of short length.

No. 4—Two-Chaser Class U Tap, for tapping fine pitch threads, ranging from 1/2" to 1-5/16" diameters.

No. 5—Style D-D Die Head for Cleveland Automatic. Floating and tripping adjustment features make this a very desirable Die Head for these machines.

No. 6—Adjustable Hollow Milling Tool. The cutters are readily removed for sharpening. Micrometer adjustment makes quick and easy settings.

No. 7—Rotary Die Head. Recommended for live spindle use.

No. 8—Class P Tap, Plate Trip Type. Used wherever tripping plate can come in contact with the work.

No. 9—Style D Die Head. For general use where thread is not too short. Made in sizes from 5/16" to 4-1/2" inclusive. Represents threaded diameters of 3/32" to 4-1/2".

No. 10—A 1/8" Style D Die Head, the smallest size. Cuts down to 1/16" diameter thread.

No. 11—Taper Threading Die Head, with inside trip and roughing and finishing attachment. Recommended for coarse pitch taper threads.

No. 12—Style C Die Head, Inside Trip Type. For cutting short threads where the length of thread is best controlled by an adjustable internal gauge or stop.

No. 13—Style D-D Die Head, with roughing and finishing attachment. Flanged for Warner & Swasey Turret Machine.

No. 14—Style C Die Head, Pull Off Type. For cutting threads on light work.

No. 15—Style C Die Head for Brown & Sharpe Automatics.

No. 16—Solid Adjustable Die Head with floating shank, for Gridley Automatic.

These Die Heads and Taps are adapted for use on the turrets of practically all makes of hand and automatic screw machines and turret lathes.

By using extra sets of Thread Chasers, each tool can be used for a range of diameters; the larger the size of tool, the greater the range.

Make screw thread cutting the most satisfactory operation in your Shop. Let a GEOMETRIC show you how.

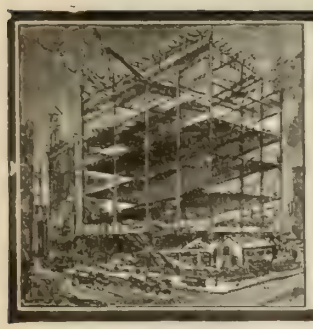
## THE GEOMETRIC TOOL COMPANY

**NEW HAVEN CONNECTICUT**

*Canadian Agents:*

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Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

*If interested tear out this page and place with letters to be answered.*



# INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES



## MEETING IN MONTREAL TO ORGANIZE THE WELDERS THERE

WORKING in harmony with a meeting held recently in Toronto, relative to the organization of a Canadian Welding Society, A. M. Barry, manager of the St. Lawrence Welding Company, of Montreal, called a special meeting of those in this district interested in the movement. The meeting was held last Thursday at the Windsor Hotel, and although the notice given was necessarily brief, a goodly number of firms were represented. Those present, beside Mr. Barry, were:—A. McMillan of the Canada Carbide Co.; C. Royer, of Welding and Supplies, Ltd.; A. F. Dyer, welding supervisor of the G.T.R. at Pt. St. Charles; P. Reynolds, Supt. of the St. Lawrence Welding Co.; W. G. Cole, of the Advance Machine Works; W. P. Bennet, of the Canadian Welding Works; T. Jones, works-mgr., of the Canadian Vickers Co.; H. P. Booth, plant manager of the Montreal Locomotive Works; D. Buttler, L'Air Liquide Society; and J. H. Rodgers, of Canadian Machinery.

In opening the meeting Mr. McMillan, the chairman, who, with Mr. Barry, had been present at the Toronto meeting a couple of weeks ago, outlined to those present the objects of the proposed association and the initial steps that had already been taken at the inauguration meeting. A copy of the proposed constitution had been received and the different clauses and sections were discussed. The meeting was unanimous in its decision that an association, well founded, would be highly beneficial, not alone to those associated with the society, but to the welding industry in general. It was the opinion of those present that the science of efficient welding was not making the progress that it should, and that, in some instances, great harm was being done and development retarded, due to the inefficiency of much work carried on by inexperienced operators, the results in such cases often giving a temporary "black eye" to the better progress of the welding art.

It was stated by Mr. Barry that the Government had the question of welding standardization under consideration, and it was only a question of time before they would be faced by certain regulations governing the practice of welding in general. It was therefore thought that a well organized body of experienced welding men would be better able to cope with the situation and at the same time present a united front in protecting the interests of the craft, and likewise provide better facilities for disseminating knowledge amongst its members.

While the proposed constitution, on the whole, was favorably received by the Montreal gathering, several clauses were the subject of criticism and discussion. One of these was that in regard to standardization in welding practice. As this was too wide a subject to be passed over lightly, and at such an early date in the activities of the association, it was deemed advisable to instruct the Montreal delegates attending the forthcoming meeting in Toronto to obtain further enlightenment in regard to the question of "standardization." Mr. Dyer of the Grand Trunk, remarked that the practice in railroad shops was, invariably, carried out under specific regulations, but that the system on one road differed from that on another, and sometimes, to a great extent.

Exception was taken to the "head office shall be in Toronto." Due to the fact that the proposed constitution called for the election of officers by letter ballot, it was not clearly seen how an arbitrary ruling could be made in this connection, as it was possible that the election of officers might result in the president and secretary being elected from points outside of Toronto. However, the Montreal interests are determined to work in harmony with those in Toronto and other centres, so that this point will receive full consideration at the next general meeting.

Still another feature was that respecting local branches. The constitution did not clearly define the organization details, and in view of the announcement of annual dues for the different grades of members, it was thought advisable to have a better understanding on this question, particularly on the point of financing branch societies, before committing themselves. Before the meeting adjourned a short discussion took place on some practical problems, and the interest shown indicated the advantages that would be derived by periodically meeting together and discussing one another's difficulties and experiences. Several present announced their intention of attending the meeting to be held in Toronto on the 26th of this month.

## LLOYD HARRIS LOOKING FOR A SELF-CONTAINED STEEL INDUSTRY

The Editor, Canadian Machinery.

Sir,—My attention has been called to an item in the issue of your journal dated Jan. 13th last quoting from an address I delivered before the Canadian Club at London, Ont. I wish to make a correction which I hope you will publish in your next issue.

When dealing with the Canadian steel industry, I stated that one of the means which we could employ to reduce our imports from the United States is to produce in Canada the $150,000,000 of steel imports we are now bringing in from the United States; that many experts had stated in the past that our steel industries in the interior of Canada would be handicapped for the reason that they had to import coal and ore from the United States as although Canada is rich in iron ores, they could not compete with American ores, on account of their refractory nature.

I went on to say that this situation is likely to be changed, as with the development of scientific methods, Canadian ores are likely to be used in the future. I referred specifically to the fact that the steel industry situated in the eastern part of Canada is exceedingly favorably situated as their coal and ore are at their doors.

I would not like to have the impression get abroad that all the coal used in the Canadian steel industry comes from American mines as I am in hopes that Canada will have a self-contained steel industry in the future by utilizing our own ore resources in all of our steel plants, and that with the deepening of the St. Lawrence River and Welland Canal, we will be able to use Canadian coal in all of the plants in competition with American coal, my thought being that we should make our Canadian industries self-contained to the utmost possible extent.

Yours very truly,
LLOYD HARRIS.

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Quality Service

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## STEEL AND IRON BARS

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Angle Bars Track Bolts Tie Plates Tie Rods Spikes

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Steel
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Steel and Brass, Copper and Bronze, Heavy and Fine, Bright, Annealed, Coppered, Galvanized, Tinned, Stranded, Steel and Copper Cable, Barb, Woven Clothes Line

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Pole Steps Cross Arm Braces Guy Clamps Guy Rods

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Shape and Drop Forgings
Carriage and Automobile Hardware

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CHANNELS

THE
## STEEL COMPANY
OF
## CANADA
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WIRE RODS
HORSE SHOES
FENCING
RIVETS
BURRS

*If interested tear out this page and place with letters to be answered.*

# The Week's Events in Montreal Industry

Thomas Hall, proprietor of the Hall Engineering Works and managing director of the Montreal Drydock and Ship Repairing Company, has been elected as one of the four commissioners for the city of Montreal West.

An address on "The Construction of the Toronto-Hamilton Highway," illustrated by lantern slides and motion pictures, will be given by H S. Van Scoyoc, of the Canada Cement Co., at the regular meeting of the Engineering Institute of Canada, on January 27. The annual general and professional meeting of the institute will be held in Toronto on February 1, 2 and 3.

The Dominion Metal Company, of Sherbrooke, Que., are now distributing to the trade a new line of Olanda products. The Olanda cast steel cement is used for filling defects in steel castings. The Olanda high temperature plastic cement, used for furnace work, will, it is stated, withstand a temperature of 3,000 Fah. Another line is Olanda foundry facing for molding purposes.

C. H. N. Connell, district engineer of the Canadian National Railways, has been promoted to the position of district engineer at Toronto, with jurisdiction over all lines in Ontario. Mr. Connell became associated with the C. N. R. in 1909, when he was appointed engineer of maintenance of way over the Quebec division. In 1914 he was appointed divisional engineer and promoted to district engineer in the early part of 1918.

One of the features of the annual meeting of the Pulp and Paper Association, held last week in Montreal, was the moving pictures shown in connection with present day methods of paper making in its many departments. The films were complete in every detail, showing as they did every essential operation and process, from the planting of the young trees to the making, weighing and rolling of the paper for commercial use, and the transportation of it to the different large centers.

One of the best exhibits of motor cars, trucks and accessories ever shown in the Dominion is now being displayed at the Montreal Motordrome on Sherbrooke. The entire three floors are devoted to the exhibition, and in addition to this it has been necessary to construct an extra building to take care of the overflow. In all about 150 firms are represented at the show including about two score of motor and truck manufacturers. The exhibition will continue all of the present week. Victor Levesque is the general manager.

Walter Lambert, naval architect, 14 Place Royale, Montreal, is now getting prices from Canadian shipbuilders for motor barges for carrying pulpwood and specially designed for shallow draft conditions for mechanical unloading. It is expected, provided prices are acceptable, that contracts for same will be placed immediately, in which case ships will be in service in the St. Lawrence during the coming season, and being of special type will doubtless attract considerable attention. Mr. Lambert hopes at a later date to be in a position to publish plans and specifications of these ships.

Reports of the twenty-first annual meeting of the Canadian Forestry Association, held in Montreal last week, showed that the association had completed one of the most successful years in its history, both as to finances and as to membership, the latter now numbering about 12,500. The forest conservation propaganda carried on by the publicity bureau has been favorably received in all quarters and the good results attained has decided the association in taking further steps to augment these activities that have proven so beneficial during the past year. The president, C. E. E. Ussher, was again elected for the ensuing year, and Robson Black, of Ottawa, was re-elected secretary.

What will be the largest garage in Montreal and one of the largest truck garages in North America is that of the Albion Motors, Ltd., at 63 Prince St. The premises occupied by the Albion is the old central station of the Montreal Light, Heat and Power Company, and the building is one admirably adapted to the use which is now being made of it. The structure extends the whole distance from Prince to Queen streets, occupying 28,000 square feet of floor space and affording over one million cubic feet of shop and storage space. It was opened last May by the Albion Motor Co., and the place has been partly occupied by other interests since then, but with the running out of leases this May it will be entirely occupied by the present owners, the Albion Company having purchased the property.

The Canadian Pacific Railway has announced its intention to offer two free scholarships, covering four years' tuition in architecture, chemistry, civil, mechanical or electrical engineering, at McGill University. The scholarships are open to apprentices and other employees under the age of twenty-one. The necessary requirement will be the passing of the regular entrance matriculation examination provided for in the annual calendar of the University, and the two candidates receiving the highest averages and complying with the requirements for admission will be awarded the scholarship and have the option of taking any of the above courses. Rules governing the continuance of the course provide that the holder shall meet the necessary requirements for the next higher year. Interruption to studies may be granted by giving due notice to the railway company.

## LOOKING FOR A RECORD YEAR NOW

**Dealer in Contractors' Equipment Has More Inquiries Than Ever This Season**

Canadian Machinery had the opportunity this week of discussing trade prospects with the representative of a firm specializing in new and used contractors' equipment. There was no doubt in the mind of this dealer regarding the business they were likely to do this year, and he was ready to brand it as likely to be "the best year's business we have ever done."

"I am basing this statement on the number of inquiries that are coming in now regarding the securing of equipment for the 1921 building season, and a number of these want to get delivery very soon in order to be in shape to put in a full season's work. Nor can it be said that these inquiries come from any particular section, as nearly every corner of the country is represented in the list."

## U. S. RECOGNIZE BRITISH EXPERT

**Sir Robert Hadfield Brought Out Steel of Great Use During War**

Sir Robert Hadfield, inventor of manganese steel and leader of the British steel industry, has been awarded the John Fritz gold medal for notable scientific and industrial achievement, it was announced by the John Fritz Medal Board, of New York, representing five leading United States engineering societies. Manganese steel was first described by Sir Robert in 1893, but it did not become generally known until the war demanded armaments in which toughness was combined with great strength. Manganese steel is non-magnetic, and millions of helmets made of this material were worn during the war by British, United States and Belgian soldiers. In addition to inventing manganese steel, Sir Robert discovered magnetic steel of high permeability especially suited for use in dynamos and motors.

# GARLOCK WALKER

HIGH GRADE MACHINE TOOLS

# RICH
## TWIST DRILLS

THE BLANK



THE FINISHED DRILL, RICH STANDARD №20



RICH HIGH-SPEED DRILLS are not brazed, welded or built up, but forged from the bar and twisted at the proper temperature, giving them physical properties superior to those of the original bar. They are built to stand hard duty and retain a keen edge for long periods.

Other RICH products consist of TRACK and BOND BITS, BRIDGE REAMERS, RIVET SETS and COUNTERSINKS in a wide range of sizes and styles, all distinguished for the quality and quantity of work which they perform.

G&W MACHINERY

*Shipped the Same Day as Ordered from*

## GARLOCK-WALKER MACHINERY CO., LIMITED

32 Front Street West TORONTO Telephone Main 5346

MONTREAL AND WINNIPEG

**METAL and WOODWORKING MACHINERY of all Kinds**

*If interested tear out this page and place with letters to be answered.*

# THERE IS AN OPENING IN THE BRITISH MARKET FOR CANADA

MR. CECIL G. HORTON, assistant manager, Engineering and Machine Works of Canada, St. Catharines, has spent some time in Britain introducing a new type of steam shovel. Some of his observations should be useful to Canadian exporters:

"When one is situated as we were with a product to introduce which was comparatively unknown in Great Britain, I only know of one sound plan of action. You must go over and study the market for yourself. When you get there you should spend considerable time in gathering up all the information available bearing upon the successful introduction of your product. Then you should spend a little longer in sifting out that information before acting. It is best to make sure of your ground before the buyers even realize that you are in the country. The ordinary channels of publicity will not serve you at first and it will be futile to attempt any general appeal to the buyers. No unknown machinery will be taken up by the British market until its value has been demonstrated to the individual purchasers, and you should not begin to look for sales until you have digested the salient features and the peculiar tendencies of the market which you are attempting.

"When your preparations are complete and you are ready to approach prospective customers, your attitude and method are of first importance. Today Canada enjoys distinct prestige in Great Britain. More than that, Great Britain is beginning to realize that Canada can manufacture. So that the way you go about your business is of utmost importance, as you are creating impressions of Canadian selling methods that will last far beyond the present instance. Moreover, it is wise to distinguish Canada from North America. There is no better way to impress this fact on the British buyer than by observing a studied caution and moderation in salesmanship. The first great fundamental for all salesmen in the British market is to watch their language. The British dislike exaggeration in any form, and they expect you to be explicit and straightforward in all your dealings with them. You must have conclusive proofs regarding your product, and you must convince them with a minimum of superlatives. They are suspicious of too much virtue, and are not inclined to take what Americans and Canadians would consider justifiable chances. I do not mean that they are not receptive and open to conviction; but I do think that greater care is necessary to ensure successful business in Great Britain than in our own market. Now, a salesman perhaps cannot change his methods overnight, but if he studies British business men, he can quickly ascertain their etiquette and their prejudices; and this must be the first achievement of the successful Canadian exporter.

"As we were introducing an article hitherto unused, our main approach to British buyers was direct, and advertising was a secondary consideration. However, I believe that the British trades papers could be used successfully when once an article has been introduced. They are widely read, and are excellent, especially in a technical sense. Exhibitions also play a considerable part in advertising and sales campaigns over there. These exhibitions are planned without reference to any sight-seeing, and they attract the most aggressive elements of British business. As to general advertising, there should be co-operation between the Canadian manufacturer and his British representatives. The manufacturer at home is in a position to compile advertising information, and the representative abroad can effectively handle the distribution. Personally, we found the Trade Commissioner service of value in putting us in touch with the buyers, and believe that this service could be used more by Canadian manufacturers for the securing of both information and connections.

"For representatives, we found it expedient to use the established British importing houses. Here again the fact that we were introducing a hitherto unused article governed our choice. These importing houses have very wide connections, and they give immediate access to trade circles. It seems improbable that anything resembling an export pool could be successfully formed by machinery manufacturers. Machinery products are intricate as a rule, and the more direct the route from the manufacturer to the user the better. The question of foreign representation arises in other than the sales capacity in machinery lines. The matter of a service station abroad must be considered, as the best of mechanics cannot master a new machine overnight. At present we ship k.d.s. (knocked down state), and our mechanics assemble our machines abroad. With increased sales this may or may not necessitate permanent technical representation abroad, but it is a point to be considered when one is entering the export field.

"In conclusion I would like to emphasize the opportunities for Canadian machinery. Great Britain needs more houses than she can possibly construct. I visited one center near London where a complete new city was being built with authorized plans for a population of sixty thousand. There are other developments of almost equal magnitude, so that it would be difficult to exaggerate the openings for every sort of building material. Speaking more particularly for firms similarly placed to ourselves, it would seem wise for Canadian manufacturers to exploit their present-day advantages, because, although money is tight now and the rate of exchange unfavorable to the British buyer, as these two factors approach normality competition will become keener and established connections will then have value all their own. With British buyers such a connection is well-nigh permanent if only the seller watches his end properly."

## Trade Gossip

**Build Coke Plant?**—The Semet-Solvay Co., the largest concern of its kind in the world, is considering building a four million dollar by-product coke oven plant at Hamilton, it is announced. It is said this would produce all the artificial gas necessary to meet Hamilton's needs for several years.

**Have Orders.**—As the result of the annual furniture exhibition at Kitchener the furniture industries there have been provided with large orders by buyers from all parts of Canada and some of the leading cities of the United States. Manufacturers here express entire satisfaction with the outcome of the exhibition and claim that there are bright indications of early revival of the furniture trade.

**In the Maritimes.**—Hon. E. K. Spinney, minister without portfolio, has arrived in Ottawa from his home at Yarmouth, N.S. Mr. Spinney expects to remain here until after the opening of the session. Mr. Spinney stated that there was little unemployment in the Maritime provinces outside of St. John and Halifax, and that business conditions were as good as could be expected during the present period of readjustment.

**Conditions in West.**—A Winnipeg report says:—G. E. Carpenter, secretary of the prairie division of the Canadian Manufacturers' Association, who attended the manufacturers' conventions in Edmonton, Calgary and Medicine Hat, reported that great confidence was expressed at these gatherings regarding market conditions for 1921. Every effort is being made, Mr. Carpenter reported, to keep plants running at full strength. In respect to unemployment in the west, such distress as prevails is being efficiently handled, Mr. Carpenter said. In his opinion, lack of employment was not as severe as in many former years.

**Showed the Books.** — The Dominion Steel Corporation opened its books to a committee of its employees which waited on the management so that they could see for themselves that orders are slack and the recently announced wage reduction necessary. The committee called to ask General Manager Merrill to cancel or at least modify the 20 per cent wage cut. Concerted efforts to end the strike of railway yardmen at the Dominion Steel Corporation plant and the Nova Scotia Steel and Coal Company's plant are being made by the steel companies, the federal department of labor and the Canadian National Railways, it is claimed in the Brotherhood of Railway Employees circles.

# MORROW



Set Screws
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Works at

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Office and Warehouse
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**A Drinking Water Service that will last a LIFETIME**

What you pay for a few ordinary drinking cups will meet the cost of the

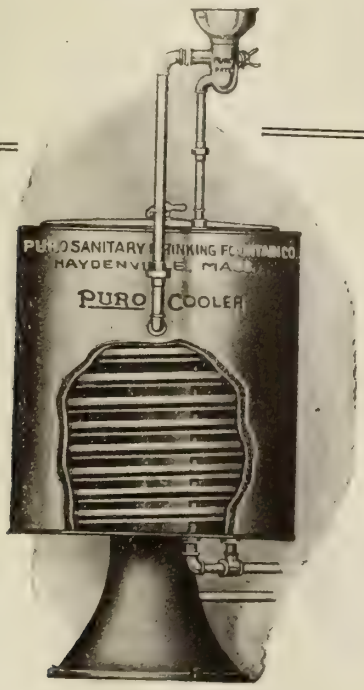
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(MADE IN CANADA)

DRINKING CUPS ARE UNSANITARY but the "Puro" delivers clean, fresh water at a reduction of 15 per cent. to 35 per cent. in water bill.
"PURO" WILL SAFEGUARD THE HEALTH OF YOUR EMPLOYEES and protect your staff against disorganization by sickness.
Easily attached. Simply unscrew the ordinary faucet and put on the "Puro."
Write us to-day for full information regarding the cost of installation of the "PURO" Sanitary Drinking Fountain Service.

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BLACK DIAMOND OVENS

**OVENS**

Japanning and Varnishing Ovens heated by Gas, Electricity, Steam or Coal. Kernchen Siphonage Ventilators, Bakers' Ovens, trucks, casters, etc. Write for Booklet.

**Brantford Oven & Rack Co. Ltd.**
*Brantford, Canada*

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Send us your blueprints and specifications. Entrust your requirements to experienced workmen and up-to-date equipment. Have your dies made in Canada. First-class workmanship guaranteed.

THE KIMBER & HILLIER MFG. CO.,
Thorold Road, - St. Catharines, Ont.

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Write for Prices
Superior Machinery Co., London, Canada



**BOLTS AND RIVETS**

We are equipped to fill the requirements of the Marine trade promptly. Square head, hexagon head and all kinds of Machine, Deck, Carriage Bolts and Rivets.

*QUALITY PRODUCTS*

LONDON BOLT & HINGE WORKS
LONDON, CANADA


## Engineering

F. C. Weston Company, Marbleton Que., is building a garage at a cost o $9,000.

A new mill is being erected by P. N Mathieu, Montmorency, Que., at a cos of $8,000.

The Warren Bituminous Paving Co. Ltd., 19 Melinda St., Toronto, will erec a storage shed.

The Twin City Arena Company, Kitch ener, Ont., are planning the erection o arena and artificial ice plant.

A service station will be built on Dun das Street West, near St. John's Road by the Imperial Oil, Ltd., 56 Churcl Street.

A site has been secured and plans ap proved for the proposed new Albert Col lege, Belleville, Ont. The cost is esti mated at $600,000.

It has been decided by the Saskatch ewan Co-operative Creamery Company Swift Current, Sask., to erect a col storage warehouse in that city.

The Snider Bros., Vancouver, have re ceived the general contract for erectio of warehouse for Vancouver Tradin Company, 136 Water Street.

A machine shop and boiler house i to be erected by Canadian National Rail ways, 411 Dorchester Street, Montrea at an estimated cost of $25,000.

The Ontario Cement Company, 5 George Street, Brantford, Ont., plan th erection of a factory. Tenders will b called in March.

The American Well Works Compan has been taken over by the Mack Fur nace Company, Chatham, and they wi remodel it to suit their requirements.

The Dominion Canners, Ltd., hav awarded the general contract for th erection of factory costing $20,000 t J. F. Nichols, 116 Summer Stree Niagara Falls.

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The Old Eagle Foundry, conducted fo years by John Smith & Sons, St. John N.B., has been taken over by M. Harr gan and Frank Howard, and they ar doing a general jobbing business unde the firm name of Courtenay Bay Iro & Brass Works.


**SMITH BLDG** 136 York St. TORONTO

**Machine Tools**
FOR SHIPBUILDERS & IRON & STEEL WORKS
BERTRAMS LIMITED
SCIENNES EDINBURGH

W. F. Pollock, president Victor Saw orks, Springfield, Mass., was at the amilton, Ont., office for several days st week.

H. W. Holmes has accepted a position th the Canadian Hart Products, Ltd., sales manager. Mr. Holmes was for veral years manager of the Hamilton, t., plant of the Victor Saw Works.

The Canadian Ingersoll-Rand Comny, Sherbrooke, Que., has secured the nadian rights for manufacturing Telith crushers and primary breakers as ilt by Smith Engineering Works, Milukee, Wis.

Wiggett Electric Company, 82 Welgton Street, Sherbrooke, Que., forerly Electric Motor and Repair Comny, will move into their new building above address shortly and will do all rts of motor repairing and selling of otors up to 50 h.p.

The Dominion Government has awardthe Sheehy Bros., of Peterboro, the ntract for the construction of a new m across the Otonabee River at Nasu, a short distance from Peterboro. e dam will, it is estimated, cost about quarter of a million dollars, and is to completed by December, 1922.

Mrs. Clara E. Speight-Humberston, 62 orold Avenue, Toronto, claims she has complished the transmuting of zinc o copper by means of electric curnts, using a solution of granite. If s has been actually achieved, it will mpletely revolutionize our knowledge transmutation of metals.

The death occurred on January 20 Major Alfred T. Tomlinson, a pronent civil engineer, at his home on enue Road, Toronto, following an illss of two months. Major Tomlinson s a member of the Engineering Intute of Canada, the American Society Civil Engineers and the American gineering Association.

The steel makers along the northst coast of England have adopted a licy of drastic price cutting, said to owing to the increased foreign comtition, which has virtually stopped deands for the dear home made articles. e reduction ranges from £2 per ton rails and ship plates to £4 for billets.

The Lang Manufacturing Company, e of Guelph's infant industries, has rged ahead rapidly since its establishnt in May, 1918. Since that time the all building in which it began its reer has been enlarged twice to accommodate the increasing business. The Lang company first manufactured Guelph convertible seats, but soon nched out into the manufacturing of chitectural iron work, flax machinery, dium and small rubber moulds, welded tanks, special small machinery, and a general machine business. They also do a big business in oxy-acetylene welding.

Evidence of its growth is shown by the fact that at its beginning two men, members of the firm and skilled mechanics, did the work and the employees now number 23. One of the most important products lately placed on the market and which is attracting much attention is a bearing of unusual design. It was invented by William Ridsdale, of Guelph, and is called the Ridsdale reinforced bearing. The idea is this: A spring or spiral made of a certain alloy is placed in the bearing cap or housing. Babbitt is next poured into the bearing, but the babbitt is merely a holder of the reinforcements. The claim for this bearing is that there are no hard spots in such construction, also that the cheapest grade of babbitt can be used with good results as the wear comes on the reinforcement and not on the babbitt. The company claims that it can be used in any bearing including those where speed and pressure is extreme. The bearing is said to have a tensile strength of 36,000 pounds per square inch against a much lower figure for babbitt only.

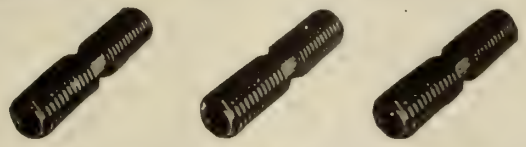
The firm is popular with its employees, no doubt to some degree due to the splendid working conditions provided.





DOMINION CHUCKS

STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY



All Screws Are Reversible

SCREWS are made of the best grade steel. Both ends are broached and are heat treated after machining. They are reversible, so that either end may be used, are large enough in diameter to stand the torsional strains applied by operator when setting up his work. They are made to give the best service—and may be depended upon to stand up under the hardest usage.

DOMINION STEEL PRODUCTS CO. LIMITED
*Engineers • Manufacturers*
BRANTFORD, CANADA


Fatal Accident.—Lying on his stomach, looking down an elevator shaft in the Sunbeam Lamp Works, 221 Dufferin street, Toronto, George J. Pond, aged 45, of 15 St. Clarens avenue, was crushed to death by the elevator cage. Fred Read, 146 Booth Avenue, was searching at the foot of the shaft with a lantern for a gold locket which had been dropped. He was standing in the pit below the basement and the elevator does not descent below the level of the basement. This saved Read from meeting with the same fate as Pond. The machinery of the elevator was started through some unknown agency, and the cage slid down the shaft pinning Pond and crushing his skull. The body was removed to the Morgue, and an inquest will be held. Mr. Pond is survived by a widow and six children.

Orders are short.—It was stated by an official of the Dominion Steel Corporation, Sydney, N.S., that unless new business was booked, the plant would suspend operations next week. To the present the plant has been working on outstanding orders, but no new ones have been received, and the outlook was none too good. Unless these are received or unless the head office in Montreal orders the manufacture of stock to be kept on hand until called for, prospects were for a shutdown at least temporarily next week.

# Classified Opportunities

## MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

## FLOOR SPACE WANTED

5,000 TO 10,000 SQUARE FEET OF GROUND floor space suitable for Forging and Stamping operations, or will consider purchasing a Forge Shop or Machine Shop, with equipment, about this size. Box 749, Canadian Machinery. (c5m)

## MACHINERY WANTED

WANTED—ONE PORTABLE FLOOR CRANE and hoist lift, 7 feet or over. W. G. Utley, Yarmouth, N.S. (c2m)

GEARED POWER PRESS, 4" STROKE OR more.
No. 21 Power Press.
16" or 18" Bulldozer.
Bradley Hammer.
20" Shaper.
16" or 18" Lathe.
20" Drill.
500 to 800 lb. Drop Hammer.
State condition and prices. Box 748, Canadian Machinery. (c5m)

## CASTINGS

Medium and light, grey iron castings for manufacturing purposes. We carry bushings, solid and cored, from 1 in. to 6 in., or larger.

**TORONTO FOUNDRY CO.**
**1884 Davenport Road, Toronto**
(c5m)

## Grey Iron Castings

Light and Medium-Bench and Floor Repetition Castings; Capacity 15 tons per day.
Expert Metal and Wood Pattern Work. Our advice and estimates will save you money.
Semi-finishing operations on Lathe or Grill on Castings supplied if required.
ASK US.
**THE KATIE FOUNDRY, GALT, ONT.**

PARTIAL LIST

## Machine Shop Equipment

***At Extremely Low Prices***

LATHES—All sizes and lengths of bed. Special price quoted on rebuilt 20 in. x 8 ft. C.M.C.

AIR COMPRESSOR—8 in. x 8 in. Chicago Pneumatic.

TANKS 10 Tanks 10 ft. 6 in. diam. x 29 ft. 6 in. long. 19,000 gals.
3 Tanks, 10 ft. 0 in. diam. x 39 ft. 0 in. long. ⅜ in. Heads. 22,893 gals.
Full line of other Steel Storage Tanks, open and closed, all sizes.

PUMPS 1 Triplex Power Pump, 1½ in. x 6 in. Hydraulic Machy. Co. Also 1 in. x 5 in. West Tire Setter.
1 Centrifugal Pump, 2½ in. x 1½ in. Gould.
1—Gould Triplex Power Pump, 2 in. x 3 in.

Milling Cutters and Reamers, full assortment, all sizes and shapes, at less than half price. Send us your enquiries.

**Standard Equipment & Tool Works**
Dept. K. 307 St. James St.
**Main 2286** **MONTREAL**
(20)

## POSITIONS WANTED

DRAUGHTSMAN (PERTH COUNTY) DESIRES change. Have had general experience of ten years. Am first-class practical shop mechanic, age 30. Married. If you are in need of a young man of ability, who has risen by merit only, let us arrange an interview. Address Box 747, Canadian Machinery. (c6m)

## FOR SALE

ENCLOSED LIQUID FUEL COMBUSTION APparatus capable of generating intense heat in pipes and confined passages for heating parts of internal combustion engines and for other uses; spark ignited; blower operated. Patented October 8th, 1918. Can be inspected at and for sale by H. W. Petrie, Limited, 131 Front St. W., Toronto.

## FOR SALE

Perfected rotary engine valve, simple design, free from defects common in rotary valves. Patented Feb. 20, 1917. Can be inspected at and purchased from H. W. Petrie Limited, Toronto.

## FOR SALE

Enclosed liquid fuel combustion apparatus capable of generating intense heat in pipes and confined passages for heating parts of internal combustion engines and for other uses; spark ignited; blower operated. Patented April 3, 1917. Can be inspected at and for sale by H. W. Petrie, Limited, Toronto.

## Used Machinery For Sale

1—24" Smith & Mills Shaper.
1—3' Bickford Radial Drill.
1—36" x 36" x 10' Bertram Planer.
3—3" x 36" Jones & Lamson Turret Lathes.
1—2" x 24" Jones & Lamson Turret Lathe.
1—15" x 6' South Bend Lathe.
1—18" x 8' Stevens Lathe.
1—18" x 8' Mueller Lathe, Q.C.G.
1—18" x 8' Cincinnati Lathe, Q.C.G.
1—26" x 12' C.M.C. Lathe, Q.C.G.
1—26" x 48" x 14' McCabe Double Spindle Lathe.
We are offering the above machines at attractive prices for quick sale.

**Charles P. Archibald & Co.**
***Machinery and Supplies***
**285 Beaver Hall Hill** **Montreal**

## REGO WELDING *and* CUTTING APPARATUS

Oxygen, Acetylene, and a complete line of Welding and Cutting Supplies.

**Carter Welding Co.**
**of Toronto, Limited.**
**7-11 Sheppard St., Toronto, Ont.**
**Phones: Adelaide 2841 and 1524**
(TF)

## HELP WANTED

GENERAL MANAGER REQUIRED IMMEDIately for small engineering works in Ontario employing about 100 men and comprising machine shops and grey iron foundry manufacturing machine moulded castings; must be thoroughly experienced in this class of work and competent to take entire charge, including office and sales end of the business; preference given to one having experience in agricultural machinery; good prospect for energetic man; apply, stating age and salary required and give references; applications will be treated in confidence. Box 745, Canadian Machinery. (c4m)

## PATTERNS

TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (ctfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

## PATTERNS

**Wragge's Pattern Works, 10 George St. South, Galt, Ont.,** Phone 1105 W. Equipped for best service in wood or metal patterns to any specification. Most reasonable prices. Expert workmanship. "Nothing ragged but the name." (cxxvi3m)

## Modern Marine Machinery

Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

## MACHINERY FOR SALE

1—24" x 12' Canadian Machinery Lathe
2—22" x 10' Davies Lathes.
1—21" x 10' London Lathe.
6—20" x 8' C.M.C. Lathes.
1—18" x 8' Mueller Lathe.
3—19" x 8' C.M.C. Lathes.
1—18" x 8' London Lathe.,
1—16" x 8' C.M.C. Lathe.
1—16" x 6' McDougall Lathe.
1—D-1 H. D. Colburn Drill.
2—No. 24 H. D. Foote-Burt Drills.
1—28" B. G. Barnes Drill.
1—22" B. G. Barnes Drill.
1—D.C. Compound Wound Generator, 110 Valts, 125 Amp.
2—No. 54 Perkins Sprue Cutters.
2—2" x 26" Pratt & Whitney Turrets.
1—10" x 52" Plain Landis Grinder.

**Write us for particulars and prices.**

**YEATES MACHINERY**
**LONDON**
**Hale St., London, Ont.**

# Classified Opportunities

MACGOVERN & COMPANY INCORPORATED POWER MACHINERY

## TURBO UNITS

### 25 Cycles

| Generator K.W. | Volts | R.P.M. | MAKER | Turbine. K.W. | Pressure |
|---|---|---|---|---|---|
| 500 | 400 | 1500 | WESTINGHOUSE-PARSONS | 500 | 150 lbs. |
| 750 | 380 | 1500 | WESTINGHOUSE-PARSONS | 750 | |
| 750 | 440 | 1500 | WESTINGHOUSE | 750 | |
| 850 | 380 | 1500 | WESTINGHOUSE-PARSONS | 750 | 150 lbs. |
| 1000 | 2300 | 1500 | WESTINGHOUSE | 750 | 150 lbs. |
| 1000 | 550 | 1500 | ALLIS-CHALMERS-RATEAU | 1000 | |
| 1250 | 6600 | 1500 | WESTINGHOUSE | 1000 | 140 lbs. |
| 1500 | 370 | 1500 | GENERAL ELECTRIC-CURTIS | 1250 | 175 lbs. |
| 2500 | 2400 | 1500 | WESTINGHOUSE | 2500 | 150 lbs. |
| 5000 | 11000 | 500 | GENERAL ELECTRIC-CURTIS | 5000 | 175 lbs. |
| 6500 | 6600 | 750 | ALLIS-CHALMERS | 6500 | 175 lbs. |

If interested in 60 cycle Turbo Units write for particulars.

**MacGOVERN & COMPANY, INC.**

285 BEAVER HALL HILL, MONTREAL

Offices: New York, Pittsburgh, Seattle. Plants: Lincoln, N.J. and Linden, N.J. Buyers and Sellers of New and Used Machinery.

## Machinery Agencies Wanted

A well established machinery supply house in Nova Scotia, covering the entire province, which has been handling American machinery, would like to hear from Canadian manufacturers of the following lines:—

**Woodworking Machinery**
**Ironworking Machinery**
**Contractors' Machinery**
**(Hoists, Mixers, etc.)**
**Pumps**
**Electric Motors**

*Address:*

**MACHINERY**
P.O. Box 847
HALIFAX

## Exceptional Offering in Rebuilt High Grade Machinery

1—24″ x 12′ Rahn Larmon, 3 step cone, S.B.G., Q.C.G.
3—24″ x 10′ Boye & Emmes, 3 step cone, D.B.G., Q.C.G.
1—22″ x 10′ Milwaukee, 3 step cone, D.B.G., S.G.C.
1—22″ x 10′ Hamilton, 3 step cone, D.B.G., S.G.C.
1—18″ x 8′ Greaves Klausman, 3 step cone, D.B.G., Q.C.G.
2—18″ x 8′ Mueller, 3 step cone, D.B.G., Q.C.G.
1—17″ x 8′ Sidney, 3 step cone, D.B.G., Q.C.G.
1—14″ x 8′ American, 3 step cone, S.B.G., Q.C.G.

GRINDERS

7—No. 6 Perfect.
1—No. 6 Perfect, with Adj. Guards.
1—No. 1 Champion.
3—No. 10 Perfect.
1—Production Surface Grinder.
1—Ford-Smith 16″ x 2′ Wet Tool Grinder complete.

The above machines have all been overhauled and are in first-class condition and the prices are right.

It is only a partial list of our large stock. What are your requirements? Let us have them. We are interested. All enquiries receive personal attention.

Western representative for The Geo. F. Foss Machinery & Supply Co., Ltd. Montreal, Que.

**R. S. HOLLY**
Room 37, 33 Richmond Street West
TORONTO - ONT.
Telephone Main 4728

## PARTIAL LIST

42″ Pond Car Wheel Lathe, Motor Drive
36″ x 22′ Bridgeford, g. h. Motor Drive.
36 x 16′ Sidney, D. B. G., Q. C., new
27 x 14′ Sidney, D. B. G., Q. C., new
14″ to 21″ x 6′ to 12′ Sidney
13″ to 15″ x 6′ to 12″ Carrol-Jamieson

Large Stock-used Lathes

40 x 40 x 10′ Powell, 2H Planer
24 x 24 x 5′ Pease 1H Planer
16 x 16 x 42″ Walter, 1H Planer
14″ Steptoe Shaper
16″ x 20″ x 24″ Steptoe, B.G., new Shaper
7″ Rhodes, Precision, new Shaper
16″ Used Smith-Mills Shaper
16″ Used Kelley, B. G. Shaper
No. 4 Brown and Sharpe, Plain Miller
No. 24 Osterlein, Plain Miller
No. 22 Garvin, Vertical Miller
No. 2 M. U. Garvin, Universal, new Miller
No. 1 Dow, Plain, new Miller
No. 3 Burk Hand Miller
No. 3½ Fox Hand Miller
6′ Western Universal Radial Drill
3′ Mueller, Plain, Radial Drill
42″ Canedy-Otto Plain, new Drill
3 Spindle Barnes, B.G. Drill
No. 1 Caplin Keyseater
No. 4 Caplin Keyseater
No. 0 Baker Keyseater
10″ x 36″ Norton Plain Grinder

WRITE FOR FULL LIST OF MACHINE TOOLS, MOTORS, WOOD-WORKING MACHINERY

**FRANK TOOMEY INC.**
127 North Third Street PHILADELPHIA, PA.

# H.W. PETRIE LIMITED

Canada's Premier Machinery House

TORONTO HAMILTON

# SPECIAL TOOLS FOR IMMEDIATE DELIVERY

1—BERTRAM VERTICAL EXTENSION TYPE BORING MILL. Swings 11′ when closed, 20′ when extended. Takes 7′ 6″ under tools. Has 2 heads on rail and auxiliary boring head. Excellent condition.

1—8′ UNIVERSAL RADIAL DRILL. Spindle 4″ dia. with plain box table. Base of "T" pattern 12′ x 4′ 3″. Belt driven. Splendid condition.

2—12′ WALL RADIAL DRILLS. (Countersinking drills.)

1—BERTRAM 6-SPINDLE INDEPENDENT-FEED DRILL. Spindles 2¼″ dia. Feed 13″. Table 12′ 3″ x 24″. Nearly new.

1—1 500-lb. BEMENT DOUBLE FRAME STEAM HAMMER. Complete with operating valve, anvil, etc.

1—30″ x 12″ x 8½′ IRON PLANER. 2 heads on rail. Table 29′ between pockets x 8′ wide. Heavy cored section housings.

1—36″ x 36″ x 12′ BELMER EAMES PLANER. 2 heads on rail. 2 side heads. Excellent condition.

1—BERTRAM DOUBLE END PUNCH AND SHEAR. 42″ throat. Will punch 1½″ in 1⅛″ plate. Shear 8″ x 1″ flat. Excellent condition.

1—EDWARDS DOUBLE END PUNCH AND SHEAR. Punch 38″ throat. Will punch 2″ in 1″ plate. Shear 30″ throat, with splitting shear blades 18″ long. Also angle shear in centre of frame for 6″ x 6″ angles. Splendid condition.

1—CLEVELAND STYLE "C" SINGLE END PUNCH. 24″ throat. Will punch 1″ in ½″ plate. Architectural jaw.

1—BERTRAM DOUBLE ANGLE SHEAR. Will cut 6″ x 6″ angles.

1—BERTRAM HORIZONTAL PUNCH. Will punch 1″ in 1″ plate. 16½″ gap. Belt driven. Like new.

1—LENNOX ROTARY PLATE BEVELLING SHEAR. Capacity ¾″ plate. Nearly new.

1—PNEUMATIC TUBE WELDER. Double cylinder type. Takes up to 3½″ flues.

1—BEATTY SELF-PROPELLING DERRICK CAR. 30′ boom. Derrick is "A" frame type. Hoist 7″ x 12″ double cyl., double drum, with link reverse. All mounted on 34″ x 10″ standard flat car. Standard gauge.

1—5-TON REVOLVING LOCO CRANE. Standard gauge. Boom 25′ long. Engine 7″ x 10″, double cyl. Truck frame 9′ 6″ x 6′ 6″, on 4 wheels.

1—42″ STYLE "A" WEST SIDE POWER FEED BAND RIP SAW. Table 52″ x 42″. Like new.

1—54″ McDONOUGH HORIZONTAL BAND RESAW, with bevel siding attachment. Has power feed and will take stock up to 30½″ wide x 12″ thick. Takes 7″ saw.

1—No. 640 AMERICAN EIGHT-ROLL "BOSS" TIMBER SIZER. Will surface all four sides on timber up to 30″ x 20″. Has 6 rates of feed. Furnished with forged steel cylinders, chipbreaker, etc. Belt driven.

***Many Other Good Tools in Stock—Let Us Know Your Requirements***

# PETRIE

*If interested tear out this page and place with letters to be answered.*

# NEW and USED
# MACHINERY and EQUIPMENT
# FOR SALE

## The GOODYEAR TIRE & RUBBER CO. of Canada, Limited

***By-Products Department*** NEW TORONTO, ONTARIO

***Offers Subject to Prior Sale, the following—***

### MOTORS

**25 Cycle, 550 Volts, 3 Phase, A.C., Westinghouse**

4 - 1 HP., 700 RPM. New
1 - 1 HP., 700 RPM. Used
2 - 1 HP., 1400 RPM. New
2 - 1 HP., 1400 RPM. Used
5 - 2 HP., 1400 RPM. New
2 - 3 HP. 700 RPM. New.
7 - 3 HP., 1400 RPM. New
1 - 3 HP., 1400 RPM. Used
2 - 5 HP., 1400 RPM. New
3 - 5 HP., 1400 RPM. Used
2 - 7½ HP., 1400 RPM. New
1 - 7½ HP., 700 RPM. Used
3 - 10 HP., 1400 RPM. Used
1 - 15 HP., 1400 RPM. New

**Wagner**

1 - 1 HP., 1400 RPM. Used
1 - 3 HP., 700 RPM. New.
1 - 3 HP., 1400 RPM. New.

**Miscellaneous**

3 - ¼ HP. New Wagner, 25 Cycle, 3 Phase, 220 V., 1420 RPM, A.C.
3 - 1 HP. New Imperial Electric, 25 Cycle, 3 Phase, 250 Volt, 500 RPM.
1 - 2 HP. New Imperial Electric, 25 Cycle, 3 Phase, 250 Volt, 500 RPM, D.C.
1 - 3 HP. New Western Electric, 25 Cycle, 3 Phase, 220 Volt, 1100 RPM, D.C.
1 - 75 HP. Used, Crocker-Wheeler, 25 Cycle, 3 Phase, 115 230 V., 750 RPM, A.C.

### MACHINE TOOLS—BORING MILLS

1 - 60" Bullard Boring Mill. Used, but in good condition
1 - 61" Bullard Maximill, with two swivel heads and plain parallel slot table with one set of four XAP-2 Independent Face Plate Jaws with Steel Bodies with Type G Motor Bracket without motor. Used only a short time.
1 - 60" Colburn Vertical Boring Mill. Used, but in as good condition as when new.
1 - 36" Bullard Vertical Turret Lathe, New Era Type, equipped with three-jaw combination chuck, built into table with type F motor bracket, with cutting lubricant system and four KT3 tool holders, complete without motor. New, never used.

### LATHES

1 - 18" x 8' American Lathe, back guard, complete with countershaft. Used, but in good working condition.
1 - 15¼" x 6' Jameson Lathe, double back geared, complete with countershaft. Used, but in good condition.
1 - 18" x 8' Walcott Lathe, with taper attachment and countershaft complete.

### MILLING MACHINES

1 - No. 4 Cincinnati Milling Machine, complete with standard equipment. New, never used.

### DRILL

1 - 48" Scott Heavy Duty Radial Drill, complete with standard equipment. Used, but in good working condition.

### SAWS

1 - No. 26 Higley Cold Metal Saw. Takes blades 33" diameter x 3/16" to ⅜" thick. Table 3' x 7' 3½". Height of table 27". Pulley 16" x 4". Practically new machine.
1—Espen Lucas Cold Saw. Used, but in fair condition.

### RUBBER MACHINERY

2 - 60" Mills. New.
4 - 60" x 12' Horizontal Heaters. New.
4 - 48" William's Vertical Heaters. New.
1 - 100 Gal. Day Mixer. New.
1—60" Spadone Bias Cutter.
1 - 66" Birmingham Calendar with Falk Gear Unit and Motor complete. New.
2 - 500 Gal. Cement Storage Tanks with Agitator, complete.

### REGULATORS

1 - Mason Regulator, 2", 100 lbs. to 40 lbs. New.
4—Mason Regulators, 2", 100 lbs. to 60 lbs. New
4—Mason Regulators, 1", Type C.C., 100 lbs. to 20 lbs. New.
4—Crane Regulators, No. 962, 1"
25—Crane Regulators, No. 962, 2".

### THERMOMETERS

20—New Bristol Recording Thermometers, Model 240, Bulb 252, each with 25' of bronze armoured connecting tube and chart No. 664. Complete in moisture-proof cases.
20—New Tagliabue Straight Stem Thermometers, 200 to 350 deg.
5—New Tagliabue Angle Stem Thermometers, 200 to 350 deg.
5—New Tycos Straight Stem Thermometers.
4—New Tycos Thermometers, No. 28, 9" Scale. Range 0 to 200C.
8—New Tagliabue combined Fahrenheit and pound steam pressure, 100 to 250 deg.

### TRAPS

10—No. 4, Model "D" Anderson Steam Traps. Used, but gone over and are in perfect working condition
4—½" No. 11 J. M. Steam Traps.
1 - ¾" No. 2 J. M. Steam Trap.
1 - 1" No. 3 J. M. Steam Trap.
1 - 1½" No. 5 J. M. Steam Trap

### SCALES

1 - National Weighing and Counting Scale. Platform 24" square. 600 lbs. capacity, with counting scoops.
1—New Brantford Blue Dial Scale. No. 20 capacity 20 lbs. in tenths

### TANKS

1—Steel Plate Storage Tank, 60" diameter, 25' long, 3,000 gals. capacity, 3/16" plate in shell, ¼" in head, manhole in middle of shell, 2" outlet on each side of manhole.
1—Only 50 gal. Bowser Tank with pump and agitator, mounted on large rubber-tired wheels. New, never used.

Address any enquiries you wish to make regarding these items to: "By Products Dept., The Goodyear Tire & Rubber Co. of Canada, Ltd., New Toronto, Ont." Full details and prices gladly furnished on request.

If you are in the market for any equipment or supplies which does not appear on this list, let us have your enquiry about it. Possibly it has been turned over to us since this bulletin was issued.

***Write for list of Engineering and Factory Supplies we have to offer.***

### REELS

100 Heavy Steel Reels. Diameter of Flanges 30", diameter of drum 10", between flanges 20", bore 2" weight 130 lbs

### STEEL

2,000 lbs 1¾" Square Machinery
1,000 lbs. 1½" Round Machinery
1,100 lbs 1¾" Round Machinery
4,000 lbs 1¾ x 2" Machinery.
100 lbs 2⅜" Hexagon C.R.
225 lbs. 1⅞" Hexagon C.R.
1,561 lbs. ¾" x 4" Oil Hardening Carbon Steel "Ketos"
326 lbs. 1" x 4" "Ketos" Tool Steel.
485 lbs. 1" x 5" "Ketos" Tool Steel.
237 lbs 1¾" Square Full-speed Steel.
258 lbs. 1¼" Square Carbon Steel.
127 lbs 1" Rd. Carbon Tool Steel.
138 lbs. 1¼" Hex. Cast Steel.

## Building Materials

### NAILS

392 Kegs 2½" Flooring Nails
218 Kegs 2½" Common Nails
56 Kegs 3" Common Nails
273 Kegs 4" Common Nails.
4 Kegs 6" Common Nails

### PAINT

225 gals Glidden's Mill White Paint
225 gals Glidden's Blue Gloss Paint
15 gals. Black Radiator Paint.
25 gals. Venetian Red Paint.

### LUMBER

495,000 ft B.M. 2x4 Spruce, D. 2 S and 2E Bevel, 2 edges
85,000 ft. B.M. 2x6 Hemlock, T. & G., D 1 S
20,000 ft. B.M. ⅞" Pine and Fir, D. 2. S.
14,000 ft B.M. 2x10 Planks, B.C. Fir (Rough).

### STONE SILLS

2,284 Lineal ft. 4¼ x 11 Indiana Limestone Window Sills for Steel Sash.

### STEEL SASH

6,000 sq ft Steel Sash.

### CAST IRON PIPE

11 Tons 8" C.I. Pipe, including Tees and Elbows

### RAILROAD TIES

1,853 Railroad Ties, practically new

### BRICK

353,000 Hard Red Brick made by Shale Brick Co

### VALVES

1 - 12" New Lunkenheimer "Victor" Flanged Gate Valve F & D
3 - 6" New Lunkenheimer "Victor" Flanged Gate Valves F & D.
1 - 4" New Lunkenheimer "Victor" Flanged Gate Valve F & D
2 - 6" New Lunkenheimer "Victor" Flanged Gate Valves F & D. Screwed.
3 - 5" New Chapman Bell End Hydrant Gate Valves
1 - 2½" Crane New XH Hydraulic Cast Steel Gate Valves (Fig. 205D). Flanged with Companion Flanges.
1 - 8" New Chapman Hydraulic Hub End Gate Valve
1 - 10" New Chapman Hydraulic Hub End Gate Valve
1 - 1½" New Homestead 3-way Hydraulic Valve, 1,500 lbs working pressure, Square Head Screwed
6 - 2" Lunkenheimer Ex. Hvy. Swing Check Valves 250 lbs
1 - 3" New Jenkins Flanged Gate Valve, O.S. & Y.

### BEARINGS

20 - 1 15/16" Chapman Lineshaft Ball Bearings
2 - 2 7/16" Chapman Lineshaft Ball Bearings

### GROMMETS

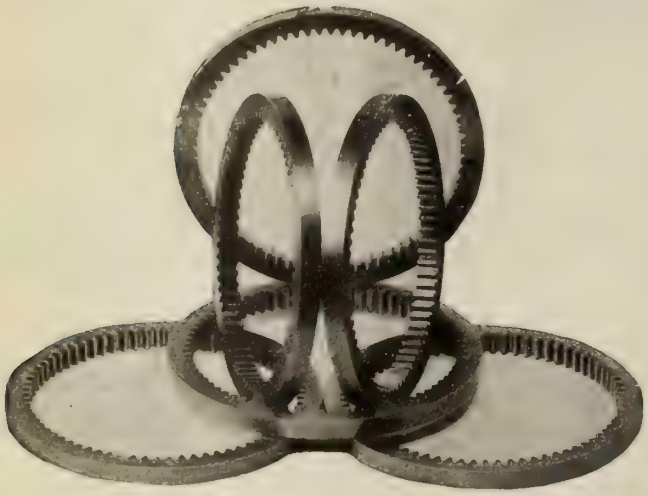
80 gross No. 1 Gun Metal Grommets with washers
30 gross No. 0 Gun Metal Grommets with washers

## The GOODYEAR TIRE & RUBBER CO. of Canada, Limited

***By-Products Department*** NEW TORONTO, ONTARIO

# Gears of Quality



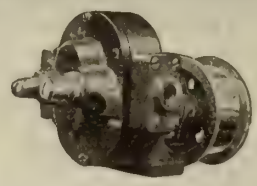



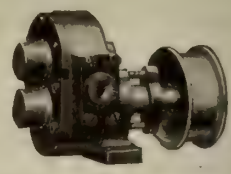
Internal Gears
with
Generated Teeth

Write Us

## Hamilton Gear & Machine Co.

Van Horne St. TORONTO





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TRAHERN
REG. U.S. PAT. OFF.

Circulating Pumps are suitable for use on Machine Tools of all kinds.

They are Rotary Geared. They deliver heavy streams of water, oil, or compound without pulsation; will reverse automatically with machines; operate against 100 lbs. pressure and supply copious streams of coolant. They run at low speed, minimizing upkeep and giving longer life to pumps. When properly installed they will not lose prime.

**Our Bulletin 44 explains in detail.**

*Canadian Representatives:*
**A. R. Williams Machinery Co., Toronto**

## TRAHERN PUMP DIVISION

*Geo. D. Roper Corporation*
**ROCKFORD, ILL., U. S. A.**

# Let them know it's there

In complimenting us upon the results secured from their advertisement in this section, one advertiser said:

> "Of course we would not have sold it without letting people know it was here, that is obvious, and thanks are due you for letting the people know it was for sale."

If you have any old or used equipment for sale, let people know it's there. Your message in Canadian Machinery will be placed before the probable buyers of such equipment.

## Canadian Machinery

*Classified Advertising Section*
**143 University Ave., TORONTO**

# "Built by Dodge"

Seven generators connected by Dodge Rope drives direct to the turbine shafts; this was the way "Dodge" solved the problem for one light and power company.

If you were to read a list of central stations using power harness "built by Dodge" you would see represented many of the most important ones in America.

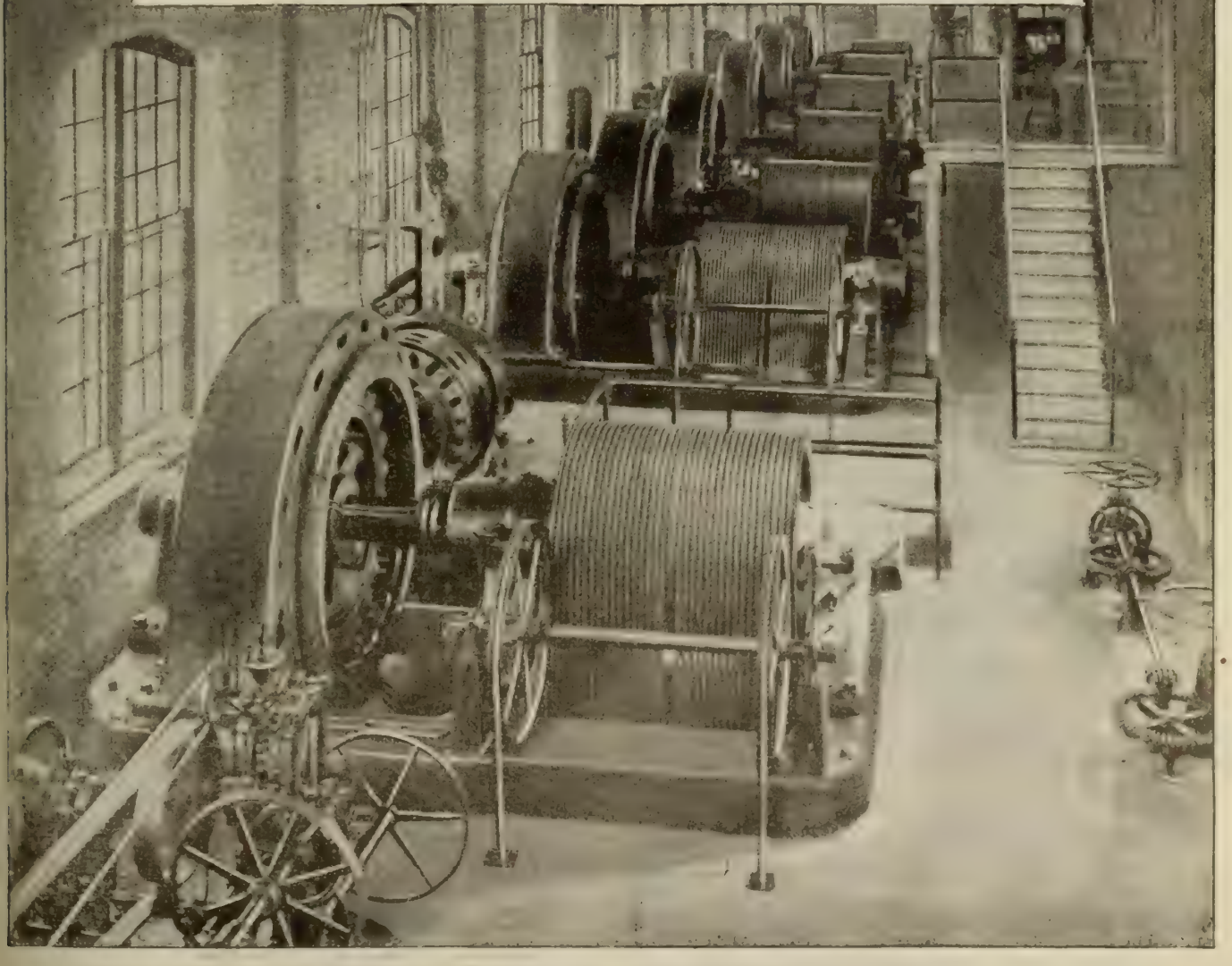
"Built by Dodge" has meant entire installations weighting millions of pounds and costing thousands of dollars; again that mark of superiority attaches itself to a single pulley, a clutch, a hanger, a bearing, a coupling or a collar; equal quality, equal value applying in either case. Everything for the mechanical transmission of power is "built by Dodge"; each product carrying the basic thought, conservation of energy.

Laying the roadbed for power with Dodge equipment immediately provides for the efficient and wasteless transporation of energy from where it is created to where it is needed.

When Dodge quality is known, it is usually specified by both buyer and seller of transmission equipment, because the owner of a Dodge installation is always ready to admit triple value for his money in quality of product, correctness of engineering suggestion and interchangeability of units from one use to another.

## Dodge Manufacturing Company of Canada, Ltd.

**Factory and Main Office: Toronto, Ont.** **Eastern Branch: Montreal, Que.**




*If interested tear out this page and place with letters to be answered.*

# HINTS TO BUYERS


## STEEL CASTINGS

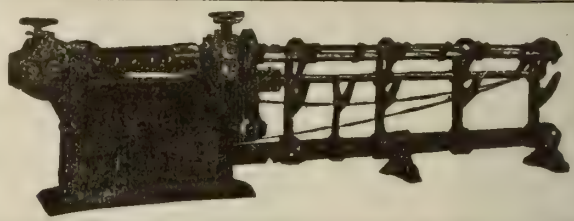
ELECTRIC Steel Castings of all kinds from 5 pounds to 5,000 pounds.

PROMPT DELIVERY

**Manitoba Steel Foundries, Ltd.**

1204 McArthur Building

Winnipeg - - - Manitoba



**THE WIRE IS PERFECTLY STRAIGHT**

and cut to accurate lengths when it comes from our AUTOMATIC WIRE STRAIGHTENING AND CUTTING MACHINE, whether it's ¾" diameter or only .020" wire, hard or soft wire, highly polished or rough stock.

May we send you catalogue C?

**The F. B. SHUSTER COMPANY, New Haven, Conn.**

Formerly John Adt & Son. Established 1866.

Also makers of Riveting Machines, Sprue Cutters, Cotter Pin Machines, etc.

## Taylor-Newbold Milling Cutters




Will outlive and out-cut any other on the market

4-in. Diameter for General Use.

Send for Bulletin R-P and 30-day trial offer.

**THE TABOR MANUFACTURING COMPANY**

PHILADELPHIA, PA., U.S.A.



## Dies, Jigs and Fixtures also Tools of All Kinds

*Designed or Made to Your Blueprints Promptly.*

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172-174 St. Joseph Street, Lachine, Quebec.

Telephones: Lachine 530 — Melrose 1066

Branch Work: IBERVILLE, QUE.

## The Hughes Owens Co. Ltd.

MONTREAL TORONTO OTTAWA WINNIPEG

*Manufacturers*

Blue and Black Print Papers

Drawing Office Supplies for Students, Architects and Engineers.

## Mechanical Engineering Company

Limited

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*Builders of "MECOL" Industrial Furnaces for use with oil, gas or coal fuel*

Executive Offices
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Montreal

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**VICTORIA** Special Machinery

DESIGNS PATTERNS

CASTINGS FORGINGS

*Send for Catalogue*

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ENGINEERS PLANNING POWER TRANSMISSIONS

Secure Data and Estimates of "MORSE" DRIVES

SAVE Construction, Space, Light, Fuel. Producing More with Less.

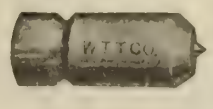
**MORSE CHAIN CO., - ITHACA, N.Y.**

Engineering Service, Assistance, Bulletins

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# WHEEL TRUEING TOOL CO.
DETROIT
MANUFACTURERS OF

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Goods Submitted on Memorandum if Desired
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5 James Street, ST. CATHARINES, ONTARIO




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88 West Pitt Street, WINDSOR, ONTARIO

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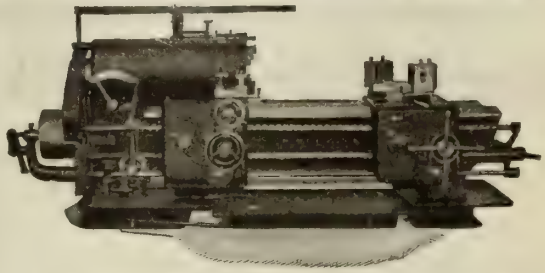
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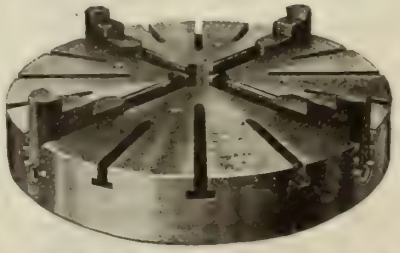
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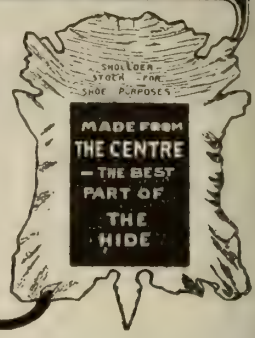
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Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Ferro-Alloy**
Can. Steel Foundries, Montreal, Que.

**Castings, Iron**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Electric Steel & Engineering Co., Welland, Ont.
Fleck Ltd., Alexander, Ottawa, Ont.
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Hyd. Press**
Can. Steel Foundries, Montreal, Que.

**Castings, Monel Metal**
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

**Castings, Naval Bronze**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Nichrome**
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Nickel**
Can. Hanson & Van Winkle Co., Toronto, Ont.

**Castings, Semi-Steel**
Davidson Mfg. Co., Thos., Montreal, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

**Castings, Steel**
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

**Cements, Iron**
Smooth Mfg. Co., Jersey City, N.J.

**Centering Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Chains (See Sprockets and Chains)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chains, Driving**
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chasers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chemists**
Toronto Testing Laboratory, Toronto, Ont.

**Chucking Machines**
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Stemle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Chucks, Drill**
Jacobs Mfg. Co., Hartford, Conn.

**Chucks, Drill and Tap**
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Goodell & Pratt Co., Greenfield, Mass.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Lathe**
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Magnetic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**
Columbia Hdwe. Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill
Starrett Co., L. S., Athol, Mass.

**Cleaners, Metal, Waste, General**
Oakley Chemical Co., New York, N.Y.

**Clocks, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont

**Clutches, Friction**
Bernard Industrial Co., A., Fortierville, Que
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**
Can. Link-Belt Co., Toronto, Ont.

**Collars, Shaft or Set**
Canada Foundries & Forgings Co., Welland, Ont
Can. Link-Belt Co., Toronto, Ont.

**Collets**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compressors, Air**
Curtis Pneumatic Machinery Co., St. Louis, Mo.

**Compressors, Air and Gas**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**
Ford-Smith Machine Co., Hamilton, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Copper**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Cored Bronze Bars**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Cotter Pins**
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Counterbores**
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Countershafts**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Couplers, Car and Locomotive**
Can. Steel Foundries, Montreal, Que.

**Couplings, Flexible**
Holden Co., Ltd., Montreal, Que.

**Couplings, Rigid**
Bernard Industrial Co., A., Fortierville, Que

**Couplings, Shaft**
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

**Cranes, Electric**
Bertram & Son Co., Ltd., The John, Dundas, Ont
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Cranes, Hand (See Hoists, Hand)**
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

**Cranes, Locomotive**
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Cranes, Traveling**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Crank Pin Turning Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia, Pa.

**Cutters, Flue**
Holden Co., Ltd., Montreal, Que.

**Cutters, Gear**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**
Atkins & Co., Inc., E. C., Indianapolis, I.
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Milling**
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Milling Machine Co., Cleveland.
Elliott & Whitehall Tool Co., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Cutters, Stay Bolt**
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Thread**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa

**Cutting-Off Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Cutting-Off Machines, Pipe (See Pipe Cutting and Threading Machines)**
Landis Machine Co., Inc., Waynesboro, Pa.
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Cutting-Off Tools**
Armstrong Bros. Tool Co., Chicago, Ill
Pilot Steel & Tool Co., Montreal, Que

**Cutting Oil Filters (See Oil Filtering Systems)**
Bowser & Co., Inc., S. F., Fort Wayne, I.
Cataract Refining Co., Toronto, Ont.

**Cutting, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

**Dealers, Machinery (See Searchlight Section)**
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Deckle Straps**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Diamonds, Black and Rough**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond, Carbon and Bortz**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Desmond-Stephan Co., Hamilton, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Wheel Trueing Tool Co., Detroit, Mich.

**Diamond Crossings**
Can. Steel Foundries, Montreal, Que.

**Die-Castings**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Die Sinking Machines, Automatic**
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

**Die Sinkers**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Screw and Thread Cutting**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

**Dies, Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

**Dies, Hammer**
Kimber & Hillier, St. Catharines, Ont.

# BUYERS' DIRECTORY

**Dies, Self-Opening, Adjustable**
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Dies, Threading-Opening**
Curtiine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Disc Cement**
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Dividing Heads**
Ackworthie, Ltd., John, Birmingham, Eng.
Dickow, Fred. C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Dogs, Lathe and Milling Machine**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drafting Boards and Tables**
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Drafting Materials**
American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Dressers, Grinding Wheel**
Carborundum Co., Niagara Falls, N.Y.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Drill Holders**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drill Rods**
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Drill Speeders**
Canada Machinery Corp., Galt, Ont.

**Drilling Machine Heads**
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

**Drilling Machines, Automatic**
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

**Drilling Machines, Bench**
Beacon Engineering Co., Tipton, England.
Can. Blower & Forge Co., Ltd., Kitchener.
Goodell & Pratt Co., Greenfield, Mass.
Henry & Wright Mfg. Co., Hartford, Conn.
High Speed Hammer Co., Rochester, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Electric and Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Fox Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Gang**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drilling Machines, Heavy Duty**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Multiple Spindle**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

**Drilling Machines, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Drilling Machines, Portable**
Haskins Co., R. G., Chicago, Ill.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Radial**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Toomey Inc., Frank, Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Drilling Machines, Sensitive**
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
High Speed Hammer Co., Rochester, N.Y.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Turret**
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

**Drilling Machines, Vertical**
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Drills, Center**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Drills, High Speed Twist**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co., Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.
Taylor Tool Co., J. A. M., Toronto, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Drills, Twist and Flat**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Dust Handling Equipment**
Can. Blower & Forge Co., Ltd., Kitchener.
Sturtevant Co., B. F., Boston, Mass.

**Electrical Instruments**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Electrical Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O.

**Elevating Trucks (See Trucks)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Elevators and Conveyors**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Emery Cloth**
Wausau Abrasives Co., Chicago, Ill.

**Emery Wheels (See Grinding Wheels)**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Carborundum Co., Niagara Falls, N.Y.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
International Machinery & Supply Co., Montreal, Que.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Engines, Capstan**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Engineers, Mechanical**
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.

**Expanders, Tube**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Eyeglasses, Safety (See Goggles, Safety)**
Prest-O-Lite Co. of Can., Toronto, Ont.
Willson Goggles, Inc., Reading, Pa.

**Fans, Electric**
Can. Blower & Forge Co., Ltd., Kitchener.
Northern Electric Co., Montreal, Que.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Exhaust**
Can. Blower & Forge Co., Ltd., Kitchener.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Ventilating**
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Fibre**
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**File Handles**
Ingersoll File Co., Ltd., Ingersoll, Ont.

**Files and Rasps**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Filing Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Filler, Iron (See Cements, Iron)**
Smooth Mfg. Co., Jersey City, N.J.

**Fire Extinguishers**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Fittings, Pipe**
International Malleable Iron Co., Guelph, Ont.

**Flexible Shafts**
Aikenhead Hardware Ltd., Toronto, Ont.
Haskins Co., R. G., Chicago, Ill.

**Flux, Galvanizing**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Fluxes, Welding**
L'Air Liquide Society, Toronto, Ont.

**Forging Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.

**Forgings, Drop**
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd., Toronto, Ont.

**Forgings, Hammer**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.

**Foundry Equipment**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Foundry Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Frogs, Spring or Rigid**
Can. Steel Foundries, Montreal, Que.

**Fuel Oil Burning System**
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Heat Treating Coal**
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Oil and Gas**
Bellevue Industrial Furnace Co., Detroit
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces and Ovens, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces, Tempering and Annealing**
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furniture, Machine Shop**
Garlock-Walker Mchy. Co., Toronto, Ont.
Ministry of Munitions, London, Eng.
National Engineering Co., Sarnia, Ont.

**Gages, Dial**
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont.
Perdue, W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass.

**Gages, Measuring (See Tool Work)**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Gages, Recording**
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.

# BUYERS' DIRECTORY

**Gages, Snap, Thread and Cylindrical**
Ackworthie, Ltd., John, Birmingham, Eng
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Standard**
Armstrong Whitworth Co. of Can., Lt Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis, I.
Elliott & Whitehall Tool Co., Galt, Ont
Johansson Inc., C. E., Windsor, Ont.

**Gages, Thread**
Ackworthie, Ltd., John, Birmingham, Eng
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Garnet, Emery and Flint Paper and Cloth**
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Gas, Coal Compressed**
L'Air Liquide Society, Toronto, Ont.

**Gas, Compressed**
Prest-O-Lite Co. of Can., Toronto, Ont.

**Gaskets**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

**Gear Blanks**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear-Cutting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

**Gear Testing Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Gears, Cast**
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

**Gears, Cut**
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Gears, Dressed**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Gears, Forged**
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Gears, Herringbone**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

**Gears, Machine Moulded**
Can. Steel Foundries, Montreal, Que.

**Gears, Rawhide (See Gears, Cut)**
Philadelphia Gear Works, Philadelphia, Pa.

**Gear, Silent Chain**
Gardner & Son, Robt., Montreal, Que
Morse Chain Co., Ithaca, N.Y.

**Gears, Worm**
Dom. Steel Products Co., Brantford, Ont.

**Generators, Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Generators, Electric**
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal, Que
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Goggles, Safety**
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

**Grab Buckets**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Grease Cups, Pressed Steel and Brass**
Can. Winkley Co., Ltd., Windsor, Ont.

**Greases, Lubricating**
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

**Grinding Discs**
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Grinding Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Grinding Machines, Abrasive Belt**
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Automatic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Bench**
Aikenhead Hardware Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Goodell & Pratt Co., Greenfield, Mass.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co., Waltham, Mass.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Grinding Machines, Center**
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines Chaser**

**Grinding Machines, Cutter and Reamer**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Cylindrical**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Die**
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

**Grinding Machines, Disc**
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Drill**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Face**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Floor and Tool**
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.
Wilkinson & Kompass, Hamilton, Ont.

**Grinding Machines, Internal**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Manhattan Machine & Tool Works, Grand Rapids, Mich.

**Grinding Machines, Portable**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Carborundum Co., Niagara Falls, N.Y.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Haskins Co., R. G., Chicago, Ill.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wilkinson & Kompass, Hamilton, Ont.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Power Oscillating Tool**
Herbert Ltd., Alfred, Toronto, Ont.

**Grinding Machines, Ring Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Snagging**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Surface**
Garlock-Walker Mchy. Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machinery, Tool Post**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wilkinson & Kompass, Hamilton, Ont.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Universal**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Machine Co., Greenfield, Mass.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co., Waltham, Mass.

**Grinding Wheels**
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I.
Carborundum Co., Niagara Falls, N.Y.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
International Machinery & Supply Co., Montreal, Que.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Guards, Machinery and Window**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Gun-Barrel Machinery**
Steinle Turret Machine Co., Madison, Wis.

**Hack Saws, Power**
Ackworthie, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Garlock-Walker Mchy. Co., Toronto, Ont.
Goodell & Pratt Co., Greenfield, Mass.
Lyman Tube & Supply Co., Montreal, Que.
McKenzie Machinery Co., Guelph, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hammers, Chipping**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hammers, Drop**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

**Hammers, Electric**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Hammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Ryerson & Son, Jos. T., Chicago, Ill.

**Hammers, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bradley & Son, Inc., C. C., Syracuse, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
High Speed Hammer Co., Rochester, N.Y.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.

**Hammers, Riveting**
Cleveland Pneumatic Tool Co., Toronto Ont.
Ryerson & Son, Jos. T., Chicago, Ill.

**Hangers, Shafting**
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F. Montreal, Que.
Terry & Co., John C., Birmingham, Eng
Williams Machinery & Supply Co., A. R. Montreal, Que.

**Hardening, Case-Hardening and Tempering**
Hamilton Gear & Machine Co., Toronto Ont.

**Hardness Testing Apparatus**
Shore Instrument Co., Jamaica, N.Y.

**Hobbing Machines**
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hobs**
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.

**Hoists, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Morris Crane & Hoist Co., Ltd., Niagar Falls, Ont.
Northern Crane Works, Walkerville, Ont
Volta Mfg. Co., Welland, Ont.

**Hoists, Hand**
Lyman Tube & Supply Co., Montreal, Que
Morris Crane & Hoist Co., Ltd., Niagar Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Hoists, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill
Morris Crane & Hoist Co., Ltd., Niagar Falls, Ont.
Northern Crane Works, Walkerville, Ont

**Holders-On, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Cleveland Pneumatic Tool Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill

**Hose, All Kinds**
Quaker City Rubber Co., Philadelphia, Pa

**Hose, Flexible**
Gutta Percha & Rubber, Toronto, Ont.

**Hose, Industrial**
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Hose, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Foamite Firefoam Co., Hamilton, Ont.

**Hose, Steam, Suction, Water**
Quaker City Rubber Co., Philadelphia, Pa.

**Hose, Steel**
International Machinery & Supply Co., Montreal, Que.

**Hydraulic Leather**
Graton & Knight Mfg. Co., Worcester, Mass.

**Hydraulic Machinery**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.

**Index Centers**
Dickow, Fred. C., Machinery Co., Chicago, Ill.

**Igniters, Gas Engine**
Canada Foundries & Forgings Co., Welland, Ont.

**Indicators, Speed and Test**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.

**Insultion**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Jacks, Hydraulic**
International Machinery & Supply Co., Montreal, Que.
Norton, A. O., Boston, Mass.

**Jacks, Planer**
Armstrong Bros. Tool Co., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

**Jigs and Fixtures (See Tool Work)**
Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que.
Crescent Machine Co., Ltd., Montreal, Q.

# BUYERS' DIRECTORY

...Motor Co., Ltd., Orillia, Ont.
...Smith Machine Co., Hamilton, Ont.
...olt Machine Co., Madison, Wis.
...ilton Engineering Service, Ltd., ...milton, Ont.
...l Tool & Machine Co., Lachine, Que.

**...esting Machines**
...Machine Co., Bridgeport, Conn.
...& Whitehall Tool Co., Galt, Ont.
...Walker Mchy. Co., Toronto, Ont.
...Mfg. Co., Muskegon, Mich.
...Ltd., H. W., Toronto, Ont.
...& Whitney Co., of Canada, Ltd., ...ilton, Ont.
...Inc., Frank, Philadelphia, Pa.

**...s, Machine**
...Drawn Steel Co., Hamilton, Ont.
...Walker Mchy. Co., Toronto, Ont.
...Mfg. Co., Muskegon, Mich.

**...ves, Machine**
...s & Co., Inc., E. C., Indianapolis, I.
...a Machinery Corp., Galt, Ont.
...ds Canada Saw Co., Montreal, Que.

**...ari Holders**
...& Whitney Co., of Canada, Ltd., Dundas, Ont.

**...ing Leather**
...per Belt Lacer Co., Grand Rapids, ...ich.
...an Belting Co. of Can., Montreal, Que.

**...ps, Electric**
...eral Eng'r'ng Co., Ltd., Toronto, Ont.
...thern Electric Co., Montreal, Que.

**...he Attachments**
...ada Machinery Corp., Galt, Ont.
...ley Machine Co., Torrington, Conn.
...mann Machine Co., St. Louis, Mo.
...Ltd., H. W., Toronto, Ont.

**...he Pans, Portable**
...ada Machinery Corp., Galt, Ont.

**...he Tools**
...strong Bros. Tool Co., Chicago, Ill.
...Atlas Crucible Steel Co., Ltd., Toronto, Ont.
...holt Machine Co., Madison, Wis.
...ley Machine Co., Torrington, Conn.

**...thes, Automatic and Semi-Automatic**
...holt Machine Co., Madison, Wis.
...erbert Ltd., Alfred, Toronto, Ont.
...es & Lamson Machine Co., Springfield, Vt.
...Dougall Co., Ltd., R., Galt, Ont.
...nal Acme Co., Cleveland, Ohio.
...ole Turret Machine Co., Madison, Wis.

**...hes, Bench**
...ald & Co., Chas. P., Montreal, Q.
...& Whitney Co., of Canada, Ltd., ...ndas, Ont.

**...hes, Boring**
...am & Son Co., Ltd., The John, ...ndas, Ont.
...a Machinery Corp., Galt, Ont.
...e Turret Machine Co., Madison, Wis.

**...hes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)**
...Machine Tool Co., Cincinnati, Ohio.
...ram & Son Co., Ltd., The John, Dundas, Ont.
...ada Machinery Corp., Galt, Ont.
...er Machine Co., Madison, Wis.
...es & Lamson Machine Co., Springfield, Vt.
...Dougall Co., Ltd., R., Galt, Ont.
...Kenzie Machinery Co., Guelph, Ont.
...son & Son, Jos. T., Chicago, Ill.
...ole Turret Machine Co., Madison, Wis.
...ver & Swasey Co., Cleveland, Ohio.

**...hes, Engine**
...ald & Co., Chas. P., Montreal, Q.
...ram & Son Co., Ltd., The John, Dundas, Ont.
...ada Machinery Corp., Galt, Ont.
...e Machinery & Supply Co., Geo. F., Montreal, Que.
...-Walker Mchy. Co., Toronto, Ont.
...ge Bros., Inc., Chicago, Ill.
...ert Ltd., Alfred, Toronto, Ont.
...ley Machine Co., Torrington, Conn.
...R. S., Toronto, Ont.
...mann Machine Co., St. Louis, Mo.
...Dougall Co., Ltd., R., Galt, Ont.
...ery of Munitions, London, Eng.
...er Machinery Co., Grand Rapids, Mich.
...Ltd., H. W., Toronto, Ont.
...ford Lathe & Drill Co., Rockford, ...
...elefson Machine & Tool Co., Toronto, ...
...son & Son, Jos. T., Chicago, Ill.
...ner Machine Tool Co., Sidney, Ohio.
...nger Co. of Can., Ltd., Chas. A., ...dsor, Ont.
...olt Lathe Co., Jackson, Mich.
...iams Machinery & Supply Co., A. R., Montreal, Que.

**...hes, Extension and Gap**
...ram & Son Co., Ltd., The John, ...ndas, Ont.
...ada Machinery Corp., Galt, Ont.
...holt Machine Co., Madison, Wis.
...Dougall Co., Ltd., R., Galt, Ont.
...er Machinery Co., Grand Rapids, Mich.

**...hes, Heavy Duty Projectile Boring**
...ram & Son Co., Ltd., The John, Dundas, Ont.
...ashill Wire Machy Co., Ltd., Montreal.
Sidney Machine Tool Co., Sidney, Ohio
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio
Blount Co., J. J., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio

**Lathes, Polishing (See Polishing and Buffing Machines)**
Ford-Smith Machine Co., Hamilton, Ont.

**Lathes, Relieving**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Lathe, Universal Hand**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Lathe, Speed and Hand**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.

**Lathes, Spinning**
Terry & Co., John C., Birmingham, Eng.

**Lathes, Threading**
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

**Lathes, Vertical Turret**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

**Lathes, Wood Turning**
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Lighting Fixtures**
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

**Linoleum Mill Machinery**
Bertrams Ltd., Edinburgh, Scotland

**Liquid Air Plants**
L'Air Liquide Society, Toronto, Ont.

**Lockers, Clothes**
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

**Lubricants**
Cateract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Lubricating Systems**
Bowser & Co., Inc., S. F., Fort Wayne, I.

**Machinists' Small Tools**
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Goodell & Pratt Co., Greenfield, Mass.
Ker & Goodwin Machine Co., Brantford, Ont.
Ministry of Munitions, London, Eng.
National Machine Tool Co., Racine, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Ryerson & Son, Jos. T., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Mandrels, Expanding**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Mandrels, Solid**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Measuring Machines**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Metals, Alloy**
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Ministry of Munitions, London, Eng.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Metalite Cloth**
Ritchey Supply Co., Toronto, Ont.

**Micrometer Calipers**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Milling Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Milling Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Milling Machines, Automatic**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Bench**
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Hand**
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

**Milling Machines, Horizontal and Planer Type**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal Q.
Cleveland Milling Machine Co., Cleveland
Ford-Smith Machine Co., Hamilton, Ont
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Milling Machines, Plain**
Bilton Machine Co., Bridgeport, Conn
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
Toomey Inc., Frank, Philadelphia, Pa.

**Milling Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Milling Machines, Universal**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Mchy. Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill
Toomey Inc., Frank, Philadelphia, Pa
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Milling Machines, Vertical**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

**Monel Metal**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Motors, Electric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Garlock-Walker Mchy. Co., Toronto, Ont
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis

**Moulded Rubber Goods**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Nickel, Bars, Sheets, Wire, Etc.**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Nickel Plating Outfits**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Nickel Silver**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Nitrogen**
L'Air Liquide Society, Toronto, Ont.

**Nut Tappers (See Bolt and Nut Machinery)**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

**Nuts, Finished and Semi-finished**
Galt Machine Screw Co., Galt, Ont.

**Nuts, S.A.E., Plain and Castellated**
Galt Machine Screw Co., Galt, Ont.

**Oil Filtering and Storage Systems**
Bowser & Co., Inc., S. F., Fort Wayne, I.

**Oil Storage Engineers**
Bowser & Co., Inc., S. F., Fort Wayne, I.

**Oils**
Canadian Oil Companies, Ltd., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Hole Covers**
Can. Winkley Co., Ltd., Windsor, Ont.

**Oils, Soluble**
Cateract Refining Co., Toronto, Ont
Imperial Oil Ltd., Toronto, Ont.

**Oil Stones**
Carborundum Co., Niagara Falls, N.Y.

**Oxygen**
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont

**Oxy-Acetylene Apparatus**
L'Air Liquide Society, Toronto, Ont.

**Packing, Hydraulic**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.
Gutta Percha & Rubber, Toronto, Ont
International Machinery & Supply Co., Montreal, Que.

**Packing, Rod and Steam**
Quaker City Rubber Co., Philadelphia, Pa.

**Packing, Steam**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.
Gutta Percha & Rubber, Toronto, Ont.
International Machinery & Supply Co., Montreal, Que.

**Paper Mill Conveyors**
Bertrams Ltd., Edinburgh, Scotland.

**Patents**
Fetherstonhaugh & Co., Ottawa, Ont
Marion & Marion, Montreal, Que.

**Pans, Wet and Dry**
Frost Mfg. Co., Chicago, Ill.

**Pattern-Shop Machinery (See Woodworking Machinery)**
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Patterns, Wood and Metal**
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Wraggis Pattern Works, Galt, Ont

**Penstocks, Steel**
MacKinnon Steel Co., Sherbrooke, Que.

# BUYERS' DIRECTORY

**Phosphor Tin**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Photographic Duplicating Machines**
Commercial Camera Co., Providence, R.I.

**Pipe Bending Machines**
American Pipe Bending Machine Co., Boston, Mass
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

**Pipe Cutting and Threading Machines**
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**
Landis Machine Co., Inc., Waynesboro, Pa.

**Pipe Fitters' Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa.

**Piston-Ring Machines**
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Planers, Parallels**
L. & P. Mfg. Co., Niagara Falls, Ont.

**Planing Machines**
Bertram & Son Co., Ltd., The John Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Toomey Inc., Frank, Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

**Planing Machines, Rotary**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Pneumatic Tools**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
International Machinery & Supply Co., Montreal, Que.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Pressed Steel Parts**
Ackworthie, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Presses, Drop and Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Foot and Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

**Presses, Forcing**
Atlas Press Co., Kalamazoo, Mich.
Niagara Machine & Tool Works, Buffalo, N.Y.
Stewart & Co., Duncan, Glasgow, Scot.

**Presses, Hydraulic**
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Niagara Machine & Tool Works, Buffalo, N.Y.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

**Presses, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Protractors**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Propellers**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Pulleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal and Fibre**
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Pulp and Paper Mill Equipment**
MacKinnon Steel Co., Sherbrooke, Que.

**Pumps, Automobile Tire**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Pumps, Barrel and Boiler-feed**
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coalant**
Trahern Pump Co., Rockford, Ill.

**Pumps, Geared and Hand**
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

**Pumps, Lubricant and Oil**
Bowser & Co., Inc., S. F., Fort Wayne, I.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**
Bowser & Co., Inc., S. F., Fort Wayne, I.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Jardine & Co., A. B., Hespeler, Ont.

**Punches, Power**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Toledo Machine & Tool Co., Toledo, Ohio

**Punching Machines, Horizontal**
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Racks, Cut**
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**
Holden Co., Ltd., Montreal, Que.

**Reamer Holders**
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

**Reamers, Expanding**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Reamers, Solid**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co., Montreal, Que.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Reamers, Taper**
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Taylor Tool Co., J. A. M., Toronto, Ont
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Recorders, Temperature**
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Recorders, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Rheostats**
Northern Electric Co., Montreal, Que.

**Resistance Materials**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Respirators**
Willson Goggles, Inc., Reading, Pa.

**Rivets**
Parmenter & Bulloch Co., Gananoque, Ont.

**Rivet Heaters**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.
Ryerson & Son, Jos. T., Chicago, Ill.

**Riveting Machines**
Bilton Machine Co., Bridgeport, Conn.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**
Stewart & Co., Duncan, Glasgow, Scot.

**Rolls (Rubber Covered)**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rudder Frames, Steel**
Can. Steel Foundries, Montreal, Que.

**Rubber Goods, Mechanical**
Quaker City Rubber Co., Philadelphia, Pa.

**Rules, Steel**
Chesterman & Co., Ltd., J., Sheffield, Eng.

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Rust Preventatives**
Oakley Chemical Co., New York, N.Y.

**Sand Paper**
Wausau Abrasives Co., Chicago, Ill.

**Sand Equipment**
Can. Link-Belt Co., Toronto, Ont

**Sand Mills**
Frost Mfg. Co., Chicago, Ill.

**Sand Rammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Cleveland Pneumatic Tool Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill
Keller Pneumatic Tool Co., Grand Haven Mich.

**Saw Frames and Blades, Hack**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont
Simonds Canada Saw Co., Montreal, Que

**Sawing Machines, Metal**
Atkins & Co., Inc., E. C., Indianapolis, I
Foss Machinery & Supply Co., Geo. F Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que
Ryerson & Son, Jos. T., Chicago, Ill.

**Sawing Machines, Power Hack**
Ackworthie, Ltd., John, Birmingham, Eng
Atkins & Co., Inc., E. C., Indianapolis, I
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Saw Sharpening Machines**
Atkins & Co., Inc., E. C., Indianapolis, I
Oliver Machinery Co., Grand Rapids, Mich

**Saw Tables, Universal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
McKenzie Machinery Co., Guelph, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que

**Saws, Hot and Cold**
Atkins & Co., Inc., E. C., Indianapolis, I
Simonds Canada Saw Co., Montreal, Que
Stewart & Co., Duncan, Glasgow, Scot

**Saws, High Speed Steel**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Metal Band**
Atkins & Co., Inc., E. C., Indianapolis, I
Oliver Machinery Co., Grand Rapids, Mich.

**Saws, Metal, Power**
Clemson Bros., Inc., Hamilton, Ont.

**Saws, Metal Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I
Butterfield & Co., Inc., Rock Island, Que
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

**Saws, Milling**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Saws, Screw Slotting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Swing Cut-off**
Oliver Machinery Co., Grand Rapids, Mich.

**Scales**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal, Q.

**Screens**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Screw Driving Machine**
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Screw Extractors**
Cleveland Twist Drill Co., Cleveland, O.

# BUYERS' DIRECTORY

**Screw Machine Work**
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
Tallman Brass & Metal Co., Hamilton Ont.

**Screw Machinery, Wood and Lag**
Cook Co., Asa S., Hartford, Conn.

**Screw Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Screw Machines, Automatic**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

**Screw Machines, Plain or Hand**
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio.

**Screw Plates**
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

**Screws, Cap and Set**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Screws, Machine**
Barnes Co., Wallace, Bristol, Conn.

**Screws, Safety Set**
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Second-Hand Machinery**
**( See Searchlight Section)**
Petrie Ltd., H. W., Toronto, Ont.

**Separators, Moisture and Oil**
Bowser & Co., Inc., S. F., Fort Wayne, I.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Separators, Oil and Waste**
Bowser & Co., Inc., S. F., Fort Wayne, I.

**Shafting**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Shapes, Cold-Drawn Special Steel**
Union Drawn Steel Co., Hamilton, Ont.

**Shaping Machines**
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Mackenzie Machinery Co., Guelph, Ont.
Rodelfson Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Toomey Inc., Frank, Philadelphia, Pa.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Shapers, Wood**
Oliver Machinery Co., Grand Rapids, Mich.

**Shears, Hand**
Can. Blower & Forge Co., Ltd., Kitchener.

**Shears, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Steel Co., Inc., D. H., Buffalo, N.Y.
[illegible] & Co., Duncan, Glasgow, Scot.
Toledo Machine & Tool Co., Toledo, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.

**Shearing Machines, Angle, Iron Bar and Gate**
[illegible] Ltd., Edinburgh, Scotland.

**Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Steel Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio.

**Sheets, Nickel, Resist, Alloy**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Sheets, Nickel, Monel and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Side Frames, Locomotive**
[illegible] Montreal, Que.

**Slotting Attachments**
[illegible] Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kennedy Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio

**Slotting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

**Solders**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Special Machinery and Tools**
Brown Engineering Corp., Ltd., Toronto.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Spectacles, Industrial**
Willson Goggles, Inc., Reading, Pa.

**Springs**
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

**Sprockets and Chains**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Squares**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Stamping, Metal**
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Elliott & Whitehall Tool Co., Galt, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Stamps, Steel**
Diamond Saw & Stamping Works, Buffalo, N.Y.

**Stairways, Wrought Iron**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Steam Specialties**
Crane Ltd., Montreal, Que.

**Steel Plate**
Dom. Foundries & Steel, Hamilton, Ont.

**Steels, Tool**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel, Cold-Rolled Strip**
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.

**Steel Castings**
Dom. Foundries & Steel, Hamilton, Ont.

**Steel Forgings**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Steel, Shafting and Free Cutting Screw**
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

**Steel, Sheet**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Illingsworth Steel Co., John, New York City, N.Y.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

**Steel, Tanks**
Can. John Wood Mfg. Co., Toronto, Ont.

**Steel, Stainless**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steels, Alloy, Open Hearth and Electric**
United Alloy Steel Corp., Canton, Ohio

**Steels, Alloy and Carbon**
Algoma Steel Corp., Ltd., Sault Ste Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Illingsworth Steel Co., John, New York City, N.Y.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steels, High-Speed**
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Illingsworth Steel Co., John, New York City, N.Y.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel, Magnet**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel, Structural**
MacKinnon Steel Co., Sherbrooke, Que.

**Steel Tubing, Close Joint and Welded,**
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

**Stern Frames, Cast Steel**
Can. Steel Foundries, Montreal, Que.

**Stools, Shop**
Ministry of Munitions, London, Eng.

**Straightening Machinery**
Bertrams Ltd., Edinburgh, Scotland.
Ryerson & Son, Jos. T., Chicago, Ill.

**Studs**
Galt Machine Screw Co., Galt, Ont.

**Surface Plates**
Bilton Machine Co., Bridgeport, Conn.

**Swaging Machines**
Atkins & Co., Inc., E. C., Indianapolis, I.

**Switches, Railway**
Can. Steel Foundries, Montreal, Que.

**Switches and Switchboards**
Northern Electric Co., Montreal, Que.

**Tablets, Bronze, Memorial**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Tachometers**
Aikenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

**Tanks, Steel**
MacKinnon Steel Co., Sherbrooke, Que.
Can. John Wood Mfg. Co., Ltd., Toronto, Ont.

**Tanks and Pumps, Oil**
Bowser & Co., Inc., S. F., Fort Wayne, I.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

**Tap Holders**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taper Pins**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Tapes, Measuring**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass.

**Tapping Machines and Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Taps and Dies**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
International Machinery & Supply Co., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Taylor Tool Co., J. A. M., Toronto, Ont.

**Taps, Collapsing**
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Teeth, Dredge Bucket**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Testing Metals and Materials**
Toronto Testing Laboratory, Toronto, Ont.

**Thermometers**
Bristol Co., Waterbury, Conn.

**Thread-Cutting Tools**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Thread Cutting Machines**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa.

**Threading Machines**
Acme Machinery Co., Cleveland, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Thread Lead Testing Machines**
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Thread-Rolling Machines**
Bliss Co., E. W., Brooklyn, N.Y.

**Tongs**
Hepburn Ltd., John T., Toronto, Ont.

**Tool Cases**
Rice Lewis & Son, Ltd., Toronto, Ont.

**Tool Holders**
Armstrong Bros. Tool Co., Chicago, Ill.
Bilton Machine Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Markers, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Tool Posts, Lathe**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Steels for all Purposes**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Tools, Small (See Machinists' Small Tools)**
Armstrong Bros. Tool Co., Chicago, Ill.
Bertrams Ltd., Edinburgh, Scotland.
Burgess & Marchand, Montreal, Que.
Chesterman & Co., Ltd., J., Sheffield, Eng.
Elliott & Whitehall Tool Co., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Hamilton [illegible]eering Service, Ltd., Hamilton, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.
Ministry of Munitions, London, Eng.
National Machine Tool Co., Racine, Wis.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
**Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.**
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Tool Work**
Brown Engineering Corp., Ltd., Toronto.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.

**Torches, Blow**
Can. Hancel Burner Co., Port Hope, Ont.
International Machinery & Supply Co., Montreal, Que.
Perfex W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Trackwork, Railway**
Can. Steel Foundries, Montreal, Que.

**Trackwork, Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Transformers**
Northern Electric Co., Montreal, Que.

**Transmission Machinery**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Toronto, Ont.
Renold (Hans) of Canada, Ltd., Montreal, Que.

# BUYERS' DIRECTORY

**Transportation Systems (See Trucks)**
Mathews Gravity Carrier Co., Port Hope, Ont

**Treated Bits**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa

**Trolleys and Tramways**
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Trucks**
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cowan Truck Co. (R. B. Smiley), Toronto, Ont.
Diamond State Fibre Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Maple Leaf Mfg. Co., Montreal, Que.
Ministry of Munitions, London, Eng.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Trucks, Industrial Motor**
Maple Leaf Mfg. Co., Montreal, Que.
Ministry of Munitions, London, Eng.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Tube, Products**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Electric Welded or Oxy-Acetylene Welded**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Flexible**
Dunlop Tire & Rubber Goods Co., Ltd Toronto, Ont.
Goodyear Tire & Rubber Co of Can., Ltd., Toronto, Ont.

**Tubing, Seamless Steel**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Seamless Steel, Brass and Copper and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Steel Products Co., Brantford, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

**Tubing, Welded**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Tubing, Welded Steel**
Tube Co. of Canada, Toronto, Ont.

**Turbines, Water**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Turret Heads**
Ackworthe, Ltd., John, Birmingham, Eng.
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Turret Machines (See Lathes, Horizontal Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Cook Co., Asa S., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Stemle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Turrets, Tool Post**
Gisholt Machine Co., Madison, Wis.

**Unions, Pipe**
Crane Ltd., Montreal, Que.

**Universal Joints**
Ford-Smith Machine Co., Hamilton, Ont
Holden Co., Ltd., Montreal, Que.

**Valves**
Can. Fairbanks-Morse Ltd., Montreal, Q
Cleveland Pneumatic Tool Co., Toronto, Ont.
Crane Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.

**Valves, Rubber Pump**
Quaker City Rubber Co., Philadelphia, Pa.

**Vises, Drilling Machine**
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.

**Vises, Metal Workers'**
Aikenhead Hardware, Ltd., Toronto, Ont.
Columbia Hdwe. Division, Cleveland, O.

**Vises, Milling Machine**
Brown & Sharpe Mfg. Co., Providence, R.I.
Crescent Machine Co., Ltd., Montreal, Q
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn
Hoosier Drilling Mach. Co., Goshen, Ind
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.

**Vises, Pipe**
Columbia Hdwe. Division, Cleveland, O.
Greenfield Tap & Die Corp., Galt, Ont.

**Vises, Planer and Shaper**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Superior Machine Co., London, Ont.

**Vises, Wood Workers'**
Columbia Hdwe. Division, Cleveland, O
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Victor Tool Co., Waynesboro, Pa.
Parmenter & Bulloch Co., Gananoque, Ont.

**Washers, Rubber**
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que.

**Welding Apparatus, Oxy-Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Welding, Electric**
Carter Welding Co., Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont

**Voltmeters**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Wagon Loaders**
Can. Link-Belt Co., Toronto, Ont.

**Washers**
Barnes Co., Wallace, Bristol, Conn.
Diamond State Fibre Co., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

**Welding Filler Rods**
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

**Welding Machines, Oxy-Acetylene**
Davis Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif
Prest-O-Lite Co. of Can., Toronto, Ont.

**Welding, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J
Holden Co., Ltd., Montreal, Que.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

**Welding Rod, Tobin, Manganese Bronze and Aluminum**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Welding Supplies**
British Smelting & Refining Co., Ltd., Montreal, Que.
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Perdue, W. B., San Francisco, Calif
Prest-O-Lite Co. of Canada, Ltd., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, O

**Wheels, Industrial**
American Pulley Co., Philadelphia, Pa
Hull Iron & Steel Foundries, Hull, Q
Kennedy & Sons, Wm., Owen Sound, O

**Winches, Electric**
Volta Mfg Co., Welland, Ont

**Winches, Headgate**
Kennedy & Sons, Wm., Owen Sound, O

**Winches, Stoplog**
Kennedy & Sons, Wm., Owen Sound, O

**Wire**
Barnes Co., Wallace, Bristol, Conn.
Canada Metal Co., Ltd., Toronto, Ont
Dennis Wire & Iron Works, London, O
Greening Wire Co., B., Hamilton, Ont
Northern Electric Co., Montreal, Que

**Wire Cloth**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Wire Rope**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Wire Straightening and Cutting Machinery**
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, O
Schuster Co., F. B., New Haven, Con

**Wire, Welding**
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Tallman Brass & Metal Co., Hamilton, Ont.

**Wires, Special**
Dennis Wire & Iron Works, London, O
Greening Wire Co., B., Hamilton, Ont
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Woodworking Machinery**
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, O
Oliver Machinery Co., Grand Rapids, Mi
Williams Machinery Co., A. R., Toron Ont.

**Wrenches, Drop Forged**
Armstrong Bros. Tool Co., Chicago.
Canada Foundries & Forgings Co., Welland, Ont.

**Wrenches, Machinists'**
Armstrong Bros. Tool Co., Chicago.
Canada Foundries & Forgings Co., Welland, Ont.

**Wrenches, Pipe**
Canada Foundries & Forgings Co., Welland, Ont.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont

**Wrenches, Tap**
Butterfield & Co., Inc., Rock Island, Q
Greenfield Tap & Die Corp., Galt, Ont


# Would You Like to make some Extra Money?

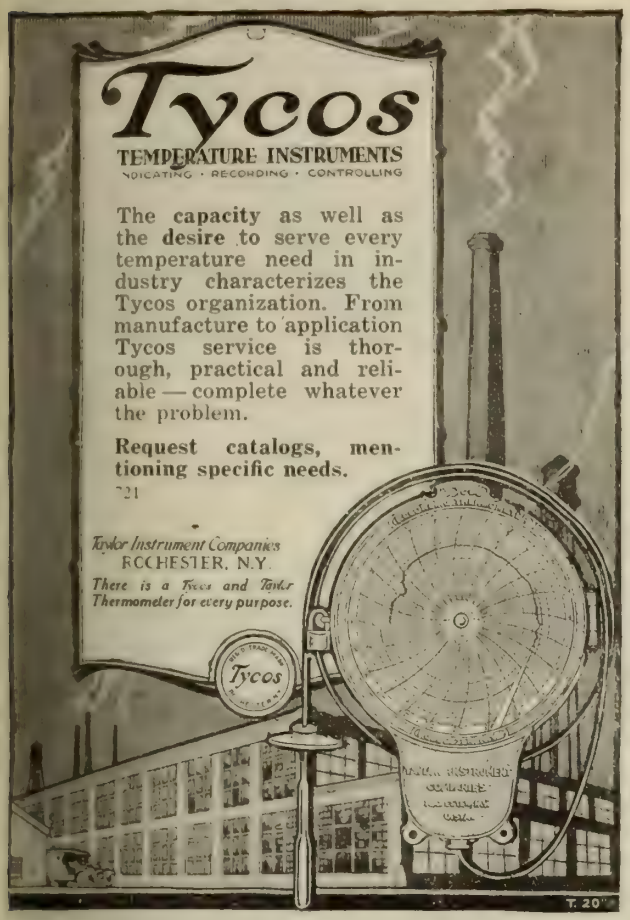
Of course you would. Well then, why not do so? Canadian Machinery is always on the lookout for well-worth-while ideas, and are willing to pay a good price for them.

We are often asked, "What sort of ideas do you want?" Briefly, what we are desirous of obtaining is this, "Any idea that has proved of value in the machine shop, drafting room, or tool room." Think of how you got over some difficulty, a ticklish piece to hold in the lathe, or perhaps how you increased production on some particular piece. Any idea that saves time or money in the machine industry will appeal to us. Never mind the style. Write it as best you know how. We will put the finishing touches to both the wording and the sketch. Start in **NOW** and send us something of such a nature.

*Address it to*

**The Editor, Canadian Machinery**

**143 University Ave., Toronto, Can.**








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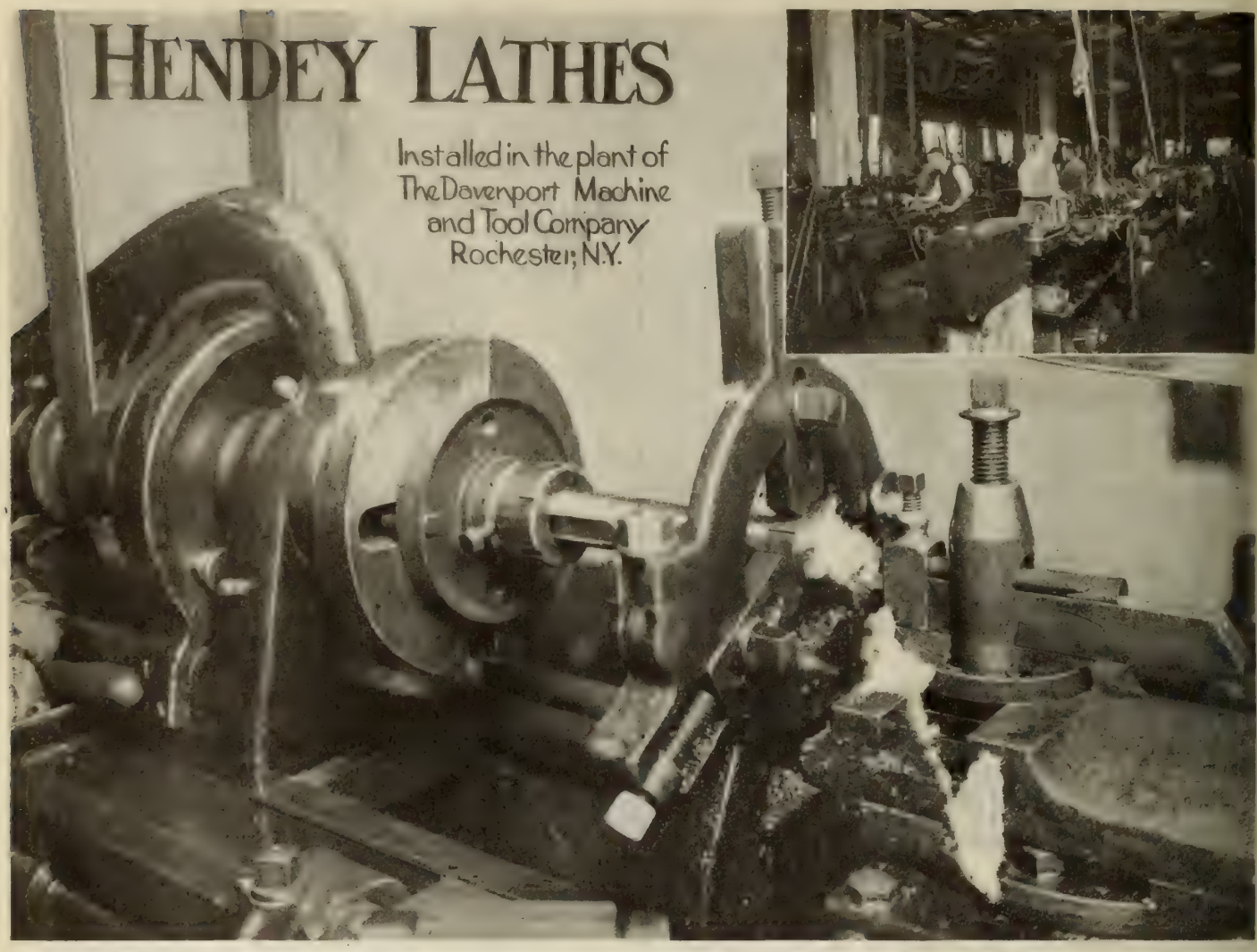
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# HENDEY LATHES

Installed in the plant of The Davenport Machine and Tool Company Rochester, N.Y.





# An Accurate Production Job

A PRODUCTION job requiring great accuracy is a **real** test for a lathe. Here is one which proves the merit of the Hendey.

It is a small plate face job—machining a Davenport inner spindle into which the chuck is screwed. The operations consist of recessing, threading, turning and boring. Nine hours only are allowed for twenty-five fully finished pieces.

Several years ago the Davenport Machine Tool Co. of Rochester, N.Y., purchased two Hendey Lathes for this work. Such satisfactory service did these machines give, that, when two additional lathes were required, Hendeys were chosen. Their tool room, showing the four Hendeys, is illustrated above.

**THE HENDEY MACHINE COMPANY**

**TORRINGTON, CONN.**

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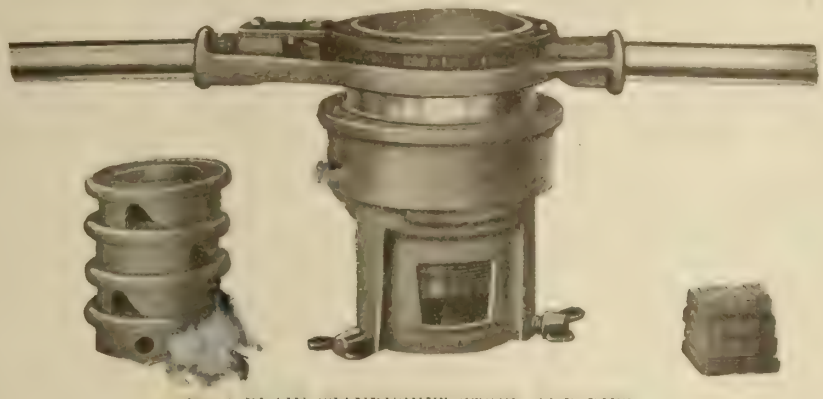
A. R. Williams Machinery Co., Vancouver
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A. R. Williams Machinery Co., 260 Princess St., Winnipeg.
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# HENDEY

*If interested tear out this page and place with letters to be answered.*

# "SANDUSKY" STOCKS AND DIES

*THE BEST PIPE THREADING TOOL*



No. 1 PLAIN "SANDUSKY" STOCK AND DIES.
Threads 1", 1¼", 1½" and 2" Pipe.

The "SANDUSKY" Stock and Die is made only of the very best materials. Dies and Cone Rings are made of superior steel, and other vital parts of a high grade malleable iron. It is the best and simplest pipe threading device made.

It has the exclusive advantage of the "Automatic Throw-out of the Die," "Taper Cone Ring," and the "Guided and Supported Leader Screw," three features patented by us and which can only be found in the "SANDUSKY" Shells and Dies.

You will note from illustrations that the "SANDUSKY" Stocks and Dies have very many less parts than others, and are unqualified, and most durable pipe threading tools of any type.

These tools are all finished in green enamel, insuring an attractive and durable finish, another exclusive feature.

They are packed each complete with dies, one in a box.

Note: All stocks furnished with either Whitworth or U.S. Standard dies. Please specify kind of thread required on order.



"SANDUSKY"
No. 1A RATCHET STOCK AND DIES
Threads 1", 1¼", 1½" and 2" Pipe.



"SANDUSKY"
No. 2 GEARED STOCK AND DIES
Threads 2½", 3", 3½" and 4" Pipe.



"SANDUSKY"
No 0 STOCK AND DIES
Threads ⅛", ½" and ¾" Pipe

## The Geo. F. Foss Machinery & Supply Co., Limited

*Machinery and Supplies*

**305 St. James Street, Montreal, Que.**

# *Buy a* C.M.C. *for accuracy and quantity production*




***24"x24"x6' Planer***

Our smallest size, but still a production tool of high order, and one that will give efficient, every-day service under the most exacting conditions.

Regularly equipped with one head on the crossrail, and standard single speed countershaft, and with operating mechanism and adjustments that are simple and convenient, but very effective.

Built in sizes up to 48 in., the larger machines being equipped with one or more heads, and any one of several styles of drives. Put your planer problems up to the C.M.C.

**Full particulars and prices on request.**

## CANADA MACHINERY CORPORATION
LIMITED

## GALT, - ONTARIO

# CANADIAN MACHINERY AND MANUFACTURING NEWS

Vol. XXV., No. 5 | Published by the MacLean Publishing Company, Limited, Toronto | February 3, 1921 | $4.00 a Year Subscription Price


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UNIVERSAL PLATE
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*ANY THICKNESS - ANY LENGTH*

Analysis and physical properties to meet any requirements.

*Prompt Shipment.*

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Hamilton Ontario

# You Need a Good Die Stock Set

if you need one at all.

Because a **GOOD** Die Stock Set embodies:

1. Accuracy in its product.
2. Adjustment for wear.
3. Free cutting qualities.
4. Provision for sharpening.
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**P. & W.** Die Stock Dies **ARE GOOD DIES.**

**BETTER** than most because of the interchangeable feature in their chasers. A broken chaser in a P. & W. Die doesn't mean a new set of chasers. You can get a new chaser to replace a breakage and the new one "fits in" perfectly in your old set. That's the 6th point, **"ECONOMY IN OPERATION."**

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### OF CANADA, LIMITED

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# PRATT & WHITNEY.

# The BERTRAM Page

## MACHINE TOOLS

JBB&SCo

## 48"X 48" Openside Planer

**Four Belt Drive**

**1 Rail Head and Side Head**

General Machine Shop Equipment, Locomotive and Car Shop Equipment, Structural, Bridge and Shipyard Machinery. Repair Shop Machinery.

Drop a card for photographs and full particulars of any product in which you are interested.




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# IMCO TOOLS

IMCO TOOLS



## Lasting!

Consider the time your men spend over the grinding wheel every day. Isn't it a considerable item toward your cutting expenses?

The ability of "Imco" Tools to hold a keen edge for unusually long periods is one of the primary reasons for their growing popularity.

**Catalog of "Imco" 3 and 4-lip drills, reamers and milling cutters upon request.**

## Ingersoll Machine & Tool Co., Ltd.

Ingersoll, Ontario.

Toronto Office — 80 Bay St. Phone Adelaide 7227.

Chas. A. Strelinger Co. Ltd. Windsor, Ont.



# *The* "Clipper" Solves Difficult Lacing Problems

THE difficulties encountered in using *quarter-turn drives* can be overcome by installing an idler *set at the proper angle* to direct the line of belt travel as shown above.

Before the installation of the idler this was a plain quarter-turn drive. The machine was a veritable "Belt Eater." No endless or laced belt could stand the strain. Belt expense was excessive.

By the use of an idler much greater pulley contact was obtained, horse-power was increased materially and all injurious side-strain eliminated. Since with an idler both sides of belt come in pulley contact, it was necessary to use a laced joint *smooth on both sides*. "Clipper"-laced Belts are now lasting as long as on straight drives.

## The Clipper Belt Lacer
## Laces a Belt in Three Minutes

It makes the smoothest possible joint, with a perfect hinge action that hugs the pulley and runs true. The "Clipper" Belt Lacer is so simple that any workman can successfully lace a belt with it. It is backed by a perpetual guarantee and goes to responsible parties for free trial.

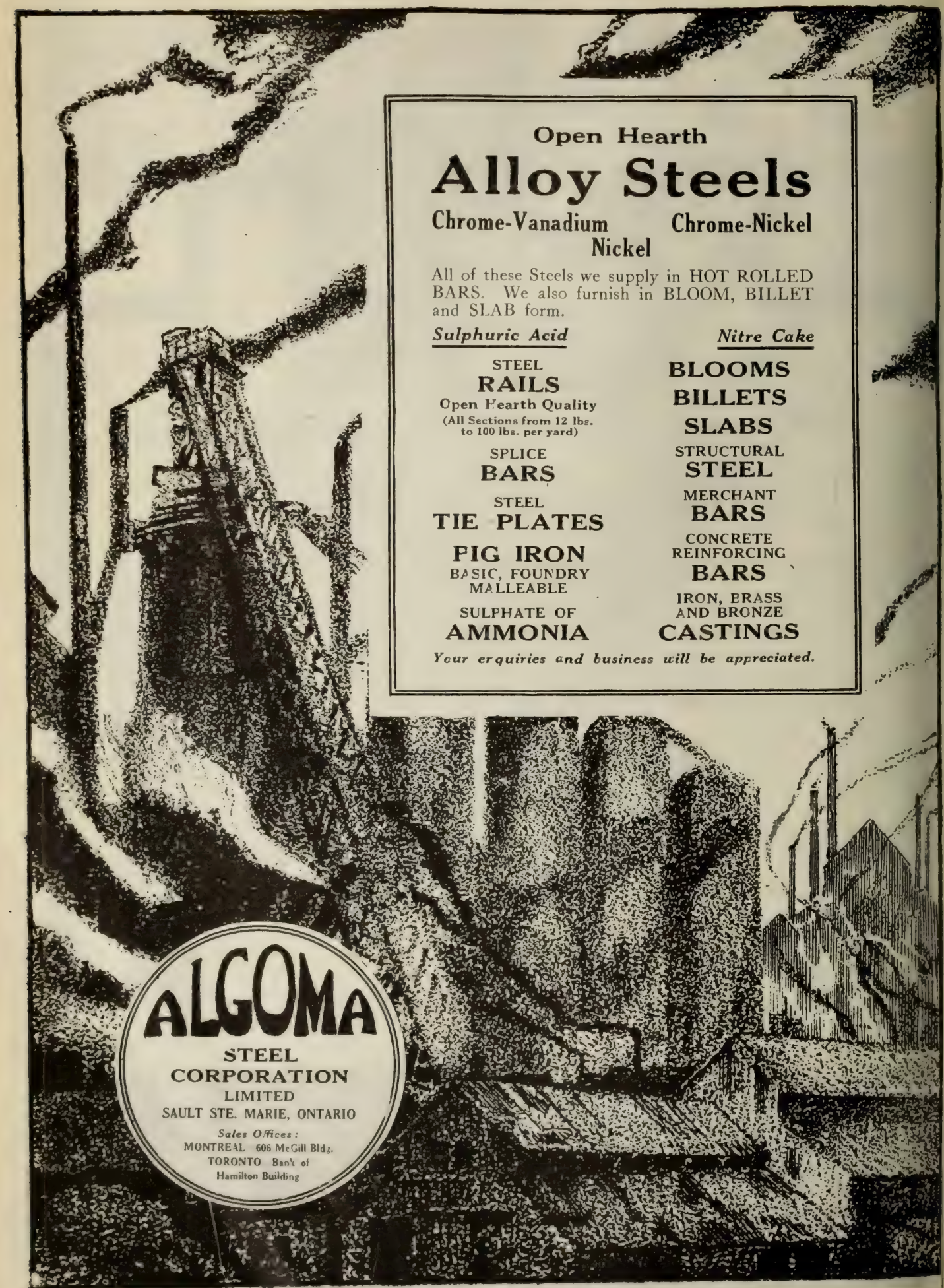
*Most mill supply houses sell the "Clipper."*
*Dealers not stocking it write for particulars.*

**"The Connecting Link Between Power and Production"**

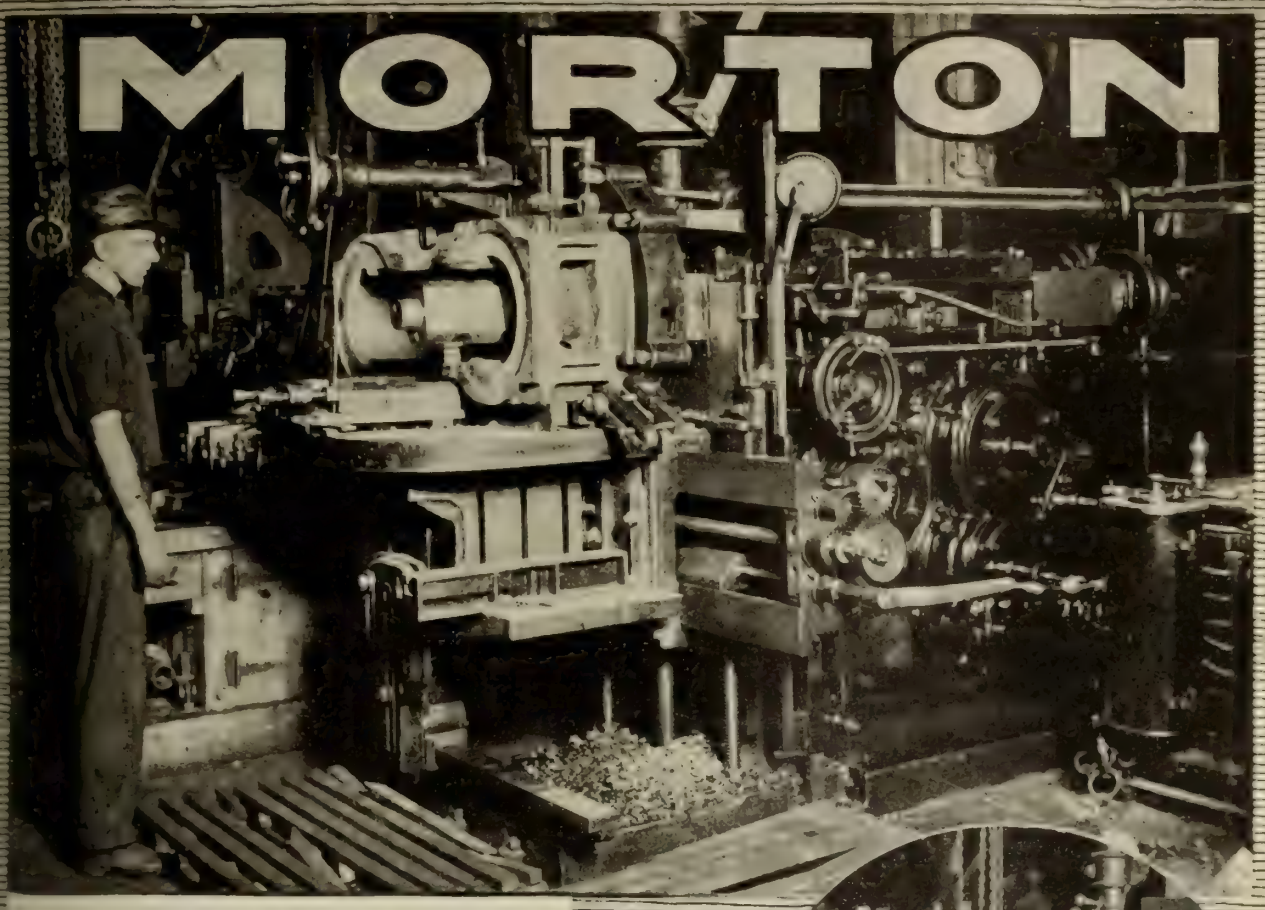
BY INVITATION MEMBER OF
NEW YORK U.S.A.

# Clipper Belt Lacer Company
GRAND RAPIDS, MICHIGAN, U.S.A.

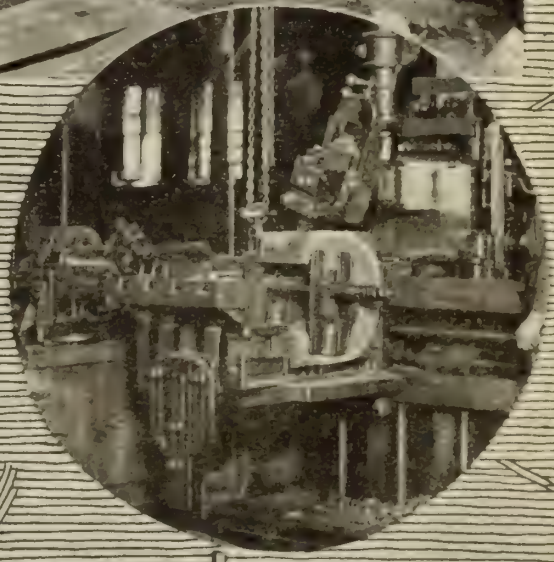
Clipper
Clipper Belt Lacer Co.
REGISTERED TRADE MARK

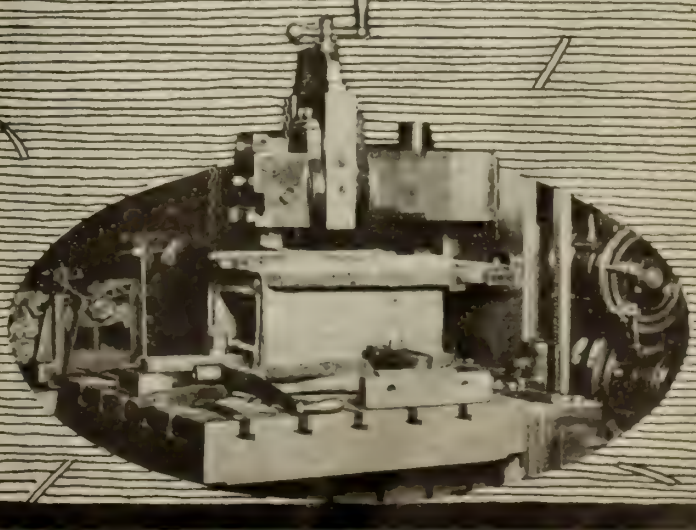

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Hamilton Building

MORTON



# Increased Driving Box Repairs Forced the Purchase of this Morton Draw Cut Shaper





Delays to output were traced direct to driving box repairs in this busy shop. Time element and shortage of man power were considered and the installation of this "Morton" reflects the good judgment of these thoughtful officials to install machines of guaranteed production power.

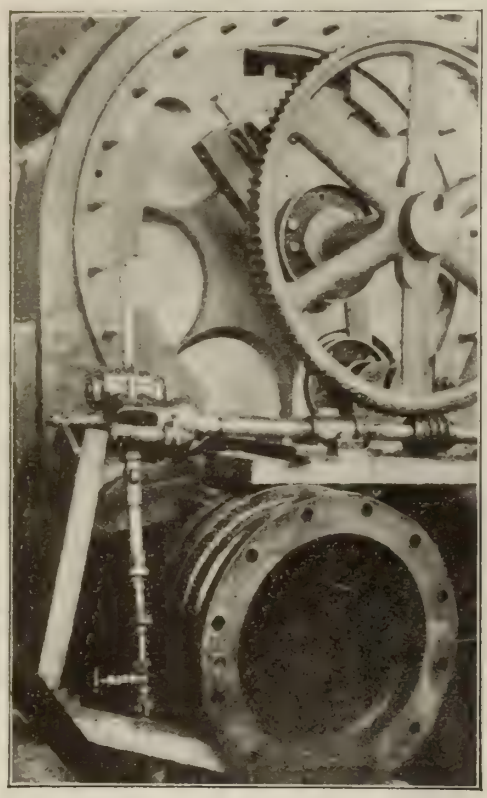
This Morton handles all the machine work on driving boxes—planing to thickness, planing shoe and wedge faces and crowning for bearing brass. It simplifies handling and reduces machine time.

May we send Bulletin A-6 explaining numerous points of merit?

**MORTON MFG. CO.**

**Muskegon Heights - Michigan**

# Weighs 40 Pounds
## *Lifts 4 Tons*



This cut illustrates a No. 2 Little David Drill reboring a 40-inch air compressor cylinder at a large Ontario mine.

Speaking of the power of this drill, the master mechanic said: "The cylinder weighed in the neighborhood of four tons, and at times, if the boring tool stuck, the Little David Drill would lift the entire casting enough to be noticeable."

You do not buy pneumatic drills on the basis of their hoisting ability, but when the question of adding to your tool equipment comes up and you choose a Little David, it's interesting to know that the tool of your choice has the power and the stamina to stand up under such an overload as this.

Shops all over the country find Little Davids rugged, highly efficient, easy to operate, and readily portable. Ask for a set of Little David bulletins. You'll find them of interest.

**Canadian Ingersoll-Rand Company,**
LIMITED

Sydney Sherbrooke Montreal Toronto Cobalt
Winnipeg Nelson Vancouver

MAPLE LEAF

# MOTOR TRUCKS

## *Winning an Argument with a Wicked Hill*

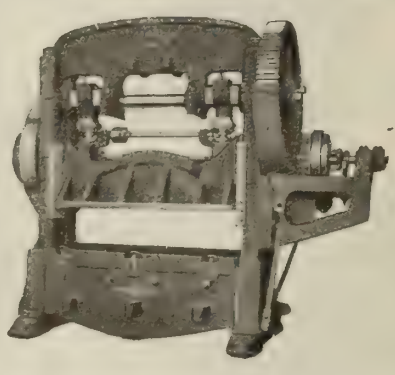
THAT'S when the driver of a Mapleleaf wears a smile. For Mapleleaf transmissions have ample multiplying power. The 5-ton model, for example, multiplies six times on lowest speed and gives two other changes between that and high.

All the gears change quietly and effectively. The whole transmission system is of the most rugged type imaginable.

Let us show you the Mapleleaf in action.

**Mapleleaf Manufacturing Company**
LIMITED
MONTREAL - CANADA

# The "TOLEDO"
## Double Crank Presses



Unequalled for rigid strength, durability and low upkeep in addition to their widely recognized speed and accuracy of performance.

Over 200 sizes weighing from 4,500 to 500,000 pounds—straight-side and gap or overhanging frame types.

Adapted to general sheet metal and drop-forged work.

*We fit the press to the needs.*

**The Toledo Machine & Tool Co.**
Toledo, Ohio, U.S.A.

# ELK BRANDS FIRE BRICK

## *Sizes and Burns Kept Uniform*

Each batch of fire brick as finished is carefully sorted into two, three or four different classes of burns—burn refers to the degree of hardness to which the fire brick is burned. We have OVER-BURNS, HARD, MEDIUM HARD, and MEDIUM.

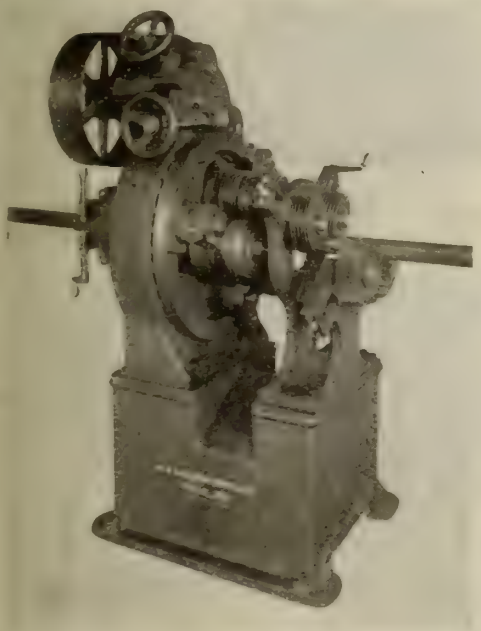
All burns have their place; we should know where and how the brick is to be used in order to furnish the best for the purpose.

Let us work with you and you will secure from Elk Brand the results you hope for.

"Elkco" "Keystone" "Elk Dust"
"Elkco" Special "M.D. Elk" "Keystone Dust"
"Elk Steel" "Rotex" "Rotex Dust"
"St. Marys"

Large stock of various shapes always in stock at Hamilton Warehouse.

**ELK FIRE BRICK CO. OF CANADA**
LIMITED
Sun Life Building, HAMILTON, ONTARIO



No. 1
1½ to 3"
Flues

No. 2
3 to 6"
Flues

**Rotary Flue Cleaning Machine**
Built in 2 sizes

This strong, easily operated machine is unequalled for removing scale or crust from boiler flues. It requires very little power and will clean from eight to ten feet per minute. It completely removes all scale without injury to the flue. Write for full particulars, and list of other Underwood Machines.

**H. B. UNDERWOOD CORPORATION**
1025 Hamilton St. Philadelphia., Pa, U.S.A.

# Now is the Time

to babbitt one or more bearings with

*Lionroyal*

to test the length of wear it gives over other babbitts.

In normal times you claim you're too busy to experiment.

You say to us "Wait until business slacks a bit—then we'll try it."

***Now is the time!***

You want to cut costs and get full value for every dollar.

Longer Wear per Bearing that is our guarantee! You have the time, therefore

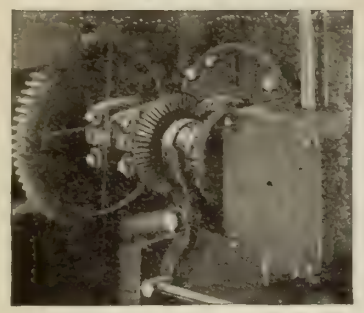
***Write for a trial case, 28 lb., 56 lb., or 112 lb. size.***

BRITISH SMELTING & REFINING COMPANY LIMITED
MONTREAL

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# THE JOHNSON FRICTION CLUTCH

## Clutches for Reversing Functions



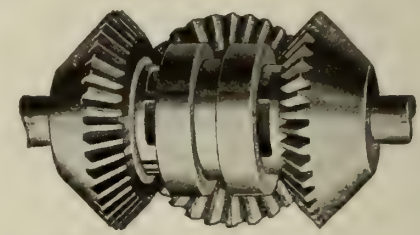
Johnson Clutch Installation on a Newton Milling Machine

A reversing clutch is a very common requirement on machinery, and one which is encountered in many different forms. Whatever the situation may be, a Johnson Clutch offers the best method of handling it.

The bevel gear assembly shown here is one of the ways in which a Johnson Double Clutch is frequently applied for reversing functions. Many of the best machine tools are equipped in this manner.

**Write for our Yellow Catalog and Booklet,**

**"Clutches As Applied To Machine Building."**



Double Clutch in Nest of Bevel Gears

*CANADIAN AGENTS:*

WILLIAMS & WILSON, LIMITED, 84 Inspector Street, Montreal

CANADIAN FAIRBANKS-MORSE CO., LIMITED, Montreal, Toronto and Winnipeg

**THE CARLYLE JOHNSON MACHINE CO.** MANCHESTER CONN.



TRADE MARK

MAGNOLIA ANTIFRICTION METAL

TRADE MARK

*New Truths and Old Fallacies*

# Hardness of Alloys—*Continued*

The differences in the measurements of the sustaining powers, under pressure, between tin-base copper hardened metals, and lead base metals, free of copper, as shown by tests by the American Society for Testing Materials, is so slight that in some cases it is not more than the breadth of a hair.

In a test, made for us some years ago, Magnolia withstood 19 per cent. greater stress than a Genuine. This test loses some value because we do not know the brand or formula of the Genuine.

In 1912, Professor Robert H. Smith, an eminent mechanical engineer and authority, tested Magnolia against an imitation. In this case Magnolia withstood 16,980 pounds (7½ long tons) per square inch pressure before the test block collapsed. When it is considered that this was a small cylindrical shaped test block, unsupported on the sides to prevent spreading, it is evident how much heavier a strain Magnolia will bear without distortion, when supported in recesses of a shell, and what a large factor of safety it provides.

For copy of complete article:

***"New Truths and Old Fallacies"***

Address our Montreal Office

Professor John Goodman, an equally eminent mechanical engineer and authority, says of Magnolia: "My experience distinctly shows that the higher the pressure applied to a Magnolia Bearing, the better does the wearing surface become." He also says: "I ran a Magnolia bearing for some weeks under a pressure of two tons per square inch, at a surface velocity of 250 feet per minute; the temperature maintained at 130° Fahrenheit, by circulating water through the center of shaft. After the run the surface was perfect, although the lubrication had been meager, viz: 0.002 lbs. of oil on a pad weighing 0.002 lbs."

(Continued next month)

***Sold by Leading Dealers Everywhere or by***

## Magnolia Metal Co. of Canada

**Limited**

**Office and Factory:**

**37-39 Shannon Street, Montreal, Que.**

# CANADIAN STEEL FOUNDRIES LIMITED

## AMONG OUR PRODUCTS

**O. H. STEEL**
- Bolsters
- Couplers
- Draft Arms
- Locomotive Side Frames
- Machinery Castings
- Marine Castings
- Rolling Mill Rolls
- Wheel Centres

**FERRO-ALLOYS**

**MANGANESE-STEEL**
- Bucket Lips
- Crusher Jaws
- Dipper Teeth
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**OTHER ALLOYS**
- Crank Pins
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**TRACKWORK**
- Diamond Crossings
- Crosses
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- Rail Braces
- Guard Rail Clamps
- Complete Intersections

This list is merely an indication

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# "STERLING"
# HACK SAW BLADES




A brand once adopted, difficult to replace.

REASONS—High quality of material used, mechanical construction, and special heat treatment.

RESULTS—Economy, which means satisfied customers.

*Write for Information and Prices*

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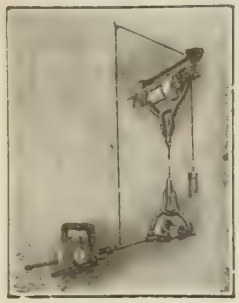
# FORD-SMITH

We Are Ready to Anticipate Your Needs for All Kinds of—

# SPECIAL MACHINERY

**and Dies, Jobbing Work, etc.**

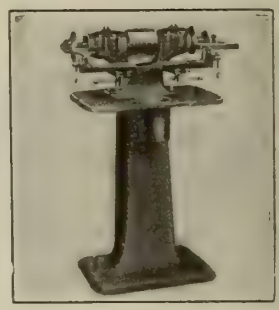
**Expert machinists of long experience only are employed in the construction of our special machines in addition to those employed on**



## OUR REGULAR LINES OF

**Milling Machines, Motor Driven and Belt Driven Grinders, Polishers, Disc Grinders, Swing Grinders.**

*Our Engineering Staff is always ready to submit estimates and answer problems. Write us to-day.*



## THE FORD-SMITH MACHINE CO., Ltd.

HAMILTON, CANADA

Foreign Agents: W. E. Storey, 3 Arundel St., London, Eng.; Gollin & Co., Melbourne, Australia; Atelier Demoor, Brussels, Belgium.

## A Good Example of What Can Be Done With

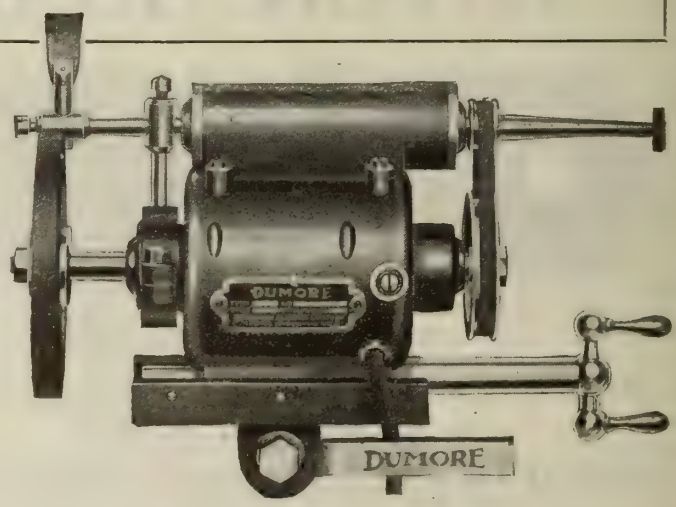
# DIE-CASTINGS

The popular grinding machine herewith illustrated is a good example of what can be accomplished by the Die-Casting process. The parts of this machine are die-cast, which represents a big saving in time and expense over any other method of construction.

The Die-Cast parts used in this grinder required no machining. They were delivered in perfect condition, ready to assemble. This is the big feature of all die-cast parts. They are accurate, and smooth in finish.

Die-Cast parts can be profitably used for many purposes. Send us your blue prints or samples for estimates.

**Largest makers of Die-Castings in Canada.**



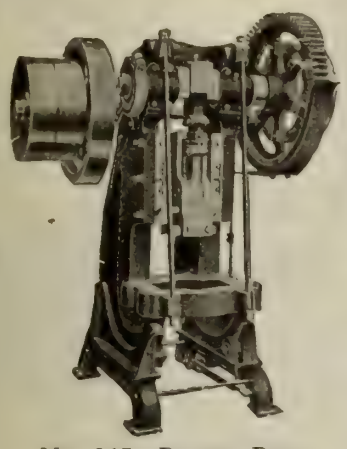

## THE FISHER MOTOR CO., LIMITED

ORILLIA, ONTARIO

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# BROWN-BOGGS

B B



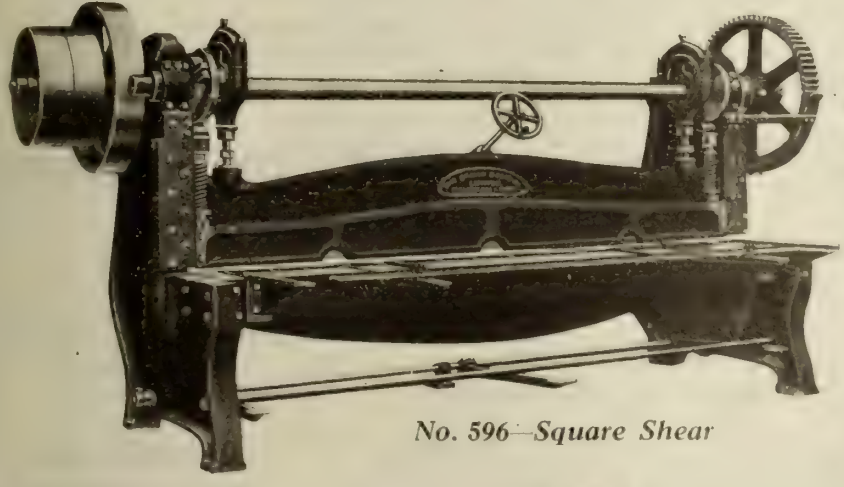
*No. 215—Power Press*

The Sheet Metal Workers' Tools shown here are typical examples of B.B. quality and mechanical excellence. Make sure of the Brown-Boggs trade mark—it's a guarantee of reliable service.



*No. 36—Ring and Circular Shear*

WHEN you buy machinery, choose that which has a reputation for giving long, satisfactory service. Every Brown-Boggs product is manufactured from the highest quality materials, by thoroughly competent workmen, in a fully equipped modern plant.



*No. 596—Square Shear*

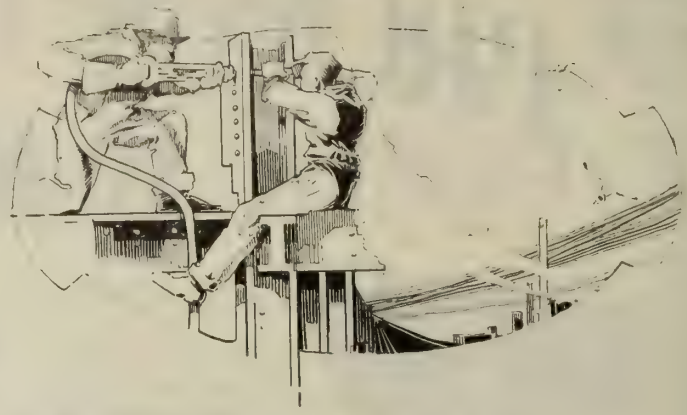
The "B.B." line comprises tinsmiths' tools and sheet metal working machines of every description; canners' and evaporators' machinery, shears of all kinds, power presses for punching, forming, embossing, blanking, etc.

*Write for complete catalogue.*

B B

# THE BROWN-BOGGS CO. LIMITED

## HAMILTON, CANADA.



# The Dependable Character of Dominion Rubber Hose

is the result of its ability to meet exacting conditions. There are two principal reasons why Dominion Rubber System Hose is used by most Canadian industries—first, because of its performance, and second, because our factory keeps abreast of industry's most exacting demands.

# Dominion Rubber System Hose

is designed for every requirement—for conveying liquids, gases, oils, acids, air or steam, at practically any temperature or pressure. When new conditions crop up, we produce special types to meet them. The fact that we do create new types for the Canadian market is evidence that Dominion Rubber System Hose measures up to the requirements of Canada's largest hose users.

Our catalog is a useful and convenient reference in selecting the right type of hose for your particular needs. A copy will be sent free on request from our nearest service banch.

CANADIAN CONSOLIDATED RUBBER CO. LIMITED
DOMINION RUBBER SYSTEM
AND ASSOCIATED COMPANIES

*Our Dominion Belting, Packing and Industrial Rubber Goods are all the same High Standard as Dominion Hose.*

## Dominion Rubber System Service Branches

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| Halifax | Toronto | Fort William | Edmonton |
| St. John | Hamilton | Winnipeg | Calgary |
| Quebec | London | Brandon | Lethbridge |
| Montreal | Kitchener | Regina | Vancouver |
| Ottawa | North Bay | Saskatoon | Victoria |

### Belting

**Transmission:** "Dominion," "Keewatin," "Para."

**Conveyor:** "Rockproof," "Canadian," "Hiheat"

**Elevator:** "Dominion," "Rockproof."

**Agricultural:** "Dominion," "Star."

**Grain Elevator:** "Metcalf Standard," "Grain King."

### Hose

**Air:** "Kushion Kover," "4810 Airtite," "Star."

**Steam:** "Indestructible," "Rockproof," "Para."

**Water:** "Indestructible," "Para," "Kushion Kover," "Star."

**Suction:** "Para," "Star," "Trade."

**Garden:** "Canadian," "Dominion," "Star."

### Packing

**Sheet:** "Join-Tite," "Star," "Importers."

**Rod:** "Cabestos," "Valve-Bestos," "Canadian."

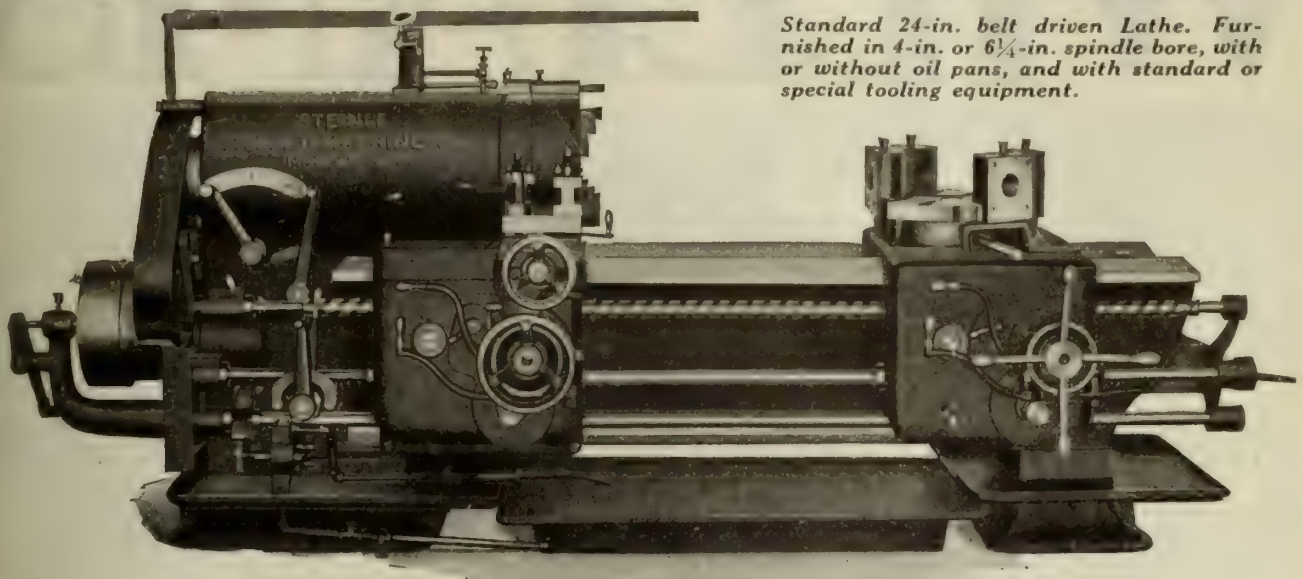
**Valves:** "Montreal," "Commercial," "Canadian."

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Mats, Matting and Flooring, Plumbers' Specialties, Rubber-Covered Rolls, Friction Tape, Splicing Compound, Dredging Sleeves, Hard Rubber Goods, Tubing, Rinex Soles, Catspaw Heels, Jar Rings, Moulded Goods.

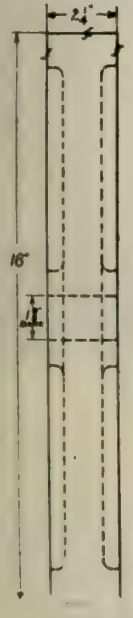
# STEINLE

## Full Swing Side Carriage Turret Lathes



*Standard 24-in. belt driven Lathe. Furnished in 4-in. or 6¼-in. spindle bore, with or without oil pans, and with standard or special tooling equipment.*

## TIME—Floor to Floor—4½ Minutes Each




THE MACHINE was a standard 24-in. Steinle Turret Lathe with 4-in. spindle bore arranged for belt drive, and equipped on turret with boring bars and special overhead bar carrying a turning tool and on cross slide carriage with a special three-cutter tool block.

THE WORK was an 18-in. cast iron gas engine flywheel. The surfaces machined included boring hub with bars, rough turning rim with special overhead bar carrying turning tool, and shaving and facing both sides of rim with a three-cutter tool block on cross slide carriage.

Just one more record of rapid production on a machine designed and built for fast severe service in producing accurate work economically.

And this record is maintained not on one or two pieces, but on lots of several hundred—just steady, consistent production under average shop conditions.

***Do your records compare with this?***

***Why not send us your blueprints and let our Engineering Department determine what can be done on your own work, or ask to have a qualified representative call and go thoroughly into the matter?***

## STEINLE TURRET MACHINE CO.

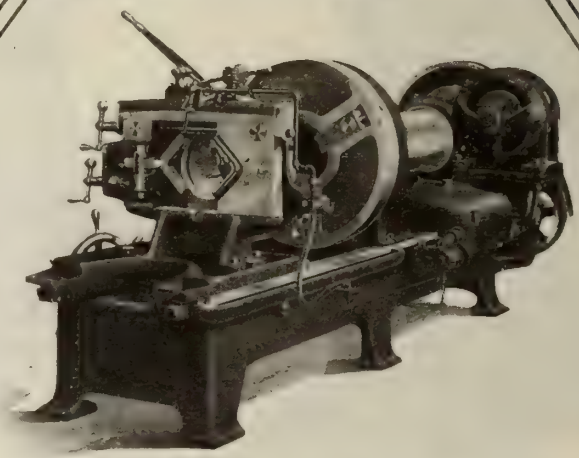
***Originators of the Full Swing Side Carriage Turret Lathe***

**Madison, Wisconsin, U.S.A.**

**AGENTS—Machine Tool Engineering Company, Singer Building, New York City; Cadillac Tool Company, Dodge Power Building, Detroit, Michigan; L. G. Henes, 75 Fremont Street, San Francisco, California, and Title Insurance Building, Los Angeles, California. Foreign—Leo. C. Steinle, 53 Victoria Street, London, England.**

*If interested tear out this page and place with letters to be answered.*

# WILLIAMS



# PIPE MACHINES

***Outstanding Features:***

1—Single Pulley Drive, through.
2—Dodge Friction Clutch, on machine.
3—Clutch Lever at operator's left hand.
4—Rigid Bearing Bracket on drive shaft.
5—Gear Box Drive away from operator.
6—Individual Adjustment for each bearing.
7—Large Spindle Bearings are ring oiling.
8—Compact Control Levers on operator's side.
9—Large Die Cabinet and Tool Tray.
10—Substantial Oil Trough around top of ways.
11—Specially constructed Reservoir and Filterer.
12—Low-down Sliding Head.
13—Rotary Geared Pump reversible for left-hand thread.
14—Specially designed Carriage to drain off oil and cuttings.
15—All Gears amply protected.

***Send for Catalog of Various Styles***

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*Successors to*

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The Sign of Efficiency

# MORSE DRIVES

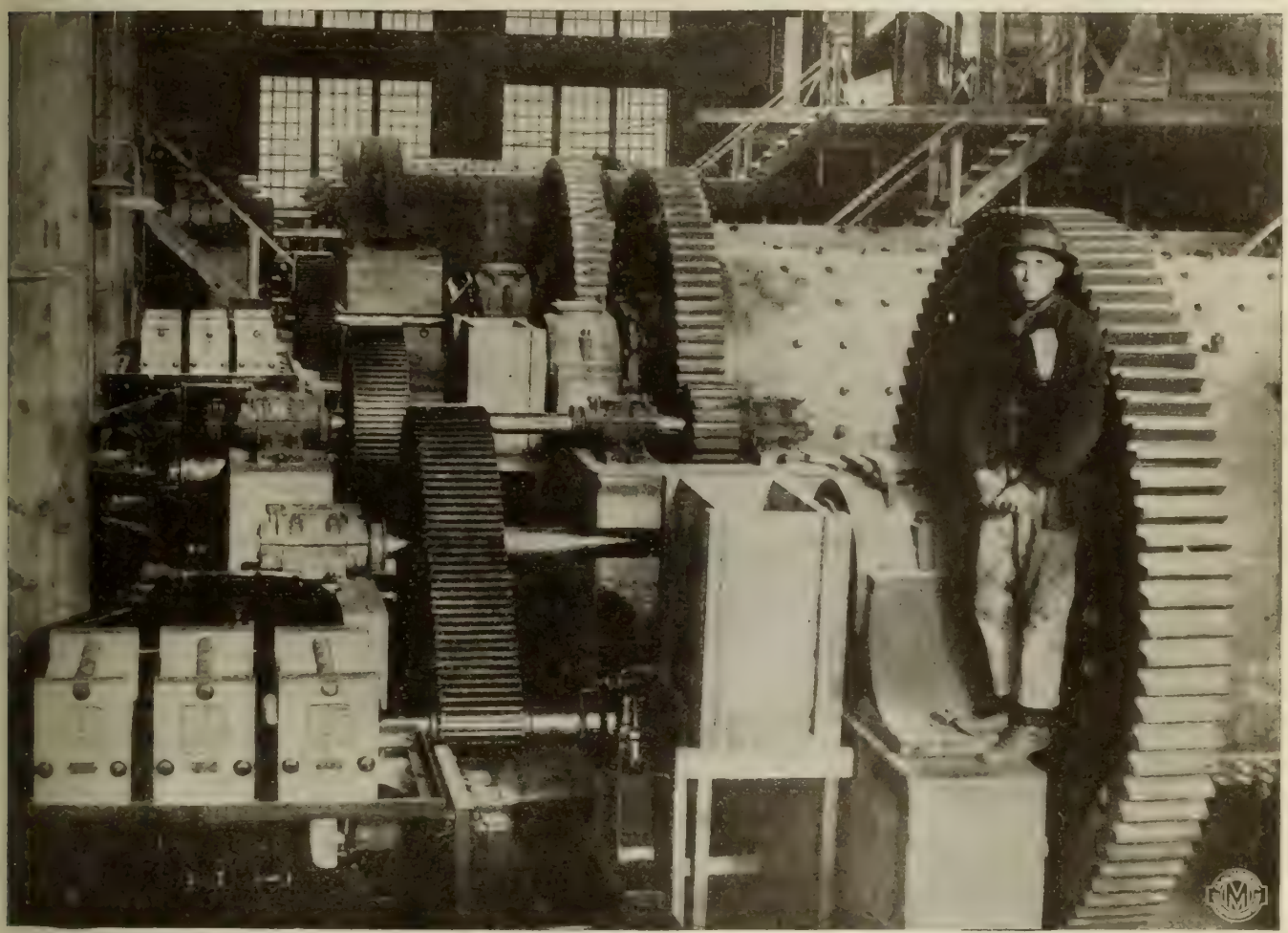
The Sign of Durability

THE MORSE "ROCKER JOINT"

Positive as Gears

Flexible as a Belt

Longer Life



## Six in Sight—More on Another Floor

MORSE Rocker Joint Silent Chain Drives installed about a year ago in plant of Canada Copper Corporation Ltd., Allenby, British Columbia, in severe service, transmitting 99% efficiency from 100 H. P. motors to 5′ x 20′ Tube Mills.

Have you troublesome drives in Hard Service in Dust, Gases or Steam? Let us show you how to save fuel, increase production, lower maintenance costs and bring out the profits lost through slipping belts.

Our Sales Engineers are Power Transmission Experts, who make it their business to secure results, that are the best available for your Power Problem.

Consult us on heavy, difficult or expensive drives

**MORSE CHAIN CO.,** LARGEST MANUFACTURERS OF SILENT CHAINS IN THE WORLD **ITHACA, N. Y.**

*Morse Engineering Service* *Assistance Without Obligation*

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**"Morse" is the Guarantee Always Behind the Efficiency, Durability and Service**

## NO. 1

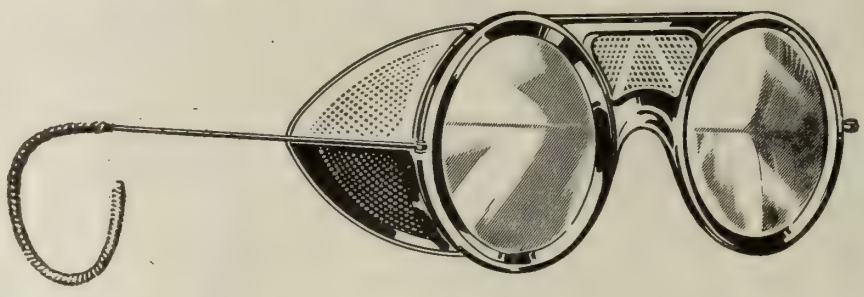
Every time you neglect to wear your goggles you become a candidate for a steady job holding a tin cup and wearing a "Please Help the Blind" sign. Wear your goggles!

This is No. 1 of a series of short pointed paragraphs which will appear regularly in our advertising in the future. Permission is freely given Safety Engineers, Editors of Employees' Magazines and others to use this material as they wish. In addition, we shall be glad to furnish these paragraphs in leaflet form, in any quantity, for insertion in pay envelopes.

# STOCO SAFETY GOGGLES
(Pat. Dec. 12, 1916)

*with*

# "CELOGLAS" Shatter-Proof Lenses



# Comfortable-Protective-Durable

Every operation on the Stoco Safety Goggle is performed entirely within our factory—by an organization with thirty odd years of experience in building a varied line of optical ware for a most exacting trade.

And because we do actually manufacture it, we must stand four square behind the Stoco Safety Goggle. We alone are responsible for its satisfactory performance. If it falls down there is no one to whom we can pass the buck.

The Stoco Safety Goggle
Price Each (F. O. B. Geneva, N. Y.)

With Celoglas Shatter-Proof Lenses ..... $1.15
With Optical Glass Lenses ..... .90

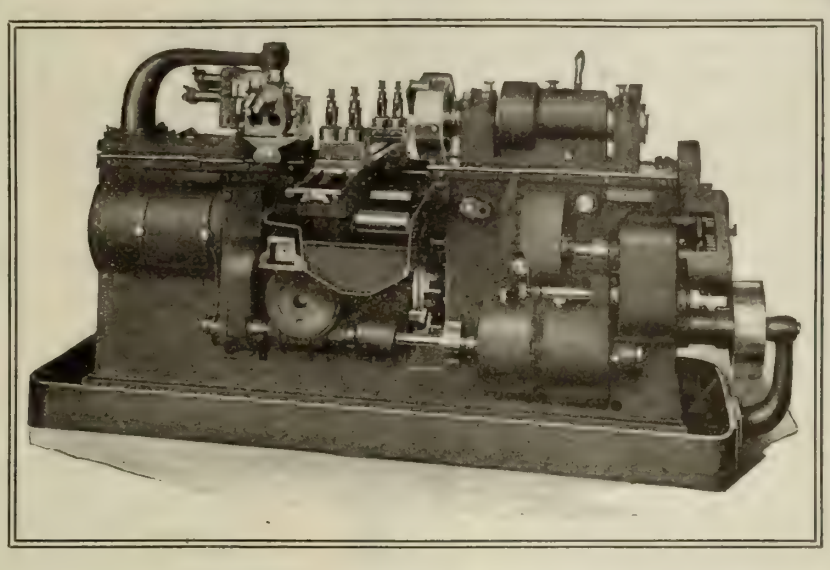
Attractive Discounts for Quantity Orders.
Comfortable earbows or black elastic headbands at the same price.

A sample Stoco Safety Goggle will be sent interested responsible people on receipt of request on letterhead.

## THE STANDARD OPTICAL CO.
## GENEVA, N.Y. U.S.A.

# AUTOMATICS

Let the P. & J. Automatics shoulder the responsibility. They solve the high cost of operation. They keep production up to the highest notch and bend the cost down to the lowest point on your chart.



Five to fifteen cutting tools may be in simultaneous operation. And three to six machines may be operated at one time by one man. All the one man does is to keep the machine fed up with enough work. The P. & J. method has displaced previously believed "unbeatable" methods a number of times.

We will be glad to let you know what economy the P. & J. can effect for you.

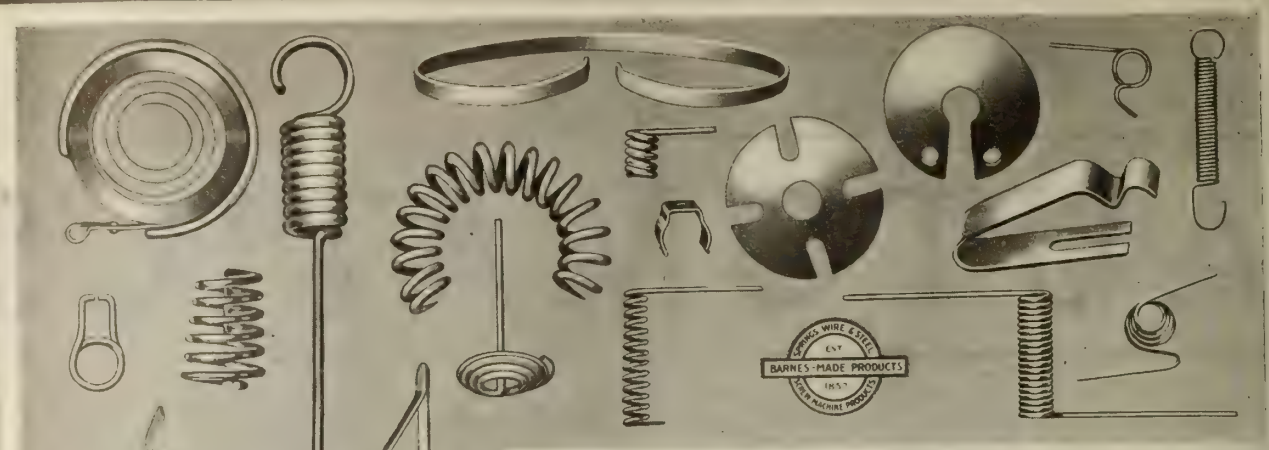
Simply send us an outline of your work.

*Canadian Offices:* POTTER & JOHNSTON MACHINE CO.

## ROELOFSON MACHINE & TOOL CO., LIMITED

*Head Office and Show Rooms:*

*11 Wellington Street East,* TORONTO, CANADA




# Not—What We *Do*
# But—What We *Don't*

Because this Company designs and manufactures springs in thousands of types and sizes—for hundreds of thousands of purposes—we propose to take a "short cut" in telling you about it.

You can count on the fingers of one hand the types of springs we do ***not*** make. They are the following:

***Upholstery Springs***
***Suspension Leaf Springs***
*—and that's ALL!*

If the springs that go into your product are not one of these types, remember this —"Barnes-Made" Springs are made to order, of our own specially tempered material. They are always in conformity with the requirements of your product—or according to your own detailed specifications. Three generations' experience stands back of every "Barnes-Made" product. Accuracy and dependability are guaranteed.

Springs of steel, brass, phosphor bronze or vanadium flat, coiled, spiral, compression, extension or torsion. Wire forming. Spring Washers, Small Parts of steel, brass, etc., in any finish. Assemblies. High Carbon Cold Rolled Steel

## THE WALLACE BARNES
### Company

*"Spring Makers for Three Generations"*

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BRISTOL, CONN.

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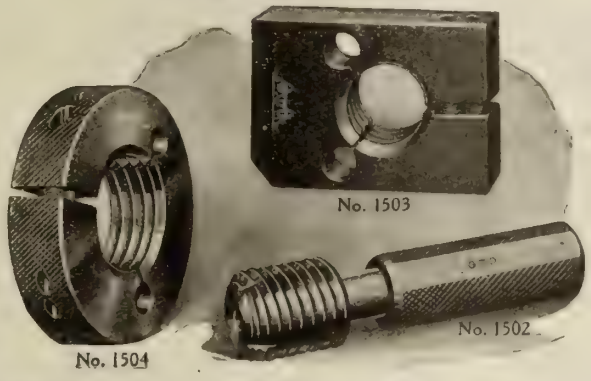
*Look for* GTD *This Mark*




**No. 5 *Little Giant* Screw Plate**



**GTD Pipe Wrench**




**GTD Male and Female Thread Gages**



**GTD Hand Reamer**

## Taps and Dies

For hand and machine use, including the Shear-Cutting ***"Gun"*** Tap and the ***"Acorn"*** Die.



***"Gun"* Tap**

## Gages

Thread limit snap—lead limit, plug and templet. Both thread and cylindrical.

## Reamers

For every purpose, accurate and hard-wearing.

## Pipe Tools

Pipe Wrenches, Vises, Cutters, Taps and Dies.

## Screw Plates

The famous *Little Giant* and "OK" brands. An assortment for every screw-threading need.

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**Successors to**
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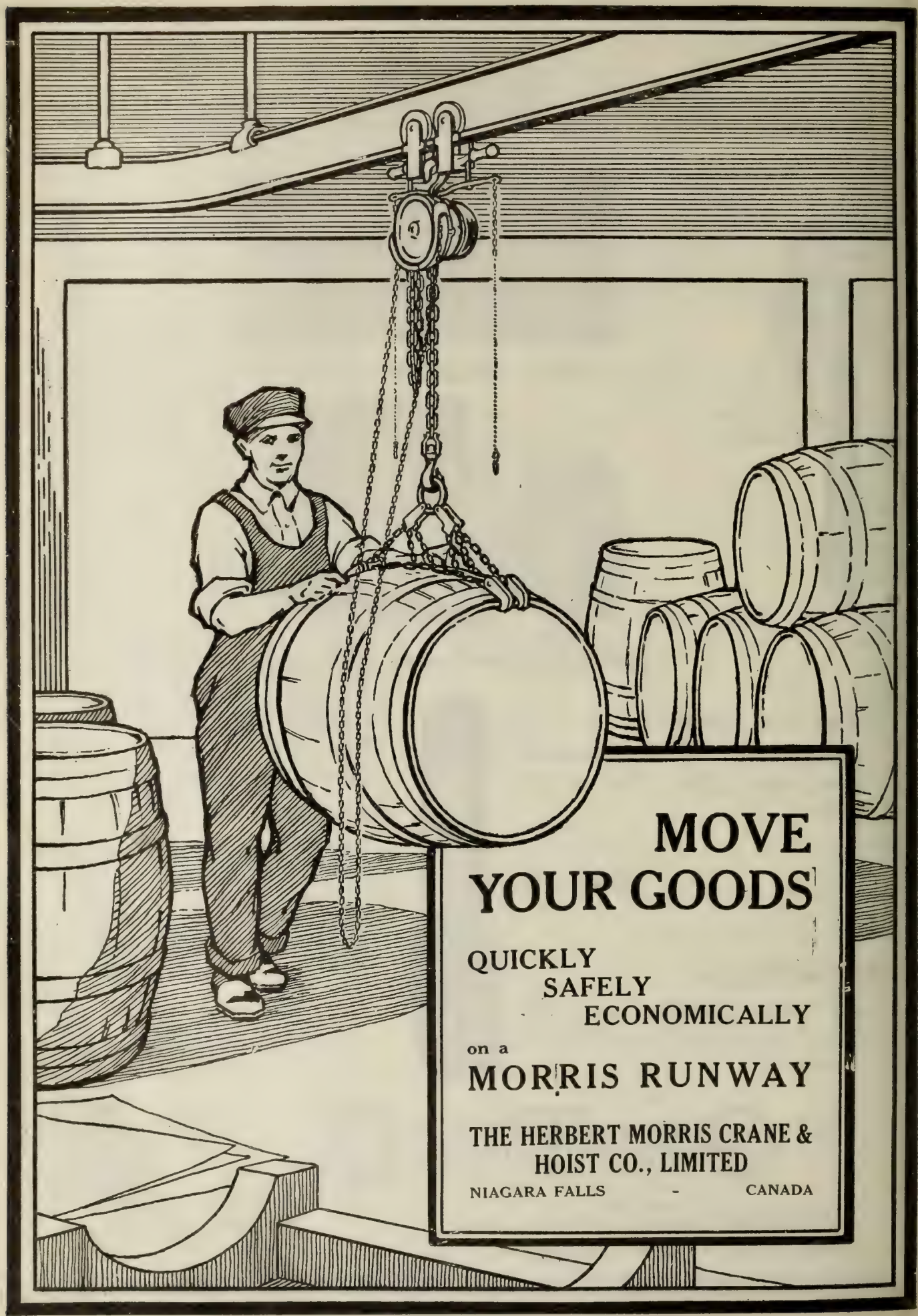
G.T.D. Corporation of Canada, Ltd., Galt, Ontario.

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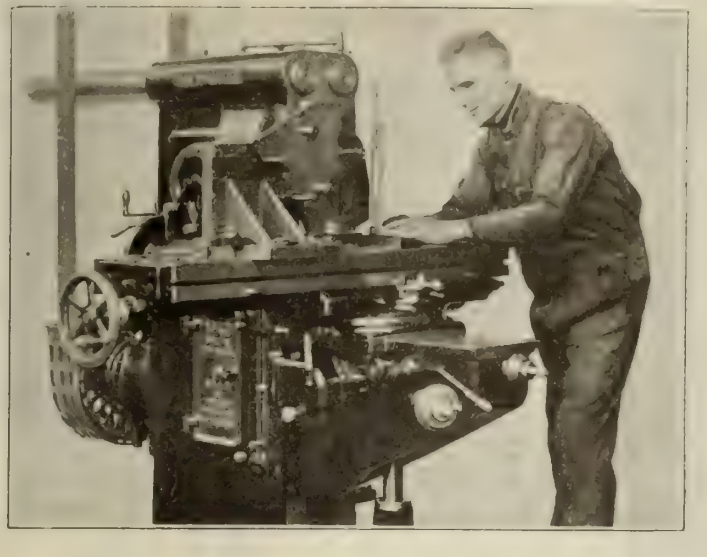
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QUICKLY
SAFELY
ECONOMICALLY
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MORRIS RUNWAY
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NIAGARA FALLS - CANADA

# MILWAUKEE MILLING MACHINES



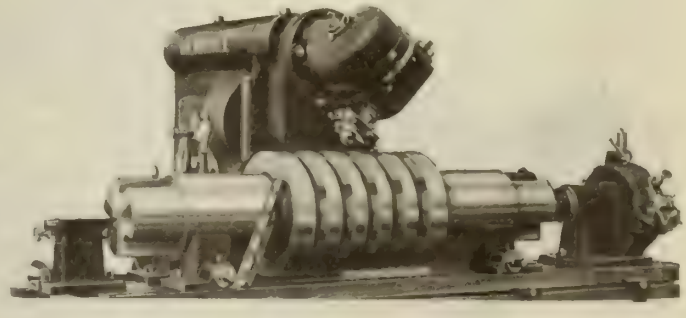
## Efficient on Light and Heavy Milling

Heavy milling jobs are not unknown to Milwaukee Universal Milling Machines, while delicate and intricate ones are efficiently performed with little effort.

Both light and heavy milling operations are handled with such smoothness and accuracy that the finest results are obtained. Because Milwaukee Universal Milling Machines perform such a wide variety of work, they are particularly well adapted for the tool-room.

The jobs shown in the two illustrations are representative of "Milwaukee" adaptability. The upper illustration shows a jig being bored with a fly cutter. The lower illustrates the milling of a chilled roll with the use of a Universal Milling Attachment.

**Write for catalogue—NOW.**

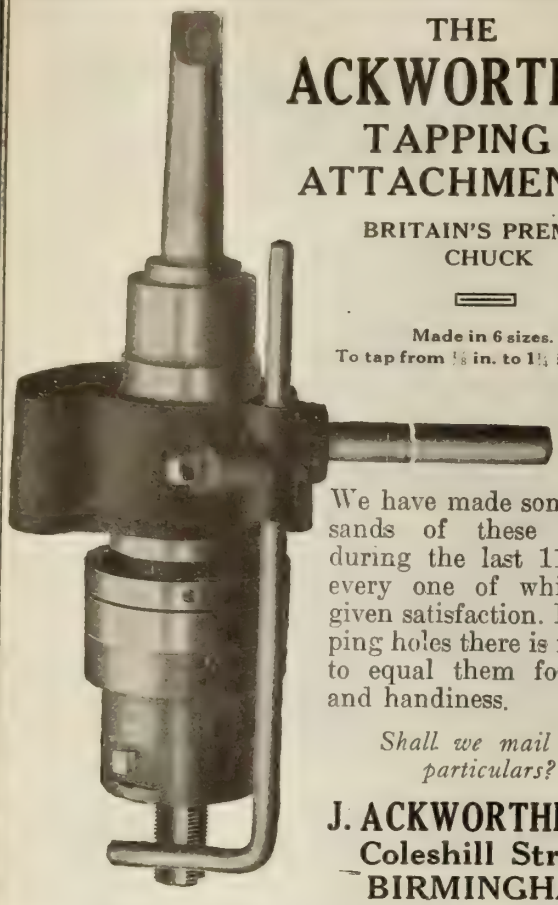




KEARNEY & TRECKER CO.
MILWAUKEE, WIS., U.S.A.

Canadian Representatives: Williams & Wilson, Ltd., Montreal; F. F. Barber Machy. Co., Toronto; A. R. Williams Machy. Co., Vancouver and Winnipeg.

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THE
**ACKWORTHIE**
**TAPPING ATTACHMENT.**

BRITAIN'S PREMIER CHUCK

Made in 6 sizes.
To tap from ⅛ in. to 1¼ in. Whit.

We have made some thousands of these Chucks during the last 11 years, every one of which has given satisfaction. For tapping holes there is nothing to equal them for speed and handiness.

*Shall we mail you particulars?*

**J. ACKWORTHIE, Ltd.**
**Coleshill Street,**
**BIRMINGHAM**

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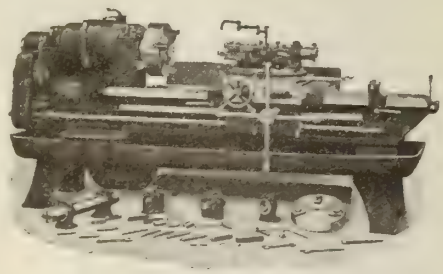


Prompt shipments of all Standard Sizes in
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Cap Screws, S.A.E.
Set Screws, V or U.S.S.
S.F. Hexagon Nuts, V or U.S.S.
S.A.E. Hexagon Nuts, Plain.
S.A.E. Hexagon Nuts, Castellated.
Turned Paper Pins.

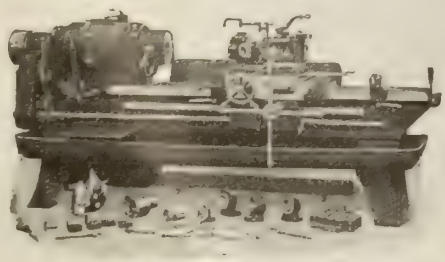
**Send us your rush orders.**

THE
**GALT MACHINE SCREW CO., LIMITED**
**GALT, ONTARIO**

Eastern Representatives: The Canadian B. K. Morton Company Limited, 49 Common St., Montreal, Que.



31½" x 36" Flat Turret Lathe with Chucking Equipment



31½" x 36" Flat Turret Lathe with Bar Equipment

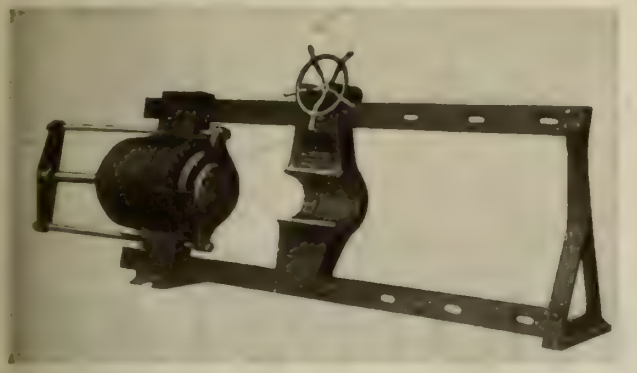
# *The Cincinnati Acme Delivers ALL the Power*

On this Cincinnati Acme Flat Turret Lathe, the only gears running are those doing actual work—every bit of power is put directly into the job.

This machine will do both bar and chuck up to 16 in. in diameter and give the utmost satisfaction on each.

A booklet containing full particulars of our entire line of Turret Lathes and Screw Machines will gladly be sent upon request.

**The Acme Machine Tool Co.**
**Cincinnati, Ohio, U.S.A.**



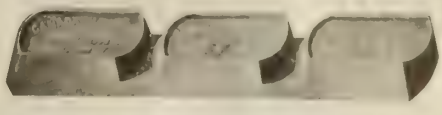
# PERRIN
## 400-Ton Hydraulic Wheel Press

This Made-in-Canada Press is built to operate direct from Accumulator at 1500 pounds per square inch pressure.

*Perrin for Reliability*

**WILLIAM R. PERRIN, LIMITED**
TORONTO

**BABBITT METALS OF**
# PERFECTION



**IMPERIAL GENUINE**




For Heavy Engines and Extraordinary Hard Work

**HARRIS HEAVY PRESSURE**

THE COPPER COATED CAKE

For Donkey Engines, Saw Carriages, Small Motors, Transmission Line Shafting and all steady heavy pressure duty.



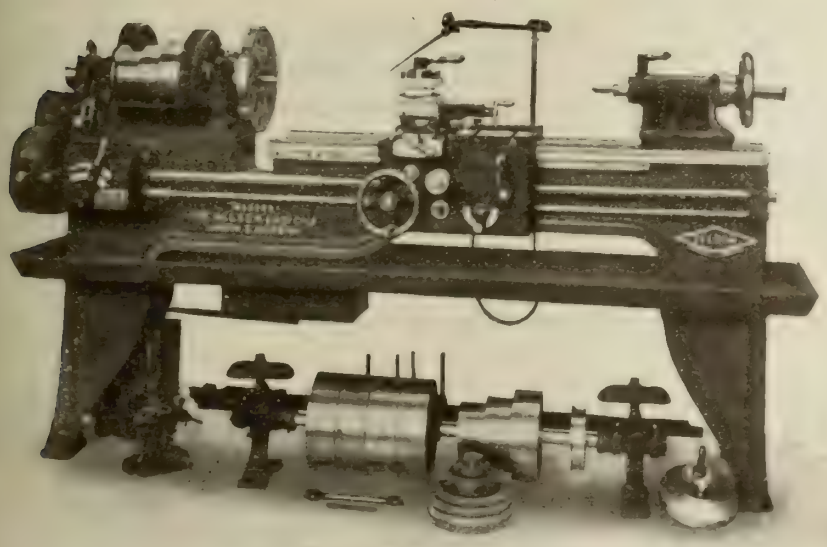
**Matchless**

Suitable For Slow-Moving Bearings

Write For Prices

**THE CANADA METAL CO., LIMITED**
TORONTO HAMILTON MONTREAL
WINNIPEG VANCOUVER

# The "SELSON" High-Speed, Vee Bed Gap Lathe



## 13" Swing

**A British Lathe, built under high production methods.**

**SELSON HOUSE, 83 and 85 QUEEN VICTORIA STREET**
**LONDON, E.C.4, ENGLAND. WORKS: COVENTRY**
*Branches: Paris, Brussels, Turin, Milan, Melbourne, New York*


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# *New Method Saves Valuable Hours*



### To Duplicate Blueprints

Tracing them in the drafting room takes hours — sometimes days — of a highly paid man's time, always with a chance of errors.

The PHOTOSTAT accomplishes the same result in a few minutes at a cost of a few cents and without errors.



### To Make Drawings of Small Machine Parts

in the drafting room, costs many dollars and takes hours or days of time.

A PHOTOSTAT copy of a small machine part accomplishes the same result and is made in a few minutes at a cost of a few cents.



### To Make Advertising Layouts

by hand for six or a dozen publications requires hours of work by an expensive man.

The PHOTOSTAT quickly duplicates the original layout at the required size and as many times as desired at a cost of a few cents apiece.



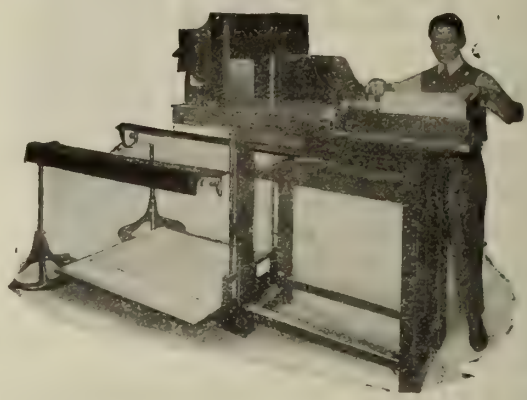
### To Copy Catalog Pages

letters, reports, charts, etc., takes hours of a stenographer's time. The results cannot be exact duplicates and there are frequent errors.

The PHOTOSTAT produces an exact duplicate, without errors, in a few minutes, at a cost of a few cents.

## The PHOTOSTAT

(Trade Mark Registered)



## is the Up-to-Date Method for Doing All This Work

**Photographic Copying Machine**

**Cuts Hours to Minutes**
**Cuts Dollars to Cents**
**Makes No Mistakes**

**"The machine pays for itself in 8 or 9 months, because of its man power savings."**

*Manufactured by the Eastman Kodak Company Exclusively for*

# PHOTOSTAT CORPORATION

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AGENCIES

Alfred Herbert, Ltd., Coventry, England.
Societe Anonyme Alfred Herbert, Paris, France.
Societe Anonyme Belge Alfred Herbert, Brussels, Belgium.
Graham Bros., Stockholm, Sweden.
Societa Anonima Italiana Alfred Herbert, Milano, Italy.



## When Friction Disc Grinding

# HEALD STYLE No. 22 EATS 'EM UP

We've always said so but you don't have to take our word for it. Ask the Borg & Beck Co., Chicago, in whose plant the above photographs were taken. They are using three No. 22 Style Heald Rotary Surface Grinders to finish the friction faces of friction discs.

As the top picture shows, these cast iron discs are held on a Heald 12-in. Magnetic Chuck equipped with a special auxiliary top plate. This was cut out in the center to allow the web and hub to drop in when grinding the upper side. Stock removed is .005 to .010 with .003 tolerance. Production is 90 an hour.

*Our Engineering Service Department can, in exchange for blueprints or samples, show you how the Heald can best produce your finished work. A letter helps us both a lot.*

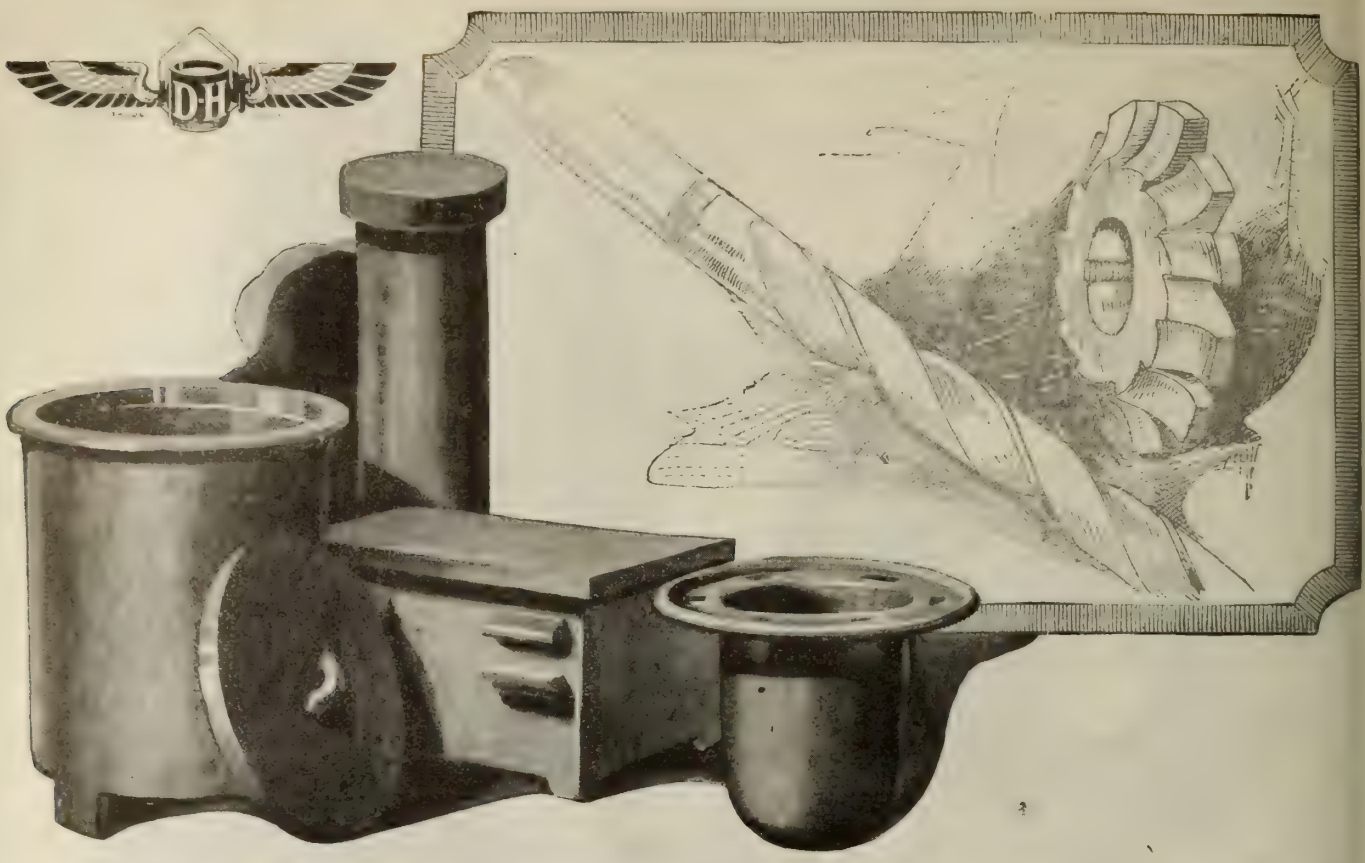
## Heald Machine Company, 51 New Bond Street

### Worcester, Mass.

BRANCH OFFICES: New York, 839 Singer Bldg.; Philadelphia, 1302 Stephen Girard Bldg.; Chicago, 26 South Jefferson St.; Detroit, 401 Marquette Bldg.; Cincinnati, 311 Provident Bank Bldg.; Cleveland, 721 Engineers Bldg.; Buffalo, 331 Jewett Ave. WESTERN AGENTS: Eccles & Smith Co., Los Angeles, San Francisco, Seattle and Portland; Salt Lake Hardware Co., Utah and Idaho; Hendrie & Bolthoff Mfg. & Supply Co., Colorado and Wyoming. FOREIGN AGENTS: Alfred Herbert, Ltd., England; Societe Anonyme, Alfred Herbert, France, Switzerland and Societa Anonima Italiana, Alfred Herbert, Italy; Alfred Herbert, Ltd., Sydney, Australia; Horne Co., Ltd., Japan; Wilh Sonesson & Co., Sweden, Denmark and Norway; Henry Benedictus, Brussels, Belgium; American Machinery Syndicate, Spain and Portugal.

*GRIND WITH A* HEALD *AND BE SURE*

*If interested tear out this page and place with letters to be answered.*



# The Mettle of the Cutting Tool

BASIC steel of proper quality may be the *beginning* of a good tool but it is far from the finished tool that meets the demands of present day practice.

And so it is with heat-treating equipment. The most highly perfected furnace equipment and other materials are handicapped if containers, muffles, racks, etc., crack, warp, scale and change in other ways that interfere with the process.

Cast Nichrome has not only contributed to surer results but is a mighty factor in heat-treating economy. Thousands of hours at 1800 deg. F.—without warping, cracking, scaling, etc.—are guaranteed. Shorter heats and less fuel consumption are inevitable. Stock patterns in hundreds of sizes; special designs for special requirements—

*Manufactured under HENDERSON PATENTS by*

CANADIAN DRIVER-HARRIS Co., Ltd.

WESTERN OFFICE AND DEPOT CHICAGO 28 So JEFFERSON ST

WALKERVILLE, ONT. CANADA

AMERICAN OFFICE AND WORKS HARRISON, N J

BRITISH WORKS MANCHESTER ENGLAND

## Heat Treating Containers of

# Cast Nichrome

ENDURE IN HIGH TEMPERATURE




# Look in the new Starrett Catalog for the tools Experienced Machinists prefer.

Three hundred and fifty-two pages describing and illustrating Starrett Micrometers, Calipers, Protractors, Gages, Verniers, Squares and all the other tools of Starrett make, including twenty-one new tools.

Copies are being distributed to machinists and dealers in all parts of the country.

Ask your dealer or write us today for a copy of Catalog No. 27"3".

**THE L. S. STARRETT COMPANY**

*The World's Greatest Toolmakers*
*Manufacturers of Hack Saws Unexcelled*

ATHOL, MASS.



STARRETT TOOLS

STARRETT HACK SAWS CUT QUICKER LAST LONGER

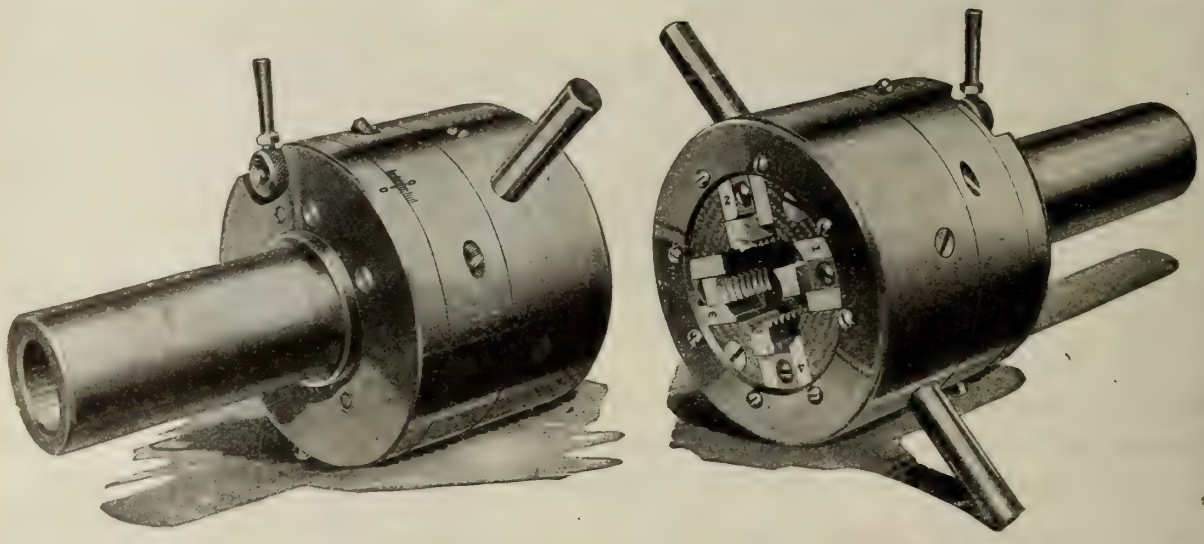
# Use Starrett Tools

42-140

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# THE VALUE OF A DIE HEAD IS WHOLLY IN THE SERVICE IT GIVES

# MODERN



"Moderns" have the strength for any duty within the capacity of the 17 sizes. They are widely known as **heavy duty** tools. This strength is not mere mass of metal. Strength comes more from correct design and proper relation of parts, one with another.

The Modern Self-Opening Die Heads are extremely simple. The design is distinctively and exclusively "Modern."

We have no hesitation in stating that a "Modern" will cut more clean, full-size threads, true to lead, and for a longer time without repairs, than any other kind. Hundreds testify to the fact that the "Modern" is the only one which will "stand up" in their work.

If you have a difficult threading job, or would like to speed production, send specifications and blueprints, and let our engineers study your problem.

**Send for latest bulletin.**

## MODERN TOOL CO., Erie, Pa.

**Main Office and Works: STATE and PEACH STS.**

*Branch Offices:*

New York, N.Y.: 54-60 Lafayette Bldg.
Chicago, Ill.: 32 N. Clinton St.
Detroit, Mich.: 408 Kerr Bldg.
Philadelphia, Pa.: The Bourse.
Cleveland, Ohio: 408 Frankfort Ave.
Buffalo, N.Y.: Associated Service Bldg.
Export Dept., Bishop Bldg., New York, N.Y.
Californian Representatives: Herberts Machinery & Supply Co., Los Angeles, and San Francisco.
Canadian Agents: Rudel-Belnap Machinery Co., Ltd., Toronto and Montreal.

# Superheat Drills Holes

## *Few "steam metals" can withstand its active chiseling action*

SO in great valves that control superheat flow for vital power production, leading designers call for essential working parts of Monel to withstand high speed gas erosion.

For, of all commercial metals, Monel alone has the ability to survive the combined chemical and mechanical attack of superheated steam at the high and rising pressures commonly used today.

In proof of this, Monel is used for guide stems, wedges, seat rings, spindles, dash pots, piston rings, clappers, piston lock nuts, pistons, etc., in the huge control valves built by Jenkins, Pratt & Cady, Crane and others equally prominent.

Monel is standard for service calling for acid, alkali, high heat and steam wear resistance. It has a prominent place in the specifications of such seasoned engineering organizations as J. G. White, Stone and Webster, Dwight P. Robinson Inc. The name Monel identifies the natural nickel alloy—67% nickel, 28% copper and 5% other metals—produced by The International Nickel Company.

THE INTERNATIONAL NICKEL COMPANY OF CANADA, LIMITED
Harbor Commission Building
TORONTO ONTARIO



THE larger picture is a "close up" of the clapper and seat ring shown in the broken out part of the small valve illustration. The clapper is seen about to lift in order to allow steam to pass into the line. The irregular spurts of steam show that the seat between clapper and ring is no longer perfect—that superheat has commenced to drill its way through. This drilling action is always in process where superheat is used, and the commonly used metals for valve parts eventually fail and allow superheat to cut through. For that reason, Monel is the only safe metal for valve parts that are in constant contact with superheated steam—the only metal that insures always tight valve closure.

INCo Monel metal

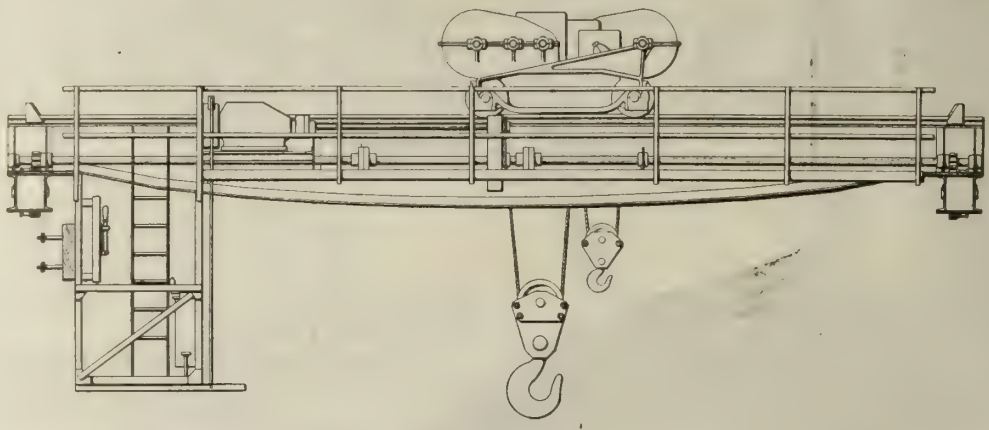
THE INTERNATIONAL NICKEL COMPANY

INCo MONEL METAL INCo NICKEL

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# CRANES

## ELECTRIC AND HAND OPERATED



**DOMINION BRIDGE COMPANY LIMITED**

HEAD OFFICE & WORKS: MONTREAL BRANCHES:-OTTAWA, TORONTO, WINNIPEG

# HYDRAULIC TURBINES AND PUMPS

Our shops are equipped for building TURBINES of the largest sizes —also high speed PUMPS of large capacity for medium and low heads. Two turbines of 20,000 H.P. are now under construction.

# PAPER MILL MACHINERY

Pulp Drying Machines.
Millspaugh Suction Rolls.
Millspaugh Shower Pipes.
Davies Oscillating Suction Boxes.
Press and Felt Rolls.
Brass Covered Rolls.
Pulp Digestors.
Barking Drums.
P.A.P.A. Screens (Spangenburg System) for pulp and paper.

## DOMINION ENGINEERING WORKS, LIMITED

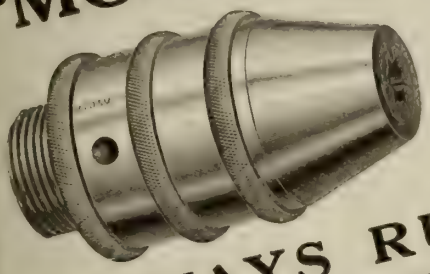
MONTREAL - QUE.

"MORSE" CHUCKS

ARE MADE OF THE HIGHEST GRADE STEEL

ARE CAREFULLY INSPECTED AFTER EVERY OPERATION AND

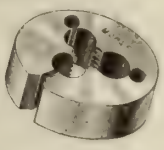
ALWAYS RUN TRUE



"MORSE" (ROUND) DIES

WILL PRODUCE CLEAN ACCURATE THREADS AND MAY BE ADJUSTED WHILE IN THE HOLDER

SOLD SINGLY AND IN SETS IN STANDARD THREADS



**Morse Twist Drill & Mch. Co.**

New Bedford, Mass.,
U. S. A.

# The "OLIVER"

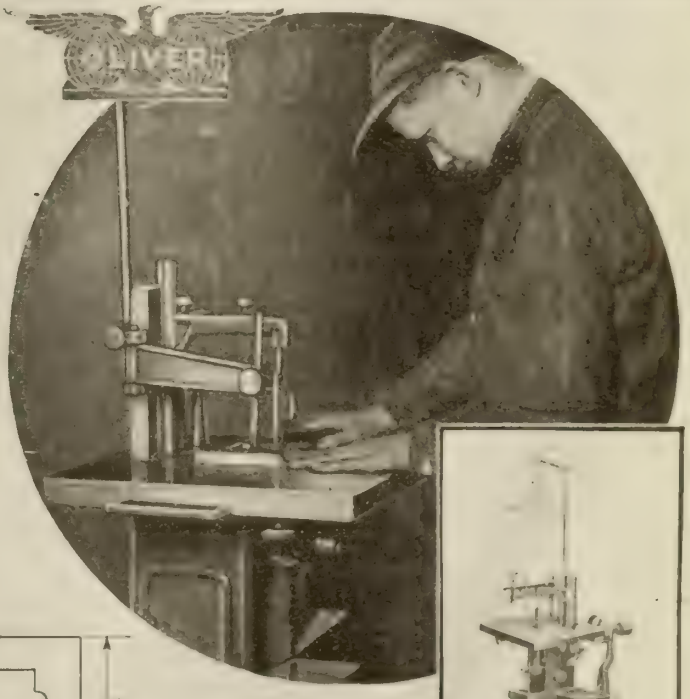
## No. 404 High Power Filing Machine

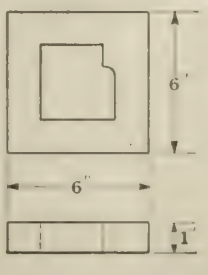
**(Rearwin Patent)**

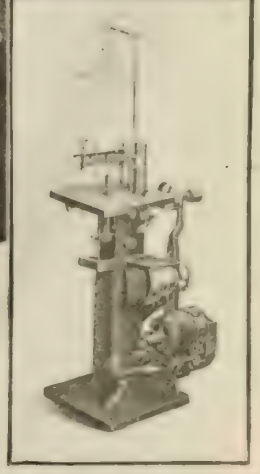
After more than five years of service, this Oliver 404 High Power Filing Machine is still the favorite at the Manhattan Machine & Tool Works, Grand Rapids, Mich., for filing dies, stripper plates, templets, etc. It is a profitable producer—quicker and less expensive than hand filing and has exclusive features which make it distinctive among machines of its class.

When photographed the machine was working on a stripper plate for a notching die—the character of the operation being indicated in the sketch.

We have just developed a still larger Filer. Write for particulars.



*Description of this and other machinse of the "Oliver" line on request.*

**OLIVER MACHINERY CO.**

GRAND RAPIDS MICHIGAN


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# ALLOY STEELS

**Open Hearth and Electric Furnace**

*Bars—Hot Rolled and Cold Drawn.*
*Billets—Slabs—Blooms.*

Chrome-Vanadium
Nickel 3½% and 5%
Chrome-Molybdenum
Chrome-Nickel
Magnet Steel
(Tungsten and Chrome)
Carbon-Chrome)
Nickel-Chrome-Molybdenum
Nickel-Chrome-Vanadium
Chrome
Ball and Race Steel
Electric Furnace Hi-Carbon
Special Analyses

When you purchase or specify our Alloy Steels for your product, you get with the steel the assurance that a competent metallurgist is at your service in the working and treatment of that steel.

Our standard analyses embrace all types of Commercial Alloy Steels—open hearth and electric furnace grades—and our specialization in the manufacture of Alloy Steels enables us to assist our customers in the selection of the correct steel for their requirements.

We melt—roll—cold draw—heat treat—our steels in one large plant, and under expert supervision.

***Avail yourself of our Consultatory Service***

If you have any place in your manufacture where you think you could use an Alloy Steel to advantage, give our engineers the opportunity of assisting you in the selection of the proper grade and type.

## UNITED ALLOY STEEL CORPORATION

**CANTON, OHIO**

Detroit
Syracuse
Cleveland

Philadelphia
New York
Indianapolis

Chicago
San Francisco
Portland

# And yet you encourage this!!!!

The body of a high speed reamer is the *lounge lizard* of tooldom—it leads a lazy life of expensive ease—while the blades do the work. And *you* support this lounge lizard, *you* pay for its luxury.

And in return it renders you nothing but *brittleness* and *breakage* because even its lazy life is too strenuous for its tender nature.



## PEERLESS HIGH SPEED REAMERS

Peerless High Speed Reamers on the contrary have bodies of a tough stalwart sort of steel—not expensive to support—fully capable of handling the sort of work it has to do—fully able to absorb the shocks and strains which smash a body of expensive high speed steel.

Peerless *blades* however are of high speed steel—especially selected stock treated especially to develop and preserve its cutting powers. The blades and body are then united by a patented process that makes the two one eternal unit—tough where toughness is needed, high speed where high speed is needed.

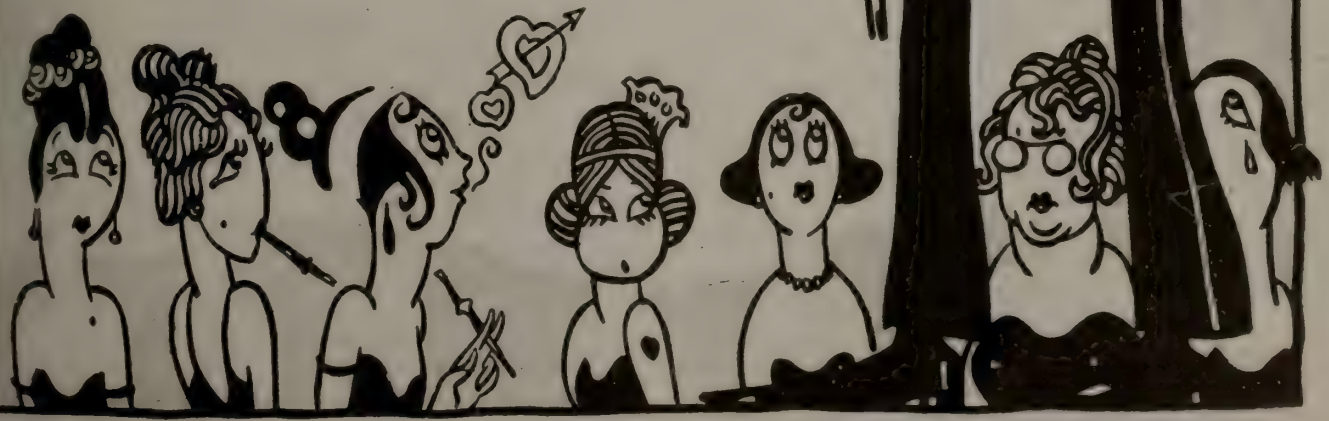
"Peerless" has no shiftless steel in its makeup—every bit of the tool is ready for the work expected of it—the body for the sudden shocks and strains—the blades for the punishment of high speed reaming—Do you wonder that we dare to ask to—

*Try to Stump "Peerless" On Your Toughest Job.*

## The Cleveland Twist Drill Co.

CLEVELAND NEW YORK CHICAGO

Agents for Europe, Cleveland Twist Drill Co., (Great Britain) Ltd.
36-37 Upper Thames St., London, E. C. 4.



MADE
IN CANADA

# MALLEABLE AND CAST IRON PIPE FITTINGS

Annual Capacity
6000 Tons

Quality Products

Prompt Service

M Brand Pipe Fittings, Screwed or Flanged, Black or Galvanized.

We are equipped to make the general run of malleable and grey iron castings for machinery manufacturers, agricultural implements, automobiles and specialties.

**Cast Iron Fittings**

stamped with our trade-mark mean fittings made with iron of high tensile strength — proper proportions and correct tappings.

**RECESSED DRAINAGE FITTINGS**

**Malleable Fittings**

of our brand mean fittings made of *Air Furnace Refined Iron,* reamed and tapped to gauge with perfect threads.

A trial of our pipe fittings will prove the quality of service they give.

## International Malleable Iron Company, Limited

GUELPH, CANADA

*Representatives:*

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St. John, N.B.—H. G. ROGERS, 147 Prince William St.
Winnipeg—HARRY F. MOULDEN, Confederation Life Building
Vancouver, B.C.—CYRIL AMES, Wilton Block
Montreal and Toronto—From Head Office, Guelph, Ont.

# RUSH ORDERS!

When our customers want machine tools or supplies in a hurry they wire or phone their orders. They know that from Petrie's gigantic stock they can get exactly what they want; they know that the order will be shipped immediately and they know that Petrie's fifty years of experience in filling the requirements of the machinery trade of Canada assures efficiency in every detail.

# PETRIE

## for MACHINERY AND SUPPLIES



## Your Problems!
### Make Them Ours!

Fifty years' experience in handling machinery of all classes in Canada places us in a position to successfully treat the problems peculiar to Canadian manufacturers. How can our engineering staff serve you?

## H.W. PETRIE, LIMITED
TORONTO and HAMILTON

*The largest selling quality pencil in the world*




TWO crowning achievements; the far-famed Venus of Milo, and the superb VENUS Pencil.

VENUS—the Peer of Pencils—meets perfectly the exacting needs of the engineer and the draftsman.

## VENUS PENCILS

**17 black degrees, 3 copying**

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| For bold, heavy lines | 6B-5B-4B-3B |
| For writing, sketching | 2B-B-HB-F-H |
| For clean, fine lines | 2H-3H-4H-5H-6H |
| For delicate, thin lines | 7H-8H-9H |
| Plain Ends, per doz. | $1.50 |
| Rubber Ends, per doz. | 1.75 |

*Three Copying Degrees for Indelible Uses*

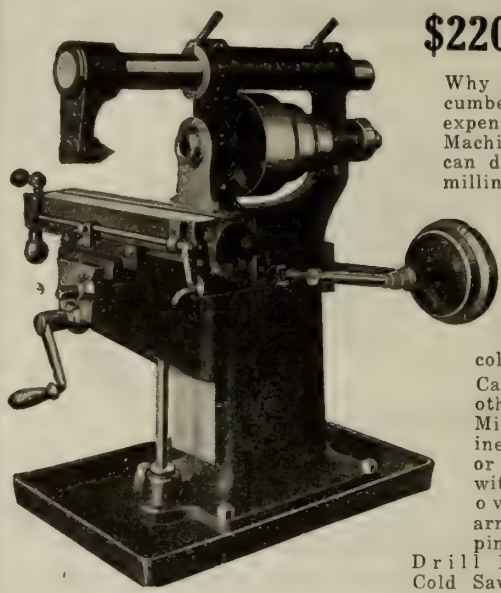
*At Stationers and Stores throughout the World*

**American Lead Pencil Co.**
238 Fifth Avenue, New York
*and London, Eng.*

**It Pays to Use High Grade Machine Tools**

## *This Power Feed Miller*

**$220** Canadian Moneys



Why buy a heavy, cumbersome and expensive Milling Machine when you can do your small milling operations to better advantage and much more rapidly on a light Burke Milling Machine. Either bench or column type?

Catalog shows other sizes of Milling Machines with hand or power feed, with or without overhanging arm. Also Tapping Machines, Drill Presses and Cold Saws.

## BURKE MACHINE TOOL CO.

CONNEAUT, OHIO, U.S.A.

For sale by: H. W. Petrie, Ltd.; National Machinery & Supply Co.; A. R. Williams Machinery & Supply; Canadian Fairbanks-Morse Co.; Williams & Wilson; Garlock-Walker Machinery Co.; Yeates Machinery Co.; Cope & Son, and Geo. F. Foss Machinery & Supply Co.

## Magazine Dresser



In this dresser, abrasive sticks are inserted in a steel tube by a knurled chuck and advanced as they are worn away.

Leave one at every grinding stand—they cost little, wear slowly, and save much.

A catalogue of the complete line of Desmond-Stephan Dressers will gladly be sent upon request.

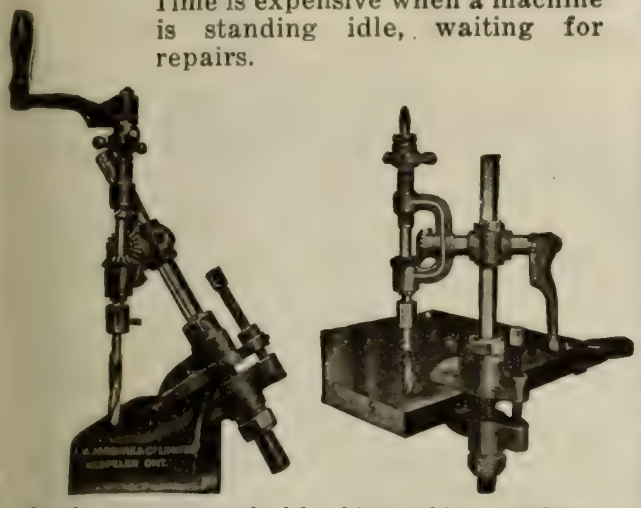
**GET OUR FEB. 1st PRICES**

## The Canadian Desmond-Stephan Mfg. Company, Ltd.

Hamilton - Ontario

# Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.

Sold by all Machinery and Supply Houses.

**A. B. JARDINE & CO., Limited**

HESPELER, ONTARIO

# Crucible

*AND*

# Open Hearth Steel

# *Tool Steel*

## "ARGO" BRAND *HIGH-SPEED* STEEL

**The John Illingworth Steel Co.**

1856

Frankford, Phila.

New York Office 217 Broadway

*RALPH B. NORTON, AGENT*

124 Craig St. W.

Montreal, Canada

THERE is as much difference in the various makes of High Speed Steel as there is in men—

The practice and methods of manufacturers differ widely in every mill and anyone who is at all familiar with the manufacture of High Speed Steel thoroughly understands this

# "Red Cut Superior"

*The Nationally Known—First Quality*

## HIGH SPEED STEEL

is the best for all Machine Work

ARE YOUR TOOLS MADE OF "Red Cut"?

**VANADIUM-ALLOYS STEEL COMPANY**

Main Office and Works :
Latrobe, Pa.

BRANCH OFFICES:

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| TORONTO | BUFFALO | CLEVELAND | CINCINNATI |
| MONTREAL | BOSTON | CHICAGO | DETROIT |
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# Gear Cutting With the "IFS" Left Out

## The Gear Shaper Way

A production manufacturer knows that he will secure good gears IF he has an accurate cutter, an accurate machine and a machine working on the correct principle. The whole question of good gears is resolved in this one little word "IF."

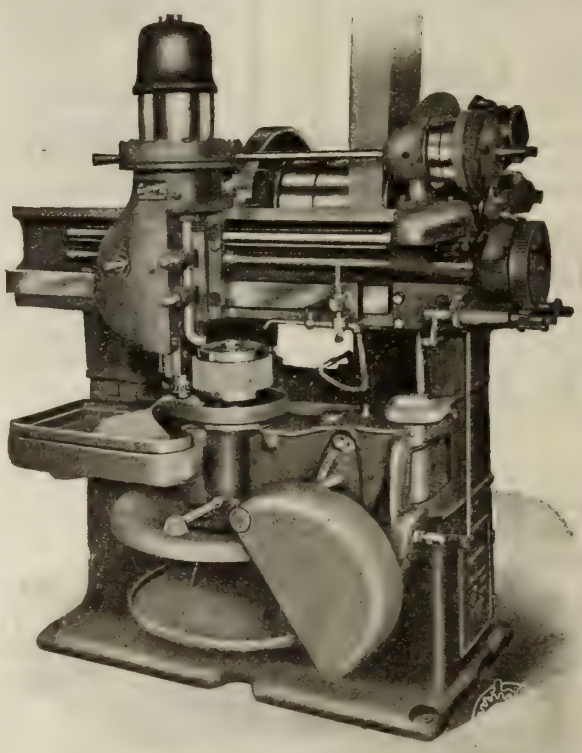
When the Gear Shaper was originally designed, the question of "IF" was taken into consideration and every possible means known to mechanical engineering was employed to eliminate the "IFS" from gear cutting.

That we have been successful in solving the problem is evidenced by the fact that each ensuing year sees a larger number of manufacturers adopting the Gear Shaper method.

How the Gear Shaper has accomplished this is clearly explained in our general catalog "Commercial Gear Cutting," which is a treatise on the subject of:—

Gear Cutting with the "IFS" Left Out.

**Send for your copy to-day.**



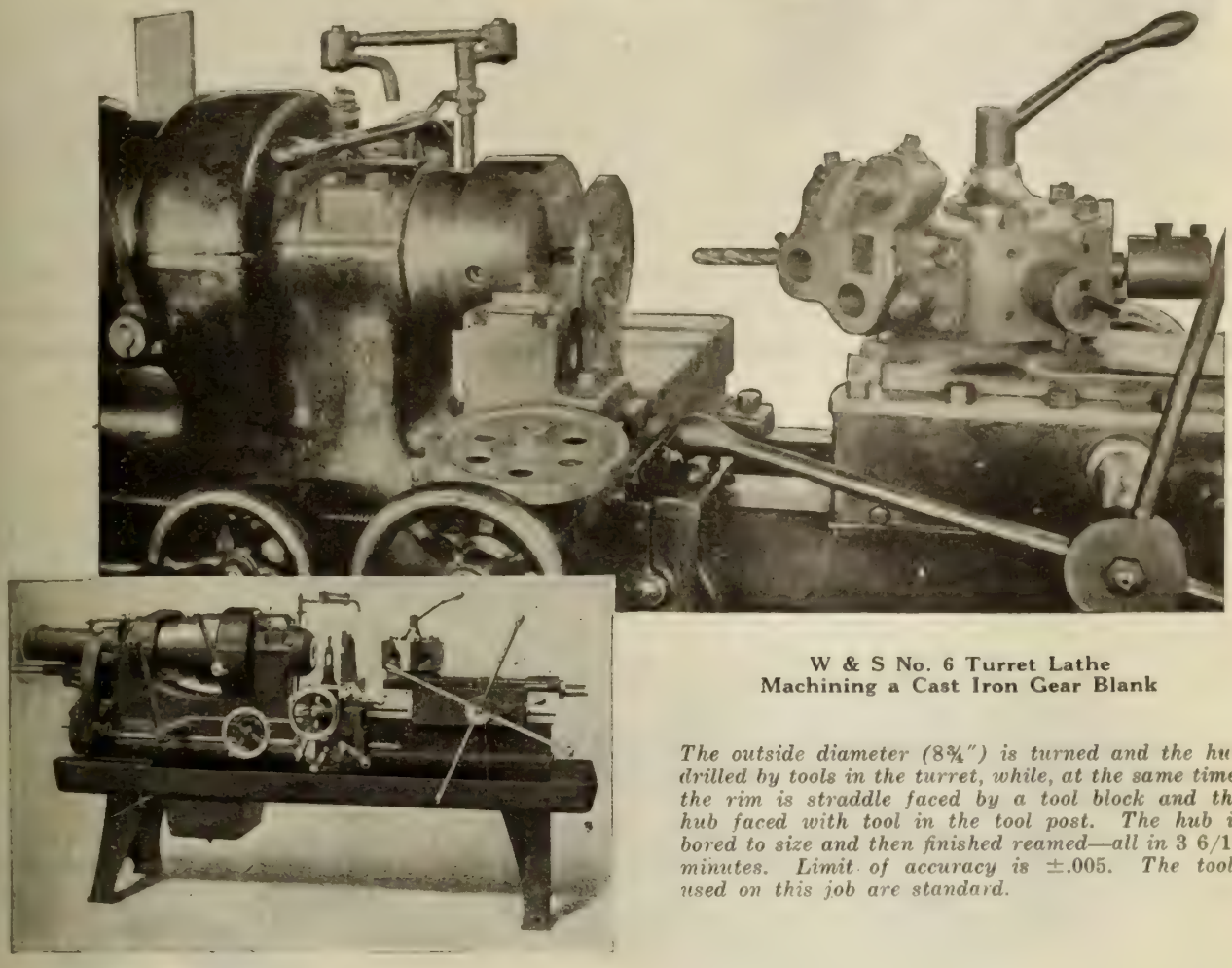
The Fellows Gear Shaper—the machine which has taken the "IFS" out of gear cutting.

# The Fellows Gear Shaper Company

## Springfield, Vermont, U.S.A.

FOREIGN AGENTS:—Alfred Herbert, Limited, Coventry, England; Societe Anonyme Alfred Herbert, Paris, France; Societa Anonima Italiana Alfred Herbert, Milan, Italy; Alfred Herbert, Limited, Yokohama, Japan; Societe Anonyme Alfred Herbert, Barcelona, Spain; Societe Anonyme Belge Alfred Herbert, Brussels, Belgium; Alfred Herbert (India), Limited, Calcutta, India.

# The Revival of Business Is Sure



**W & S No. 6 Turret Lathe**
**Machining a Cast Iron Gear Blank**

*The outside diameter (8¾") is turned and the hub drilled by tools in the turret, while, at the same time, the rim is straddle faced by a tool block and the hub faced with tool in the tool post. The hub is bored to size and then finished reamed—all in 3 6/10 minutes. Limit of accuracy is ±.005. The tools used on this job are standard.*

Anticipate your needs for the Revival of Business. Be ready to compete in price and quality. Warner & Swasey Engineers are eager to help you. They will study the working cost of your turret lathe equipment and show you where and how this cost can be reduced if possible, thereby increasing the earning capacity of the equipment.

There is no obligation attached to asking for our Engineer to call.

# The Warner & Swasey Company

## CLEVELAND, U.S.A.

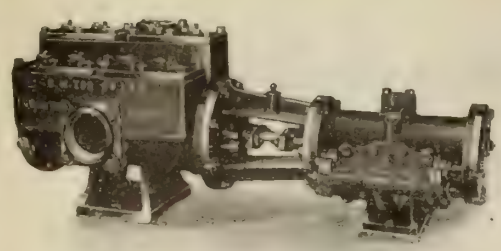
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Note the location of the Steam Chest on the side of the cylinder. The Steam Ports enter the cylinder bore near the bottom, and allow of all condensation being drawn away. The Hepburn is the only Self-draining Steam Pump made in Canada

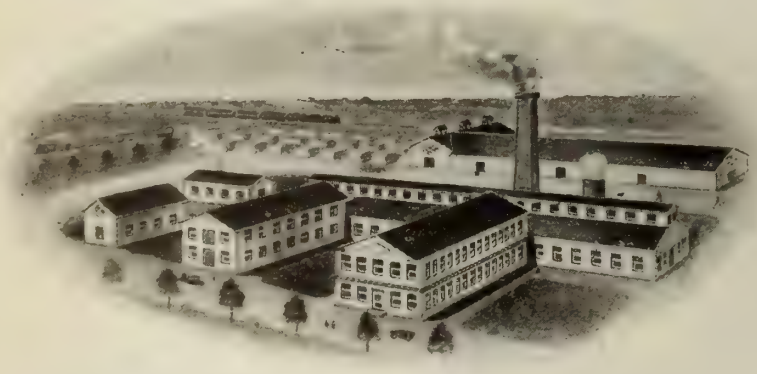
## Put a Hepburn Vacuum Pump On the Job

This Hepburn Patent Vacuum Pump is the very pump you need. Look at its simple construction. There are no tappets or levers to get out of order. Its working parts are few, and the valves are very accessible. Then it has a long stroke which assures a decided economy in steam. **Write for full particulars.**

Hepburn Products include Vertical Engines, Compressors, Winches, Cut Gears, Derricks, Cranes, Brick Machinery, Hydrants, Valves, Blacksmith Work and Acetylene Welding.

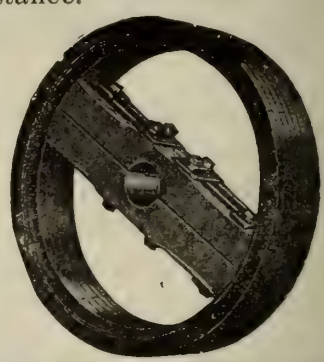
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# TRANSMISSION APPLIANCES



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have achieved an enviable reputation in the Industrial World. Their performance under every conceivable working test has proved their dependability, and they are the most economical because of their durability.
We stand back of our products and will give Dealers every assistance.



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*Manufacturers of High-Grade Power Transmission Appliances*
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Rotary Continuous Heat-Treating Furnaces Used in Quantity Production of Pressed Steel Parts.

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Bringing material up gradually to the final temperature.
Utilizing heat in spent gases to preheat material.
Exposing each piece to heat in same manner, to same temperature, for same length of time.
Uniformity not only of the individual piece but of the sections thereof as compared with the corresponding sections of other pieces.

**DO THESE ADVANTAGES APPEAL TO YOU?**

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*Furnace Engineers and Contractors*
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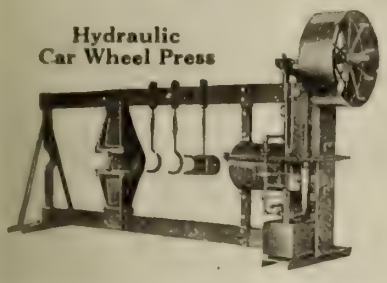
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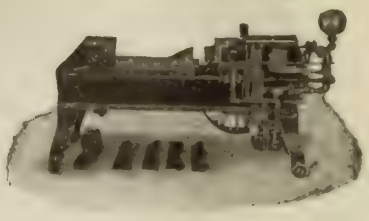
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We manufacture a complete line of presses for bending, straightening, forcing, forming, broaching, welding, baling, and many other purposes.

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Pumps for pulp and paper mills, Pumping Engines for municipal purposes, Centrifugal Pumps.

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**Hack Saw Blades That Reduce Cutting Cost**

# SIMONDS

For Machine or Hand Use. Hardness in the teeth for rapid cutting—Flexibility in the blade for long wear. They do not break when properly used.

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# Dependable Quality!

Dependable quality in abrasive wheels is next to impossible unless the manufacturer commands his own raw material supply. Inability to do this has always stood against dependability in Canadian wheels.

**Dominion Wheels are now manufactured from abrasive from our own furnaces. Their quality is thus assured—they run true to grade and grain.**

Give Dominion Wheels a trial. You will find them equal to the best grade of imported wheels—and you save duty and exchange.




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Equal to the Best

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## EXTREME STRENGTH and QUALITY

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Specify Armstrong when ordering and get the best.

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MAINLY through the portability of Prest-O-Lite it was possible to weld the base of this heavy railroad crane in a few moments less than five hours.

That's the usual quick way in which it is possible to weld with Prest-O-Lite and the oxy-acetylene process.

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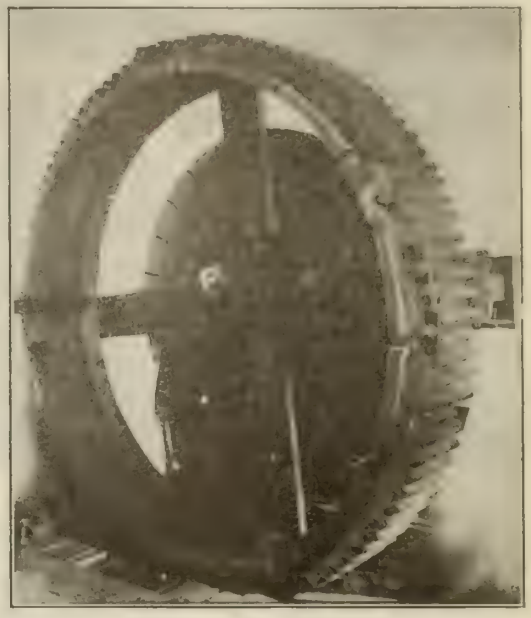
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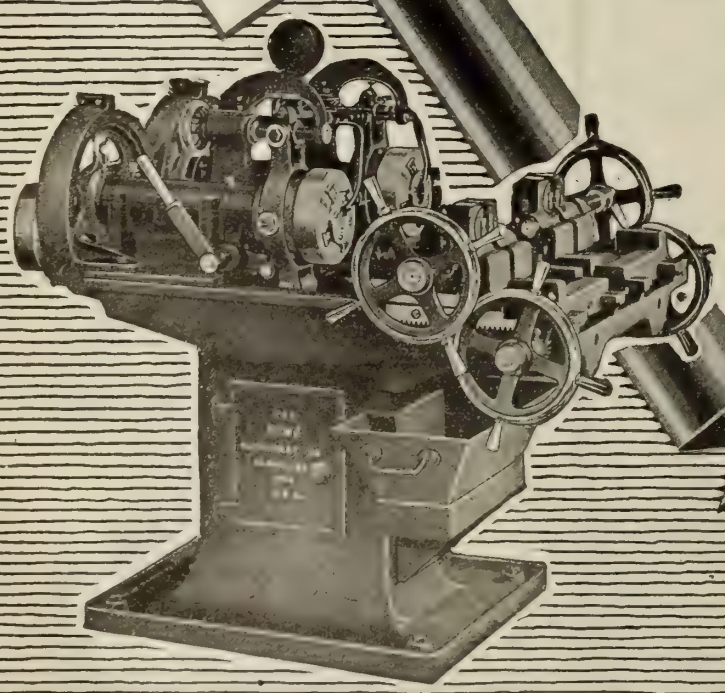
## Machine-Moulded GEARS

"HISCO" machine-moulded gears, while requiring no pattern, insure accuracy, dependability, quality, and the price is minus the cost of patterns—which in these days of high prices of lumber and labor is something to be considered.


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## SQUARE HEXAGON TEE-HEAD



**Cut Them In Your Own Plant**

***and Save Money on Cost and Delay in Deliveries***

## ACME BOLT CUTTERS

are made in various sizes for cutting bolts from ¼ to 1 in. diameter. Their heads allow micrometer adjustments while they are in motion. The dies can be changed from one size to another in less than one minute and produce clean, accurate, highly-finished threads.

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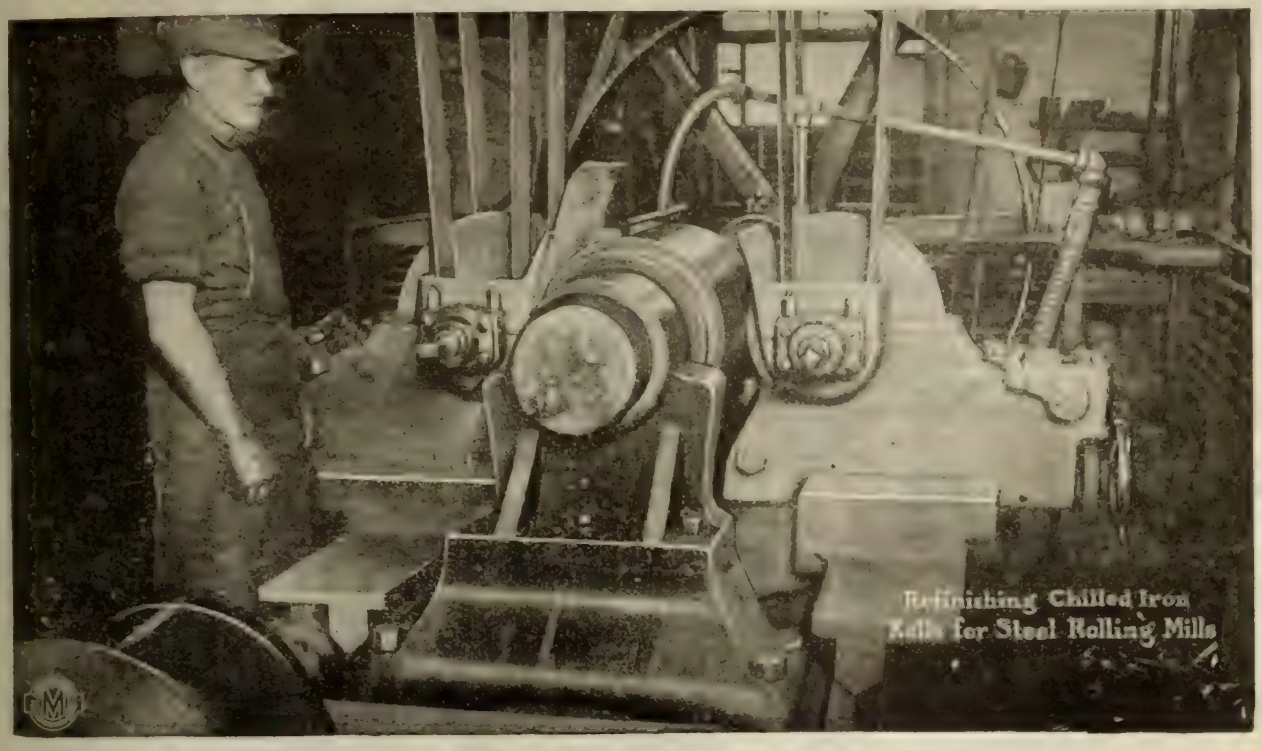
**4530 St. Clair Ave. Cleveland, Ohio**

We make a complete line of Bolts, Rivet, Heading, Upsetting and Forging Machines, Bolt Cutters, Hot Pressed Nut Machines, Hammer Heads, Bolt Pointers, Nut Tappers.

**Representatives for Canada:**

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# ACME BOLT CUTTERS




# Waltham Carbowalt Wheels

*Tough Grinding? We'll say It is.*

Re-grinding chilled iron rolls—any rolling mill operator will tell you how he likes that job, especially where the finish must be as nearly perfect as possible.

The American Tube & Stamping Company (Bridgeport, Conn.) uses a special Waltham Carbowalt Grinding Wheel—18 x 1⅝ x 12/12¼—346—2½—to put the finishing touch on these rolls and has no kick to register either on the wheel or the work.

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ALOWALT

RICHARDSON PLASTIC — WALTHAM GRINDING WHEEL COMPANY — SILICATE VITRIFIED

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**WALTHAM GRINDING WHEEL CO.** OF CANADA LIMITED
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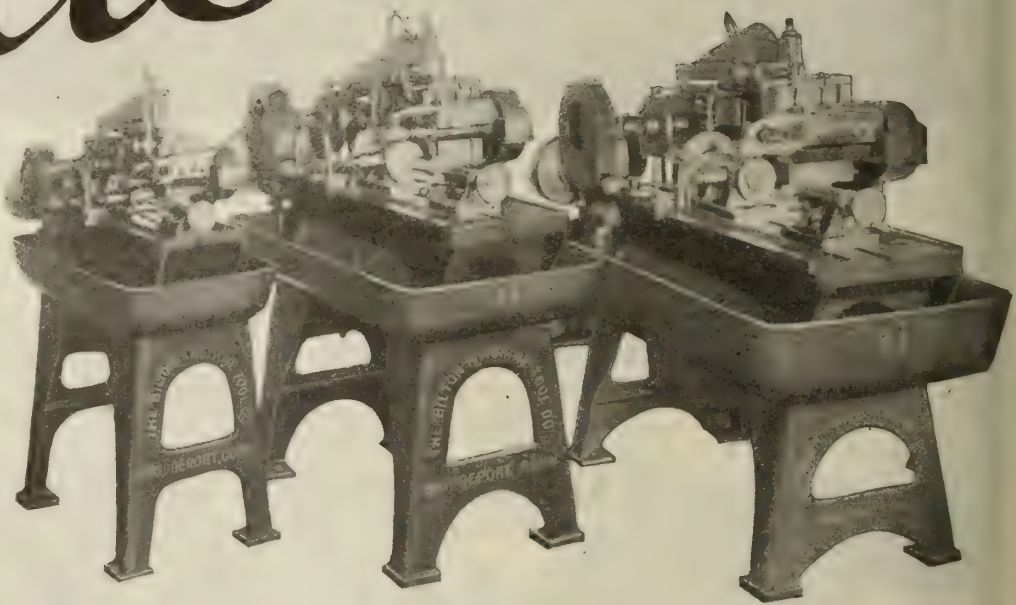
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# Bilton GEAR MILLERS



## Fully Automatic

Their adaptability is almost unlimited on small work—such as cutting spur, bevel, miter, angle gears, saws, ratchets, sprockets, cutters, knurls, taps, cylinders, form cutting, manufacturing, milling, etc.

A big time saver, as indexing takes place during return stroke of cutter — which is removing metal 90% of the time.

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***Over 500 leading manufacturers now use the Bilton for high production on accurate work***

**Bilton Machine Tool Co.** Housatonic Avenue **Bridgeport, Conn., U.S.A.**

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***Theoretically Correct***

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The Loop Hand Chain Guide (patented) permits the rapid operation of the hoist from any angle.

## *Making the Short Haul s-p-e-e-d the Long Haul*

It's only a short distance—from the ground to the floor of a truck—but it's often the difference between profit and loss.

Loading and unloading is merely a matter of lifting and carrying. The FORD TRIBLOC, suspended from a roller-bearing trolley on a small I-beam trackway, will do the "Short Haul" speedily, safely, economically—and require the services of but one man.

A cut stone manufacturer found it a saving to use his TRIBLOC at both ends of the Haul. A truck is a heavy investment—its idle time loading and unloading might more than pay *you* for a rigging of this kind. Want to know more about it?

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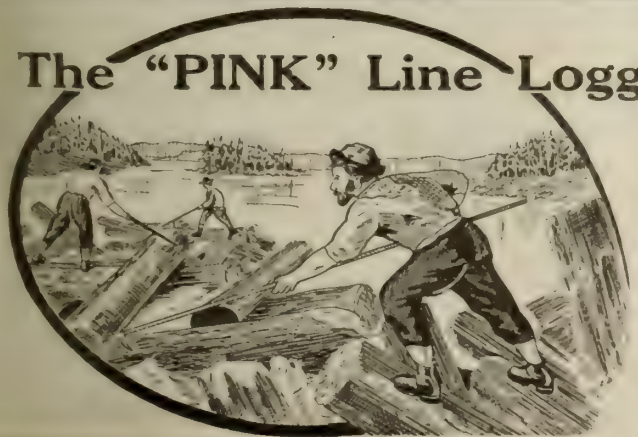
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**MADE-IN-CANADA Products---Headquarters for British Empire for all Lumbering Tools**

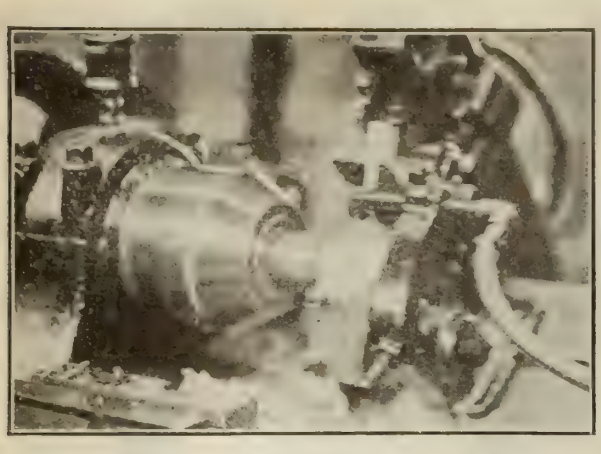
In every lumber camp in Canada you'll find PINK'S famous lumbering tools. They are the favorites there and have won the esteem of all woodsmen through their superior merit. They are world-renowned and are extensively used in Australia, New Zealand and other countries where the lumbering industry thrives.

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We export the same good quality of lumbering tools that have made PINK'S TOOLS a by-word in the matter of good tools in all Canadian lumber camps. Enquiries cordially solicited.

**Thomas Pink Co., Limited**

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# LARCUL CUTTING OILS SAVE TOOLS

Tools that ordinari y have to be reground every two or three hours can be kept in use continuously for long periods when cooled with Larcul.

No other lubricant carries the heat from the cutting edge of the tool so rapidly—hence no other lubricant enables the tool to retain its cutting power for such long stretches of time.

The saving in tools alone, in shops that use Larcul, is a big item, not to mention the saving of time made possible by eliminating frequent stops for re-grinding.

The quality of the work, too, is improved by Larcul. Greater accuracy—finer finish. From every standpoint Larcul is the coolant of highest economy and efficiency.

### LARCUL EBONY

Many users claim that they get better results with this oil than they formerly got with lard oil. Recommended for pipe and bolt threading, nut tapping, turrets and automatic forming, turning, boring and threading machinery. On open hearth, low and high carbon steel.

### LARCUL AMBER

A transparent cutting oil that gives an even smoother finish than lard oil. For all types of automatics, turret machines, gear cutters, hobbing machines, broaching machines, nut tappers, profilers, etc., on high carbon, vanadium, chrome nickel and tungsten steel.

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*QUICK DELIVERIES*

**High Carbon Steel**
**Manganese Steel**
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*QUALITY GUARANTEED*

**Sizes—½ lb. to 5,000 lbs. each**

**THE WILLIAM KENNEDY & SONS,**
*LIMITED*
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ESTABLISHED 1860

# DIAMOND TOOLS

FOR TRUEING GRINDING WHEELS

QUALITY SERVICE SATISFACTION

INDUSTRIAL GEMS

**Tools For All Mechanical Purposes**

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# STEEL CASTINGS

We shall be glad to supply, in addition to our General Catalogue, literature on

Steel Castings — Lithographed Ware
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Made by the Acid Electric process up to fifteen tons. Castings made by this process are free from blow holes, easy to machine, and superior in every way to ordinary Steel Castings.

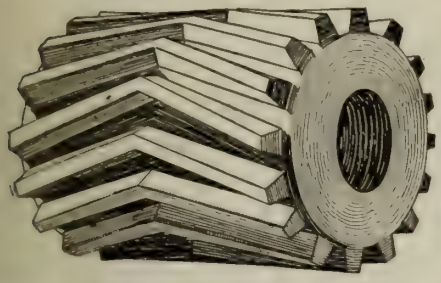
Castings supplied for shipbuilding, cars, locomotives, all classes of machinery, etc.

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Branches: Toronto and Winnipeg

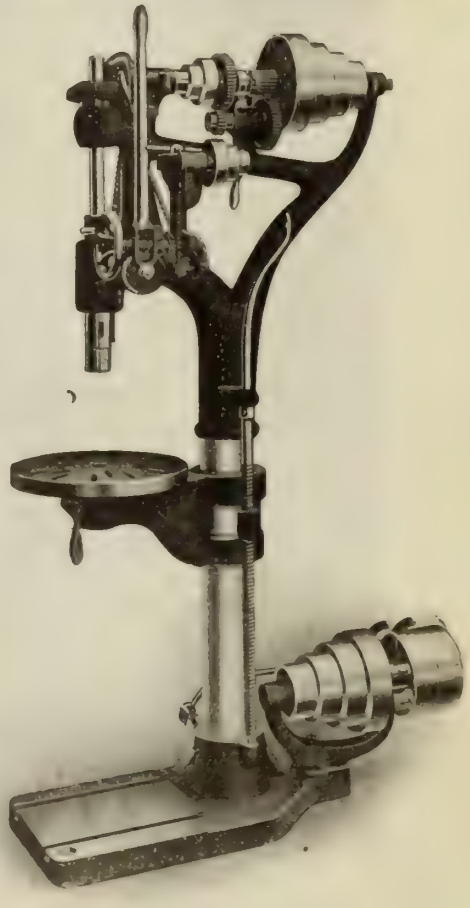
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# DENBIGH DRILLING MACHINES



## BUILT IN FOURTEEN SIZES

By the aid of a very efficient plant and organization, we manufacture these machines in large numbers by mass production.

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CABLES—ATHENIAN, SEDIST, LONDON





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# The Automatic Double-Roll Feed

on this "BLISS" No. 69-N Cam Drawing Press makes possible an output of 3,500 rod-ends per hour for Simmons Brass Beds, while the operator sits back and takes it easy. The stock used is 18 gauge, 3-inch strip brass.

BLISS 1857

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BLISS 1921

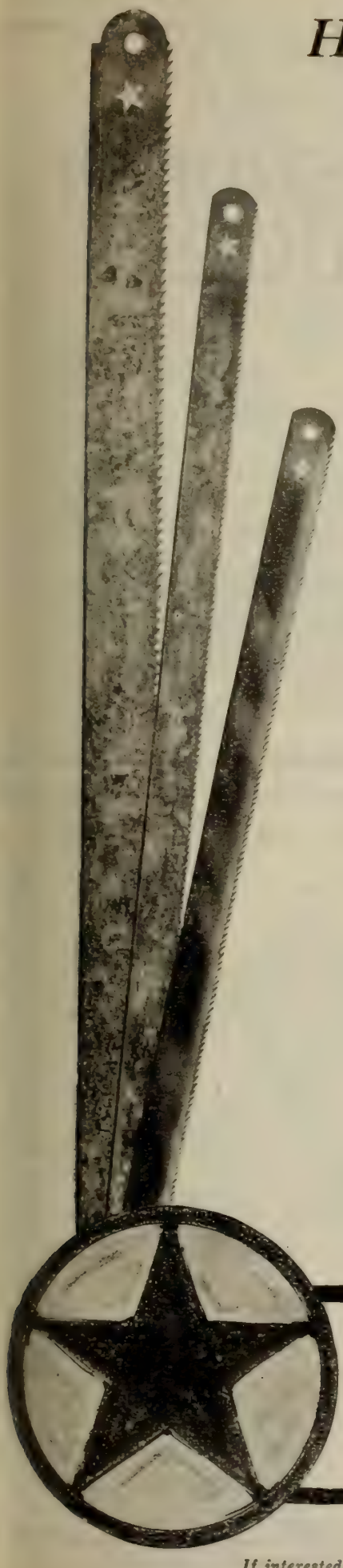
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No. 114



# How to Save Money on Hack Saw Blades

Do you "get prices" when you buy hack saw blades? If you do, you are fooling yourself.

The place to save money on hack saw blades is not on the purchasing agent's desk, but in the shop.

Cost per blade has but little or nothing to do with hack saw economy. The blade that will really save money for you may cost a little more per blade, but a great deal less per cut. Figure cost by service rendered and you will realize why so many purchasing agents have changed their specifications from "Star Blades or equal" to "Star Blades—no substitute."

You can use one Star Saw on more kinds of sawing and use it longer.

You have fewer blades to buy; that means you have less money tied up in stock and less chances to run out of sizes.

Star Saws are standardized for all kinds of cutting. You can keep a medium-sized blade in your machine and use it for all kinds of work except very large or small cuts.

It all depends on the way Star Saws are made. In Star blades, the greater amount of tungsten and the acute cutting angle of the teeth enable you to go through heavy work almost as easily as light work—the hardest steel as well as the softer metal.

Don't let "prices" fool you. It's the work that the Star does out in your shop that saves you money.

## Star Saws are Now Sold By the Makers

We now sell our own product, for we believe no other organization is in such a good position to give selling service on Star Saws as our own factory that has made them for 37 years.

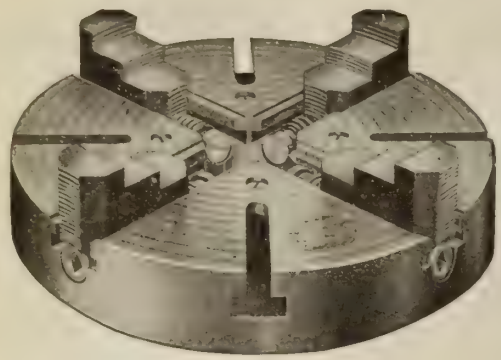
We are not satisfied only to sell you Star Blades, but stand ready to render you every service in getting the best results in their use.

**CLEMSON BROS. INC.**
**MIDDLETOWN, N.Y.**

*Canadian Offices and Warehouse,*
**304 Imperial Office Building, Hamilton, Ontario**

# STAR HACK SAW BLADES

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We make a complete line of steel chucks, including **Geared Scroll Chucks and the Geared Scroll Combination.** These types are conceded to be unparalleled for heavy work and hard usage. **Write for our illustrated catalogue.**

ALL STEEL

# INDEPENDENT CHUCKS

will put your work on new standards for accuracy and fast production. Independent Chucks are built for abnormally hard wear —the kind of usage that calls for great strength and long wearing qualities. Independent All Steel Chucks have proven so satisfactory that they are almost a necessity wherever high-speed cutting tools are used.

**UNION MANUFACTURING, CO.,**
**New Britain, Conn.**

***New York Office:*** **26 Cortlandt Street**

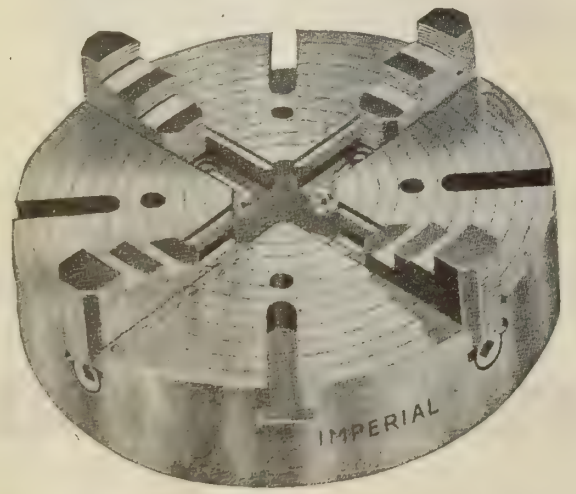
***Makers of a Complete Line of Chucks***

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Sturdy long-wearing "Made-in-Canada" Chucks that are making good everywhere.

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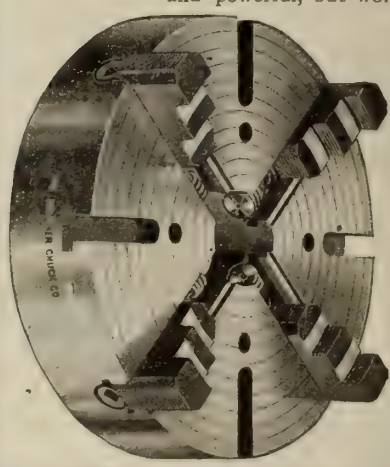



**Ker & Goodwin Machinery Co.**
BRANTFORD, Ont. LIMITED

SKINNER CHUCKS

## Strong Chucks—

That truly describes Skinner Steel Body Independent Lathe Chucks. They are not only strong and powerful, but wonderfully accurate. The



**4-Jaw Independent Chuck, Steel Body, for Heavy Duty**

**SKINNER Steel Body Independent Lathe Chuck**

is a single steel casting of great strength, well proportioned and accurately finished. Face is graduated accurately in inches. Screws and bearings are made of the toughest steel to withstand abnormally hard wear.

The dependability of Skinner Steel Body Independent Lathe Chucks is conclusively proved by the fact that not one has ever been known to break in service—and we have been making them for many years.

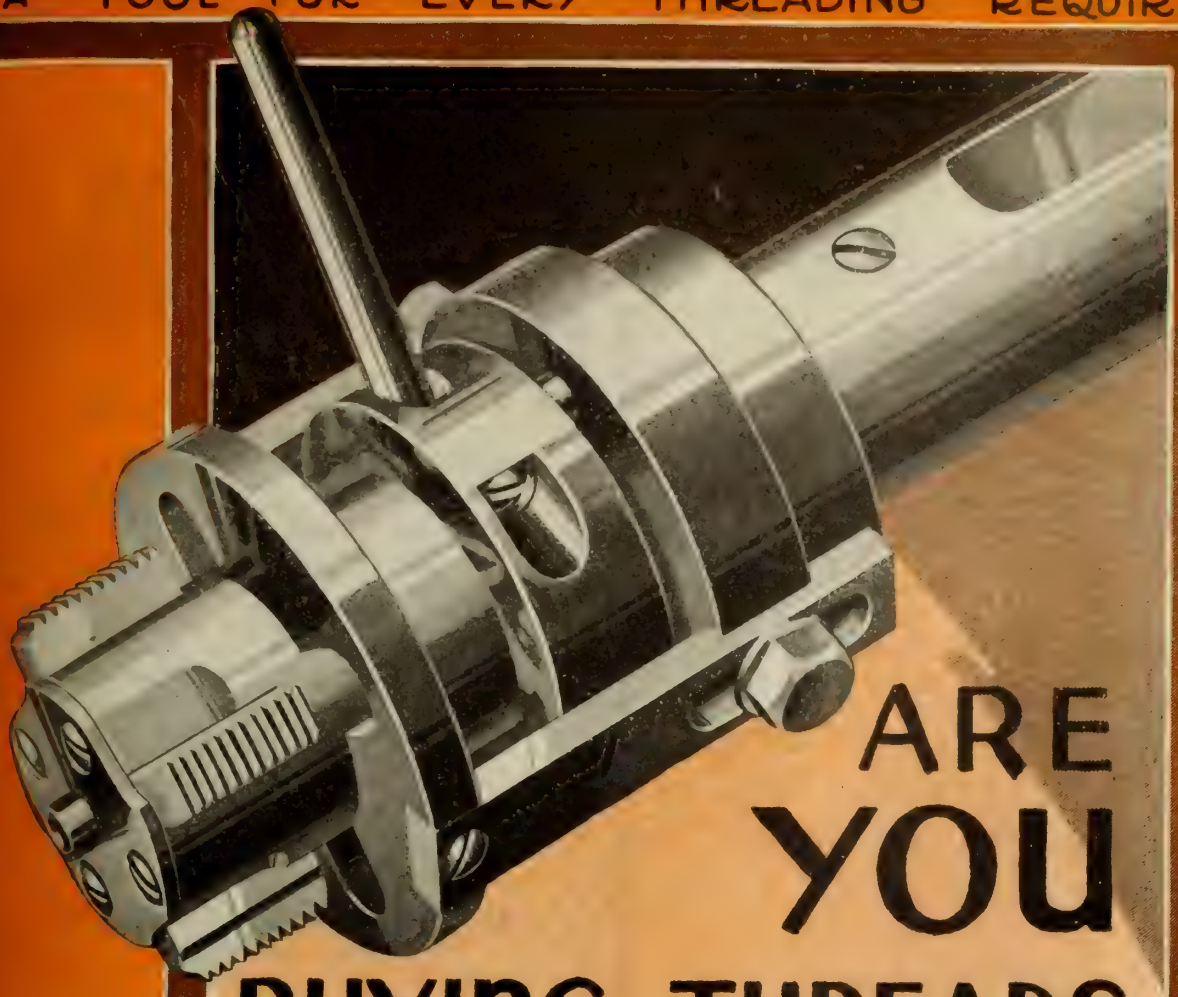
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**THE SKINNER CHUCK COMPANY**

NEW BRITAIN, CONN U S A
ESTABLISHED 1887
NEW YORK OFFICE: 94 READE ST.
SAN FRANCISCO OFFICE: RIALTO BLDG.
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The man who knows threading knows that there is a vast difference between mere theory and good threading practice.

He is buying THREADS—wants the greatest number of pieces per day—wants them to fit the gage and at cost which he is proud to turn in for inspection.

These are exactly the factors that are considered most important in building NAMCO Collapsing Taps—they are also the factors you should fully investigate in connection with YOUR WORK.

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For over fifty years we have made — nothing but files!

Think of it! The scientific study, the careful testing, the accumulated experience of fifty years, all concentrated on the making of one line!

Is it any wonder that our files are accepted as the standard of file quality?

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# FILES

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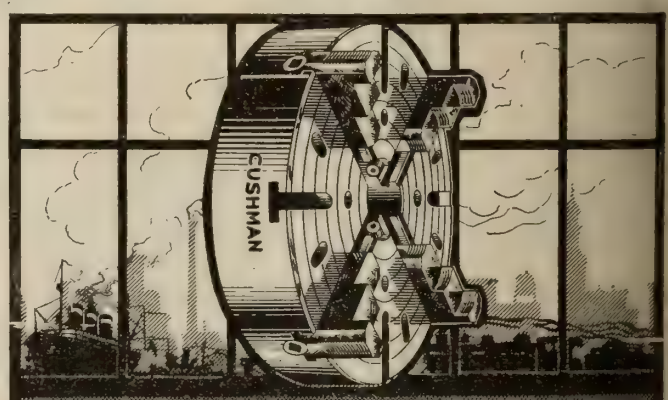
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**THE CHUCK WITH A REPUTATION TO MAINTAIN**

**"CUSHMAN" CHUCKS**
**1862**

**THE CUSHMAN CHUCK CO.**
HARTFORD, CONN.

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HIGH SPEED STEEL
INTRA STEEL GIBRALTAR STEEL
Tool Steel for Every Purpose
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Twist Drills, Taps, Hack Saw Blades Milling Cutters,
Files, Etc., Music Wire for Springs, Steel Balls.
Cold Rolled Tool Steel in Strips and Sheets,
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OF BELTING
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*The back of the Ox*




is the part where the fibre of the hide is tightest and unaffected by the action of breathing, therefore the most suitable to produce a dead straight and practically stretchless belt.

**Tullis**
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is made entirely from this portion of the hide.

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# Why I Increased My Space in Business Papers for 1921

*—By a Manufacturer*

(1) "Business conditions are fundamentally sound.
(2) "My goods will have to be *sold,* not just bought.
(3) "I propose to cut travelling costs by relieving salesmen of work that advertising can do better and more cheaply.
(4) "My advertising will aid in the restoration of Confidence.
(5) "Increased sales resistance calls for added sales effort.
(6) "Conditions make your papers more indispensable, more closely read.
(7) "I know they reach my market without waste.
(8) "Because they are doing a big, constructive, creative work—benefiting me through promoting the welfare of my customers.
(9) "It is time to intensify sales forces of proven productiveness and low cost.
(10) "I need the business."

**Just Common Sense**

—a good many will say. Nothing here that everyone does not know, but half of wisdom consists in *being wise in time.* This advertiser not only did some clear thinking, but he acted.

Ask our Advisory Service Department for any help you need in working out the right plan and schedule for your business in 1921. No charge or obligation of any kind.

**All Business Papers are good, but some are better than others. The phrase "Member of the Associated Business Papers, Inc.," means proven circulation PLUS the highest standards in all other departments.**

***Canadian Machinery is a Member of the Associated Business Papers and also of the A. B. C.***

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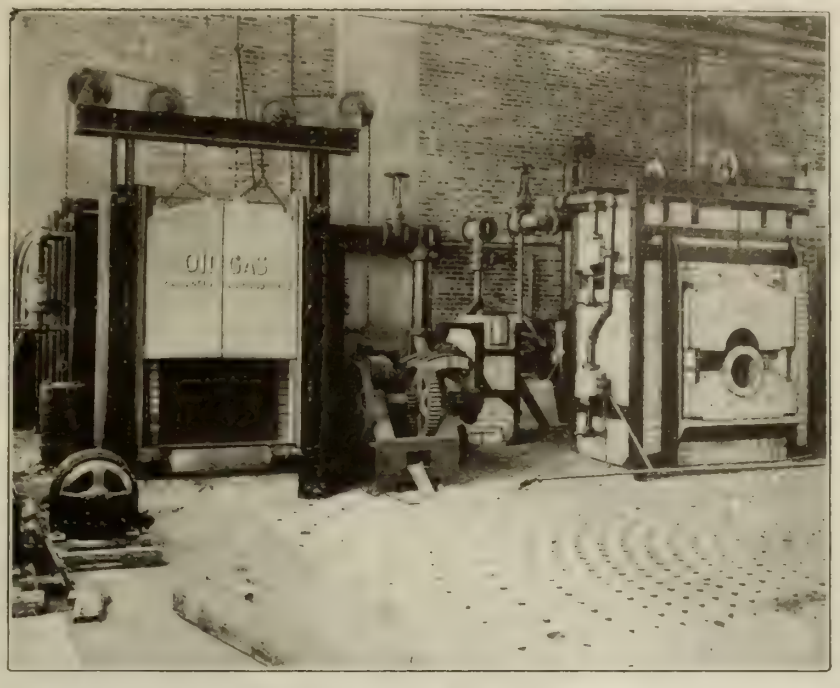
## ASSOCIATED BUSINESS PAPERS, Inc.

*Jesse H. Neal, Executive Secretary*

**Headquarters 220 W. 42nd Street New York**

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ELECTRIC FURNACES




"OILGAS" FURNACES AT CRANE LTD., MONTREAL

FOR STEEL OR BRASS

## As the Tungsten Lamp is to the Carbon

The relation of the new type of "OILGAS" furnace to former designs is similar to that existing between the old type of carbon bulb and the modern tungsten. The "OILGAS" way is the modern way!

If the work requires *heat,* we can supply an "OILGAS" furnace to handle it with the highest degree of efficiency and economy.

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| **Continuous Forging** | **Enamelling** | **Malleable Melting** |
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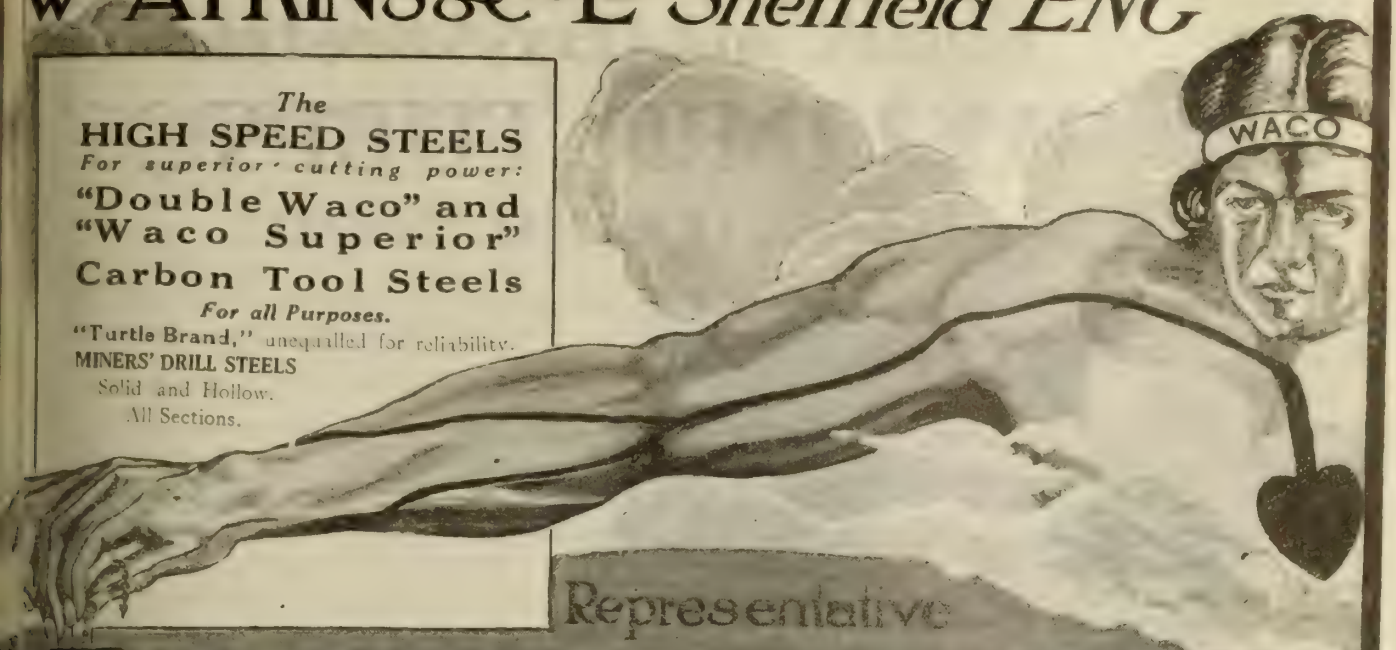
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TRAHERN
Better Threads
One of the vital necessities for cutting clean and accurate threads, is a steady stream of coolant kept flowing upon the chasers of the die head. The coolant gives longer life to the chasers, keeps them cool, and makes threading much easier.
But a dependable circulating pump is necessary to assure a steady flow of coolant.
Trahern Rotary Geared Coolant Pumps are furnished as regular equipment on leading machine tools to-day. They throw heavy, forceful streams entirely free from pulsation. Supply can be shut off at discharge without stopping the pump, assuring the right quantity of coolant at the proper time. Will pump water, oil or compound. Operate at low speed, guaranteeing long life. If necessary will work against 100 lbs. pressure. When properly installed, guaranteed not to lose their prime.
For high quality threads, equip your machines with TRAHERN Pumps. Our catalog No. 11 explains in detail.
TRAHERN PUMP DIVISION
Geo. D. Roper Corporation
ROCKFORD, ILL.


SaBeN ExTrA
HIGH SPEED STEEL
The Highest Achievement
of British Tool Steel
Metallurgy
H.A.DRURY COMPANY
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# W. ATKINS & Co Ltd Sheffield ENG

*The*
**HIGH SPEED STEELS**
*For superior cutting power:*
**"Double Waco" and "Waco Superior"**
**Carbon Tool Steels**
*For all Purposes.*
"Turtle Brand," unequalled for reliability.
**MINERS' DRILL STEELS**
Solid and Hollow.
All Sections.




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# STEEL *for*
## Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

**We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.**

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**Steel Ingots**
*by the*
**HARMET**
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# Electric and Oxy-Acetylene
# WELDED TUBING
## *Also BUTT SEAM TUBING*

We have a thoroughly equipped plant for Welding by Electric and Oxy-Acetylene processes. Butt Seam Tubing is also one of our specialties. Tubing made hot or cold rolled finish.

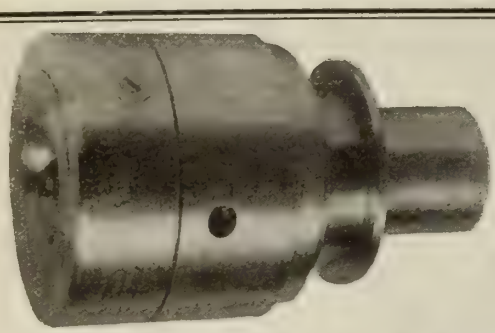
***Our Work Includes Tubing for***

Bicycles, Bedsteads, Automobile Parts, Electric Fixtures, Gas Fixtures, etc. Round, Square, Rectangular and Special Shapes. Sizes ⅜ in. to 2 in. outside diameter, from 16 to 22 gauge. Also equipped for bending 16 gauge or lighter, any shape or radius.

Let us advise you of the kind of tubing that will best suit your requirements. Inquiries gladly answered.

**The Tube Company of Canada LIMITED**

**233 Dufferin Street, TORONTO, Canada**



# No. 2 TYPE "R"
# Hartness Automatic Die

***WITH SHANK FOR REVOLVING SPINDLES***

These dies are designed for use on either vertical or horizontal spindles. Die is re-locked by forward motion of sleeve, which may be actuated by a yoke working in the groove or by a fixed stop making contact with rear edge of sleeve at the return stroke. Die is unlocked in the usual manner by retarding its forward motion or by a fixed stop, making contact with the external tripping button shown on the face of the die. External tripping button is especially desirable in cutting very short threads as it relieves the thread of the strain incidental to unlocking by the pull-off device.

**The diameter of the No. 2, Type R die is 3 3-16 in., and its length as shown is 3½ in.**

**The Die cuts both right and left-hand threads ½ in. to 1 in. in diameter, and from 10 to 40 threads per inch.**

**Shanks are varied to meet individual requirements.**

**A set of standard chasers in carbon steel is supplied gratis with each Die.**

**No tools of any kind need be used in changing chasers.**

**A chaser grinding jig is supplied gratis on Die orders if desired.**

## Jones & Lamson Machine Company
**(DIE DIVISION)**

**9-10 Water Lane, Queen Victoria St., LONDON, ENGLAND.** — **SPRINGFIELD, VERMONT, U.S.A.** — **503 Market St., SAN FRANCISCO, California, U.S.A.**

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France, Spain, Belgium—F. Auberty & Company, 91 Rue de Maubeuge, Paris, France.
Holland—Spliethoff, Beewukes & Company, Rotterdam, Holland.
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# Versatility

A tool room to be complete must be equipped with machines of sufficient adaptability to handle varied and difficult jobs.

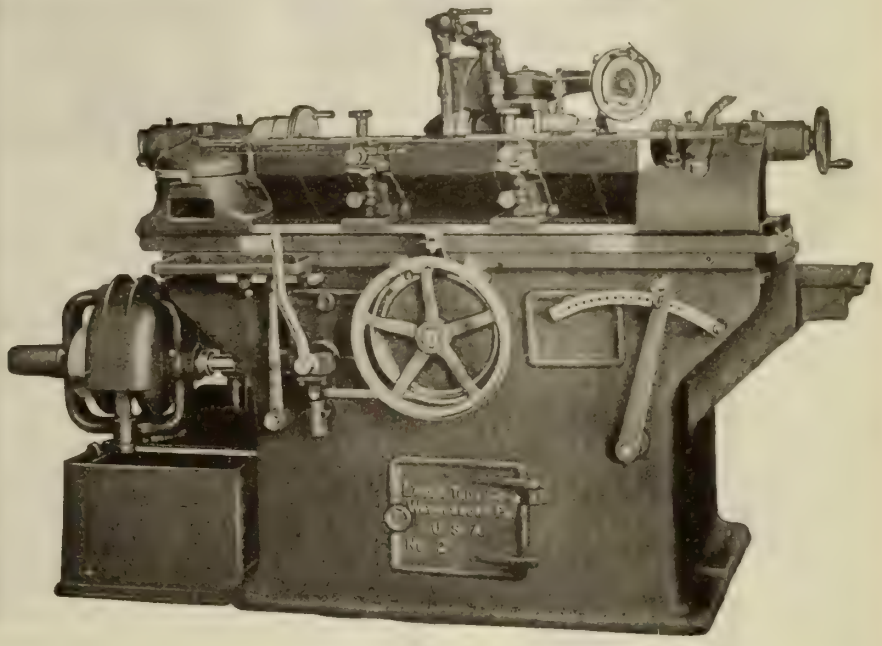
Combining as they do both an external and internal grinding machine, the versatility of Landis Universal Grinding Machines is practically unlimited.

Economical, efficient grinding is the rule wherever Landis Grinders are used. Let us explain the many features of this machine in detail.

**Landis Tool Co.**
Waynesboro, Pa.
New York Office: 56 Church St.

LANDIS

## UNIVERSAL GRINDER



More Speed
Better Work
With—

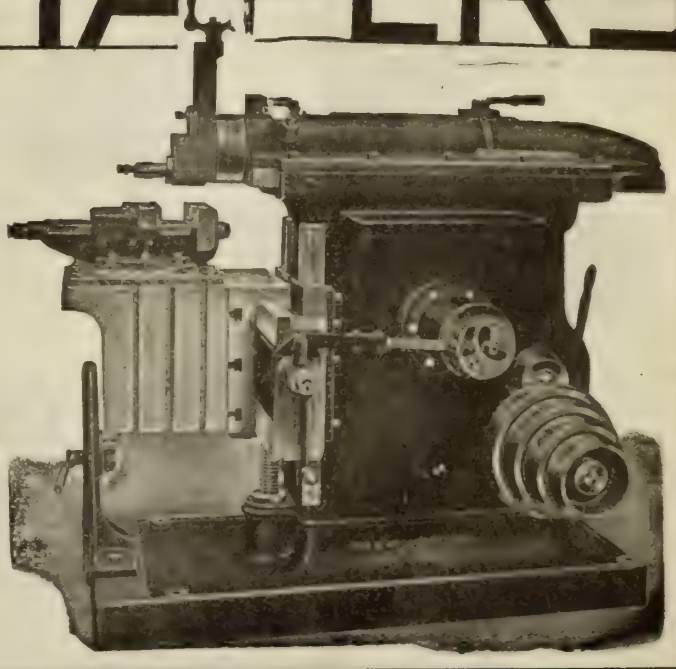
## McDougall SHAPERS

16 and 20 inch Crank

Modern methods of manufacture require modern tools. McDougall 16 and 20 inch Shapers embody the best features of all machines which have been placed upon the market and can be depended upon to produce work **accurately** and **fast.**

An important feature is the column. It is massive in construction, well braced and reinforced internally. Has ample opening under ram for keyseating or other long work. Bearings for ram extend beyond vertical line of column both front and back. The ram is of exceptionally strong construction.

McDougall shapers have other points of interest you should know about. **Write for full description.**

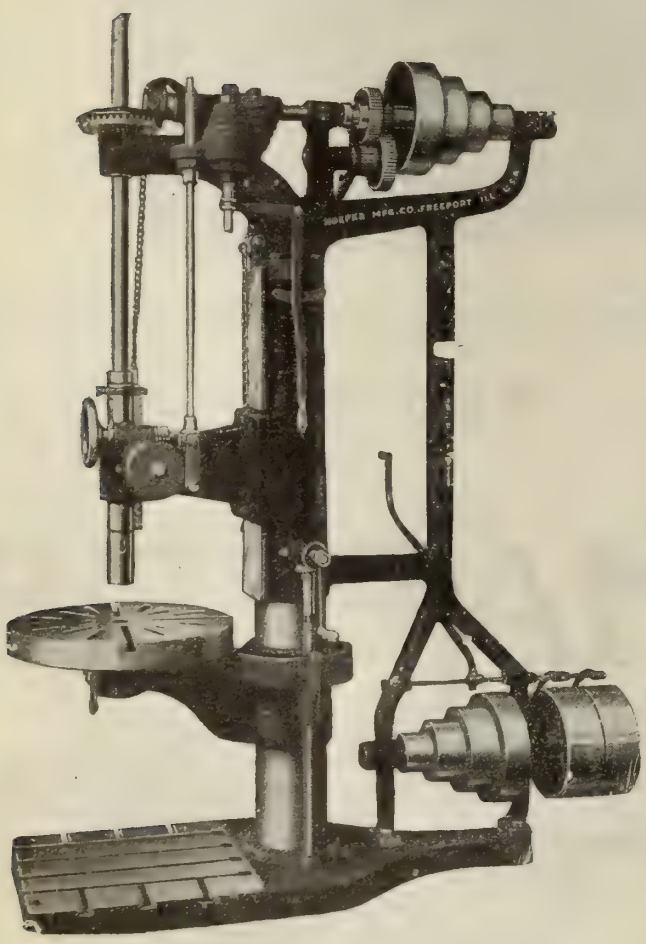


**The R. McDougall Co., Limited**
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Sales Agents

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# HOEFER

## *the whole answer to any hole question*




With HOEFER Drilling Equipment, your drilling department can easily be made to set the pace for the shop in speed, accuracy and economy. That's a broad statement to make, but hundreds of satisfied users can back it up and point to substantial figures of savings that we have effected with standard and special Hoefer Drillers. We were able to help these manufacturers by carefully studying their shops and their drilling jobs and then putting the present-day results of our twenty-five years of "know-how" to work at finding the best and most practical answer to their problems.

We may be able to show **you** possibilities of similar savings in **your** drilling operations, present or proposed. The chance is certainly worth the free consultation service that we offer. All you need do is to tell us what you are drilling and how you are drilling it or intend to drill it. We'll give you—without cost or obligation—authoritative advice as to the best way to do it. Write to our nearest sales agent or direct to the factory.

***Send for the Hoefer Catalog.***

# HOEFER MFG. CO., FREEPORT, ILL.

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**Sales offices for Hoefer Drillers: Boston,** Factory & Mill Supply Co.; **Providence,** Brownell-Machinery Co., **New York,** F. H. Niles & Co., Woolworth Bldg.; **Philadelphia,** Fairbanks-Morse Co., 917 Arch St.; **Baltimore,** Aumen Machinery Co., 107 Lombard St.; **Syracuse,** C. H. Wood Co.; **Rochester and Buffalo,** Ogden B. Adams; **Pittsburgh,** Motch & Merryweather Machinery Co.; **Cleveland,** Cleveland Tool & Supply Co.; **Indianapolis,** E. A. Kinsey Co.; **Detroit,** Cadillac Tool Co.; **Chicago,** Federal Machinery Sales Co., 12 N. Jefferson St.; **Milwaukee,** Badger-Packard Machinery Co.; **Minneapolis,** F. E. Satterlee Co.; **St. Louis,** Colcord-Wright Machinery & Supply Co.; **Atlanta,** Walraven Co.; **Tampa, Jacksonville and Charleston,** Cameron & Barkley; **Spartanburg,** Montgomery & Crawford; **Birmingham,** Young & Vann Co.; **Mobile,** Turner Supply Co.; **New Orleans,** Oliver H. Van Horn Co.; **Houston,** Peden Iron & Steel Co.; **Seattle, Portland, Ore., San Francisco, Los Angeles,** Eccles & Smith Co.; **Montreal,** Canadian Fairbanks-Morse Company (head office) for all Canada.

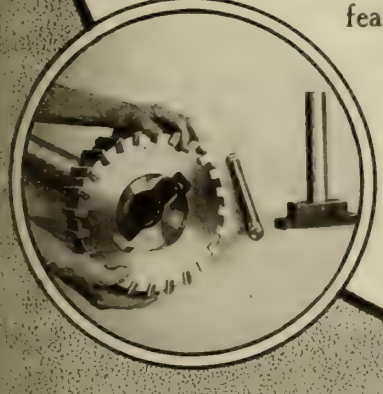
# BROWN & SHARPE TAPER-NOSE SPINDLE

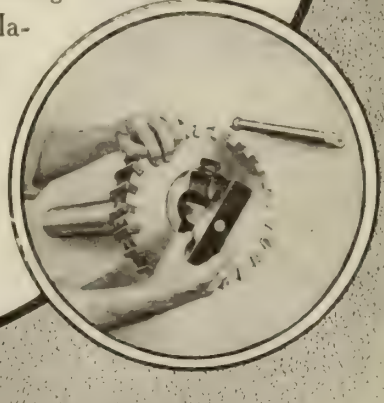
*No Screws Plates or Loose Parts*



THE TAPER-NOSE SPINDLE . . .

assures a positive cutter drive under all conditions. The front end of spindle is tapered, hardened and ground and has a recess to receive cutter driver and clutch on arbors and collets. The ease with which face milling cutters are removed and replaced is particularly noteworthy—simply place cutter onto the taper nose of the spindle, insert cutter drive as shown in the illustration and tighten drawing-in-bolt. There are no plates, screws or loose parts used and when arbor, collet or cutter is in place it is essentially as firm as though a part of the spindle itself. This is one of the many outstanding features of Brown & Sharpe Milling Machines. For further information send for our Milling Machine Book.





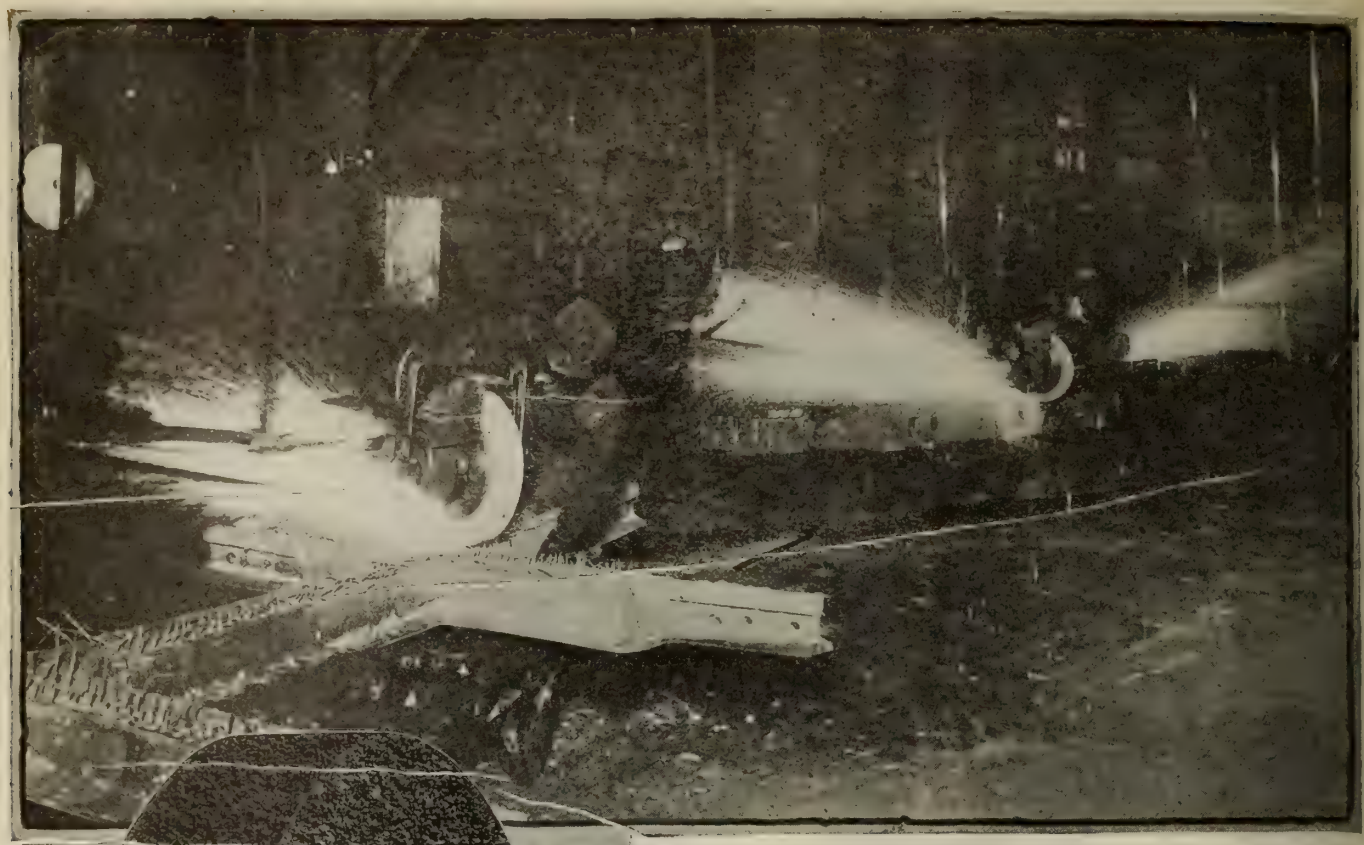
**BROWN & SHARPE MFG. CO.**
PROVIDENCE, R.I., U.S.A.

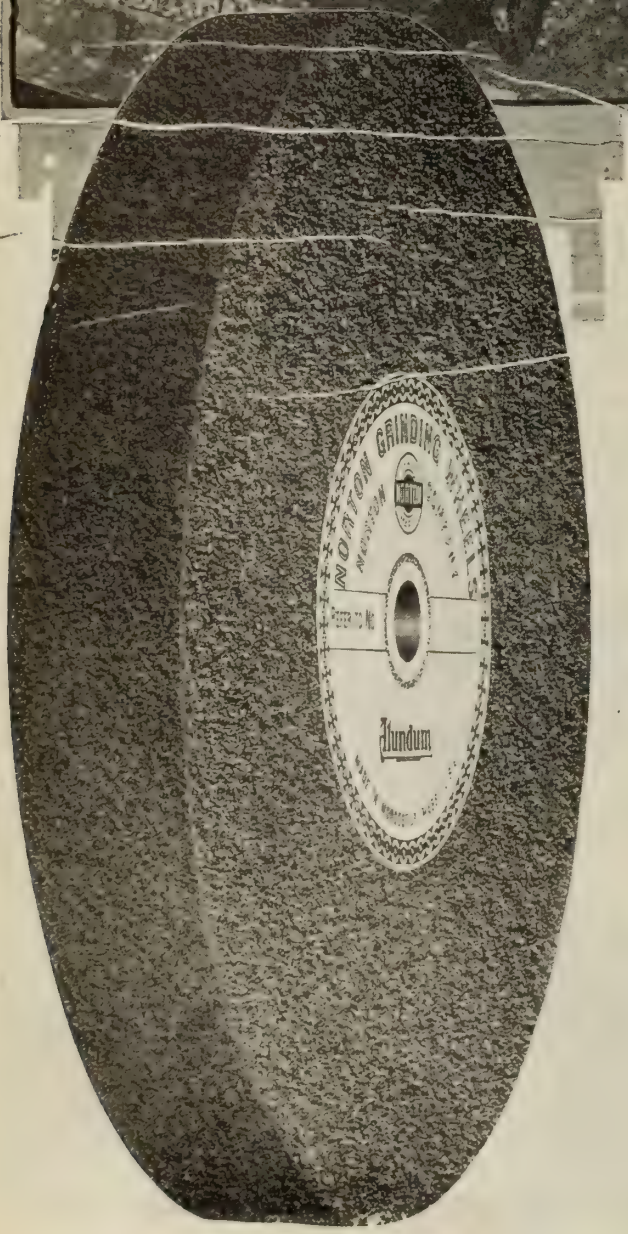
*Canadian Representative:*
CANADIAN FAIRBANKS-MORSE CO., Ltd.

# Brown & Sharpe Milling Machines

UNIVERSAL MACHINES FOR THE TOOL ROOM

HEAVY PLAIN MACHINES FOR THE MANUFACTURING FLOOR






# ALUNDUM
## In the Foundry

Tearing off fins and excess metal from giant castings is no difficult machining operation, but it is rough on the wheel doing this heavy foundry work.

ALUNDUM wheels **stand up** under the strain of hogging off metal. This artificial abrasive, known to the grinder as "Alundum," has no superior for fast and cool cutting.

The size of the wheel, the amount of material to be removed, and the nature of the material to be ground, readily determine the size of the grain.

Norton engineers, qualified by years of experience, are ready to give recommendations to the foundryman for whatever work is to be done.

**NORTON COMPANY OF CANADA, Limited**
**HAMILTON, ONTARIO**

*Electric Furnace Plants:*

Niagara Falls, N.Y. Chippawa, Ont., Canada

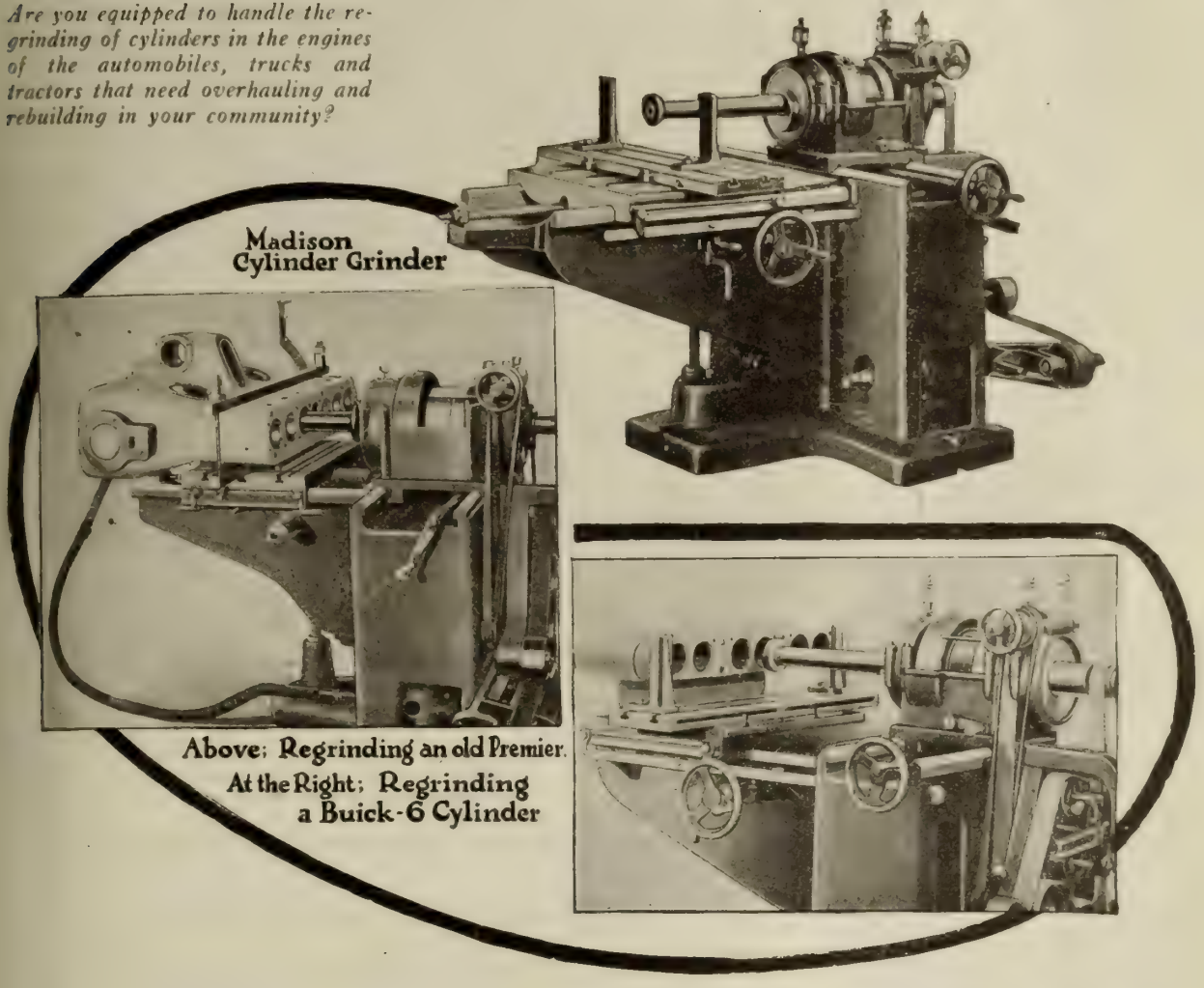
*Canadian Agents:*

The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B., Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. F. H. Andrews & Son, Quebec, Que. Simonds Saw Co., Vancouver, B.C.

**ALUNDUM WHEELS for Steel and Steel Alloys**

# Re-grinding Cylinders at a Profit

*Are you equipped to handle the re-grinding of cylinders in the engines of the automobiles, trucks and tractors that need overhauling and rebuilding in your community?*



Madison Cylinder Grinder

Above: Regrinding an old Premier.
At the Right: Regrinding a Buick-6 Cylinder

Add the profit of cylinder grinding to your automobile repairing and not only increase your profits considerably but make your customers boosters for you by putting power and life into their cars.

Put a Madison Cylinder Grinding Machine to work for you and do the gas engine cylinder re-grinding for all the repair shops in your vicinity.

Ask for the circular describing this machine—it will be sent you by return mail.

## MADISON MACHINE TOOL COMPANY

**1245 East Washington Avenue, Madison, Wisconsin, U. S. A.**

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# FAIRBANKS-MORSE




## An Achievement in Mechanics

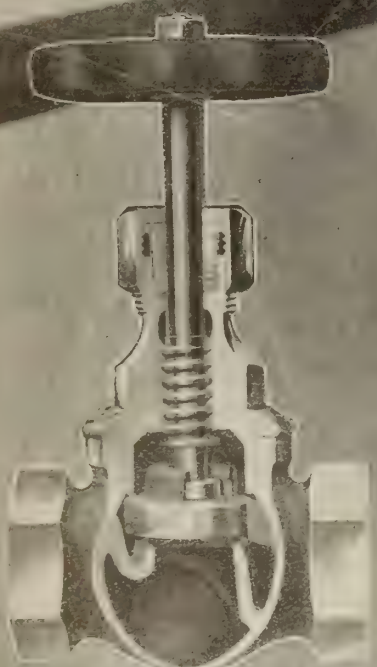
EACH individual department of The Canadian Fairbanks-Morse Company, Limited has given industrial Canada a new conception of achievement in mechanics. Each department has established a 100% quality and service standard. This is what enables Fairbanks valves to stand pre-eminent wherever valves are used.

When an engineer specifies Fairbanks valves, he knows that he has selected not only quality of material but workmanship that guarantees perfect operation.

He is satisfied with the reputation and service of the institution that stands behind them. He acknowledges an achievement in mechanics.

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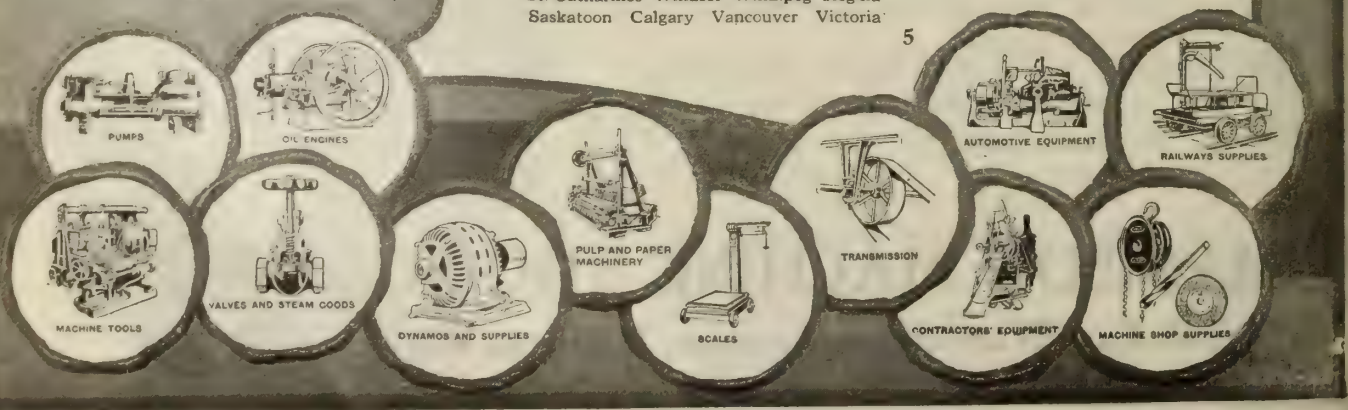


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# Turret Lathe Applications

Careful planning of tool layout is necessary to ensure maximum production. The layouts, in this, the first of a series of articles on turret lathe practice, show how to machine a truck wheel, an automobile flywheel, and another flywheel of unusual design.

*By J. H. Moore*

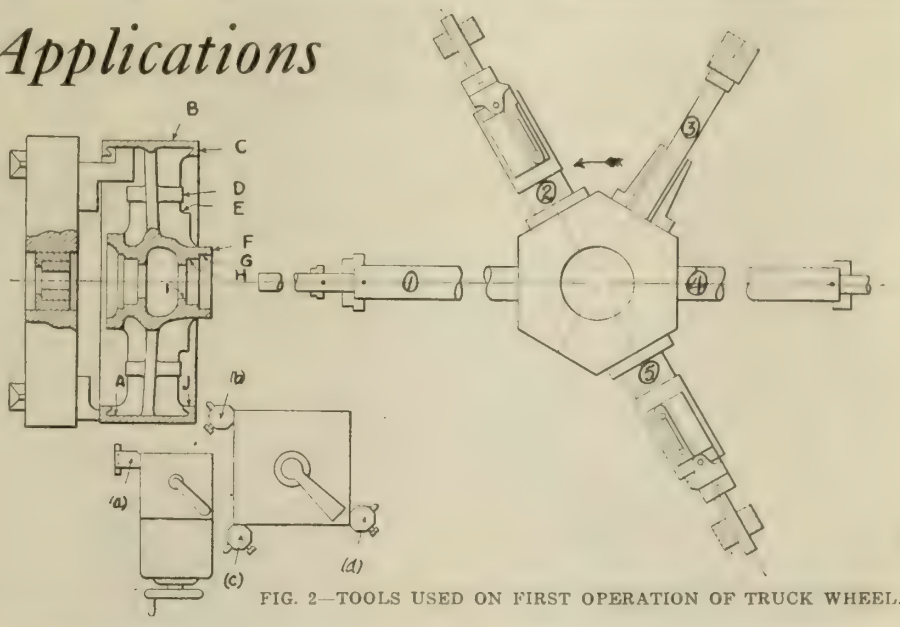



FIG. 2—TOOLS USED ON FIRST OPERATION OF TRUCK WHEEL.

THE subject of turret lathe work is always interesting, especially in these days when production is [illegible]. A turret lathe, irrespective of its design, cannot accomplish its best [illegible] if improperly tooled. It is therefore perfectly safe to say that proper tool layout is just as important, if not more so, than the machine itself. A good machine can be rendered of very little value by the use of poor tools. Believing the readers of Canadian Machinery are interested in the subject of tool layout, we have prepared a series of articles, each complete in itself, dealing with this important matter. The information embodied in these articles was secured at the plant of the Gisholt Machine Tool Co., Madison, Wis., and deals with various parts produced on their machines.

### Auto Truck Wheels

The first example is that of a truck wheel shown at Fig. 1. This view details the design of a rear wheel used on an automobile truck. The heavy lines indicate finished surfaces, that is, the surfaces finished in the turret lathe. This example is especially interesting, because the auxiliary tool post, commonly known as the wing rest tool post,

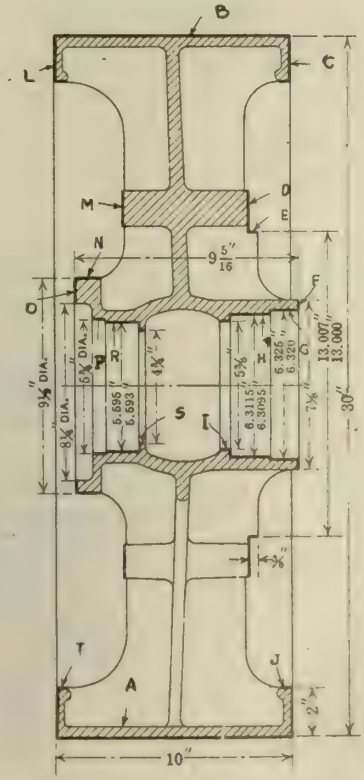



FIG. 1—DETAIL VIEW OF THE TRUCK WHEEL.

is brought into action. It might be well to add that all Gisholt turret lathes have an extension on the carriage for this tool post, so that it can be used whenever required. This auxiliary post is especially useful when turning diameters which are too large for the regular tool post. Of course, this post also provides for additional permanently set tools should the operation lend itself to their use. As a general rule, this auxiliary is not necessary, but it's good to know it's there if you require it.

Referring once more to the drawing of the wheel. The work is finished in two operations, the tool layout for the first operation being shown at Fig. 2. It will be noted that the wheel is held from the inside of the rim by means of special hardened jaws A, and is located by means of special blocks on the chuck. The outside surface B of the wheel is next rough turned with the tool (a) which is held in the auxiliary tool post. The surfaces C, D, E, and F are now rough faced with tool (b) in auxiliary tool post.

The holes G, H, and I are next bored with cutters held in the boring bar mounted in position 1 of the turret. This bar is provided with a pilot, guided by a bushing in the chuck of the machine.

The surface H is now finish bored by a cutter held in position 4 of the turret, this bar being guided in the same manner as the bar already described.

The hole H is reamed out with the reamer in position 3 of the turret, and the surfaces E and F are rough turned by means of cutters held in the facing head at position 2 of the turret. The tool working on surface E is held in the top arm, and the tool machining F is held in the bottom arm of the facing head.

The surfaces E and F are next finished with tools held in the facing head at position 5 of the turret. This facing head is exactly similar to that used for the roughing operation.

Next come the surfaces C and D, these being finished with the tool (c), see auxiliary tool post. The inside of the rim at J is bored with the tool (d) also held in the auxiliary tool post. The total time for these various steps in 50 minutes.

### Second Operation

We now come to the second step. This is shown clearly at Fig. 3, and the following steps are gone through. The work is held on a special chuck plate by means of clamps. The surfaces L, M, N, and O are rough machined with the tool (a) held in auxiliary tool post. The holes P, R, and S, are next rough bored with cutters held in position 1 of the turret. This bar has a pilot which is guided in a bushing mounted in the chuck plate.

The hole is now finish bored with the cutter held in boring bar at position 2 of the turret, this bar being piloted as stated previously. This same hole is next reamed with a reamer mounted at position 3 of the turret. A second roughing cut is now taken over the outside of the wheel by means of tool held in the auxiliary tool post, this cut being followed by the facing head mounted at position 5 of the turret. This head finishes the outside of the rim also the surfaces N and O. The three tools necessary to complete this work are mounted in the top, rear, and bottom arm of head respectively.

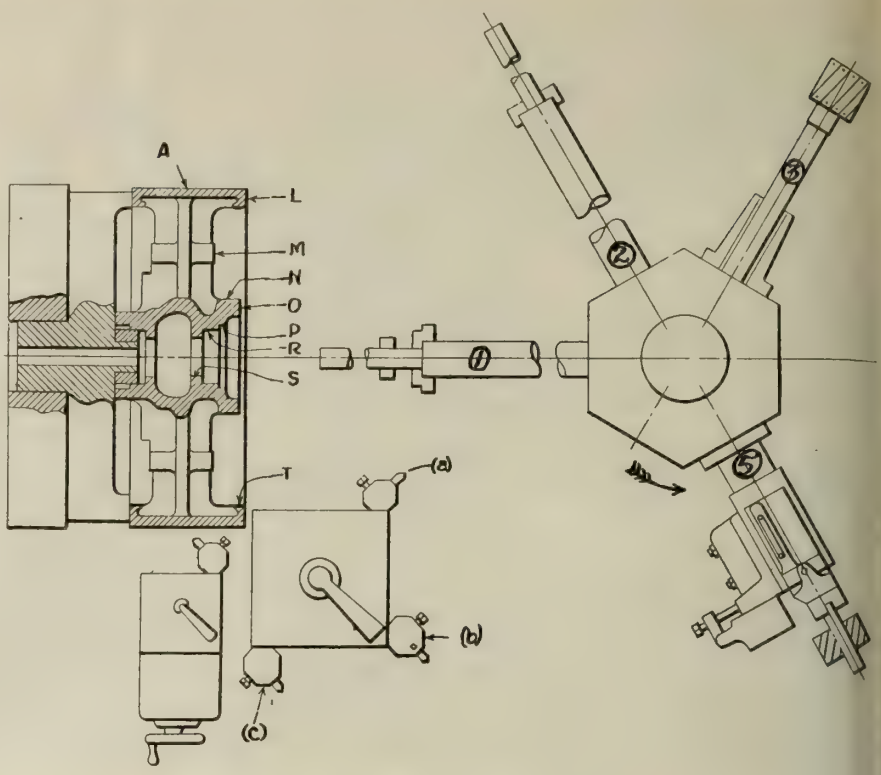



FIG. 3—SECOND OPERATION ON THE WHEEL SHOWN AT FIG. 1.

While this operation takes place, the facing head is guided by means of a bushing on its pilot which enters the hole R. The surfaces L and M are next finished with the tool (b) in auxiliary tool post. The inside of rim is now bored with the tool (c) in tool post. The total time required for these steps is 45 minutes.

Figs. 4 and 5 show up to good advantage the two operations in photographic form. The auxiliary tool post is plainly seen in each case, and as the steps have already been described in detail we need not dwell on these views.

### Automobile Flywheel

The next example of work perfor d is shown at Fig. 6. This represents a automobile flywheel made of semi-st l on which the sections are rather t n. In finishing this piece, three operati s in place of two are necessary, as a gr at amount of stock has to be remo d. As the sections are very light con l- erable distortion would result if all t e stock was removed at once on each f e of the wheel. In a case of this kind i s good policy to have one, or even m r extra operations, rather than allow d tortion.

### First Operation

The first operation consists of ro h ing one side. The other side is rou h

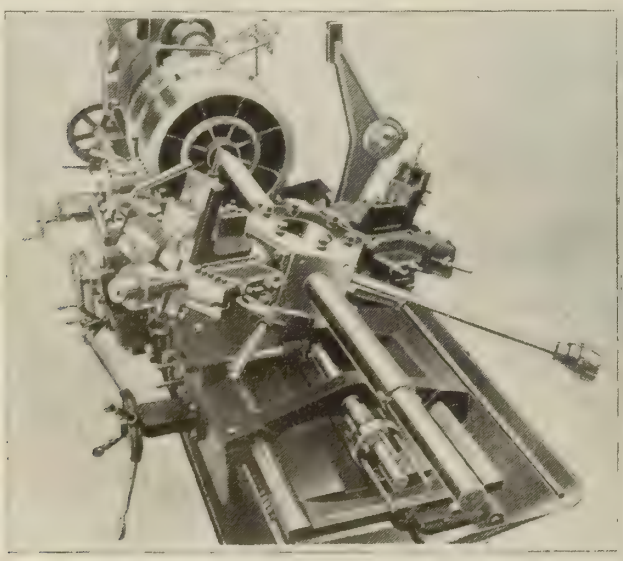


FIG. 4—TOP VIEW OF EQUIPMENT USED ON THE FIRST OPERATION OF TRUCK WHEEL SHOWN AT FIG. 1.

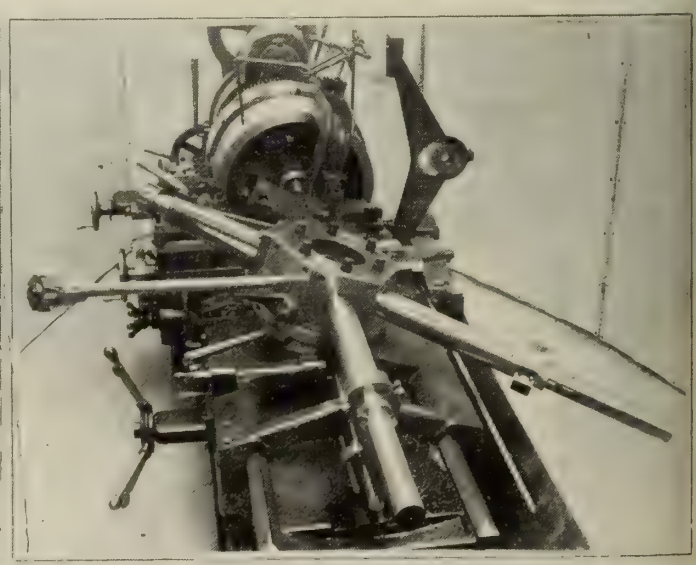


FIG. 5—A SIMILAR VIEW SHOWING THE TOOLS USED ON THE SECOND OPERATION OF THE TRUCK WHEEL.

ad finished in the second operation, vile the flywheel is rechucked in the trd operation, and the first side, which i only roughed, is next finished. Fig. 7 illustrates the tool layout for the first eration. The rough turned flywheel, ai the method employed to hold the sne is shown at Fig. 8. Following are t steps in the first operation.

The work is held in special hardened cick jaws, and the bottom A is rough fed with tool B in tool post, and the he is bored with the cutter mounted at p ition 1 of the turret. The inside and o side surfaces C and D are next bored ai turned respectively, with the facing h d mounted at position 3 of the turret.

The head shown at position 6 of the tret is now used, but is merely mounte to balance the turret.

The surfaces E, F, and G are now r gh faced with the tool H in the tool pt. This first operation is completed in minutes.

**Second Operation**

The work is held in the second operati as shown at Fig. 9. At this operati the one side of the flywheel is roughe and finished complete, and the steps p formed are as follows. The work is h l in special jaws as indicated, and clck jaws are used to support it against th surface A. The surfaces I, J, K, L, a M, also the bottom of the counterbe N are rough faced by the tool O ir he tool post.

fter this is accomplished the bore P nd counterbore N are rough bored w cutters in the bar mounted at positi 1 of the turret. This same bore a counterbore is now finished with the ers in bar mounted at position 2 of th turret. The bars used in these steps ar provided with pilots that enter into a ushing in the chuck.

ne bore P is next reamed with the rener mounted in position 4 of the tret, after which the outside surface

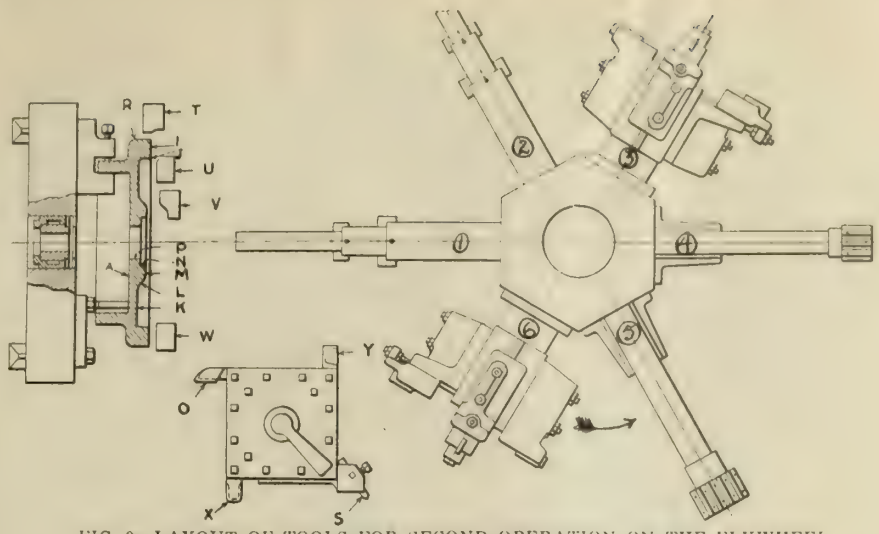
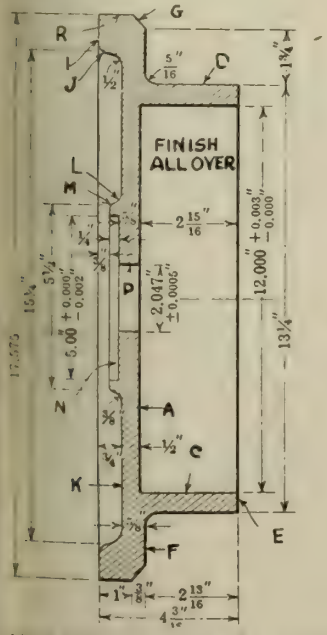



FIG. 9 LAYOUT OF TOOLS FOR SECOND OPERATION ON THE FLYWHEEL SHOWN AT FIG. 6.



FIG. 8 SHOWING THE METHOD OF HOLDING FLYWHEEL IN THE FIRST OPERATION.




IG. 6 DETAILS OF THE AUTOMOBILE FLYWHEEL.

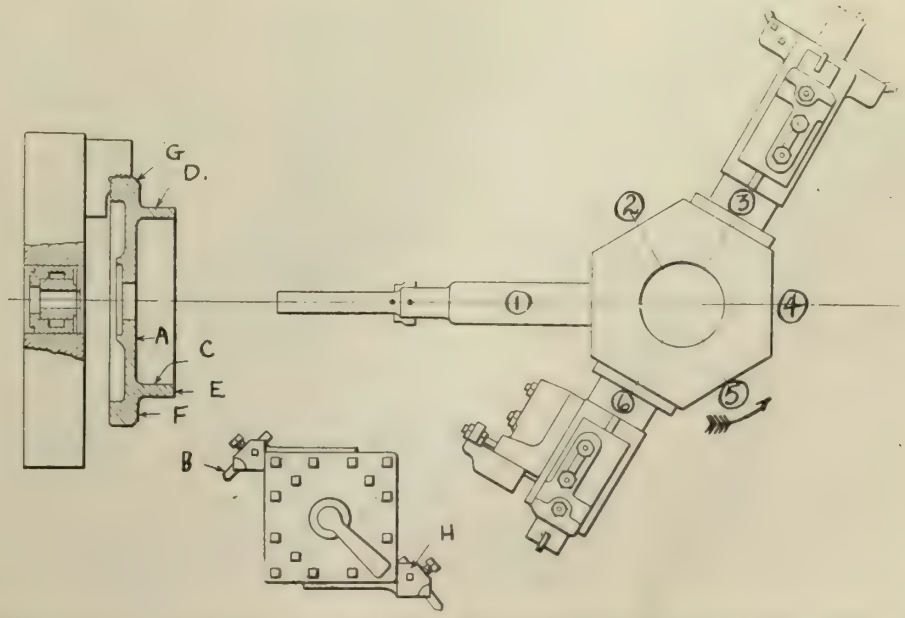



FIG. 7—LAYOUT OF TOOLS FOR THE FIRST OPERATION ON THE FLYWHEEL SHOWN AT FIG. 6.

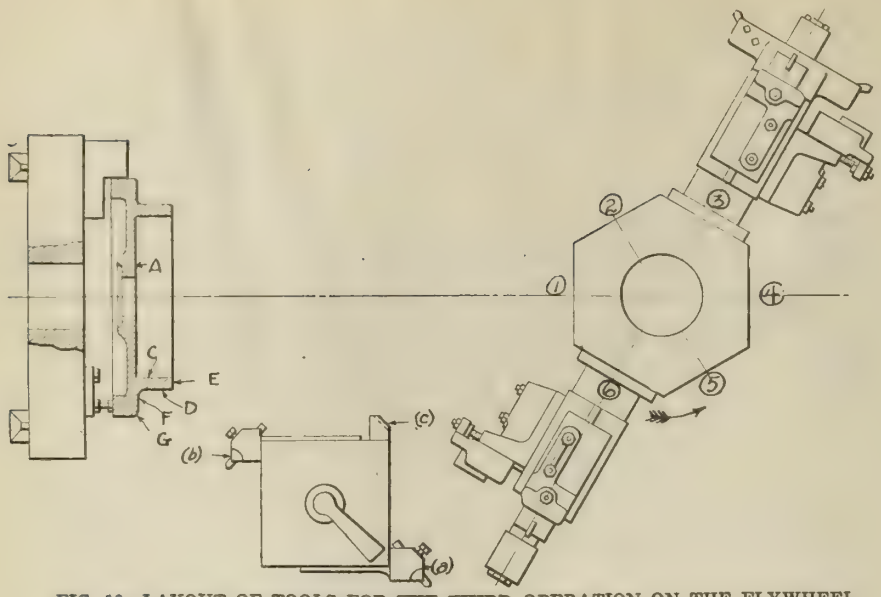



FIG. 10—LAYOUT OF TOOLS FOR THE THIRD OPERATION ON THE FLYWHEEL.

R is rough turned with tool S mounted in the tool post. This tool is followed by the facing head mounted in position 3 of the turret. This head roughs the surfaces R, I, J, and M. The facing head is provided with a pilot entering the bore of the flywheel. The tool T which turns the surface R is held in the top arm, while the cutter U is held in the front arm of facing head. The cutter V is held in the bottom arm, and cutter W in the rear arm of the same head.

The surfaces R, I, J, and M are now finished by the tools of similar nature. The surfaces K and I are finally completed by means of tool X held in the tool post. The bottom of the counterbore N is finished by tool Y held in the tool post. The cylindrical surface of the counterbore N is finished by reaming with the reamer shown at position 5 of the turret. The total time for this second operation is 10 minutes.

### Third Operation

Fig. 10 depicts the third and last operation on this piece. This work consists of finishing the already rough finished side of the wheel. The work is followed out in this manner. The flywheel is held with soft jaws, and is supported by means of chuck jacks. The outside of the cylindrical surface D, and the face F are rough faced by the tool (a) in the tool post.

The surfaces C and E are rough machined, and the surfaces D and F are finished with tools in facing head at position 3 of the turret. This facing head is piloted in the bore of the flywheel. The bottom A is finish faced with tool (b) in the tool post, after which the surfaces C and E are finished with cutters held in the facing head at position 6 of the turret. It will be noted that these tools are directly opposite, this being, of course, to balance up the turret.

The chamber G is finished with tool C in the tool post, and the total time for this, the final operation is ten minutes. This makes a total of 28 minutes for the three operations.

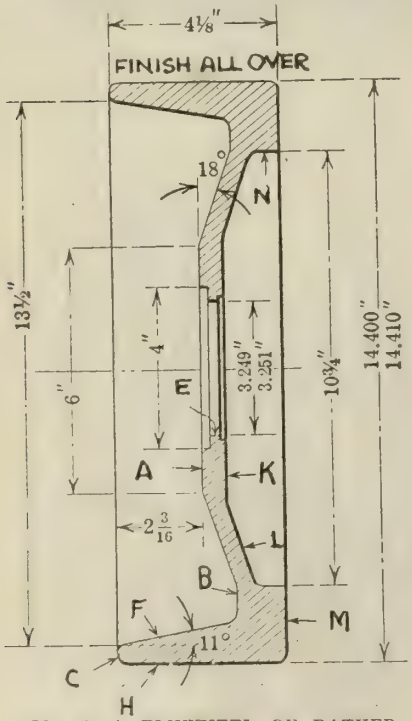



FIG. 13 -A FLYWHEEL OF RATHER UNUSUAL DESIGN.

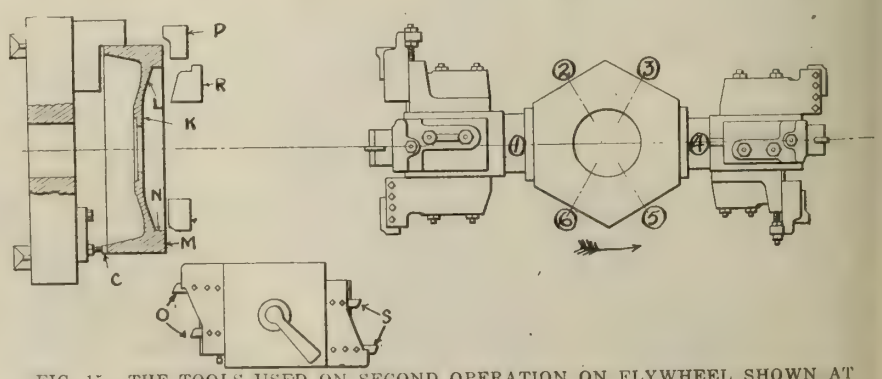



FIG. 15. THE TOOLS USED ON SECOND OPERATION ON FLYWHEEL SHOWN AT FIG. 13.

### Flywheel of Unusual Design

The remaining example in the presen article is shown at Fig. 13. This viev depicts another flywheel, but one whicl has a most unusual design. It will b noted that this wheel has central web part of which is at an angle with th axis of the flywheel. The material i cast iron, and the wheel is finished al over on a 24 inch turret lathe in tw operations.

The first operation consists of rough ing and finishing the convex side of th web, the beveled inside surface, and th outside of the rim. Fig. 14 illustrate the tool layout for the first positior The work is held by the inside of rim b means of special chuck jaws. The sur faces A, B and C are roughed with th tool D in the tool post. The hole E i next bored, and the surface A is finis faced with tools mounted in position 1 ( the turret. The tool is guided by a pil which enters a bushing in the chuck.

The hole E is now reamed with th reamer held at position 3 of the turre The bevelled surface F is next roug bored with the tool in the facing head a position 4 of the turret. Simultaneousl with this operation, the outside H ( the wheel is rough turned with the to G in the tool post. The beveled surfac F is now finished with the tool held i the facing head at position 2 of th turret.

Following this step the surfaces C an B are machined, and the corners of su faces C are chamfered with the too at position 5 of the turret. The facin head used for this work can be clearl noted in the photograph shown at Fi 16. This tool is specially designed finish the tapered surface F with a sing point tool. In this way the angle bound to be correct. In action here what occurs: A pilot enters the bore the flywheel, and a flange is provide with a ball thrust bearing which bea against the web of the wheel at C. Th locates the tool accurately, and prevent the pilot from entering beyond a ce tain point. The head then slides ov the pilot, and as the head is provide with a pin that rests against a taper surface immediately beyond the thru bearing, the tool in the facing head lowered as it slides forward, thus e suring that it will finish the surface a

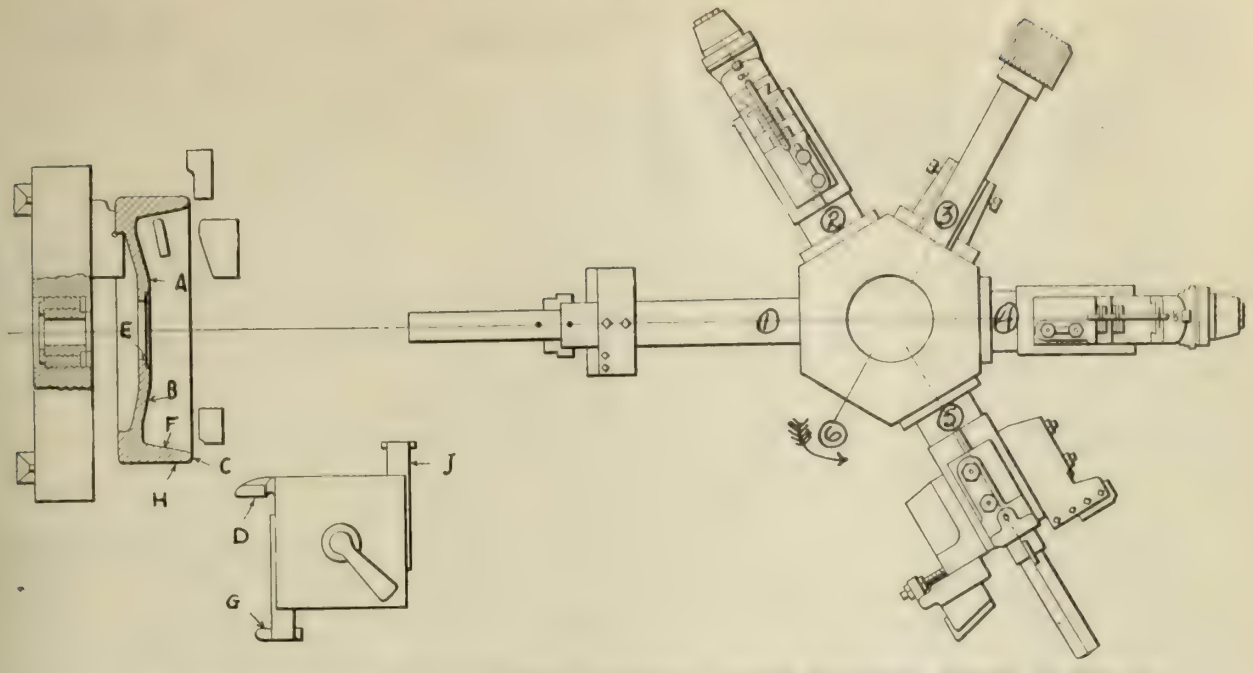



FIG. 14 TOOLING USED FOR THE FIRST OPERATION ON THE FLYWHEEL SHOWN AT FIG. 13.

curately. The last step in the first operation consists of finishing the outside surface H with the tool J in the tool post.

### Second Operation

The second operation is shown at Fig. 15. This consists of roughing and finishing the concave side of the fly wheel, and the method employed is as follows. The work is held in soft chuck jaws which bear against the finished outside surface of the flywheel. It is also supported by means of chuck jacks which bear against the rim at C.

The surfaces K, L, and M are now rough faced with tools held at O in the tool post. The surface N is next rough bored, and the surface L is rough faced. The outside corner at N is also rounded with tools held in the facing head at position 1 of the turret. The surfaces N and L are now finished, and the inside corner of N is rounded with the tools held in head at position 4 of the turret. In both the third and fourth steps, the facing heads are piloted in the bore of the flywheel. The tool P is held in the rear arm of facing head, while the other R is held in the top arm. The last step is that of finishing the surfaces K and M by means of the tool S in the tool post. Fig. 17 depicts the second operation, as viewed from the front of the machine.

This completes the present article. In a later issue we will show further examples of work performed on these styles of lathes.

### PROPERTIES OF METALS

An investigation into the properties of white metals for bearings has recently been carried out by the Bureau of Standards. It was found that tin-base alloys maintain their strength properties better at elevated temperatures than do those containing lead. However, the yield point or ultimate strength of a high-grade babbitt at either 25 deg. or 75 deg. Cent. is not affected by lead admixtures up to 3 per cent. Prolonged heating lowers the strength of lead-base alloys much more seriously than it does that of tin-base alloys. The yield point of a tin-base alloy was not affected by heating for six weeks at about 100 deg. Cent., but the yield point of a lead-base alloy was lowered by only two weeks' heating at the same temperature.

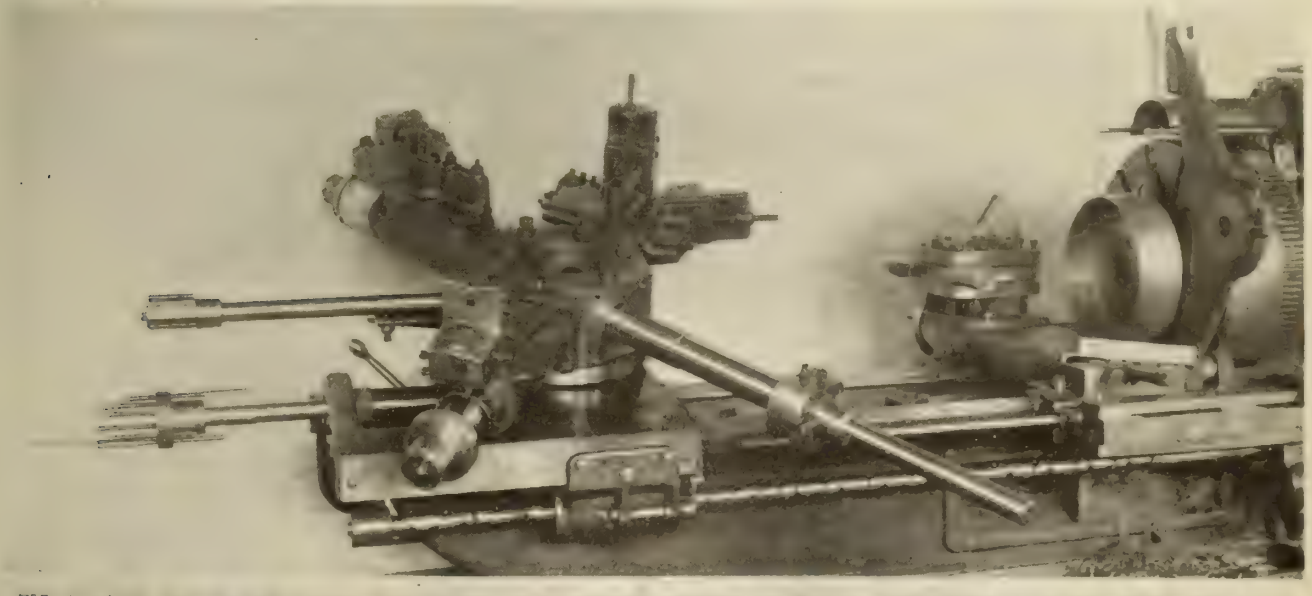


FIG. 17.- THE SET UP FOR FIRST OPERATION ON FLYWHEEL SHOWN AT FIG. 13. THIS VIEW IS TAKEN FROM THE REAR.

# The Side-Cutting of Thread Milling Hobs

## The Hobbing of Screws, Interference Due to Helix, and Other Important Formulae—Points Out the Corrections in the Form of Thread Milling Hobs Which Can Readily Be Made

*By E. BUCKINGHAM

WHEN a thread is chased in a lathe and the cutting tool has proper clearance and is set so that the plane of the cutting edges contains the axis of the thread, the exact form of the tool will be duplicated on the work. Assuming that the thread is completed, if the tool in its cutting position is brought into contact with the flanks of the thread, it will have a line bearing only. If sufficient clearance can be provided on the tool, this holds true regardless of the pitch of the thread, the angle of the flanks, or its diameter.

When a thread is hobbed, however, the axis of the hob being parallel to the axis of the thread, the path of any one cutting point is a circle, and this circle will interfere with the helix of the thread to an amount depending upon the pitch of the thread, the angle of the flanks, and the diameters of both hob and thread.

It is assumed in this discussion that the cutting teeth of the hob are backed off sufficiently to prevent any dragging of the relieved portion of the tool on the work. The interference between the cutting edge of the hob and the helix of the thread therefore results in the removal of additional metal, thus distorting the form of the thread. The amount of this distortion varies as the values of any of the following factors change: the pitch of the thread, the form of the thread, the diameter of the work, and the diameter of the hob.

*The author is Engineer of Standards for Niles-Bement-Pond Co., and Pratt & Whitney Co. He is an associate member A.S.M.E. This is an abstract of his paper presented at the annual meeting, New York, of the American Society of Mechanical Engineers.

It will be shown that correction for some of this distortion inevitable with this method of manufacture is impossible. The amount of this distortion, however, can be reduced in many cases by the proper relation between the diameters of work and hob. It will also be shown that most of the distortion can be corrected by a suitable alteration in the form of the cutting tool.

### The Hobbing of Screws

In Fig. 1, which shows a diagram of a hob and screws, let

R=radius of any cutting point on the hob

r=radius of deepest point on work touched by R

N=number of threads per inch

A=angle of rotation of hob

B=angle of point of contact of R at angle A

C=½ included angle of thread

r′=radius of point of contact on R on work.

Formulas will first be derived to show the interference between the path of any cutting point on the hob and the flanks of the thread and for purposes of plotting the radial distance of the cutting point R from the deepest point on the work touched by R will be designated as y. In other words,

$$y = r' - r \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

The longitudinal (or axial) distance R of the cutting point from the flank of the theoretical thread will be designated by x. A plus value of x will indicate a clearance, while a minus value will indicate an interference or side-cutting.

In order to determine the value of y the triangle shown in heavy lines in Fig. 1 must be solved. The known factors will be taken as r, R and B. We first have

$$\frac{(R+r)\sin B}{R} = \sin 180° - (A+B)$$

$$\sin 180° - (A+B) = \sin (A+B)$$

$$\frac{(R+r)\sin B}{R} = \sin (A+B) \quad \ldots \quad (2)$$

From this equation we determine the value of A. Solving the triangle for r′, we have

$$r' = \frac{R \sin A}{\sin B} \quad \ldots\ldots\ldots\ldots \quad (3)$$

and when the value of r′ is determined, the value of y is established from Equation [1].

As the hob revolves away from the common center line of the hob and work, the cutting points on one side of the tooth of the hob, due to the helix of the thread, will have a clearance with the flank of the thread, while the cutting points on the other side of the tooth of the hob will develop an interference. But the side of the hob which clears the helix as the cutting point revolves away from the common center line will interfere as the cutting points approach to the common center line, and the nature and extent of this interference will be symmetrical and equal on both flanks of the thread as long as the form of the thread is symmetrical.

The amount of interference depends upon the value of B and the pitch of the thread, or number of threads per inch, N. Thus

$$\text{Interference Due to Helix} = \frac{B}{360N} \quad \ldots \quad (4)$$

If the included angle of the flanks of the thread is greater than zero (which is the case for all but square threads), as the cutting point of the side of the cutting tooth departs from the common

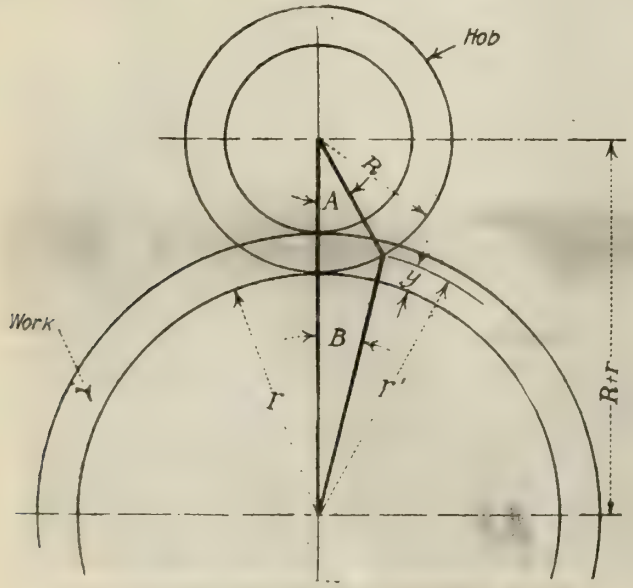



FIG. 1—DIAGRAM OF HOB AND EXTERNAL SCREW.

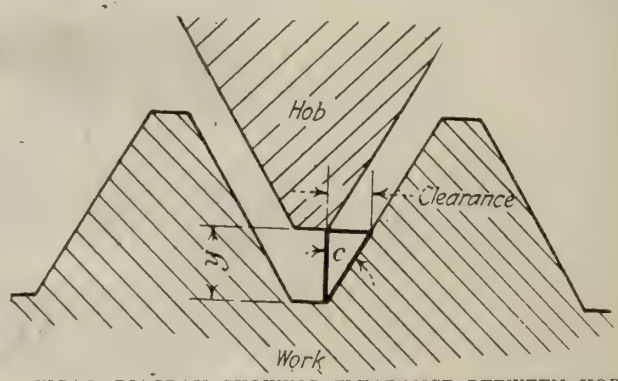



FIG. 2—DIAGRAM SHOWING CLEARANCE BETWEEN HOB AND WORK.

centre line of the hob and work a clearance develops between the cutting point on the hob and the flanks of the thread. The amount of this clearance depends upon the value of y and the included angle of the thread, and referring to Fig. 2 it will be seen that its value, ignoring for the present the helix of the thread, may be expressed as:

$$\text{Clearance} = y \tan C \quad \ldots\ldots\ldots\ldots [5]$$

The value of x is therefore found by subtracting the amount of interference given by Equation (4) from the amount of clearance given by Equation (5), or

$$x = y \tan C - \frac{B}{360N} \quad \ldots\ldots (6)$$

As an example of the use of the above formulae, we will assume that we wish to hob a thread which has a radius r or 0.5625 in. at the minor diameter with a hob whose radius R is 2.250 in. at its outside diameter with 4 threads per inch. A thread with a relatively large helix angle is taken as the first example in order to show the nature of the resulting side-cutting of a hob. The thread has an included angle of 60 deg., making C=30 deg., and N=4. The value of B is taken from 0 deg. to 12 deg., which gives the following values for x and y:

| For B = 0° | 2° | 4° | 6° | 8° | 10° | 12° |
|---|---|---|---|---|---|---|
| x = 0 | —0.00114 | —0.00176 | —0.00194 | —0.00157 | —0.00064 | —0.00084 |
| y = 0 | 0.00043 | 0.00176 | 0.00386 | 0.00691 | 0.01092 | 0.01589 |

The above as well as intermediate values are plotted in Fig. 3-A at the left, and the actual path of the cutting point is shown at the right. These curves show the general form of the side-cutting of any point on the cutting face of a thread hob.

This cutting face of the hob is made up of an infinite number of points. As the positions of these points vary, the ratio between R and r varies, as also does the helix angle of the thread, and therefore each cutting point travels in a different form of path. Thus, in order to determine the resulting form of a thread cut with a hob it will be necessary to plot the paths of a few other points. A point 0.20 in. higher on the flank of the thread will therefore next be taken. This gives R=2.050, and r=0.7625, as before, C=30 deg. and N=4, and the values for x and y with these factors are as follows:

| For B = 0° | 1° | 3° | 5° | 7° | 9° |
|---|---|---|---|---|---|
| x = 0 | —0.00061 | —0.00126 | —0.00117 | —0.00032 | —0.00136 |
| y = 0 | 0.00015 | 0.00143 | 0.00398 | 0.00786 | 0.01318 |

These values are plotted at the left in Fig. 3-B. The actual path of the cutting point is shown at the right.

A third point 0.40 in. above the bottom of the thread will also be taken. This point is beyond the top of the thread, but it is taken to accentuate the distortion developed by hobbing. In this case R=1.85, r=0.9625, C=30 deg., and N=4. The values for x and y with these factors are as follows:

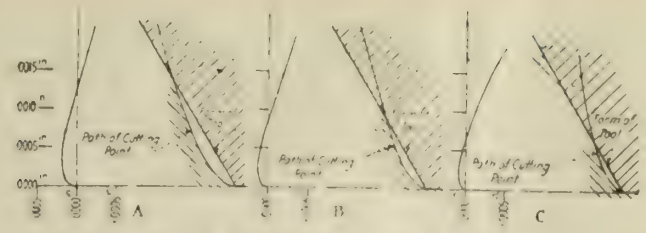



FIG. 3 CURVES SHOWING PATHS OF CUTTING POINT.

| For B = 0° | 1° | 3° | 5° | 7° |
|---|---|---|---|---|
| x = | —0.00057 | —0.00093 | —0.00026 | —0.00151 |
| y = 0 | 0.00022 | 0.00199 | 0.00566 | 0.01104 |

The above values are plotted at the left in Fig. 3-C. The actual path of the cutting point is shown at the right.

In order to show more clearly the nature of the side-cutting of hobs, the curve in Fig. 4 is plotted in an exaggerated form with the intervals along the y-axis equal to 0.001 in., and those along the x-axis equal to 0.0001 in. The curves shown in Figs. 3-A, 3-B and 3-C are plotted to this scale and brought together proportionately; that is, the origins of these curves are spaced equally from the bottom, but these spaces are not to scale. This distorts still further the exact shape of the curve, but its general properties are quite correct.

This curve shows the general nature of the distortion in the form of a thread which is caused by the side-cutting of the hob. It will be noted that it is a double curve, the lower part (below the line A-A) being developed by the bottom corner of the hob tooth while the upper part (above the line A-A) is developed by the overlapping paths of successive cutting points on the cutting face of the hob. It is evident that the distortion shown at the bottom of the curve is inevitable and no correction in the form of the hob is possible that will eliminate it. It can be reduced in many cases, however, by making the hob smaller in diameter. On the other hand, the distortion shown in the upper part of the curve can be eliminated by changing the form of the cutting edge on the hob.

The correction of the hob is determined in the following manner: The greatest amount of side-cutting is done by the bottom corner of the hob. In the foregoing example the tabulation shows 0.00194 in. when B=6 deg. This is not necessarily the exact maximum. If a closer value is required, the tabulations must be made with increments of B of smaller amounts. Tabulations as shown, however, will be correct to the fourth decimal place, which is sufficiently accurate for most purposes.

If the tooth of the hob is narrowed at each point of the cutting edge by the amount which it side-cuts the thread form, the contour of the thread above the line A-A in Fig. 4 will be correct and in most cases it will be found that the correction in a straight line will be sufficiently accurate as the resulting error will be negligible.

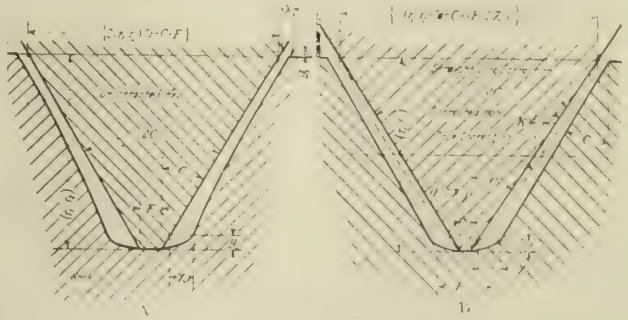


FIG. 5 FORM OF EXTERNAL THREAD CUT WITH UNCORRECTED AND CORRECTED HOB.

Fig. 5-A represents the form of a thread cut with a hob having the form of the cutting edges identical with the true form of the thread. In this figure,

C=half included angle of thread

F=width of flat of thread at the root or minor diam.

$r_1$=largest value of r employed (radius of major diam.)

$r_2$=smallest value of r employed (radius of minor diam.)

$x_1$=maximum minus value of x for $r_1$

$x_2$=maximum minus value of x for $r_2$

$(r_1—r_2)$ = depth of thread

$2(r_1—r_2)$ tan C + F = width of space at major diameter (outside).

Fig. 5-B illustrates a corrected hob and the form of thread cut with it. In this figure,

$F—2x_2$ = width of flat at bottom of hob form

$2(r_2—r_3)$ tan C + $(F—2x_1)$ = thickness of hob form at top.

C′ = half the included angle of corrected hob.

If the cutting edge of the hob is kept as a straight line, the tangent of half the included angle of the hob form will be equal to half the difference between the widths of hob form at the top and bottom divided by the height of the form. Using the values shown in Fig. 5-B, we have the following:

$$\tan C' = \frac{2(r_1—r_2)\tan C+(F—2x_1)—(F—2x_2)}{2(r_1—r_2)}$$

$$\tan C' = \tan C + \frac{F—2x_1—F+2x_2}{2(r_1—r_2)}$$

$$\tan C' = \tan C + \frac{x_2—x_1}{r_1—r_2} \quad \ldots\ldots\ldots\ldots\ldots\ldots (7)$$

It will be seen from Equation [7] and also from the figures that a corrected hob will have a greater included angle than the thread itself; or, in other words, the included angle of a hobbed thread on a screw or male-threaded part will be less than the included angle of the hob.

The dotted line in Fig. 5-B represents the true correction of the hob. Also in this figure,

$r_3$ = value of r at middle of thread flank (or at pitch diameter)

$x_3$ = maximum minus value of x for $r_3$

K = difference at $r_3$ between straight-line correction on hob and true correction.

$$\frac{x_2—x_1}{2} + x_1 = \frac{x_2—x_1+2x_1}{2} = \frac{x_2+x_1}{2}$$

= correction at $r_3$ when hob form remains a straight line.

$$K = \frac{x_1+x_2—x_3}{2} \quad \ldots\ldots\ldots\ldots\ldots\ldots (8)$$

If the rounding or fillet at the bottom of the thread as shown in Fig. 5-B is objectionable, the point of the hob may be extended by an amount about equal to $y_2$, provided that such an undercut is permissible. By so doing an almost theoretically perfect thread form will be secured. Theoretically, the point should extend slightly more than $y_2$ as at this point r becomes smaller and R becomes larger than the values of $r_1$ and $R_1$. Referring to Equation [3], this increase in the value of R will increase the value of r′. Referring to Equation [1], this increase in the value of r′ and the decrease in the value of r will increase the value of y. But for all practical purposes an extension on the point of the hob of the nearest even dimension to $y_2$ will usually be sufficiently accurate. On standard threads cut with hobs the resulting error will be in fifth or sixth decimal place.

For the purpose of simplifying calculations tables have been developed which are given in the complete paper. These tables are based on work whose radius is 1.000. The value of B/360 is given opposite varying values of B and values of y/r are given for different values of r/R. In order to use the tables the value of r/R must first be determined, then the value of y/r is multiplied by the radius of the work to obtain the value of y. The values of y/r may be obtained by interpolation when the value of r/R does not agree with any of those given. The values given under B/360 are divided by N and substituted in the equation x = y × tan C—(B/360N) to obtain the value of x.

In order to illustrate the use of these tables and to determine the effect of carrying the diameter of the hob, values are given in the complete paper for an Acme thread (5 threads per inch, one inch in outside diameter) cut with three hobs, the first one inch in diameter, the second two inches in diameter, and the third four inches in diameter. An Acme thread is selected because the smaller included angle of thread results in more side-cutting, thus making more pronounced the effect of varying the diameter of the hob. The depth of an Acme thread of this pitch is 0.110 in. The included angle is 29 deg. The width of the flat at the root of the thread is 0.0689 in.

The final value of the included angle, 2C′, is given by Equation [7] is found to be 29° 59′ 26″, and in the particular case chosen the difference between the angle of the hob and angle of the work is 59 min. 26 sec. The correction is therefore made in a straight line. By means of Equation [8] the difference K between this correction and the true correction at the middle of the flank is also determined as 0.000064 in. This is negligible and can safely be ignored. In fact, it is much less than the probable error in the hob.

From the values derived in the complete paper the following tabulation is also made to show the various effects

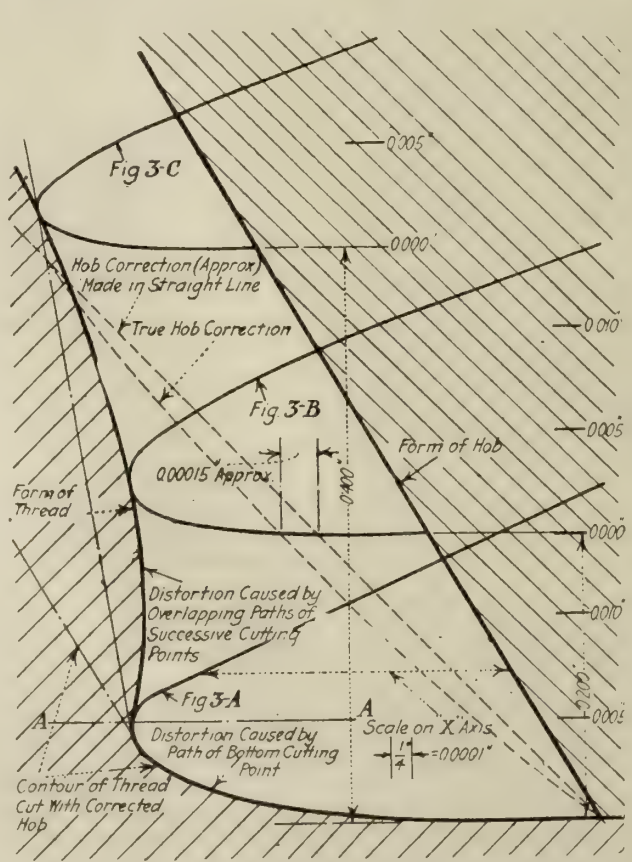



FIG. 1—CURVES SHOWING SHAPE OF CUTTING PATH.

of varying the diameter of the hob. (See Fig. 5-B.):

| | | |
|---|---|---|
| Hob. diam. = | 1.000 in. | 4.000 in. |
| $x_2$ = | 0.002695 | 0.003475 | 0.004048 |
| $y_2$ = | 0.008912 | 0.012344 | 0.014422 |
| 2C′ = | 29° 59′ 26″ | 30° 0′ 16″ | 30° 0′ 54″ |
| F—$2x_2$ = | 0.0635 | 0.0619 | 0.0608 |
| K = | 0.000064 | 0.000054 | 0.000026 |

From this tabulation it will be seen that the amount of side-cutting at the bottom of the thread ($x_2$) increases as the diameter of the hob is increased. The height of the fillet at the bottom of the thread ($y_2$) also increases as the diameter of the hob increases, in fact, it increases about three times as much in this case as $x_2$. The included angle of the corrected hob (2C′) increases very slightly as the diameter of the hob increases. The width of the point of the corrected hob (F—$2x_2$) varies less than 0.003 in. as the diameter of the hob is increased from 1 in. to 4 in. The dimension K in Fig. 5-B is reduced as the diameter of the hob increases.

The correction for angle used in these solutions is a chordal correction. This shows a slight change in angle as the diameter of the hob varies. A geometrical solution of this side-cutting will show that, except for the fillet at the root of the thread, the profile is unchanged regardless of the diameter of the hob. Therefore, if the correction is taken as the tangent of the profile at the pitch line of the thread, the angle C′ will remain unchanged. The formulae for determining this angle are as follows:

Let C = ½ included angle of thread

C′ = ½ included angle of corrected hob

H = helix angle of thread at pitch line

Then

$$\tan H = \frac{1}{\text{pi } N \times \text{pitch diam. of thread}}$$

and

$$\tan^2 C' = \tan^2 C + \tan^2 H$$

It is evident from the above that if the form of the cutting edge of a hob of a certain diameter be corrected to cut a thread of a certain diameter and pitch, a variation in the diameter of the hob of, say, 25 per cent. will have but little effect on the form of the thread produced on the work.

In order to determine the effect of varying the diameter of the work, the following tabulation was made for a hob 2.000 in. in diameter with 5 Acme threads per inch:

| | | | |
|---|---|---|---|
| Work diam. = | 1.000 in. | 2.000 in. | 4.000 in. |
| $x_2$ = | 0.003475 | 0.001161 | 0.000350 |
| $y_2$ = | 0.012344 | 0.004103 | 0.001512 |
| 2C′ = | 30° 0′ 16″ | 29° 14′ 8″ | 29° 3′ 6″ |
| F—$2x_2$ = | 0.0619 | 0.0666 | 0.0682 |
| K = | 0.000054 | 0.000012 | 0.000003 |

The above tabulation shows that the amount of side-cutting at the bottom of the thread ($x_2$) decreases as the diameter of the work increases. The height of the fillet at the bottom of the thread ($y_2$) decreases as the diameter of the work increases. In this case it decreases about four times as much as $x_2$. The included angle of the corrected hob decreases quite rapidly as the diameter of the work increases. The width of the point of the corrected hob increases about 0.006 in. as the diameter of the work is increased from 1 in. to 4 in. The dimension K in Fig. 5-B decreases as the diameter of the work increases. In this case the amount of error introduced by a straight-line correction in the hob is in the fifth and sixth decimal place and is negligible. It is evident, therefore, that a hob which is corrected for a certain diameter of work cannot be used on work which varies very much in diameter if accurate results are desired. The smaller the diameter of the work, the more this condition is accentuated. This is due in large measure to the rapid increase of the helix angle on smaller diameters. On work of large diameters, where the helix angle employed is very small, little or no correction is required on the hob.

## FIRMS THAT ARE ASKING FOR TRADE OPENINGS WITH CANADA

By communicating with this paper and mentioning key numbers, information can be obtained by firms interested in the following lines:

2684.—Wire from nickel chrome alloys. —A firm in Birmingham, England, desire to import from Canada special wire manufactured from nickel chrome alloys.

2686.—Radial Brick.—A firm in Boston, U.S.A., desires to be placed in communication with manufacturers of radial brick for use in building chimneys of power plants and similar structures.

2687.—An important French firm would like to trade with Canada, being specially well placed to export Mediterranean products, and in exchange would like to import wood pulp, acetic acid, mica and asbestos.

2689.—Vancouver concern having representation in Mexico, Japan, China, India, East Indies, Australia, and other countries bordering Pacific Ocean are anxious to get in touch with Canadian manufacturers wishing to extend their operations in that field. Particularly interested in iron and steel, wire, wire nails, nuts and bolts.

## BUSINESS IN OLD COUNTRY STEEL TRADE

### Cutting Prices in Effort to Stimulate Business—Trade Is Not Brisk

In South Wales business continues quiet, but with the lower prices now prevailing it is anticipated that there will be a revival in the demand for steel, and this prospect is confirmed by the fact that a large furnace at Dowlais which has been out of blast for some time has been recently relighted. New furnaces have recently been brought into operation at Ebbw Vale and Blaenavon for the production of billets, etc., but in the latter case the steel departments are short of orders, and the depression in the tinplate trade is exercising a detrimental effect in the output of steel bars, prices of which have been twice reduced during the past few weeks. Until a month ago the official minimum was £21 10s.; this was later reduced to £18 10s., and followed by a further concession of £1 at the beginning of December. Even this price is being cut by non-associated makers, who are offering at £16. Welsh hematite is nominal at £13 to £13 10s., and steel rails have been done at £23.

### Conditions at Sheffield

The steel-producing capacity of Sheffield has been greatly reduced on account of the depression, the open-hearth plant, vastly extended during the war, proving productive in excess of the present volume of demand. The trade in high-speed steel is also in a low state. As regards steel and manufactured goods, manufacturers have been disappointed by some heavy cancellations. The only departments which are fairly active are those producing railway steel, steel castings, tools for building and general trades, and agricultural tools.

Soon after the end of the boom prices of materials began to fall, and although the movement has been slow and has scarcely affected the best qualities of steel, it has made possible substantial reductions in the selling prices of finished goods produced from the cheaper steels. Iron has fairly held its own, but has now begun to fall. The output of wrought iron is so small, however, that makers can command their own terms.

The Imperial Oil Co., Ltd., are planning to erect a two-story, fireproof office, a large two-story fireproof garage, a boiler and pump house and a plant for the repair and care of barrels, at Brandon, Man. Two ten-thousand barrel tanks will also be installed and the necessary lubricating storage plants. It is expected construction will begin in the spring and be completed in the fall of 1921.

# Effect of Relative Humidity on Leather Belts

## Explanation of Humidity, Relative Humidity, Testing Apparatus, Atmospheric Control, Standard Conditions and Series of Tests

*By F. W. ROYS, M.E., Worcester Polytechnic Institute

ANY ONE who has ever had anything to do with leather belting knows that an ordinary oak tanned leather belt, not waterproofed or weather proofed, changes its characteristics considerably with the weather conditions, and it was because no information was available regarding these effects that the experiments were undertaken.

All of the experiments were made on a single specimen of belting, and it will not be contended that the results are applicable, directly, to any other belt. However, it is assumed that if consistent results have been obtained for this particular sample, other belts of the same sort of material will show similar characteristics, the same in kind, if not in amount.

Any work done in any branch of belt testing may easily run on interminably because there are so many variables that must be considered. It is therefore necessary to fix as many conditions as possible, and to accurately know all the others at any stage of the test.

In this particular investigation the following method was finally adopted:

1st. An oak tanned leather belt was selected. This belt was a 4" single belt about 25 feet long, first quality; 2nd. The belt was made endless and operated over a pair of 24-inch diameter, 6-inch crown face cast iron pulleys; 3rd. The belt speed was maintained as nearly constant as practicable at about 1,900 feet per minute; 4th. The transmitted horse power was kept constant; 5th. The temperature was kept constant except in the last part of the work when the sum of the belt tensions was kept constant instead.

*A paper read before the National Association of Leather Belting Manufacturers.

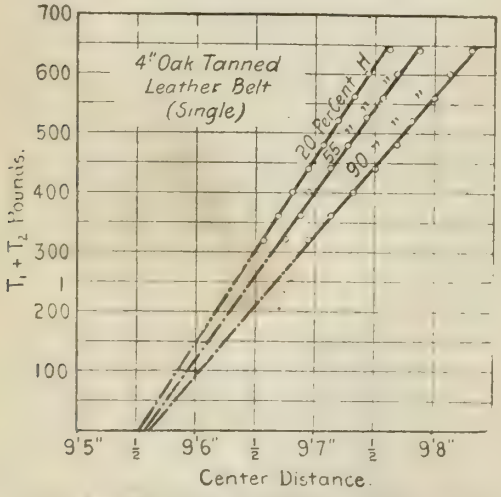



FIG. 2—RELATION BETWEEN T1—T2 AND CENTER DISTANCE AT THREE CONDITIONS OF RELATIVE HUMIDITY. HORSE POWER CONSTANT.

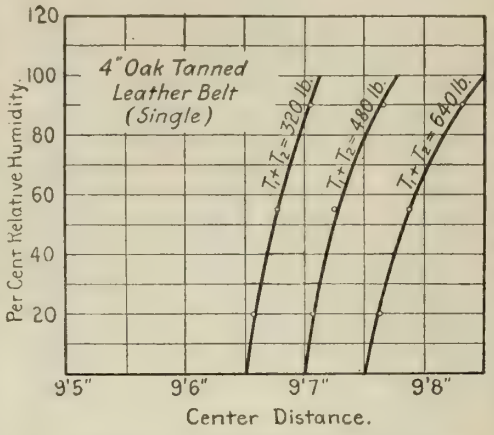



FIG. 3—RELATION BETWEEN PER CENT. RELATIVE HUMIDITY AND CENTER DISTANCE AT THREE CONDITIONS OF T1+T2. HORSE POWER CONSTANT.

Having fixed the above conditions it was considered that three important ones were left to vary. They are: 1st, the belt length; 2nd, the sum of the tensions in the tight and slack sides of the belt; 3rd, the relative humidity.

### Explanation of Humidity

The condition of the atmosphere which has to do with the moisture content is called humidity. The actual weight of water vapor held in a cubic unit of the atmosphere is understood as the absolute humidity, and this amount of moisture varies greatly with the temperature.

The ratio between the amount of water vapor actually in the atmosphere at any temperature compared to the maximum amount which it would carry at that temperature is known as the relative humidity. Either one of these ways of considering the humidity might have been used, but it seemed more natural to use relative humidity for this work and it is felt that it will be of more benefit to most people to consider the effects from that standpoint.

### Measurement of the Different Variables

**Belt Length.** Instead of measuring the belt length directly the distance between the shaft centers was measured as being a direct function of the belt length.

**Some of the tensions. $T_1+T_2$.** When a belt is working over any pulley, the tension of one side is of course greater than on the other side of the pulley. The tension in the tight side is to be designated as $T_1$ and the tension in the slack side as $T_2$. Then $T_1+T_2$ is the total pull of the belt from both sides of the pulley (see blackboard sketch). The sum of the tensions was easily measured by means of platform scales bearing the foot of a bell-crank lever whose arm was connected by a chain to the carriage of the apparatus. See Fig. 1.

**Relative Humidity.** The relative humidity was determined by a sling psychrometer, similar to the type developed by the U. S. Weather Bureau. The sling psychrometer is a simple instrument made of two mercurial thermometers placed side by side in a frame. The

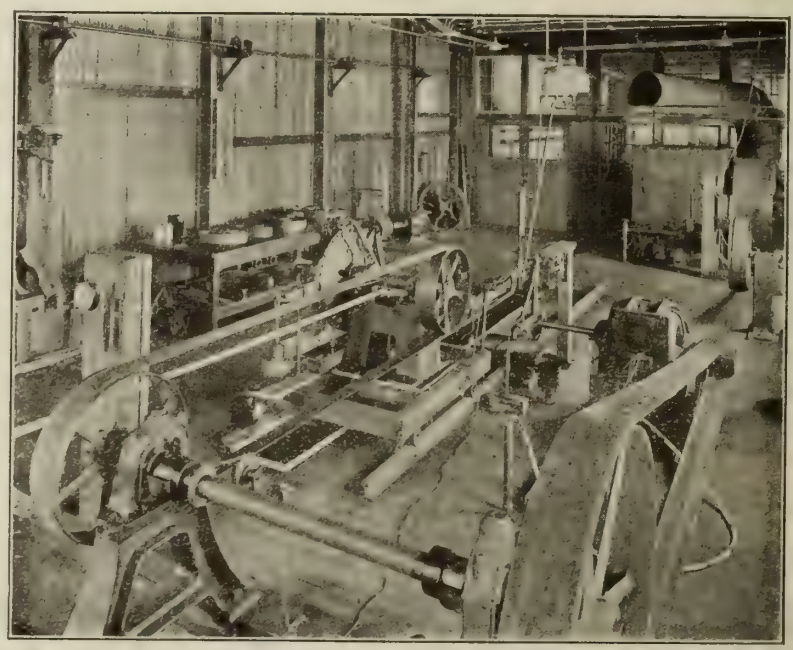


FIG. 1—SHOWING THE APPARATUS USED.

frame is attached at one end to the swivel handle so that it may be whirled, thereby causing the thermometer bulbs to move rapidly through the air. One of the bulbs is covered with a piece of fine muslin and, before the instrument is whirled, this muslin is dipped in water. It thus is a special type of wet and dry bulb thermometer set. The advantage of the type of wet and dry bulb thermometer is that the rate of evaporation is much more definitely controlled than in an ordinary stationary set which has to depend on whatever air currents may be stirring.

A precision hair hygrometer was also used, but could not be depended upon except to indicate whether the humidity was constant or not.

### Method Used in Investigation

In order to study the three variables already referred to above three sets of experiments were carried out as follows: First. Determination of the relation between the center distance and $T_1+T_2$, relative humidity remaining constant. This simply means that the tightness, or looseness as you please, was varied and the corresponding stretch carefully noted, great care being taken to see that the atmospheric conditions did not change.

Second. Determination of the relation between center distance and relative humidity. $T_1+T_2$ remaining constant. Or in other words, the condition of the atmosphere was changed and the corresponding stretch or contraction was noted, care being taken that the sum of the tensions, or $T_1+T_2$ did not vary.

Third. Determination of the relation between relative humidity and the sum of the tensions. Center distance remaining constant. This means that the condition of the atmosphere was varied and the effect on the sum of the tensions was noted, while care was taken to see that the center distance remained always the same.

### Description of the Apparatus

A general layout of the apparatus used in these experiments, which were conducted at the Worcester Polytechnic Institute, is shown in Fig. 1.

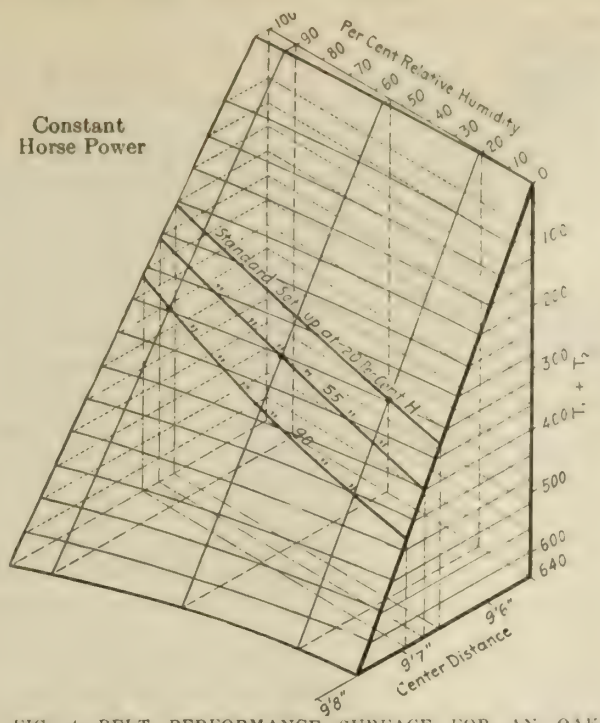



FIG. 4 BELT PERFORMANCE SURFACE FOR AN OAK TANNED LEATHER BELT 4 IN. WIDE, SHOWING RELATION BETWEEN CENTER DISTANCE, SUM OF TENSIONS AND PER CENT. RELATIVE HUMIDITY.

It consists of a driving pulley mounted on a shaft whose bearings are in fixed hangers and a driven pulley mounted on a shaft carried by a base which rests on a movable carriage. If power is to be delivered to the pulley on the movable base two reactions must be furnished. First there must be a direct pull to equal the sum of the belt tensions. This pull is furnished through a chain, equipped with turnbuckles for adjustment, one end of which is fastened to the carriage and the other to the bell-crank lever which has already been mentioned and which serves to measure the amount of the reaction. Second there is the torque or twist. This torque is furnished by an Alden absorption dynamometer, and the amount of the torque is weighed by balancing the dynamometer with standard weights at the end of a definite length of lever arm.

The Alden dynamometer is simply a defined form of Prony brake of large capacity in proportion to its size. A single disc dynamometer consists of a cast iron disc which is keyed to the shaft, and which rotates in oil between two copper plates which are fastened to the casing. Water under pressure is admitted to the casing, thereby pressing the coppers toward the cast iron disc and making the oil film thinner. The more viscous the oil and the thinner the oil film the greater the torque required. The casing, not being keyed to the shaft, is restrained from turning and the force, at a definite radius, necessary to restrain it is a factor in determining the power transmitted. The water not only furnishes pressure, but since there is a constant circulation it also serves to take away the heat of friction. An automatic valve serves to regulate the pressure and the regulation is so nice that oftentimes one of these brakes will run for an hour or more if necessary, always in perfect balance.

The load on the dynamometer is a direct function of the difference in tensions or $T_1+T_2$. Since $T_1+T_2$ and $T_1-T_2$ are both easily measured $T_1$ and $T_2$ may each be easily calculated.

### Atmospheric Control

A Sturtevant heater and blower was used to heat and circulate the air. At first it was attempted to control the humidity by a humidifier such as is used in cotton mills, but finally a live steam

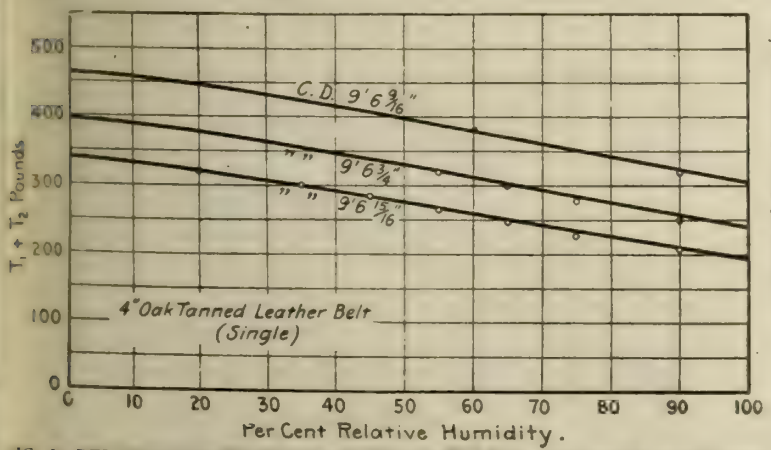



FIG. 5 RELATION BETWEEN T1 + T2 AND PER CENT. RELATIVE HUMIDITY FOR THREE CONDITIONS OF CENTER DISTANCE HORSE POWER CONSTANT.

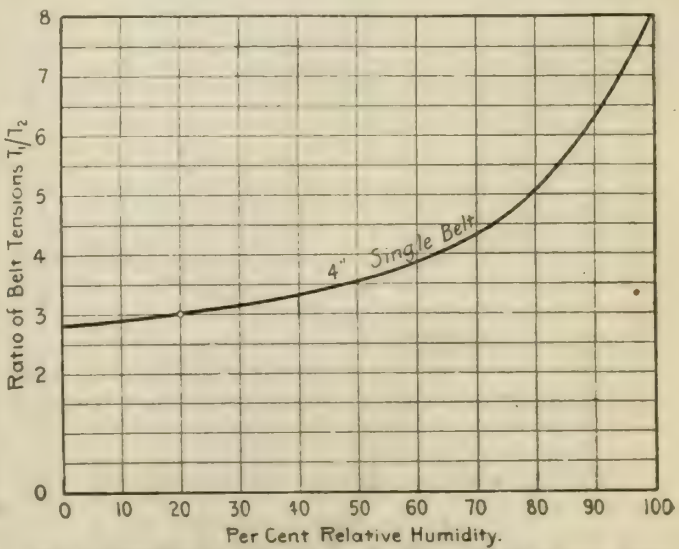



FIG. 6 EFFECT OF CHANGE OF HUMIDITY FROM 20 PER CENT. HORSE POWER CONSTANT.

jet was used altogether. It was found that the humidifier made just a fog, that is minute globules of water suspended in the air, and not vapor containing the heat of vaporization. It was found that no consistent results could be obtained when using the humidifier, but that perfect consistent results which could be duplicated at any time were obtained by the second method.

### Standard Conditions

Certain ideal conditions were assumed as a standard. These were as follows:—Tension in the tight side of the belt $T_1$ = 240 lbs. or 60 lbs. per inch of width. Ratio of the tension in the tight side to the tension in the slack side 3 to 1.

Now if $T_1 = 240$ and $T_1/T_2 = 3$ and we wish to know the tension $T_2$ we have

$$\frac{240}{T_2} = 3$$

Or $3T_2 = 240$

and $T_2 = 80$

Then $T_1 - T_2 = 240 - 80 = 160$ lbs.

This difference in the belt tensions multiplied by the radius of the pulley, in fact, is the number of foot-pounds of torque received by the belt. The power transmitted is of course also a function of the speed and in this case the speed was such that the horse power was approximately 9.21. This value for the horse power prevailed throughout the test and since the speed was constant the value of $T_1 - T_2$ remained constant regardless of what either $T_1$ or $T_2$ may have been.

For the specimen belt which was used and for the conditions stated above, the creep was between 0.8 and 0.9%.

### First Series of Tests

The first series of tests was made by changing the sum of the tensions and measuring the centre distance (belt length) for three different values of relative humidity. The three values of the relative humidity were 20%, 55%, and 90%.

Fig. 2 shows the results of this test graphically and the significance of it is that the modulus of elasticity of the belt, or the ratio between the load applied and the stretch produced, is different for different values of the relative humidity. It is readily seen from the diagram that

given change in tension at a high humidity than at a low.

### Second Series of Tests

The second series of tests, that is the series with $T_1 + T_2$ constant, was carried out with three different values of $T_1 + T_2$. Fig. 3 shows these results graphically and it shows quite clearly that the stretch of a belt for a given change in

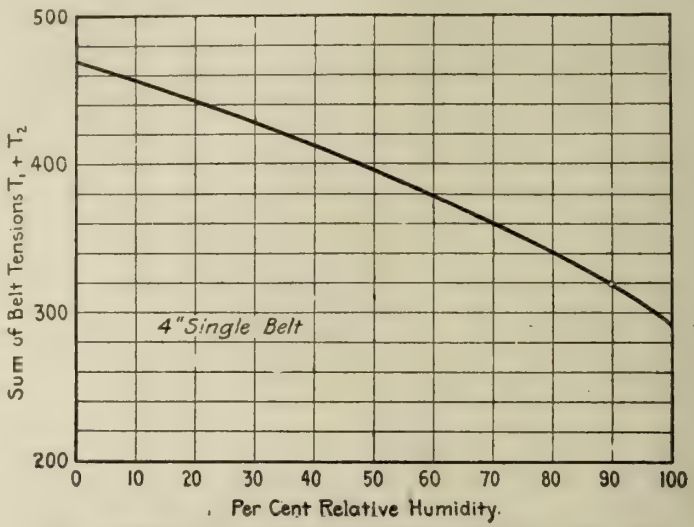



FIG. 7—EFFECT OF CHANGE OF HUMIDITY FROM 90 PER CENT. HORSE POWER CONSTANT.

humidity is greater at high tensions than at low. It would be strange if this were not the case but this test showed just what the variation was.

From these two sets of data which are in terms of three variables it is possible to construct a diagram in space and the result is a surface such as is shown by the diagonal face of Fig. 4. Any one of the curves already referred to may be located on this surface. It is only necessary to know what condition was constant and also the value of that constant and then to trace the curve in terms of the other two coordinates.

The data for the construction of Fig. 5 was obtained in this manner and the curves were drawn. Afterward the belt was operated at different values of relative humidity and the value of $T_1/T_2$ was noted. The plotted points are the results of the experiments and the fact that they lie so close to the calculated position is All of the factors being more or less unknown it is impossible to make definite predictions regarding other leather belts.

However in a general way it may be stated that the effect of a change in the relative humidity is greater at high humidities than at low; that the effect is shown more rapidly in single than in double belts; that increasing the humidity shows practically immediate results, while a decrease in the humidity takes a longer time to be effective.

Much more attention should be paid to the effect of the relative humidity than is ordinarily the case. This will be apparent from the discussion that follows.

Suppose that a plant has an engineer who is supposed to see to it that belts are kept tight and working at the proper tensions. Suppose also that he pays no attention to the weather conditions, but has the belt tightened to a tension which he calls standard.

Continued on page 99

### Conclusions

The warped surface shown in Fig. 4 might well be called the characteristic of this belt and it indicates in a general way what might be expected from similar belts. Leather itself will vary due to various causes as you are well aware.

good evidence that there was no error of any account in the other work.

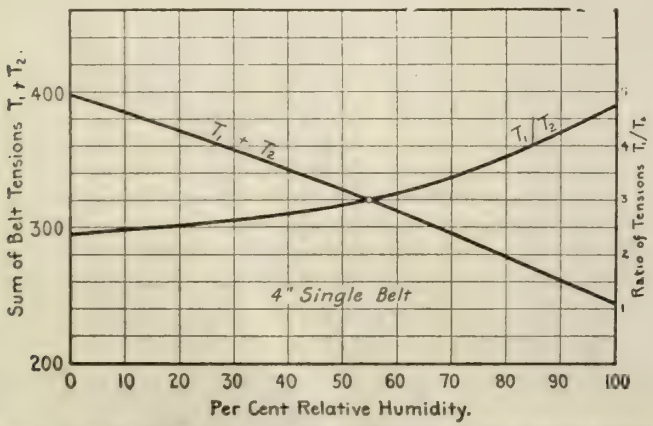



FIG. 8—EFFECT OF CHANGE OF HUMIDITY FROM 55 PER CENT. HORSE POWER CONSTANT.

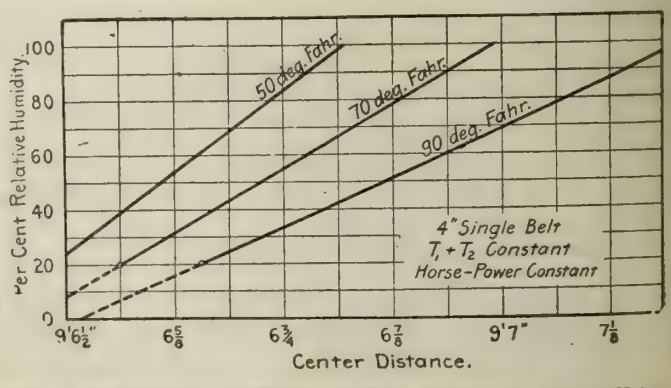
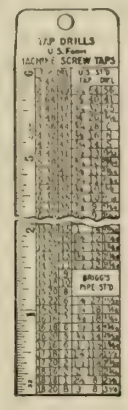



FIG. 9—RELATION BETWEEN CENTER DISTANCE AND RELATIVE HUMIDITY THREE DIFFERENT TEMPERATURES.

# Have You Tried This Contest Yet? If not--- Do so Now

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.




The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

## What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

Here are the two prize-winners for the January 13th contest. Daniel Sheg, 559B Berri St., Montreal, and George Land, 567 Patterson St., Peterboro', Ont. One of our contestants asked this question, "Can any reader of Canadian Machinery try this contest, even though he is not a subscriber." Certainly, the more answers we receive, the better we are pleased, although we cannot imagine anyone reading Canadian Machinery and still remaining a non-subscriber.— Editor.

**CONTEST FOR FEBRUARY 3RD ISSUE**

**Contestants are required to write us, stating to which advertisements we refer in this number.**

1—Something that lifts 200 times its own weight.
2—Something that is like a cannibal—eats them up.
3—A product said to be of dependable character.
4—What to do if you have work requiring accuracy.
5—How to increase production.
6—How to become a candidate for a steady job holding a tin cup.
7—Something said to be equally efficient for light or heavy work.
8—How to save many valuable hours.
9—Something that will stand up to its work.
10—Something that has served five years' service and is still a favorite.
11—How to make sure of good gears.
12—How to save money on cost, also delay in deliveries.

**These are Correct Answers for List from January 13th Issue:**

1—Dominion Oxygen Co., Ltd.
2—Bristol Co.
3—H. H. Robertson Co.
4—J. H. Williams & Co.
5—Wright Mfg. Co.
6—Holden Co.
7—Nicholson File Co.
8—Victor Tool Co.
9—Landis Tool Co.
10—Wilt Twist Drill Co.
11—J. T. Hepburn.
12—In the Classified Section, or Buyers' Directory of Canadian Machinery.

## Closing Date for This Contest is February 24th



# DEVELOPMENTS IN SHOP EQUIPMENT



### MACHINE WITH MANY USES

You can accomplish surfacing, boring, milling, drilling and tapping on the one machine. Briefly, that is what H. W. Kearns & Co. Ltd., Broadheath, England, claim for their patented multi-purpose machine shown in Figs. 1 to 3 inclusive. These machines are made in two types, known as the standard and the patent machine. In all essential features they are similar, and with the exception of certain parts are identical and interchangeable. The standard machines are fully universal, and are capable of handling a very large variety of work.

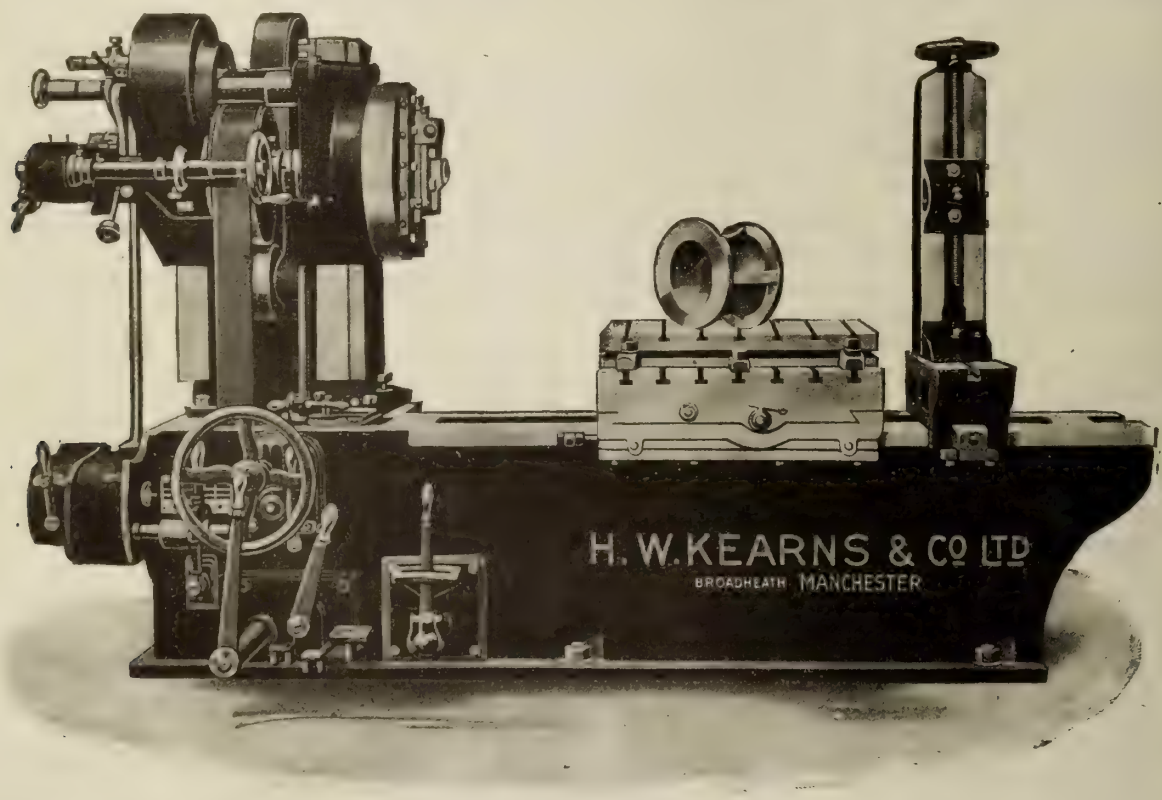
They are said to be especially suited for marine work, pump work, and in fact any work of large size, and where the operations take considerable time, also where the diameters dealt with are well up to the capacity of the machine. All boring feeds are obtained by travelling the tables, and this is the method they recommend for holes of large diameter, as it allows them to use good substantial bars.

This concern have proved by experience that a demand exists for a machine similar to the above, but with the addition of a travelling spindle, so the patent machine, next to be described, was produced. This latter machine contains all the features of the former with the addition of a travelling spindle of substantial diameter. The advantages of such an addition for certain classes of work are easily understood. Where the operations are great in number, and the holes to be bored are of small or medium diameter, it is much more convenient to travel the spindle. The patent machines are supplied with a larger table than the standard type. This is due to the fact that there is a tendency to require less space between the boring bar socket and stay on this type of machine, owing to the reduced need to travel the tables where a travelling spindle is available. The travelling spindle can be revolved either simultaneously with, or independently of, the facing chuck. This is a feature of considerable importance, as the independent action of the spindle will be found of benefit for drilling, tapping, and boring of small diameters. In addition to these features the momentum of the facing chuck when running at high speeds is avoided. Where cylindrical articles are manufactured in large quantities, the patent machine will bore and face simultaneously.

At Fig. 1 is shown a general view of what is known as the No. II standard machine, while at Fig. 2 is illustrated the facing slide for the standard type of machine. Fig. 3 depicts the type of facing slide for the patent machine, and it will be noted in this latter case that a clear hole is left through the spindle of the clutch to carry the travelling spindle.

### Facing Slides

The facing slides on these machines are patented and embody certain features. For example, they are capable of facing from the maximum diameter to zero without adjustment. This overcomes the usual trouble of changing the




GENERAL APPEARANCE OF THE NO. II. STANDARD MACHINE.

position of nut before the job can be completed. Before adopting the present patented facing head they had this trouble to contend with, and the adoption of this type of head has saved considerable time. Their patent clutch consists of a section of a worm, operated on a helical rack carried on the back of the facing slide. Ball thrusts are provided in each direction, and in addition to the advantage already mentioned, increased bearing surface and reduction of effort required for hand adjustment are obtained. The facing tool is arranged to make an acute angle with the work, thus reducing the chance of chatter. This principle is found of special value when finishing work at a broad rate of travel. The slide is fitted with detachable socket for carrying boring bars, twist drills, reamers, snout boring tools and milling cutters. Special adjusting strips are provided which ensure the slide remaining in truth when in central positon.

In the patent machine head (see Fig. 3) it will be noticed that a radial motion is given to the facing clutch by means of a scroll plate carried at the back of the facing slide. The engaging portion of this plate is of large diameter, and it makes engagement with two scroll sections spaced sufficiently widely apart to admit between them the travelling spindle. Automatic feed is obtained in either direction by accelerating or retarding the scroll plate relative to the facing slide. This feed is obtained from the main feed box operating through an epicycle gear. By this means a wide range of feeds is obtained. The facing head is provided with tee slots running its full length. The tool holder can thus be placed in the most convenient position, and a boring bar is supplied which is secured to the facing slide for use when it is desirable to use fixed bars of large diameters in conjunction with the table feed.

### Spindle Slides

The vertical sliding head is geared to enable the machine to deal with work varying from the largest to the smallest diameter, and power is transmitted to the spindle by means of an endless belt. When drilling or boring small diameters this driving pulley is directly connected to the spindle, thus obtaining direct drive without the intervention of toothed gearing. In holes of large diameter the power is transmitted from the belt to the spindle through gearing of ample purchase, operating on an external pinion, driving through spur ring of large diameter. The spindle is relieved of all torsional stress when boring large diameters. All bearings are of ample proportion, and are kept as far apart as possible, thus allowing the use of snout boring tools.

The spindle slide on the patent machine is identical with the one already explained, and the travelling spindle is carried on bearings of ample length. Automatic feed to the spindle is provided in either direction, together with reverse motion for tapping. The spindle is gripped in a tail bracket, and is sufficiently long to give twice the travel provided with instantaneous engagement for automatic feed. A fine hand adjustment is also provided.

The feed motion to facing slide is of patented improved design, and these feeds are now taken from the main feed box. This is connected to the facing slide through epicycle gearing, with the result that as many feeds are provided to the facing slide in either direction as are provided to the other motions of the machine. In other words eight feeds in either direction are provided to the facing slides on the standard machines.

### The Tables

The machine is provided with a rectangular main table arranged with adequate cross traverse. On the main table is fitted a detachable square turntable which enables the machine to operate on all four sides of the work at one setting. The table can be locked in any position, and at any angle. It is fitted with a special patented locating arrangement which locks it securely at each 90 degrees.

Tee slots are provided on both tables. A centering pin is used whereby the detachable turntable is located central with the spindle. A spacing arrangement is also provided when required that enables the proceeding of repeat articles with perfect uniformity.

### Rapid Power Traverse

The machine is fully automatic, variable and reversible feeds being provided to the longitudinal and transverse motions of the table, and to the vertical motion of the sliding head. This renders the machine capable of milling in all directions. Rapid power traverse is provided to the whole of these motions in either direction. This traverse is independent of the feeds, and is of constant speed.

Alfred Herbert, Ltd., are handling these machines for the Canadian trade, from their offices at 1-3 Jarvis St., Toronto.



FIG. 2—VIEW OF FACING SLIDE AS USED ON STANDARD MACHINE.

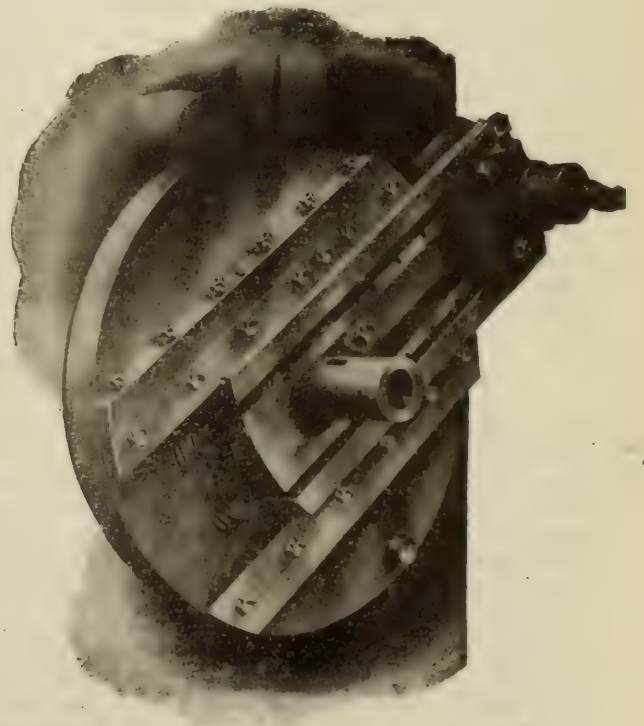


FIG. 3 THIS TYPE OF FACING SLIDE IS USED ON PATENT MACHINE.

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## Asking—And Getting It

AT a meeting of the Canadian Association of British Manufacturers held in Toronto a few days ago, several remarks were made by representatives from various fields and the trend of these could be interpreted as meaning that conditions were mending. One dealer put the thing tersely when he said: "We are asking for business now and we are getting it."

The casualty list in Canadian industry has been light and the same holds good in other fields.

Dealers in other lines, such as foodstuffs, are protecting their customers for a reasonable length of time on prices. That is, they promise stability of prices for a period that will allow the dealer to dispose of a reasonable amount of goods. It is encouraging buying on a larger scale and the movement is growing.

## The Market Not Crowded

IN a signed statement by T. A. Russell, president of the Willys-Overland Co., the much-repeated talk of overstocked automobile dealers is plainly denied. The remark has often been made that as soon as prices were cut some months ago dealers rushed in and bought very large stocks for the 1921 trade and therefore put an end to the buying movement as far as they were concerned for some time to come. Mr. Russell's statement follows:

"Motor dealers in Canada can look forward to 1921 with confidence. The statistics which were prepared by the manufacturers and dealers for submission to the Government in connection with the question of luxury taxes, brought out the surprising fact that the total number of cars in the hands of dealers, throughout the whole of Canada, did not exceed the normal production of the Canadian factories for one month. In other words, one month of normal sales would dispose of a greater number of cars than were in stock in the hands of dealers in Canada on January 1, 1921."

Dealing with general conditions, all of which will have a very direct bearing on the sale of cars and other business, Mr. Russell goes on to say: "A large part of Canada's grain crop has not been moved. Canadian banks and institutions have stood the strain of reconstruction without an important casualty. Liquidation, which has been so general, has been accomplished without shaking our commercial credit. Are these conditions not a sound basis for a healthy and profitable business in 1921?"

## Making Salesmen Now

THERE are certain business houses where the visitor knows what to expect now. Go in and make a call. Sit down and talk for a few minutes. You will come out with an ear full of gloom. You will hear that the firm is not making money; that they are not selling as much as they did last year; that the future is uncertain.

After one gets well sprayed with that kind of speech it is easy to pass a little of it along.

Thank goodness there are other places. This week we found one that was out for a record year. Yes—not an inch less—out for a record year.

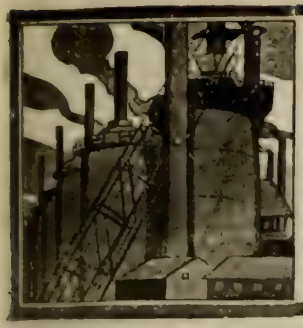
Their motto may be rather straight and unadorned, but it means this—the way to get business is to get it.

"We are going after business now in a way that some of our new salesmen never heard of before. There has not been much selling done since 1915—largely a case of taking orders. It's bad for the whole force. Salesmen are developed when business is not brisk, when the traveler has to think, has to study the business of his client, has to find out if he has anything to sell him that he should have. We believe there will be more salesmen developed in Canada during the year 1921 than there have in the previous five years."




**THE FORD LEADS THE WAY**

**Fine! But it isn't every vehicle that can make as short a turn as a Henry!**
—Spencer in Omaha "World-Herald."



# MARKET DEVELOPMENTS



## Inquiries Are Numerous, But Not The Orders

### Pittsburgh Despatch Intimates That New Basis For Steel Values May Be Reached—A Few Reductions Made in the Price of Tools—Scrap Metal Prices are Marked Down in This District To Very Low Levels.

PRICE talk is heard again in the markets this week, but this does not mean that there is going to be any immediate advantage in it for the Canadian buyer. New York reports that two makers have brought out new selling schedules, but there is nothing to show that the action has aided in the closing of any more business. Pittsburgh also talks about a new basis for steel prices, but intimates that the time is not ripe yet for the bringing of these into effect. Wages and other costs will have to be dealt with first, and there is a feeling that cuts in wages would lead the buying public to turn on the steel makers and ask them for cheaper steel.

Machine tool dealers in Canada are working harder for business than for some time past and the experience of many is that the firms that are working hardest to secure business are meeting with the most gratifying results. The change in the attitude of some American firms in opening a Canadian account and taking payment in Canadian funds has also helped sales.

Buying that is being done, though, is on a small scale, although reports indicate that industry in Canada is improving. Some shops are releasing orders they have held up for some months and more are getting under way even if on a small scale.

The scrap metal market was further marked down this week, many of the figures now named being only shadows of their former war-time greatness. Even at this schedule there is little trading being done.

## SOME LARGE SHOPS IN MONTREAL ARE FARMING THEIR WORK OUT

Special to CANADIAN MACHINERY.

MONTREAL, Feb. 3.—The past week has brought nothing new to the surface. Some reports indicate that business is more brisk, while on the other hand one hears of the suspension of operations at some of the larger plants, with many willing, but not knowing how, to help put trading on a firmer basis. When speaking to the proprietor of a small machine shop here he made the remark that: "We have succeeded in obtaining sufficient work to keep us going for several months, and with the promise of more. The peculiar fact, however, is that this work has been obtained from one of the largest firms in the city, as it appears that they have let nearly all of the tool makers go, and when it is necessary to have such work done they are sending it out to the small shops. It is my belief that the small shops will be the first to benefit from the situation now confronting us, as the larger shops will prefer to have work sent out rather than take on more men just now, or until there is a general return to normal activity."

### Steel Remains Quiet

"We are still looking forward to the time when business will be more than the answering of inquiries. If orders resulted from all of these we would have no cause for worry, but in the great majority of cases it seems as though they were feelers to get the trend of the market." This statement by a steel dealer would indicate that buying is contemplated, but that their needs are not sufficiently urgent to place an order, except it be for material wanted for immediate use. There is a tendency on the part of sales organizations to offer inducements to buyers to fill their requirements, but these are not shown on the price quotations, the latter being maintained for moral influence. The feature that dominates present trading is the lack of interest shown by the average consumer, and this attitude makes it all the harder for the salesman when trying to secure an order. "We cannot complain of present business," said one dealer, "as we do not expect any heavy buying at this season of the year. We are keeping just sufficient stock to satisfy the spasmodic demand of the trade. January and February are usually quiet in normal times, so we are showing no anxiety. Should our expectations be realized we will in a few months require to carry more in our warehouse to meet the summer needs of the trade." Local quotations are firmly held in many cases. Sheets are easing off somewhat, and that in face of the gradual return of automobile activity.

No visible improvement has, as yet, developed in machine tool movement, although a few dealers state that the past week has brought out several interesting inquiries. Not all of these have resulted in sales but the encouraging tone has given heart to those who have frequently despaired of an early return to active business. "We cannot say that present business is much improved over that of the past few weeks," remarked a dealer here, "but when you realize that the past three or four months have produced little more than sufficient to pay overhead, the possibility of increased business is an encouraging feature in an otherwise quiet period. We are not anticipating any rapid return of normal activity but everything points to a steady betterment in business generally, a condition that will naturally be shared by those in the machine tool lines. Prices—this is a question not easily settled. Of course, some makers endeavor to meet the desires of the trade in this respect, but new tools continue to find their way to the users at figures in keeping with general conditions, and these require that a fairly high standard be maintained."

Those houses that make a practice of catering to the rural districts have been fortunate in securing some business but usually small and well distributed orders. Even this, however, is very acceptable. There is still a fair movement in small supplies but volume is light, salesmen endeavoring to maintain sales by extending their calls and covering more territory.

# CANADIAN FUNDS MADE THE SALE

**Feeling Grows That Firms That Get Out After Business Will Secure Orders**

TORONTO.—One has not to make many calls in the Toronto market at present to pick up any shade or variety of opinion, but through them all there is a note that the worst has happened, and events are certain to turn for the better soon. Even in cases where they admit that it is a case of nearly all going out with very little coming in, they look forward to a good year's business, and look upon the present in the light of the whole year.

"We are going to have a good year," was the statement of one firm this morning. "We are going to have a good year because we are going after the business in a different way. Our men are out now to sell, and not simply to take orders. It's not a good thing to have business coming too easy. It is a great chance right now for salesmen to show that they know something about the fine points of the game. It has been no trick for some years past to make a showing like a fairly good machine tool salesman, but for the past six months or so this has changed. The man who can get away now and pick business out of this market is the man we want around here. It's a great chance for men out selling to do some real constructive work now. We are finding out that the man who gets out now and fights for business is getting the results."

Machine tool dealers report nothing from their principals that would indicate any intention on their part to let down the prices. In fact the matter is not discussed in the markets now nearly as much as it was a few weeks ago. It seems to be generally conceded that there will be price changes some time later on, but it cannot be said that this consideration is making much difference. There are other factors, amounting to about the same thing, though, that do result in sales, and it is worth noting that other cases might work out the same way.

### Here is the Case

A Canadian firm had secured a figure from a Toronto house on a certain kind of drill for a special purpose. The first quotation was made last May, but the deal was not closed, and apparently the would-be purchaser had let the matter drop. He called up on the phone the first of this week, and asked what the price was at the present time. He was informed that there had been no change in the price, but that the firm would now accept Canadian funds at par, a change which had been made in their selling policy since the quotation in May. "If that's the case, send along the machine," was the answer.

## POINTS IN WEEK'S MARKETING NOTES

**Pittsburgh states that the price of steel may come to a lower level, but the present is not an opportune time to bring about this change. Wages and other costs will have to come down first.**

—

**Steel Corporation mills are continuing to operate within 10 to 12 per cent. of their capacity on orders booked some time ago. There is not much new business being placed.**

—

**Some of the larger shops are farming out portions of their work rather than start their whole plant operating.**

—

**The prices that dealers were paying for scrap metal were cut again this week. Any sales that are taking place now will bear an intrinsic value to the market.**

—

**The steel companies have enough scrap to last them for months to come, and foundries are buying only what they need.**

—

**One maker of grinding machines and another manufacturer of shapers have announced reductions in their selling prices, but other machine tool makers have not followed suit.**

### Steel Market Quiet

Steel prices have not changed during the week, nor are there indications that there will be anything much of a departure from present lists for some time. There are offers made to Canadian dealers now to take on tonnages from American rolling mills that are out looking for business, but the average yard in Canada has all the material it cares to handle now, and for the most part they much prefer to clean out their stock, even without profit, rather than add to it at fairly close prices.

There is a certain amount of buying being done, but it is not in a large way.

### More Prices Are Cut

The prices which dealers will pay for scrap material were operated on again this week, and now they possess only a very small share of their former war-time greatness. In fact were the dealer to take his club and whack the schedule any lower it would simply cease to exist.

Speaking of the changes, one of the dealers said "Foundries are not taking on anything to speak of, neither are the steel companies. The latter are pretty well loaded. If some of them keep on producing at their present low rates they will not have to buy anything for the next year or so. The large dealers are not taking on anything. They are pretty well stocked, and are afraid of even lower prices. They have been taking their losses pretty regularly for some time now. Anything that is bought or sold at present prices is below the intrinsic value of the material, but that seems to make no difference."

One might imagine it would be a good time for the speculators to get busy in the metal market, but they are afraid of it. When copper came down recently and hit 14 cents for the first time in many months, there were several in this district quite eager to go in and take a chance. They did, and all that is necessary is to say that to-day copper can be bought in New York at between 12 and 13 cents.

# NEW YORK MARKET STILL MINUS ORDERS

**Some Changes Have Been Made in Selling Prices, but They Are Not General**

Special to CANADIAN MACHINERY.

NEW YORK, Feb. 3.—There is as yet no marked improvement in the demand for machine tools, though a fair number of inquiries for single machines is being received. Orders are few, however, and buyers are evidently awaiting the working out of the price situation.

The most important reduction of the past week was that of the Norton Company, Worcester, Mass., which made varying changes in its prices on grinding machines and grinding wheels. These declines approximated 15 per cent. Other wheel manufacturers have also reduced, but the reduction in grinding machines is not general. Some of the Norton Company's competitors on tools have not indicated whether they will or will not make like reductions.

Manufacturers of shapers have likewise not followed the action of Gould & Eberhardt in reducing prices about 15 per cent.

Prices on riveting machines made in New England have been reduced 12½ per cent. Nearly all of the makers of precision bench lathes have reduced prices.

A large manufacturer of foundry equipment announces a second reduction of prices within one month, making a 20 per cent. cut in all.

Some of the machine tool manufacturers intimate that they will make no reductions at present. The general disposition toward the price question is that reductions at this time will not stimulate buying.

During the past week or two there has been a slight improvement in business among some of the metal-working industries. The improvement is in evidence mostly in the smaller shops.

Many of the large plants are wholly or partially shut down. The General Electric Company has just announced a reduction in wages and has also cut down the size of its office forces. This is typical of the situation as it exists among many metal-working plants.

It is the general opinion that a slow but gradual improvement in the business situation may be expected from now on. Few, however, are willing to predict that there will be any real activity in some of the metal-working lines before the last half of the year.

# STEEL PRICES MAY SHIFT AGAIN BUT TIME FOR IT IS NOT RIPE

Special to CANADIAN MACHINERY.

PITTSBURGH, February 3. — There has been a slight increase in production by independent steel mills as a whole, the average rate of output by independents now being in the neighborhood of 30 per cent., against a 25 per cent. average for several weeks. The increase in production, however, does not seem to reflect any definite increase in demand, but seems due rather to several mills chancing to resume work at the same time, after a spell of idleness in which they allowed orders and "releases" to accumulate, the releases being withdrawals of instructions previously issued to discontinue shipments on old orders. At some time in the future several mills may chance to go down entirely at the same time, and then a particularly low operating rate will be shown.

The Steel Corporation is operating at an average of about 90 per cent., on the basis of the steel ingot production. Operations have decreased slightly of late by the American Steel & Wire Company, Illinois Steel Company (operating also the Gary plant) and the Tennessee Coal, Iron & Railroad Company. The National Tube Company continues to operate full. The Carnegie Steel Company has been maintaining an average output of ingots 96 per cent. of rated capacity, and last week blew in an additional blast furnace, making 48 Carnegie stacks in operation, the largest number for months. The American Sheet & Tin Plate Company, an important subsidiary of the Steel Corporation, but one that makes very little steel, maintains its former rate of operation at its tin plate mills, but has tapered off slightly in sheet mill operations.

There is no certainty that the Steel Corporation will be able to maintain even approximately its present rate of operation for any length of time. The large mass of business the Steel Corporation accumulated on books last year has proved very sound except for a small volume of cancellations, much sounder than the independent steel producers expected would prove to be the case whenever the steel situation should turn easy, but that would not prevent the buyers from requesting that shipments be made at a slower rate. The consumer may be able and anxious to take every ton on his contract, but his rate of operation might be such as to require that deliveries originally intended to be completed by June 30 should be strung out to December 31.

### Prices

There is some price cutting in a number of the finished steel products, but the cutting does not amount to much in either volume or extent. As to volume, the Steel Corporation is probably booking more business than the independents, and of course its prices are absolutely firm, while some at least of the independents are holding strictly to regular prices, yet are booking an order here and there. As to extent, the maximum shading, where there is any at all, is probably only $2 or $3 a ton.

However, this does not indicate that present prices are going to hold. There is absolutely no prospect that they will. The point is that the time is not ripe. Some day there will be a readjustment in prices to a level that will suit buyers, on the basis of the general liquidation that is now in progress. No readjustment to the eventual bottom could be made now, for it is still to be ascertained how far costs of production can be reduced, and even if the mills could name bottom prices now they would be quite indisposed to do so since buyers would not take hold freely at this time no matter what prices were named, and there is a tactical advantage in holding off from making reductions, or at any rate the last of the reductions that will have to be made.

### Wages

Possibly it is largely because mills do not consider it advantageous to reduce prices at this time that they are so slow in reducing wages. No employer pretends that wages should not come down, and by a large amount, yet less than half the independents, in point of capacity, have reduced wages to any noteworthy extent, while the Steel Corporation appears not even to have considered the matter. The steel producers doubtless feel that if there were such general reduction in wages buyers would at once clamour for much lower steel prices, and there might be more lost than gained. Particularly in the Pittsburgh and Youngstown districts wage reductions have been lacking, though of course there has been some reduction in wage costs, by less efficient men being let go, and by men previously drawing bonus or special wages being released, to be engaged afresh at standard rates.

### Prices and Costs

That there is room, eventually, for very considerable declines in prices is shown by the Steel Corporation's earnings reports. The year 1920 shows $177,000,000 earnings, after allowance for all taxes including the federal income and excess profits taxes, and after paying interest on bonds of subsidiary companies. That is 10 per cent. more than the corporation's earnings in the best year before the war and about two and one-half times the earnings in the poorest year. Yet the corporation was greatly handicapped in 1920. It had an average operation of only about 82 per cent., while in 1916 it had a 100 per cent. operation. Its costs were high on account of conditions in general, and there was the particular disadvantage that the costs rose to an extent by sympathy with the high costs of the independent mills, the latter caring little about costs since they advanced their selling prices. The corporation got nothing by increased selling prices but lost something by increased costs. The independents used to claim that they had to have their high prices because they were at a disadvantage by comparison with the Steel Corporation, and when pressed for particulars the chief item they mentioned was "overhead," just what before the war it used to be said distinguished the Steel Corporation. How the tables came to be turned so suddenly has never been satisfactorily explained. There is room for suspicion that many of the references to the high overhead of the independents included large dividends, bonuses, etc., in overhead. Now the independents are largely idle, and they are forced to lose the alleged overhead.

### Pig Iron and Coke

Valley foundry iron has become readily available at $30, furnace, or $1.50 decline, Bessemer and basic being altogether inactive and therefore remaining at $32 and $30 respectively. Most of the merchant furnaces are idle and the few in operation are facing the prospect of having to blow out.

The better balanced mentally of the merchant furnacemen are taking no interest in pig iron prices at this time. It is a matter of indifference whether the quotable market is one thing or another. What they are thinking of is costs. The costs will have to be reduced, there being confidence that when costs are made right the market will take care of itself. There is coke, for instance, now held at $6.00 as a contract price, though odd lots for spot shipment can be picked up at $5.00 or less. Two or three months ago the Connellsville coke operators were talking about holding out for one price or another, even prices higher than $10, and keeping their ovens idle until furnacemen should become willing to step up to the counter and buy at the seller's idea. Now the coke operators are hoping for reductions in costs. They need hardly anything but two things, contentment with lower profits and lower wage rates.

# BERTRAM AND PRATT & WHITNEY HELD THEIR SALES CONFERENCE

ON January 12, 13 and 14 the sales convention of the John Bertram and Pratt & Whitney Companies was held at Dundas, representatives being present from Montreal, New York, Halifax, Chicago, Winnipeg, Toronto, as well as a large number from Dundas.

This sales convention, which was a success in every way, was the first one held by the companies concerned, but it is the intention that it shall be an annual fixture in January of each year. Aside from the social part of the convention, which enabled the salesmen and managers to get better acquainted with each other and with the staff at Dundas, the papers and discussion which followed them in each case provided a valuable means for a free exchange of ideas, and enabled the salesmen to get the head office point of view and vice versa. The papers were, of course, all prepared in advance, and a bound copy of each paper was made by means of a duplicating machine, and placed in the hands of each person attending the convention, before the opening of the sessions, which gave each one a chance to look over the subject and become sufficiently acquainted with the paper to discuss it intelligently. Many of the papers were illustrated by lantern slides, which added considerably to the value of the papers as it enabled the speakers to illustrate points which could not otherwise have been made clear.

### Spoke of Earlier Days

A particularly interesting feature of the dinner on Thursday evening was Sir Alex. Bertram's address "Reminiscences," in connection with the founding of the Bertram plant by his father and the late Robert McKechnie. The dinner was held in the building which was lately the rectory of St. James Church, and the fact that the building was for many years the residence of the late John Bertram and the early home of Sir Alex. and Henry Bertram, recalled many incidents of the early days which stirred the emotions of every man present.

Wednesday, the first day of the conference, was largely taken up with tours of inspection to the Bertram and Pratt & Whitney plants, and the demonstration of certain machine tools, with descriptive addresses on these by A. W. Draeseke. Mr. Sprague, principal of Hamilton Technical School, was the speaker at the evening session.

Thursday morning papers were given by H. W. Angold, on some of the shop methods and inspection at the Bertram plant; G. H. Howard discussed enquiries, quotations and orders, from the viewpoint of the head office, while H. G. Bertram dealt with "Order Department Requirements." Helpful discussions fol-

Continued on page 96

SALES CONFERENCE OF JOHN BERTRAM AND PRATT, & WHITNEY CO. AT DUNDAS.



First Row, left to right—James Young, Montreal, W. J. Flaig, Chicago; Sir Alex. Bertram, Montreal; Henry Bertram, Dundas; E. L. Leeds, New York; H. G. Bertram, Dundas.

Second Row—A. Martin, Halifax; G. H. Howard, Dundas; A. M. Maver, Toronto; Douglas Robb, Winnipeg; A. W. Paquin, Montreal; J. Ferguson, Toronto.

Third Row—R. McKechnie, Windsor; H. W. Angold, Dundas; W. Davidson, Dundas; A. W. Draeseke, Dundas; C. E. Dickson, Dundas; C. A. Fisher, Dundas.

Fourth Row—H. W. Simpson, Dundas; T. Tolton, Dundas; W. J. Houghtling, Dundas; I. L. Ibbotson, Montreal; M. B. Davidson, Dundas; A. E. R. Turner, Dundas; T. A. Woods, Toronto.

# SELECTED MARKET QUOTATIONS

**Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.**

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $33 96 |
| Lake Superior, charcoal, Chicago | 48 50 |
| Standard low phos., Philadelphia | 44 79 |
| Bessemer, Pittsburgh | 33 96 |
| Basic, Valley furnace | 30 00 |
| Toronto price:— | |
| Silicon, 2.25% to 2.75% | 43.64 |

## IRON AND STEEL

| Per lb. to Large Buyers | Cents |
|---|---|
| Iron bars, base, Toronto | $ 4 75 |
| Steel bars, base, Toronto | 4 75 |
| Iron bars, base, Montreal | 4 50 |
| Steel bars, base, Montreal | 4 50 |
| Reinforcing bars, base | 4 75 |
| Steel hoops | 6 00 |
| Tire steel | 5 00 |
| Spring steel | 8 00 |
| Band steel, No. 10 gauge and 3-16 in. base | 5 50 |
| Chequered floor plate 3-16 aud heavier | 7 50 |
| Bessemer rails, heavy, at mill | |
| Steel bars, Pittsburgh | 3 00-4 00 |
| Tank plates, Pittsburgh | 3 50 |
| Structural shapes, Pittsburgh | 3 00 |
| Steel hoops, Pittsburgh | 3 50-3 75 |
| F.O.B., Toronto Warehouse | |
| Small shapes | 5 00 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 3 62 |
| Structural shapes | 3 72 |
| Plates | 3 67 to 5 50 |
| Small shapes under 3" | 3 62 |

## FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

| | C.L. | L.C.L. |
|---|---|---|
| Montreal | 58½ | 73 |
| St. John, N.B. | 84½ | 106½ |
| Halifax | 86 | 108 |
| Toronto | 38 | 54 |
| Guelph | 38 | 54 |
| London | 38 | 54 |
| Windsor | 35 | 50½ |

## METALS

| | Gross. Montreal | Toronto |
|---|---|---|
| Lake copper | $19 00 | $19 50 |
| Electric copper | 18 50 | 19 00 |
| Castings, copper | 18 00 | 19 00 |
| Tin | 44 00 | 46 00 |
| Spelter | 8 00 | 9 00 |
| Lead | 7 25 | 8 00 |
| Antimony | 8 00 | 9 00 |
| Aluminum | 34 00 | 35 00 |

Prices per 100 lbs.

## PLATES

| | | |
|---|---|---|
| Plates, 3-16 in. | $ 5 50 | $ 5 50 |
| Plates, ¼ up | 5 00 | 5 50 |

## PIPE—WROUGHT

Standard Buttweld Pipe

Per 100 Ft.

| | Steel Blk. | Steel Galv. | Gen. Wrought Iron Blk. | Gen. Wrought Iron Galv. |
|---|---|---|---|---|
| ⅛ | $ 6 50 | $ 8 50 | $..... | $..... |
| ¼ | 5 31 | 7 41 | 5 91 | 8 01 |
| ⅜ | 5 31 | 7 41 | 5 91 | 8 01 |
| ½ | 7 10 | 8 63 | 7 95 | 9 48 |
| ¾ | 8 80 | 10 87 | 9 95 | 12 02 |
| 1 | 13 01 | 16 07 | 14 71 | 17 77 |
| 1¼ | 17 60 | 21 74 | 19 90 | 24 04 |
| 1½ | 21 04 | 25 99 | 23 79 | 27 84 |
| 2 | 28 31 | 34 97 | 32 01 | 38 67 |
| 2½ | 44 75 | 55 28 | .... | .... |
| 3 | 58 52 | 72 29 | .... | .... |
| 3½ | 74 06 | 90 62 | .... | .... |
| 4 | 87 75 | 107 37 | .... | .... |

Standard Lapweld Pipe

Per 100 Ft.

| | Steel Blk. | Steel Galv. | Gen. Wrought Iron Blk. | Gen. Wrought Iron Galv. |
|---|---|---|---|---|
| 2 | $32 01 | $ 38 67 | $35 71 | $42 37 |
| 2½ | 48 26 | 58 79 | 54 11 | 64 64 |
| 3 | 63 11 | 76 88 | 70 76 | 84 53 |
| 3½ | 75 90 | 92 46 | 85 10 | 101 66 |
| 4 | 89 93 | 107 55 | 100 83 | 120 45 |
| 4½ | 1 05 | 1 29 | 1 30 | 1 54 |
| 5 | 1 22 | 1 50 | 1 52 | 1 80 |
| 6 | 1 58 | 1 95 | 1 97 | 2 33 |
| 7 | 2 06 | 2 53 | 2 53 | 3 01 |
| 8L | 2 16 | 2 66 | 2 66 | 3 16 |
| 8 | 2 49 | 3 07 | 3 07 | 3 64 |
| 9 | 2 98 | 3 67 | 3 67 | 4 36 |
| 10L | 2 77 | 3 41 | 3 41 | 4 05 |
| 10 | 3 56 | 4 39 | 4 39 | 5 21 |

Prices—Ontario, Quebec and Maritime Provinces

## WROUGHT NIPPLES

4" and under, 60%.
4½" and larger, 50%.
4" and under, running thread, 30%.
Standard couplings, 4-in. and under, 30%.
Do., 4½" and larger, 10%.

## OLD MATERIAL

Dealers' Average Buying Prices

Per 100 Pounds.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $10 50 | $ 9 00 |
| Copper, crucible | 13 00 | 11 00 |
| Copper, heavy | 12 50 | 11 00 |
| Copper wire | 12 50 | 11 00 |
| No. 1 machine composition | 13 00 | 9 75 |
| New brass cuttings | 7 00 | 8 00 |
| Red brass turnings | 10 00 | 8 00 |
| Yellow brass turnings | 7 00 | 6 00 |
| Light brass | 5 00 | 5 00 |
| Medium brass | 6 50 | 6 00 |
| Scrap zinc | 5 00 | 4 00 |
| Heavy lead | 5 25 | 4 00 |
| Tea lead | 2 50 | 2 00 |
| Aluminum | 16 00 | 10 00 |

| | Per Ton | Gross |
|---|---|---|
| Boiler plate | $11 00 | $12 00 |
| Heavy melting steel | 18 00 | 14 00 |
| Axles (wrought iron) | 25 00 | 20 00 |
| Rails (scrap) | 18 00 | 14 00 |
| Malleable scrap | 20 00 | 20 00 |
| No. 1 machine cast iron | 32 00 | 25 00 |
| Pipe, wrought | 8 50 | 8 00 |
| Car wheel | 30 00 | 25 00 |
| Steel axles | 20 00 | 18 00 |
| Mach. shop turnings | 8 00 | 6 00 |
| Stove plate | 23 00 | 20 00 |
| Cast boring | 8 00 | 7 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, 7-16 and up | Net list |
| Carriage bolts, ⅜" and less | 15 |
| Coach and lag screws | —20 |
| Stove bolts | 55 |
| Wrought washers | —25 |
| Elevator bolts | Net |
| Machine bolts, 7-16 and over | —5 |
| Machine bolts, ⅜-in. and less | —30 |
| Blank bolts | Net |
| Bolt ends | —5 |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | +25 |
| Machine screws, fl. and rd. hd., brass | Net |
| Machine screws, o. and fil. hd., brass | Net |
| Nuts, square, blank | +25 add $2 00 |
| Nuts, square, tapped | add 2 25 |
| Nuts, hex., blank | add 2 25 |
| Nuts, hex., tapped | add 2 75 |
| Copper rivets and burrs, list less | 15 |
| Burrs only, list plus | 25 |
| Iron rivets and burrs | 40 and 5 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, bright | 67½ |
| Wood screws, flat, brass | 55 |
| Wood screws, O. & R., brass | 55½ |
| Wood screws, flat, bronze | 50 |
| Wood screws, O. & R., bronze | 47½ |

## MILLED PRODUCTS

(Prices on unbroken packages)

| | Per Cent |
|---|---|
| Set screws | —40 |
| Sq. and hex. hd. cap screws | —25 |
| Rd. and fil. hd. cap screws | |
| Flat but. hd. cap screws | +25 |
| Fin. and semi-fin. nuts up to 1-in. | 12½ |
| Fin. and Semi-fin. nuts, over 1 in., up to 1½-in. | 15 |
| Fin. and Semi-fin. nuts over 1½ in., up to 2-in. | Net |
| Studs | +5 |
| Taper pins | —12½ |
| Coupling bolts | +40 |
| Planer head bolts, without fillet, list | +45 |
| Planer head bolts, with fillet, list plus 10 and | +55 |
| Planer head bolt nuts, same as finished nuts. | |
| Planer bolt washers | net |
| Hollow set screws | +60 |
| Collar screws | list plus 20, 30 |
| Thumb screws | 40 |
| Thumb nuts | 75 |
| Patch bolts | add +85 |
| Cold pressed nuts to 1½ in. | add $1 00 |
| Cold pressed nuts over 1½ in. | add 2 00 |

## BILLETS

| | Per gross ton |
|---|---|
| Bessemer billets | $60 00 |
| Open-hearth billets | 60 00 |
| O.H. sheet bars | 76 00 |
| Forging billets | 56 00-75 00 |
| Wire rods | 52 00-70 00 |

Government prices.

F.O.B. Pittsburgh.

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails, base | $5 25 |
| Cut nails, base | 6 70 |
| Miscellaneous wire nails | 50% |

## ROPE AND PACKING

| | |
|---|---|
| Plumbers' oakum, per lb. | 0 10¼ |
| Packing, square braided | 0 38 |
| Packing, No. 1 Italian | 0 44 |
| Packing, No. 2 Italian | 0 36 |
| Pure Manila rope | 0 29 |
| British Manila rope | 0 28 |
| New Zealand hemp | 0 23 |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | Net |

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | $ 0 27½ |
| Solder, guaranteed | 0 29½ |
| Soldering coppers, lb. | 0 62½ |
| White lead, pure, cwt. | 20 35 |
| Red dry lead, 100-lb. kegs, per cwt. | 15 00 |
| Gasoline, per gal., bulk | 0 42 |
| Pure turp., single bbls., gal. | 3 15 |
| Linseed oil, raw, single bbls. | 2 37 |
| Linseed oil, boiled, single bbls. | 2 40 |
| Wood alcohol, per gal. | 4 00 |
| Whiting, plain, per 100 lbs. | 3 00 |

### CARBON DRILLS AND REAMERS

| | |
|---|---|
| S.S. drills, wire size | 40 and 5 |
| Can. carbon cutters, plus | 10 |
| Standard drills, all sizes | 40 and 5 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 and 5 |
| Bit stock | 50 |
| Ratchet drills | 10 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 50 |
| Sleeves | 50 |
| Taper pin reamers | 25 off |
| Drills and countersinks | Net |
| Bridge reamers, carbon | 50 |
| Centre reamers | 5 |
| Chucking reamers | Net |
| Hand reamers | 10 |
| High speed drills, list net to plus | 20 |
| Can. high speed cutters, net to plus | 10 |
| American | plus 40 |

### COLD ROLLED STEEL

[At Warehouse]

| | |
|---|---|
| Rounds and squares | $7.00 base |
| Hexagons and flats | 7.00 base |

### IRON PIPE FITTINGS

| | Black | Galv. |
|---|---|---|
| Class A | 70 | 80 |
| Class B | 24 | 34 |
| Class C | 16 | 24 |

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 7 50 | $ 7 50 |
| Sheets, blue ann., No. 10 | 6 50 | 6 50 |
| Canada plates, dull, 52 sheets | 13 00 | 13 00 |
| Can. plates, all bright | 14 00 | ..... |
| Apollo brand, 10¾ oz., galvanized | .... | ..... |
| Queen's Head, 28 B.W.G. | 13 00 | ..... |
| Fleur-de-Lis, 28 B.W.G. | 12 50 | ..... |
| Gorbal's Best, No. 28 | .... | ..... |
| Colborne Crown, No. 28. | .... | ..... |
| Premier, No. 28, U.S. | 10 00 | 10 00 |
| Premier, 10¾-oz. | 10 50 | 10 40 |
| Zinc sheets | 16 50 | 20 00 |

### PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13; 5-16, $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

### ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13; 5-16 in., $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

### FILES AND RASPS

| | Per Cent. |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 32½ |
| Black Diamond | 27½ |
| J. Barton Smith, Eagle | 50 |
| McClennand, Globe | 50 |
| Delta Files | 20 |
| Disston | 40 |
| Whitman & Barnes | 50 |
| Great Western-American | 50 |
| Kearney & Foot, Arcade | 50 |

### BOILER TUBES

| Size | Seamless | Lapweld |
|---|---|---|
| 1 in. | $27 00 | $..... |
| 1¼ in. | 29 50 | ..... |
| 1½ in. | 31 50 | 29 50 |
| 1¾ in. | 31 50 | 30 00 |
| 2 in. | 35 00 | 30 00 |
| 2¼ in. | 35 00 | 29 00 |
| 2½ in. | 42 00 | 37 00 |
| 3 in. | 50 00 | 48 00 |
| 3¼ in. | ..... | 48 50 |
| 3½ in. | 63 00 | 51 50 |
| 4 in. | 85 00 | 65 50 |

Prices per 100 ft., Montreal and Toronto

### OILS AND COMPOUNDS

| | |
|---|---|
| Castor oil, per lb. | — |
| Royalite, per gal., bulk | 28 |
| Palacine | 31 |
| Machine oil, per gal. | 58 |
| Black oil, per gal. | 27 |
| Cylinder oil, Capital | 1.01 |
| Petroleum fuel oil, bbls., net | 19 |

### BELTING—No. 1 OAK TANNED

| | |
|---|---|
| Extra heavy, single and double | 6½ |
| Standard | 6½ |
| Cut leather lacing, No. 1 | 2 00 |
| Leather in side | 2 40 3 00 |

### TAPES

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES

| | |
|---|---|
| Polishing wheels, felt | $4 50 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, Turkish | 8¾ |
| Pumice, ground | 06 |
| Emery glue | 30 |
| Tripoli composition | 9½ |
| Crocus composition | 12 |
| Emery composition | 11 |
| Rouge, silver | 64 |
| Rouge, powder, nickel | 38 |

Prices per lb.

### ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | 8½ |
| Grits, 80 and finer | 6 |

BRASS—Warehouse Price

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 30 |
| Brass sheets, 24 gauge and heavier, base | 38 |
| Brass tubing, seamless | 42 |
| Copper tubing, seamless | 44 |

### WASTE

| | | | |
|---|---|---|---|
| XXX Extra | .23 | Atlas | .19 |
| Peerless | .22 | X Empire | .18½ |
| Grand | .21½ | Ideal | .18 |
| Superior | .21½ | X Press | .17 |
| X L C R | .20 | | |

Colored

| | | | |
|---|---|---|---|
| Lion | .16 | Popular | .12 |
| Standard | .14 | Keen | .10 |
| No. 1 | .14 | | |

Wool Packing

| | | | |
|---|---|---|---|
| Arrow | .35 | Anvil | .22 |
| Axle | .28 | Anchor | .17 |

Washed Wipers

| | | | |
|---|---|---|---|
| Select White | .20 | Dark colored | .09 |
| Mixed colored | .10 | | |

This list subject to trade discount for quantity.

### RUBBER BELTING

| | | | |
|---|---|---|---|
| Standard | 10% | Best grades | 15% |

### ANODES

| | |
|---|---|
| Nickel | .55 to .60 |
| Copper | .38 to .40 |
| Tin | .70 to .70 |
| Zinc | .16 to .17 |

Prices per lb.

### COPPER PRODUCTS

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | $35 00 | $37 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 40 00 | 44 00 |
| Copper sheet, tinned, 14 x 60, 14 oz. | 43 00 | 46 00 |
| Copper sheet, planished, 16 oz. base | 47 00 | 50 00 |
| Braziers', in sheets, 6 x 4 base | 39 00 | 42 00 |

### LEAD SHEETS

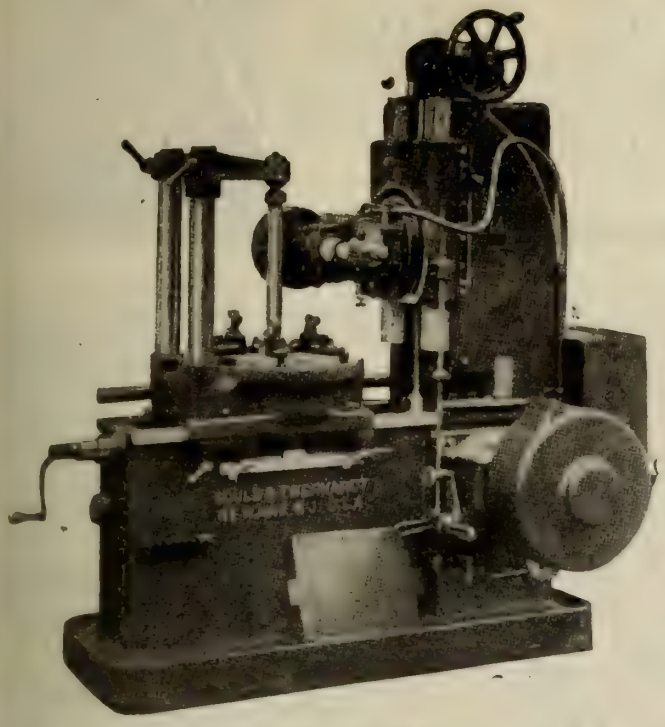
| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $10 50 | $14 50 |
| Sheets, 3½ lbs. sq. ft. | 10 25 | 14 00 |
| Sheets, 4 to 6 lbs. sq. ft. | 10 00 | 13 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS

| | |
|---|---|
| Acid, boracic | $ .23 |
| Acid, hydrochloric | .04¾ |
| Acid, nitric | .11 |
| Acid, sulphuric | .04½ |
| Ammonia, aqua | .15¾ |
| Ammonium, carbonate | .23 |
| Ammonium, chloride | .22 |
| Ammonium, hydrosulphuret | .75 |
| Ammonium sulphate | .30 |
| Arsenic, white | .16 |
| Copper, carbonate, annhy. | .41 |
| Copper, sulphate | .13 |
| Cobalt, sulphate | .20 |
| Iron perchloride | .62 |
| Lead acetate | .30 |
| Nickel ammonium sulphate | .20 |
| Nickel carbonate | .32 |
| Nickel sulphate | .20 |
| Potassium sulphide (substitute) | .40 |
| Silver Chloride (per oz.) | 1.15 |
| Silver nitrate (per oz.) | 1.10 |
| Sodium bisulphate | .13 |
| Sodium carbonate crystals | .04 |
| Sodium cyanide, 127-130% | .39 |
| Sodium hyposulphite per 100 lbs. | 9.00 |
| Sodium phosphate | .15 |
| Tin chloride | .30 |
| Zinc chloride, C.P. | .30 |
| Zinc sulphate | .08 |

Prices per lb. unless otherwise stated



# Gould & Eberhardt
## GEAR HOBBERS

are

***Automatic** therefore **Economical***

If you cut gears in quantities they can be cut with advantage on G. & E. Gear Cutting Machinery.

For gears up to 120" dia.

Catalog describing full line of Gear-cutting, Hobbing and Rack-cutting machines on request.

*Write for prices and deliveries*

**The A. R. Williams Machinery Company, Limited**

ST. JOHN, N.B.
WINNIPEG, VANCOUVER

*If It's Machinery—Write "Williams"*

64 Front Street West
TORONTO

***They must be getting results—***

or why would they continue to advertise each week? That's logic, isn't it? Have you noticed that each week the same advertisements appear? If you don't care to use large space, insert a "tickler" ad.

CANADIAN MACHINERY
143-153 University Ave., Toronto, Ont.

# CARBONS *for electric arc welding*

THE ELECTRIC WELDING INDUSTRY has been tremendously advanced by the high development of arc carbons for specific purposes. We manufacture the following grades, named in the order of their current carrying capacities:

PLAIN WELDING CARBON:
A hard carbon for ordinary service.

COLUMBIA WELDING CARBON:
Very hard. It can also be furnished copper coated, making it suitable for use as a cutting electrode as well as for heavy welding work.

SPECIAL GRAPHITE WELDING CARBON:
Rather soft and graphitic. High conductivity. Used where a high amperage is required. Used with excellent results on general work.

*Correspondence Invited*

CANADIAN NATIONAL CARBON CO., LIMITED, Hillcrest Park, Toronto

420

*If interested tear out this page and place with letters to be answered.*



# INDUSTRIAL NEWS

## NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES



## READY FOR THE EXPORT TRADE

**International Malleable at Guelph Put in Plant to Machine Castings**

The International Malleable Iron Company, Guelph, have installed, in an addition to their plant, complete equipment for the machining of their malleable and cast iron pipe fittings and malleable and gray iron castings. This plant has practically doubled in capacity in the last five years. The company's sales organization includes the following representatives: Halifax, Geo. D. Hatfield, Bedford Chambers; St. John, N.B., H. G. Rogers, 147 Prince William Street; Winnipeg, Harry F. Moulden & Son, Confederation Life Building; Vancouver, Cyril Ames, Wilton Block. The Toronto and Montreal fields are taken care of from the head office, Guelph. Arrangements are being made whereby the company will be capably represented in the development of fittings business in foreign markets.

## PLENTY OF ORDERS AT THIS PLANT

At the annual meeting of the Canadian Car and Foundry Company, W. W. Butler stated he had been disappointed in the showing for the past year, as he had expected to report greater profits. Business had been curtailed by strikes, the car embargo, and difficulties in obtaining material, with the result that only 1,700 cars had been turned out, despite large orders on the books. Most of the profits for the year were the result of the company's production of specialties. He pointed out in this connection that the company was the most self-contained car plant in the world, and manufactured more of its own requirements than any other plant in existence.

Fifty-five hundred cars had been carried over on the books, which exceeded any previous year. The company had on its books at the commencement of its present fiscal year orders in excess of $26,000,000, as compared with about $8,000,000 at the start of the previous year. At present the company has $14,000,000 in orders on its books, enough to keep the company going for some time.

## CHANGES MADE AT WILLYS-OVERLAND

**J. R. Marlow to be Secretary-Treasurer —Mr. Burt Goes to Syracuse**

Several changes have taken place in the personnel of Willys-Overland Limited. J. R. Marlow has been promoted from the position of Montreal branch manager to be secretary and treasurer of the company. As he will also have supervision of sales generally, Mr. Marlow will take over many of the duties formerly performed by Mr. MacKay and Mr. Dover. His appointment follows Mr. Burt's transfer to one of Overland's allied industries, the New Process Gear Company, of Syracuse, N.Y. When T. A. Russell, president of Willys-Overland Limited, announced the appointment of C. R. Burt as general manager, it was part of the arrangement with Mr. Willys and Mr. Chrysler that Mr. Burt would return to the United States later in the present year. Owing to developments earlier than expected, it was found advisable for Mr. Burt to assume the management of the gear company in January. Formerly sales manager of the Russell Motor Car Company in Toronto, Mr. Marlow went to Montreal in 1915 to take charge of the then Russell Motor Car Company branch. This branch was taken over as a branch of Willys-Overland Limited in 1917 and Mr. Marlow continued as manager.



J. R. MARLOW,

Appointed Secretary and Treasurer of the Willys-Overland Co., Toronto.

## NEW SALES FORCE NOW ORGANIZED

Considerable interest is being shown in the forthcoming organization of what will be known as the Dominion Industrial Products Co., Ltd. This concern will be the accredited Canadian representatives of some thirty or more United States manufacturers of numerous industrial products.

The products handled range from industrial railway equipment, and road contractors' equipment and supplies to various metal specialties, i.e., machine screws, bolts, nuts, washers, special nails, escutcheon pins and screw machine products in all metals. Non-ferrous metals, steel sheets, bars shapes, etc., will be dealt in, as also will certain types of foundry equipment and supplies.

It is not expected that warehouses will be maintained before the end of the year, but there are immediate prospects of sales offices being opened in the principal Canadian cities this year.

Those connected with the enterprise include W. P. Young, formerly general purchasing agent of the Canadian Edison Appliance Co., Ltd., of Stratford, and the Canadian General Electric Co., Ltd.; J. M. Young, formerly connected with the Russell Motor Car Co., Ltd., and the Machine & Stamping Co., Ltd. James W. Derbyshire will be general sales manager, and a fairly large sales staff will be engaged, as the Dominion Industrial Products Co., Ltd., is Dominion-wide in its scope.

## APPOINTED NOW AS SALES MANAGER

**G. F. Morris Started as an Apprentice Machinist with Business Machines**

Announcement has been made of the appointment of G. F. Morris to the position of sales manager of the time recording division of the International Business Machines Company, Limited, Toronto. Mr. Morris' connection with the company has extended over a period of ten years. He started as an apprentice machinist with the International Time Recording Company, Limited, in 1909 when International time recorders were first manufactured in Canada. When F. E. Mutton became general

(Continued on page 99)

# THE WORLD CALLS

## NEVER BEFORE, AS NOW, HAS THE WHOLE WORLD CALLED

# "PRODUCTION"

Are you doing any Screw Thread Cutting?
How are you doing it?
Do you know that Geometric Thread Cutting Tools have effected an enormous saving of time and costs in many thousand shops?
The first step is to investigate. Tell us the job you have to do, and hear what we can do for you.



## THE FINAL SHIPMENT OF THE DAY---*THE FREIGHT SHIPMENT*

***Express -- Parcel Post -- Mail -- Freight***

These are the four channels by which Geometric Screw Thread Cutting Tools and Machines are shipped:
There is no place where more business is done to the square foot than in our Shipping Department, because of the demand for Production Tools—Automatic Die Heads and Collapsing Taps—everything for more and better screw threads.
Make Screw Thread Cutting the Most Satisfactory Operation in Your Shop.

——Write——

# THE GEOMETRIC TOOL COMPANY

## NEW HAVEN CONNECTICUT

***Canadian Agents:***

Williams & Wilson Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B., Halifax, N.S.
Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

*If interested tear out this page and place with letters to be answered.*

# The Week's Events in Montreal Industry

The Dominion Bridge Company, of Montreal, held their second annual reception and dance at the Windsor Hotel last week, when about 600 were present, including the president, G. H. Duggan, and a number of directors and representatives from the branch offices and plants.

Owing to the falling off in orders the management of the Canadian Steel Foundries are contemplating the closing down of the Longue Pointe plant for a period of several weeks. The car division of the company's activities is fairly active but curtailment has been made in other departments.

The C. P. R. Angus shops in Montreal, are still working on the 8-hour 5-day schedule, with practically the same staff as before the holidays. A slight change has been made in respect to starting and stopping, the works opening one hour earlier on account of the increasing daylight.

At the forthcoming annual meeting of the Engineering Institute of Canada it is expected that J. M. R. Fairbairn, chief engineer of the C. P. R., will be elected to the office of president for the ensuing term, succeeding R. A. Ross, who retires at this time. Mr. Fairbairn has been connected with the head office of the C. P. R. in Montreal for the past twenty years.

One man, Alfred Robson, was killed, and three others seriously injured, by the explosion of a quantity of old flash powder thrown into the furnace at the plant of the National Drug Company in Montreal. The small quantity first thrown in flashed back and ignited the remainder held in the hands of Robson, who was also blown to pieces by the force of the explosion. Slight damage was done to the boiler and building.

The death of W. J. Moule, assistant comptroller of the Canadian Pacific Railway removed another well known official of the railway company. For three weeks before his death Mr. Moule suffered from sleeping sickness. Mr. Moule spent his entire career with the C. P. R., starting as a young office clerk back in 1891, and gradually advancing to more responsible positions until he became assistant comptroller in 1918.

J. V. Robinson, inventor of the original Robinson train connector, has taken action against his brother, E. A. Robinson, of Montreal, for the marketing of a similar device, this, it is claimed, being contrary to agreement. E. A. Robinson claims that he severed his connection with the original company, and that the improved connector has been developed since that time, and that any restrictions placed upon it would be detrimental to the public interest. Judgment has been reserved.

An interesting demonstration of a forest tractor, manufactured by the Renault Company of France was given by H. Thiebaut, the Canadian agent in Montreal, before a number of engineers and interested parties, early this week in Montreal. The tractor is a modification of the war tank and is especially adapted to work in field and farm, forestry work and mountain transport, and the drawing of trucks and the towing of barges. A similar demonstration will be held, later in the week, before the representatives of the Montreal Harbor Commissioners.

An interesting incident in connection with industrial inactivity was noted last week in Montreal, when a casual visit to the old plant of the John McDougall Caledonia Iron Works brought to light the fact that all the old patterns were being disposed of at the remarkably low figure of $3.50 per load. The McDougall firm went out of business about a year ago, and this industrial firm was one of the oldest of its kind in the Dominion. In the days of ascendancy this load of "firewood" would represent an outlay of tens of thousands of dollars.

The Blashill Wire Machinery Company of Montreal are looking for a location to establish a plant for the making of wire fencing. A. E. Blashill is the designer of a new type of fence making machine, and the company had contemplated a manufacturing move a couple of years ago, but owing to the difficulty of securing raw materials, the enterprise was temporarily abandoned, but with the conditions for the securing of wire product much improved, the plans are again under way, and it is expected that the company will be making fence before the early summer.

The eighteenth annual banquet of the Canadian Railway Club was held at the Windsor Hotel, in Montreal, on the last Saturday in January, and proved to be one of the best attended and most successful in the history of the club. The chair was occupied by W. H. Winterrowd, chief mechanical engineer of the C. P. R., and the speaker of the evening was the Hon. F. B. Carvell, chairman of the Board of Railway Commissioners. Other speakers were Dr. Stephen Leacock of McGill University; W. W. Butler, president of the Canadian Car and Foundry Company, and others. The entertainment committee provided an excellent program of musical and vaudeville talent.

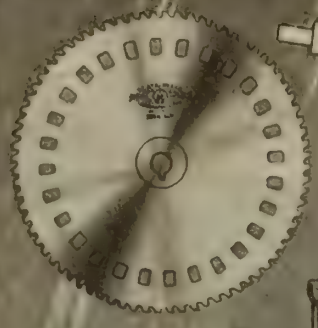
This week will see the commencemen of the sittings in Montreal in connection with the arbitration boar which will decide the present value o the Grand Trunk Railway, and th amount the Canadian Government wil have to pay for the acquisition of th holdings of the road. It is expecte that the proceedings will occupy nearl three months. The Board will be pre sided over by Sir Walter Cassels, of th Exchequer Court of Canada; Sir Thos White will represent the Government and ex-president W. H. Taft will lool after the interests of the Grand Trunl shareholders. Associated with these will be a long array of lawyers, engineers and experts.

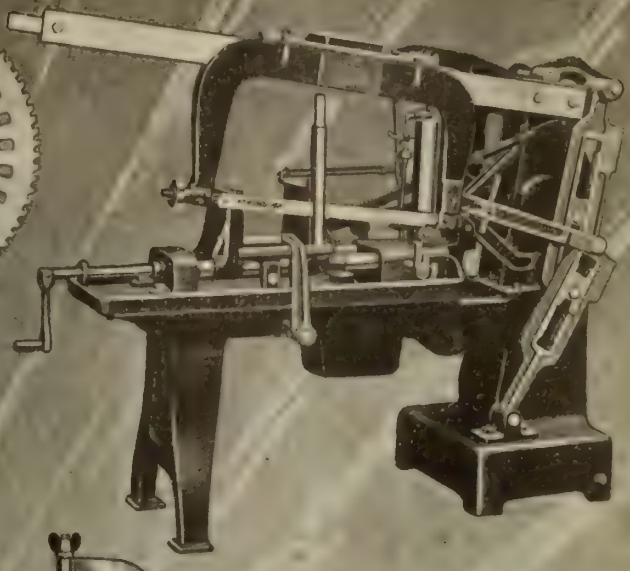
Speaking before the Canadian Railway Club, at their recent banquet the Hon. F. B. Carvell, chairman of th Board of Railway Commissioners, emphasized the fact that rates on railways whether private or Government owned must be sufficient to pay a reasonabl profit over and above operating expenses. "Only one set of rates can be use for all railroads," said Mr. Carvell. "You must face conditions as you find them The Government must consider the C.N R., as well as the C.P.R., and it is the duty of all public bodies to support the C.N.R. I was always opposed to it as many others were. But whether we favor Government ownership or not, we have it, and within a year more than half the railways in Canada will be under Government ownership. I am not so sure that it was necessary to take over the Grand Trunk, but we have these lines, and the people must face the situation. I would impress upon the employees of the national system that they must give the same efficient service as those of the C. P. R., forgetting the common idea of those serving Government owned businesses."

**New Power Plant.**—A Niagara River water works project, jointly controlled by the United States and Canada and utilizing all the power developed from the river, was proposed to the Federal Power Commission at Washington by Peter A. Porter, of Niagara Falls, and T. Kennard Thomson, of New York City. The project would include a dam across the gorge below the falls and a tunnel under Goat Island and practically would eliminate all other projects. Proponents of the plan claim that it would be more economic and efficient than a number of small projects.

# ATKINS STERLING QUALITY SAWS







## O'er Land and Sea
North South East West

## Atkins Sterling Quality Saws

are noted for their efficiency. Their use will increase your production.

Ask for new literature describing Atkins Kwik Kut Power Hack Saw and Metal Cutting Band Saw Machines, Circular Metal Cutting Saws, AAA Hack Saw Blades and Frames, etc.

*"A Better Saw For Every Use"*

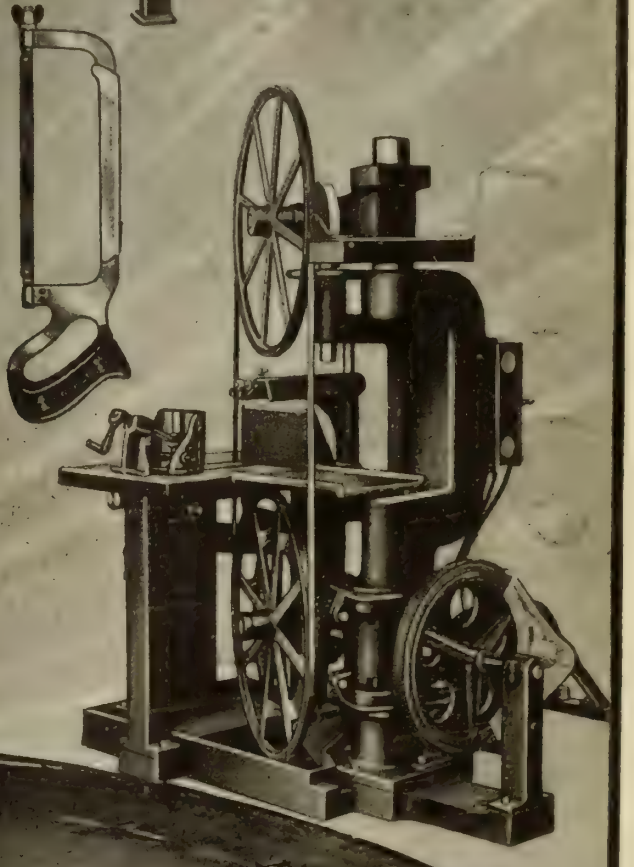
*Write for Catalog*

## E. C. Atkins & Co.

Established 1857

*"The Sterling Quality Saw People"*

*Factory:* HAMILTON, ONT. *Branch:* VANCOUVER, B. C.





# Selling British Made Goods in Canadian Market

## Strong Organization to Take Up Matter of Fraudulent Trademarks—Montreal Speaker Believes That Tide Has Turned, And Feeling of Stability in Values Can Bring Business Revival.

ANOTHER step in bringing the Montreal and Toronto branches of the Canadian Association of British Manufacturers and their representatives closer together was taken at the annual meeting of the Toronto branch at the King Edward Hotel on January 28. Greetings were brought from the Montreal branch by Messrs. F. I. Spielman and John E. Ritchie, first and second vice-presidents of the Montreal branch, and both the retiring president, Mr. Geo. A. Marshall, and the newly-elected president, Major John Harris, intimated that steps would be taken to extend the activities of the organization to other centres of the Dominion.

Following luncheon in the banquet room, at which Mr. George A. Marshall presided, Secretary Bunney read the minutes of the last annual meeting. Treasurer Sharpe reported on the financial condition, showing a favorable balance in the treasury. A number of necessary changes in the constitution were left to the council to dispose of, these having been practically agreed upon by the Montreal and Toronto branches.

### The President's Address

Mr. Marshall, in his annual report, gave a very thorough resume of the work of the association, both in Toronto and Montreal, the Montreal annual meeting having been held on January 21. The work of the two associations being reviewed in this manner gave a wider scope of the activities of the organization.

"The association," said Mr. Marshall, "which was established in the early part of 1919 on the initiative of H. M. Trade Commissioners in Montreal and Toronto, has now a membership of over 200 representatives of the British trade in the Dominion of Canada, which development is due to your branch council members, trade section committees, and the valued assistance rendered through the good offices of H. M. trade commissioners. As outlined in our last annual report, the association, as members, has been strengthened considerably by the Federation of British Industries, which is an extensive organization dealing with British manufactures all over the world. They are in touch with chambers of commerce and boards of trade in all industrial centres, and we cannot too highly credit them with appreciation of their valuable assistance this past year to our association both as regards useful correspondence exchanged, and in the manner our suggestions are dealt with. In order of reciprocity the position is now better to extend to them our knowledge



MAJOR JOHN HARRIS.

President Canadian Association of British Manufacturers. Came to Canada in 1914 and saw military service in the Great War, rising from lieutenant to major. Decorated by the President of France. Also in South African War. Keenly interested in British trade in Canada.

of any British firm desirous of purchasing in this country, and information relating to the Canadian markets. Several of our members when visiting England have called at their London office, 39 St. James St., S.W. 1, with very satisfactory results. In this connection alone it should be an incentive to double our membership, as the governing authority of such an enormous organization is, in time, bound to prove beneficial to our mutual interests.

### Central Office

For the purpose of co-ordinating the business of the Montreal and Toronto branches, especially in dealing with overseas correspondence, it was unanimously decided by your respective councils to establish a central office at 39 Richmond St. East, Toronto, which is now suitably furnished in order to afford greater convenience and accommodation for businessmen interested in British manufacturers, and who wish to get in touch with the Association.

### Excise Taxes

When the new excise taxes were enforced this association added its protest to those of other representative bodies, as a result of which modifications were made to advantage of the importers of British-made goods.

### Customs Valuation of Invoices

During the past year the question of the value of invoices for duty purposes arose, and in order to meet the suggestions from various members a deputation consisting of Montreal and Toronto branches waited upon the commissioner of customs at Ottawa, with the result that the authorities decided in July last to accept for the purpose of appraising duty the pound sterling at the current rate of exchange. This is one achievement which the members, their customers and the British exporter should appreciate, and I consider this action alone should justify the association's existence.

### Chamber of Commerce

A welcome was extended by this association to the deputation of the Allied Chamber of Commerce of the Empire who visited this Dominion in September last, and a communication was received from Lord Desborough, president of the Imperial Chamber, thanking the association and regretting the short duration of their stay with the many calls made upon the delegates would not permit of a special meeting being held.

### Meetings

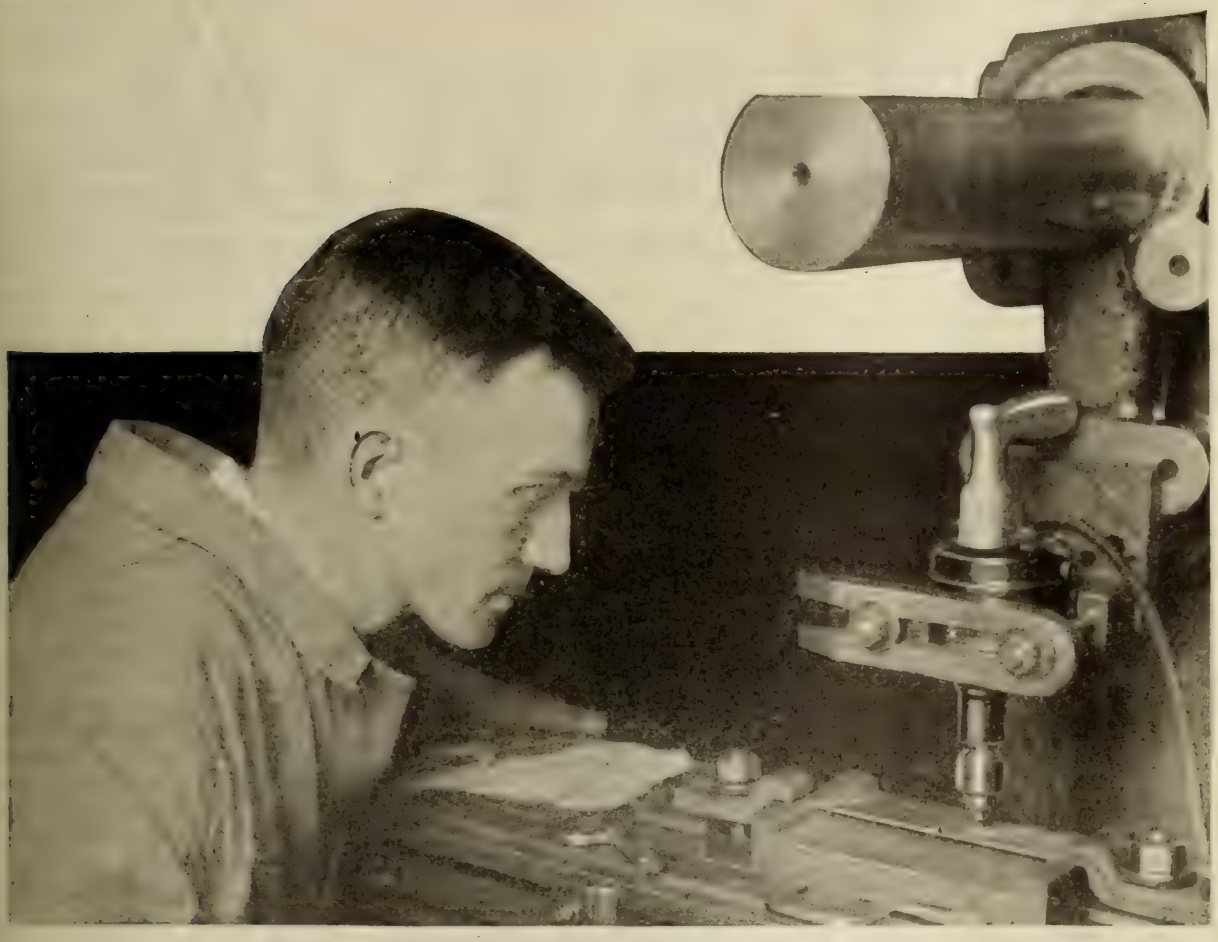
During the year we held 17 branch council meetings, 14 trade section meetings and made three visits to Montreal council.

### Trade Sections

The trade sections are now well organized and show great improvement, especially the Textile section, consisting of the most members, with Harold Wilson as chairman. This section deserves special mention as it has been exceedingly active and of much assistance to the trade generally, inasmuch as it has provided for a Board of Arbitration to deal with disputes arising. They have also dealt satisfactorily with cases concerning cancellations and other important matters in the interest of every member connected herewith.

### Publicity Committee

The Publicity Committee, for which C. W. Beal is responsible, also must not be overlooked. A booklet entitled "Sales-Craft," published periodically by the association for the benefit of members and their principals, with the object of distributing broadcast, contains useful information. Two editions already have been prepared and printed, one dealing with the steel trade and the other with the textile trade, copies of which have been mailed to members and various overseas associations with a view of in-



# *Yankee Ingenuity Solves Drilling Problems with the Aid of this Dumore High Speed Drill*

John Bath & Company, Inc. (Worcester, Mass.)—maker of fine tools—uses a half dozen each of Dumore Drills and Grinders in his up-to-date shop.

The Photograph shows a Dumore Drill mounted on the overarm of a milling machine drilling holes in a tool steel jig plate 1/8" thick. There are 76 holes spaced .080" apart in several rows and a drill .051" in diameter is used.

Dumore Drills—like the well known Dumore Grinders—are accurately built, with an almost unlimited range of application. Used to supplement the work of big machines, Dumore High Speed Drills add to the capacity of the shop and cut production costs on many classes of work.

***Send for the details of Dumore High Speed Drills and Grinders. Let us show you how you can use them to advantage.***

**WISCONSIN ELECTRIC COMPANY,** 2932 Sixteenth Street - Racine, Wisconsin

# DUMORE PORTABLE DRILLS

*If interested tear out this page and place with letters to be answered.*

creasing British trade in Canada and stimulating our aim.

### Advertising

Through the courtesy and good offices of H. M. trade commissioners we were enabled to exhibit at the Canadian National Exhibition last year advertising matter from various members of the association, and in addition, distribute 10,000 printed blotters advocating closer trade within the Empire and British-made goods. I should like to tender our thanks to H. M. trade commissioners in Canada for their sound advice and cheerful suggestions at all times given for the welfare of the Canadian Association of British Manufacturers.

### Appointments of Agents in U. S. for Canada

The association has taken up most energetically with the Federation of British Industries the question of appointment of agents in the United States for the Dominion of Canada. As evidence that this matter has received the attention it deserves, we would point out that during November last the matter was brought up in the British House of Commons. Whether any further action will be taken or not, attention has been called to this regrettable and inefficient policy.

### General

The question of the newspapers printing the times of departure of English mails in a prominent place, a request for the provision of late fee-boxes in Montreal, and the standardization of catalogues and printed matter of uniform size have all received careful attention of your councils.

No doubt you will be pleased to learn from the recent returns at Ottawa of the enormous increase during 1920 over 1919 in the imports from the United Kingdom to Canada. In the year 1919 only $87,659,198.00 worth of goods were brought in from the British Isles, whereas in 1920 the amount reads $231,479,294.00.

As ex-president I shall take my seat on the council of this branch for another year, during which time I shall endeavor to act with as much pleasure and interest as before, and give the council all the support possible, and in conclusion would like to express my grateful appreciation of the valuable assistance rendered me by your vice-president, Major John Harris, and the members of the council, with whom our business relationship has always been most friendly."

### Election of Officers

The election of officers resulted as follows:

President of both Montreal and Toronto branches, Major John Harris.

First vice-president of Toronto branch, C. W. Beal.

Second vice-president, Harold Wilson.

The president of the two organizations, Toronto and Montreal, is elected alternately from these places, the selection coming this year to Toronto as it had the greatest paid-up membership. Members of the Toronto council were elected as follows: Messrs. R. D. Harling, W. G. Patrick, W. Bruce Morrow, Arthur C. King, R. W. Paton, James Haywood and John Wilson.

President-elect Harris, on taking the chair, was given a hearty round of applause. In a few words he thanked the members for the honor shown him, paying a tribute to the pleasant relationships that had been formed with the other members of the council during his tenure of the office of vice-president.

Other business included the appointment of George A. Touche & Co. as auditors for the association, with Mr. Sharpe for the local organization.

Mr. John Wilson extended a welcome to the visitors from Montreal, assuring them of the desire of the Toronto branch to work closely in touch with them.

### Montreal Visitors Speak

Mr. F. I. Speilman, first vice-president of the Montreal branch, assured the gathering that he had felt the warmth of the Toronto welcome in a very real way, for when he left home it was ten below zero, and when he reached Toronto there were no signs of winter, "and I even noticed an absence of that white covering which is emblematic of the innocence and purity of Montreal." (Laughter). "I congratulate the new president and can promise him the support of the Montreal branch. There is a very desirable cohesion between the two organizations now. Formerly they were two, but now they are one, and we hope in the course of time to go ahead with further developments in other cities. The association is now recognized at Ottawa, and we had an opportunity to appear before the tariff commission a short time ago." Mr. Speilman also stated that they found it much easier getting appointments with the government at Ottawa now to present their views on various matters.

Mr. John E. Ritchie, second vice-president of the Montreal branch, pointed out that the textile men, especially during the last six months, had had some pretty serious times, but he believed the worst of it was over. He had words of counsel for the press of the country, claiming that they had in some cases led the public to expect larger reductions than were possible, although he was pleased to see they had mended their ways since. "Confidence is the main foundation of business," he stated, "and we believe it is being restored. In Montreal we are going out and asking for business now and we are getting it. What we need now is stability of prices. Any more reductions in textiles will have to be gradual. Prices took some six years to rise to present levels, and they are not going to come down overnight." Mr. Ritchie referred to a move that was being worked out by Mr. Wilson from Ottawa regarding duties from countries where money was at a discount or premium. The pound sterling was at a discount : he would add 20 per cent. or so to equa ize, and Canadian money being di counted in United States, there wou be a reduction of the discount, the resu being to reverse the British preferen in Canadian tariffs.

### Other Matters Discussed

Mr. Sturgeon brought up the matte of securing more publicity for Britis made goods, and also pointed out th the words British or England were ofte used on articles that never saw th country. "I have often seen goods marke 'Old English' that had never been mad in England."

President Harris said the council ha taken this matter up before, as sever complaints had been made, and the mat ter would be taken to Ottawa to fin out what could be done. He instance one article that was made in Phila delphia and marked "Old English." The were going to try and have such trad marks deleted. Mr. Speilman also re ferred to several instances in Montrea one very recently where a charge ha been made in the papers that Germa dyes in English packages were bein shipped to United States. This rumo they quickly denied by a letter to th English press of Montreal.

Before the meeting adjourned refer ence was made by several members t the work of Mr. George A. Marshall a president and also to the able assistanc of other officials.

## BERTRAM AND PRATT & WHITNEY HELD THEIR SALES CONFERENCE

Continued from page 86

lowed all these papers. Thursday after noon was opened by Mr. Leeds' addres on Niles, Bement, Pond products, fol lowed by Mr. Flaig on the Pratt & Whit ney lines. "Advertising" and "Branch Office Systems" were dealt with by C E. Dickson, Mr. Robb also giving a paper on the former subject. C. A. Fisher went into considerable detail on the de sign and manufacture of Pratt & Whit ney small tools. A dinner was held in the evening at which the address of Sir Alex. Bertram, referred to previously was the feature.

On Friday morning sales methods were discussed by M. B. Davidson and James Young, interest also being added by the presence of Mr. Smith, of Cleve land, who represented the Acme Ma chinery Company. The afternoon was also taken up with sales talks and a general review of the sales policy of the company.

**New Company.** — Incorporation has been granted to the Super Charge En gineering Company, of Canada, Ltd. with head office at Montreal and in corporation of 2,000,000 dollars. The company has been incorporated to manu facture, purchase, lease or deal in motors, tools, engines, machines, electric and mechanical fixtures, etc.

# MORROW

*Also Largest Manufacturers in the Dominion of Set and Cap Screws and Semi-finish Nuts.*

## Buy Morrow Drills at Morrow's Risk

**It's easy for you to order by the name---**
**Say MORROW DRILLS---and Mean it**



PLEASE
NOTE
OUR NEW
MONTREAL
ADDRESS

John Morrow Screw & Nut Co., Limited
489 St. Paul Street West
MONTREAL, QUE. *Telephone :* Main 8418

*Works at*

# INGERSOLL

*If interested tear out this page and place with letters to be answered.*



**A Drinking Water Service that will last a LIFETIME**

What you pay for a few ordinary drinking cups will meet the cost of the

**PURO SANITARY DRINKING FOUNTAIN**

**(MADE IN CANADA)**

DRINKING CUPS ARE UNSANITARY but the "Puro" delivers clean, fresh water at a reduction of 15 per cent. to 35 per cent. in water bill.

"PURO" WILL SAFEGUARD THE HEALTH OF YOUR EMPLOYEES and protect your staff against disorganization by sickness.

Easily attached. Simply unscrew the ordinary faucet and put on the "Puro."

Write us to-day for full information regarding the cost of installation of the "PURO" Sanitary Drinking Fountain Service.

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and waste money by using cheap, inaccurate Index Centers, when a few dollars more will buy a DICKOW INDEX CENTER, which is absolutely dependable, and guaranteed for its high degree of accuracy.



Holds over 850 lbs. 22 inches from center of swivel block. This means heavier cuts and more production. Over 2000 satisfied users all over the world.

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Stood the test for 14 years

Also Manufacturers of "DICKOW SUPERIOR EIGHT" Precision Lathes

Dependable and Accurate.

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THE KIMBER & HILLIER MFG. CO., Thorold Road, - St. Catharines, Ont.


## THE EFFECT OF RELATIVE HUMIDITY

(Continued from page 78)

If such an adjustment was made when the relative humidity was 20% and a subsequent change in the weather conditions produced a relative humidity of say 90%, while the power to be transmitted remained the same, it is apparent that the sum of the tensions must decrease. Since the difference in tensions remains the same while the sum decreases, it is evident that the ratio $T_1/T_2$ must increase. Fig. 6 shows this variation quite clearly, and at the higher humidities this ratio reaches a value where the belt is in great danger of slipping.

On the other hand, suppose that the belt was set to standard conditions when the relative humidity was 90% and subsequently the atmosphere dried. The belt would then become far too tight, not only working at too high a stress, but also producing excessive pressure on the bearings. Fig. 7 shows this effect very clearly.

If care were taken to allow for the effect of a change of the relative humidity, or if the adjustment were made when the humidity was 55% then no change of humidity that would occur would either tighten or slacken the belt in a degree that would be likely to give any trouble. Fig. 8 shows the effect on both the ratio and the sum of the tensions.

All of the preceding work is at a temperature of 70°F. and as the higher humidities are apt to occur at temperatures above 70° and the lower humidities below 70° it was thought best to extend the field of investigation by varying the temperature. Accordingly a series of experiments was made at 50°F. with the relative humidity varying from 20% to 90%. Another series with the temperature 90°F. was carried out.

The sum of the tensions, and also the horse power, was constant for all of these tests. The results of these tests are shown in Fig. 9, which also has the results for 70°F. from the previous experiments.

If a belt can be fitted with a spring or gravity tightener, so called, a load probably fifty per cent greater can be carried without danger of stretching the belt, slipping or excessive pressure on the bearings.

---

**Start Warehouse.**—H. W. Byrne, 39 Duke Street, St. Catharines, dealer in new and second-hand machinery, proposes to open a warehouse in that city within the next month.


**HAMILTON ENGINEERING SERVICE LIMITED**

*Consulting and Designing* — Tools, Jigs, Fixtures and Special Machinery. Let us shoulder your problems.

**17 MAIN ST. EAST, HAMILTON**

## Personal

Mr. Reeves, of John Inglis & Company, is in Europe on business in the firm's interests.

The death occurred of Thomas Worrell, aged 54, at his home, 39 Beverley Street, Toronto. Born in England, he had been in Canada since a boy. For the past twelve years he had been foreman of the machine shops at the Pendrith Machinery Company's works.

One of St. Catharines' esteemed residents and a valued employee of the Welland Vale Manufacturing Company passed away suddenly, Nicklin Nicholas Bulger. The deceased, who was in his 58th year, returned from work and shortly after was stricken and passed away. The late Mr. Bulger was born in Montreal, and came to this city as a boy. He had been an employee of the Welland Vale Manufacturing Company for the past thirty years and was superintendent of the plant.

H. E. Brasier is now Ontario sales manager of the Willys-Overland Company. He has been handling the service department since 1914. Mr. Brasier is a native of Peterboro but came to Toronto as a boy. His first work was with the Massey-Harris bicycle department and he was with the Canada Cycle & Motor Company from 1900 until 1904, when he joined the American Abell Engine and Thresher Company as chief accountant. He remained there until 1912, when he became accountant at the Toronto branch of the Russell Motor Car Company.

### APPOINTED NOW AS SALES MANAGER

(Continued from page 90)

manager of the International Time Recording Company in 1915 Mr. Morris was placed in charge of the time recorder service department at Montreal. It was here that he graduated as a salesman and after a short time spent in Montreal and Toronto in this capacity was appointed sales agent for time recorders in Manitoba and Saskatchewan. At the time the International Business Machines Company, Limited, was organized in 1917, comprising the International Time Recording Company, Dayton Computing Scale Company and Tabulating Machine Company, Mr. Morris made a study of the tabulating machine business and was appointed subsequently representative of this branch of the company's interests in Western Canada. In August of last year he was called to the head office in Toronto to assume the duties of assistant to Mr. Mutton, vice-president and general manager.

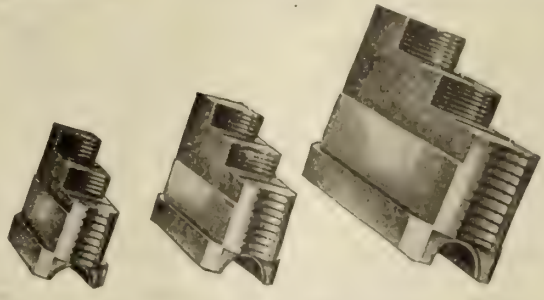
His appointment as sales manager of the time recorder division was announced at the convention which the company held January 3-8.





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BUILT FOR HEAVY DUTY



The Jaws Are Extra Strong

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No. 4 Press
10 to 12 tons

Write for complete information on Atlas Arbor Presses. All sizes for all purposes.

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Machine Springs, Valve Springs, Automobile Cushion Springs, etc., of a quality that defies competition. Tell us your requirements. Send sample or specification for price.

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"Maple Leaf" BRAND
Stitched Cotton Duck Belting

"Maple Leaf" brand costs less than leather, rubber and balata; has a positive grip on the pulley and is true running.




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## MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

## FLOOR SPACE WANTED

5,000 TO 10,000 SQUARE FEET OF GROUND floor space suitable for Forging and Stamping operations, or will consider purchasing a Forge Shop or Machine Shop, with equipment, about this size. Box 749, Canadian Machinery. (c5m)

## MACHINERY WANTED

GEARED POWER PRESS. 4" STROKE OR more.
No. 21 Power Press.
16" or 18" Bulldozer.
Bradley Hammer.
20" Shaper.
16" or 18" Lathe.
20" Drill.
500 to 800 lb. Drop Hammer.
State condition and prices. Box 748. Canadian Machinery. (c5m)

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**Medium and light, grey iron castings for manufacturing purposes. We carry bushings, solid and cored, from 1 in. to 6 in., or larger.**

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## Grey Iron Castings

Light and Medium-Bench and Floor Repetition Castings; Capacity 15 tons per day.
Expert Metal and Wood Pattern Work. Our advice and estimates will save you money.
Semi-finishing operations on Lathe or Grill on Castings supplied if required.
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1—24" x 12' Canadian Machinery Lathe
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1—18" x 8' Mueller Lathe.
3—19" x 8' C.M.C. Lathes.
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1—D-1 H. D. Colburn Drill.
2—No. 24 H. D. Foote-Burt Drills.
1—28" B. G. Barnes Drill.
1—22" B. G. Barnes Drill.
1 D.C. Compound Wound Generator. 110 Valts, 125 Amp.
2 No. 54 Perkins Sprue Cutters.
2 2" x 26" Pratt & Whitney Turrets.
1 10" x 52" Plain Landis Grinder.

Write us for particulars and prices.

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ELECTRIC MOTORS FOR PROMPT SHIPment, new and re-manufactured, fully guaranteed. 3 Phase, 25 Cycle.

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| 1 | 1¾ | 220 | 1,400 | 3 | 25 | 550 | 750 |
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| 1 | 3 | 550 | 1,400 | 3 | 40 | 550 | 720 |
| 6 | 5 | 220 | 720 | 4 | 50 | 550 | 720 |
| 1 | 4 | 550 | 1,400 | 3 | 75 | 550 | 720 |
| 3 | 7½ | 550 | 1,400 | 1 | 150 | 550 | 720 |
| 10 | 10 | 550 | 1,400 | 1 | 200 | 550 | 720 |

Box 750F. Canadian Machinery.

## For Sale

**Rivet Precision**
**LATHE**
**and**
**Extra Attachments**

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## Used Machinery For Sale

1—24" Smith & Mills Shaper.
1—3' Bickford Radial Drill.
1—36" x 36" x 10' Bertram Planer.
3—3" x 36" Jones & Lamson Turret Lathes.
1—2" x 24" Jones & Lamson Turret Lathe.
1—15" x 6' South Bend Lathe.
1—18" x 8' Stevens Lathe.
1—18" x 8' Mueller Lathe, Q.C.G.
1—18" x 8' Cincinnati Lathe, Q.C.G.
1—26" x 12' C.M.C. Lathe, Q.C.G.
1—26" x 48" x 14' McCabe Double Spindle Lathe.
We are offering the above machines at attractive prices for quick sale.

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## PATTERNS

**Wragge's Pattern Works, 10 George St. South, Galt, Ont.**, Phone 1105 W. Equipped for best service in wood or metal patterns to any specification. Most reasonable prices. Expert workmanship. "Nothing ragged but the name." (cxxvi3m)

## Modern Marine Machinery

Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

## CANADIAN MACHINE SHOP

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Will handle medium Specialty Line — Manufacturing and Selling

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**Apply Quickly**
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# Classified Opportunities

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A well established machinery supply house in Nova Scotia, covering the entire province, which has been handling American machinery, would like to hear from Canadian manufacturers of the following lines:—

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**Contractors' Machinery**
**(Hoists, Mixers, etc.)**
**Pumps**
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**MACHINERY**
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## Ideal Offerings of Used Machines

LATHES

3—28″ x 12′ Boye & Emmes, 3 step cone, D.B.G., Q.C.G.
3—26″ x 12′ C.M.C., 3 step cone, D.B.G., Q.C.G.
2—26″ x 10′ C.M.C., 3 step cone, D.B.G., Q.G.G.
6—24″ x 12′ Boye & Emmes, 3 step cone, D.B.G., Q.C.G.
1—24″ x 12′ Rahn Larmon, 3 step cone, S.B.G., Q.C.G.
3—24″ x 10′ Boye & Emmes, 3 step cone, D.B.G., Q.C.G.
1—22″ x 10′ Devenport, 3 step cone, D.B.G., Q.C.G.
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ADDRESSOGRAPH

1—Type A. Rubber System, complete, motor driven.

Our complete list includes other lathes, screw machines, turret lathes, horizontal boring mills, upright and radial drills, presses, pumps, boilers, etc. Write for particulars.

A complete line of Elliot Woodworking Machines, Belleville and Wagner Motors.

Western representative for Geo. F. Foss Machinery & Supply Co., Ltd. Montreal, Que.

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12″ Pond Car Wheel Lathe, Motor Drive
36″ x 22′ Bridgeford, g. h. Motor Drive.
36 x 16′ Sidney, D. B. G., Q. C., new
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14″ to 21″ x 6′ to 12′ Sidney
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Large Stock-used Lathes

40 x 40 x 10′ Powell, 2H Planer
24 x 24 x 5′ Pease 1H Planer
16 x 16 x 42″ Walter, 1H Planer
14″ Steptoe Shaper
16″ x 20″ x 24″ Steptoe, B.G., new Shaper
7″ Rhodes, Precision, new Shaper
16″ Used Smith-Mills Shaper
16″ Used Kelley, B. G. Shaper
No. 4 Brown and Sharpe, Plain Miller
No. 24 Osterlein, Plain Miller
No. 22 Garvin, Vertical Miller
No. 2 M. U. Garvin, Universal, new Miller
No. 1 Dow, Plain, new Miller
No. 3 Burk Hand Miller
No. 3½ Fox Hand Miller
6′ Western Universal Radial Drill
3′ Mueller, Plain, Radial Drill
42″ Canedy-Otto Plain, new Drill
3 Spindle Barnes, B.G. Drill
No. 1 Caplin Keyseater
No. 4 Caplin Keyseater
No. 0 Baker Keyseater
10″ x 36″ Norton Plain Grinder

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Alfred Herbert Hexagon Turret Lathes for bar work for 1⅝″ and 2¾″ dia. bar.
Alfred Herbert Combination Turret Lathes, 13″, 20″, 22″ swing.
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12″ Pollard Bench Drills.
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20″, 22″, 24″, 27″ Pollard Upright Drills.
36″ Pollard Sensitive Radial Drill.
6′ Tangye Radial Drill.

SHAPERS

16″ Milwaukee.

PLANERS

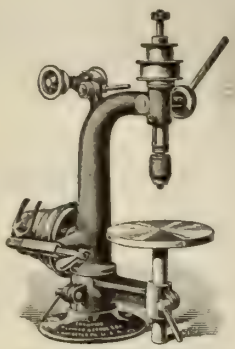
24″ x 24″ x 6′ Stirk Planing Machine.
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No. 3 Herbert Horizontal Cone Pulley, 21″ x 7″ x 16″.
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No. 16 Herbert Vertical Single Pulley, 34″ x 13½″ x 21″.
No. 8 Herbert Vertical Cone Pulley, 62″ x 38″ x 28½″.

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**ALFRED HERBERT, LIMITED**
**1-3 JARVIS ST. TORONTO**

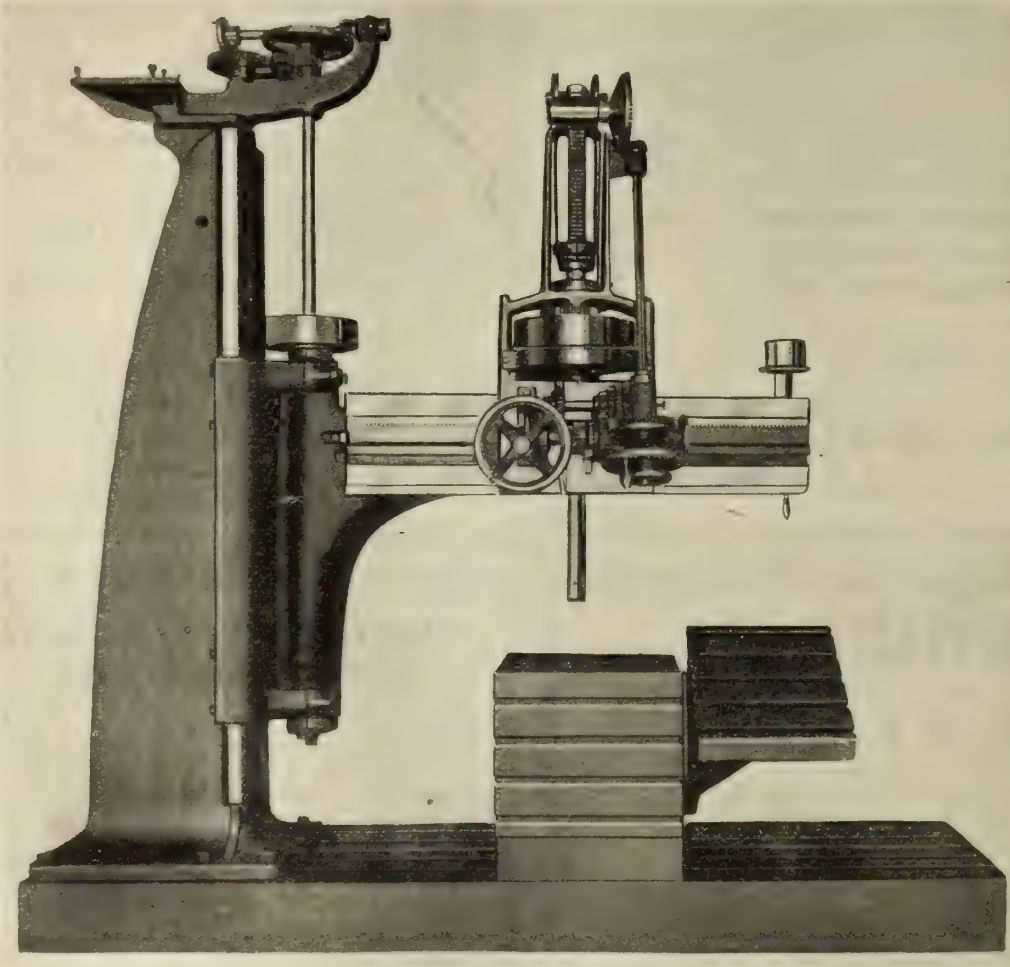


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## OF ALL SIZES AND KINDS



20 in. DRILL, SQUARE BASE



6 ft. RIDGWAY RADIAL DRILL

*Wire, write or phone for prices*

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**We have one of the largest stocks of new and used metal and woodworking machines in Canada.
Many machines only very slightly used and all absolutely guaranteed.
A few machines from our Toronto stock at exceptionally attractive prices are:**

**AIR COMPRESSORS**

1—3″ x 1½″ x 3 American Steam Pump Co., motor driven (used).
1—8″ x 8″ Sullivan Class "W.G. 8." Belt driven (used).
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**DRILLS**

1—10″ Burke Sensitive, bench type (new).
20″ "Sibley" Champions, Rockwell, and Silvers (new and used).
1—36″ C.M.C. Heavy Duty (used).
1—3-spindle 20″ Silver Gang Drill (used).
1—4-spindle W. & R. Sensitive (used).
A number of smaller sizes in bench and column type.

**BORING MACHINES**

1—66″ Bement-Niles Vertical, 2 head, 24″ under rail (used).
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1—12″ x 17½″ x 6′ Perfect (used).
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1—21″ x 30″ x 7′ South Bend (used).
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1—38″ x 54″ x 12′ Bertram (used).

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No. 4 Millhollands, capacity 1⅝″ (used).
Several Oliver & Davis Turrets, various capacities (used).

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1—42″ x 42″ x 20′ Putnam, 1 head (used).
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1—Rotary Bevel Shear, "Lennox," 1″ cap. (new).

## GARLOCK-WALKER MACHINERY CO., LIMITED

**MONTREAL, 337 St. James St.** **TORONTO, 32 Front St. W.** **WINNIPEG, 567 Banning Ave**

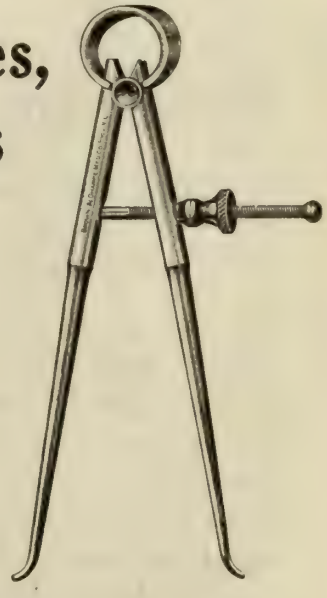
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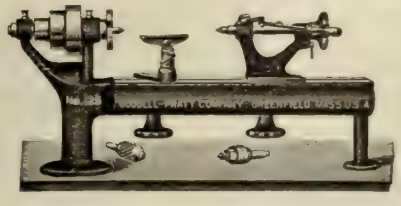
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The prompt, courteous service and dependable goods for which Rice Lewis is noted is but the development of a policy commenced 74 years ago. Full particulars, prices, and dates of delivery of any of our supplies are yours for the asking.





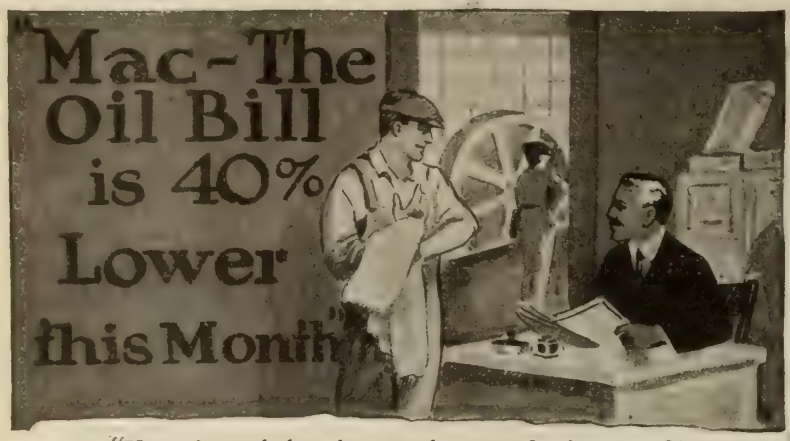




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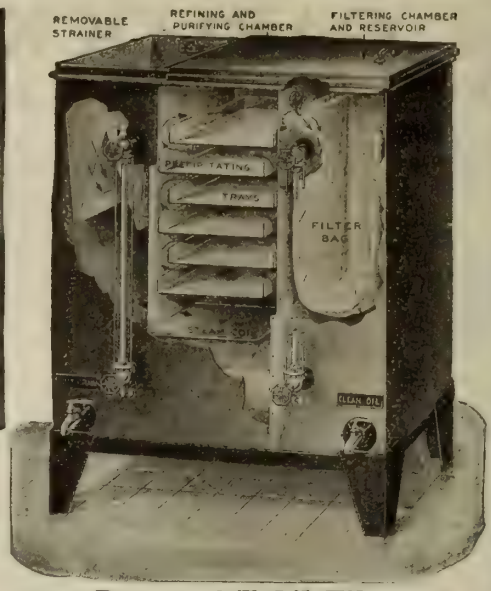
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*If interested tear out this page and place with letters to be answered.*




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First, means a cleaner engine room.

Second, it cuts your lubricating oil bill considerably.

Third, IT PAYS FOR ITSELF over and over.

WRITE FOR LITERATURE DESCRIBING OIL FILTERING SYSTEMS SUITABLE FOR YOUR POWER PLANT.

LONDON
32 Victoria St., S W. 1
HAVANA
Lonja del Comercio 427

**S. F. BOWSER CO., Limited**
66-68 Fraser Avenue, TORONTO, ONT.

PARIS
5 Rue Denis-Poissons
SYDNEY
6 Castlereagh St.



# Would You Like to make some Extra Money?

Of course you would. Well then, why not do so? Canadian Machinery is always on the lookout for well-worth-while ideas, and are willing to pay a good price for them.

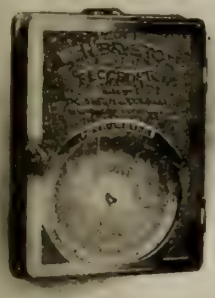
We are often asked, "What sort of ideas do you want?" Briefly, what we are desirous of obtaining is this, "Any idea that has proved of value in the machine shop, drafting room, or tool room." Think of how you got over some difficulty, a ticklish piece to hold in the lathe, or perhaps how you increased production on some particular piece. Any idea that saves time or money in the machine industry will appeal to us. Never mind the style. Write it as best you know how. We will put the finishing touches to both the wording and the sketch. Start in **NOW** and send us something of such a nature.

*Address it to*

**The Editor, Canadian Machinery**

**143 University Ave., Toronto, Can.**

## Data For Heat Control
WITH
BRISTOL'S
## Recording Pyrometers



To-day every progressive operator, foreman and superintendent demands full details of every heat treating operation. Bristol's Recording Electric Pyrometers give every variation of temperature and make records for future guidance.

Get Bulletin I-291.

**THE BRISTOL CO.**
Waterbury, Conn., U.S.A.
Canadian Distributor: A. H. Winter Joyner
TORONTO MONTREAL

## Increased Output
and
## Lower Operating Costs
follow the use of
P.H. and IMPERIAL FILES.

P H IMPERIAL

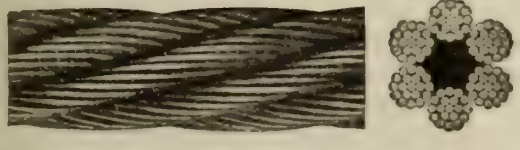
*"They Cut Faster and Wear Longer."*

**Be File-Wise.**

INGERSOLL FILE COMPANY, LIMITED.
John Morrow Screw and Nut Company Limited,
Sole Distributors,
Ingersoll, Ontario.

**INGERSOLL**

## WIRE ROPE



"We have the Right Rope for every purpose"
We solicit your inquiries Write for our catalogue
We also manufacture
*Wirecloth, Perforated Metal and Guards for Machinery and Windows*
**Canada Wire & Iron Goods Co., Hamilton**



Franklin Die-Castings Used in Farm Machinery

## *Improving Farm Methods*

THE Franklin Die-Casting Process has contributed its share to the advancement of living and working conditions on the farm. Die-Castings have simplified and reduced the cost of many parts for tractors, trucks, incubators, cow-milkers, separators and other devices which have helped establish the modern standard for farm life.

In 1892 we originated the Die-Casting Process and we have for nearly thirty years aided in the development of many fields of industry.

Send us samples or blueprints and we will give you quotations on castings in Aluminum, Tin, Lead or Zinc base alloys.

Write for booklet, "Franklin Die-Castings in Many Fields."

FRANKLIN
DIE-CASTING CORPORATION
Gifford and Magnolia Streets
Syracuse, N. Y.

**FRANKLIN DIE-CASTINGS**


*If interested tear out this page and place with letters to be answered.*




It is not alone on the hard worked, generally convenient portable drills that Jacobs Quality Chucks produce more accurate drilling, but on the most sensitive drill presses they render a service which naught but their unequalable quality makes possible.

**The Jacobs Manufacturing Co.**
**Hartford, Conn., U.S.A.**




*If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.*

# THE NEW LANDIS AUTOMATIC DIE HEAD



The new Landis Automatic Die Head for application to Screw Machines and Turret Lathes is now placed upon the market to handle your threading jobs in the efficient Landis style.

This head is made in the 1¼″ and 2″ sizes. It may be equipped for cutting bolt, pipe or special threads. It is furnished with a shank to fit your requirements. This Automatic Head is entirely different in design from any head of its type. It embodies features which made the Landis Rotary Head famous. Consider the following:—

1. Chasers and holders are located on face of head which permits of quick and easy adjustment.
2. Rough and finishing cuts may be taken by merely a turn of the latch.
3. Right and left hand threads can be cut on the same head with same chasers by using right and left hand chaser-holders.
4. Fine adjustments quickly made by simply turning graduated adjusting worm.
5. Positive locking mechanism insures correct size at all times.
6. All adjustments are made on outside of head.
7. No dirt or chips can enter inside of head.
8. Fewer parts enter into this head than any other make.
9. Head is made of steel, is rigid in design and simple in construction.
10. This head employs Landis Chasers which are interchangeable with chasers on the Landis ½″ Rotary Die Head.

*It will pay you to install this head. Write for description and send specifications.*

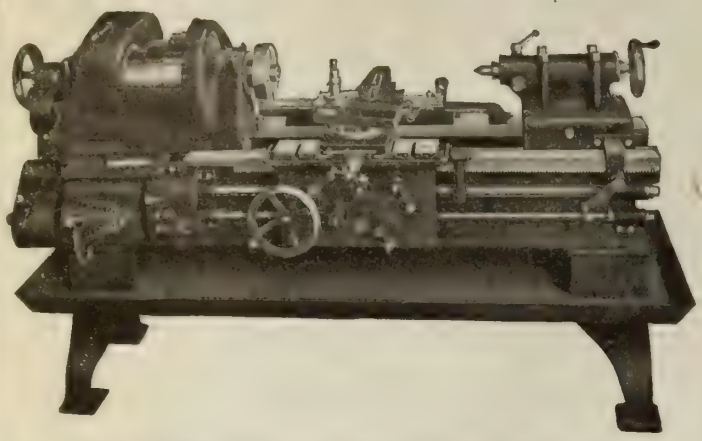
## LANDIS MACHINE COMPANY

*WAYNESBORO, Pa.*

*If interested tear out this page and place with letters to be answered.*

# "LEHMANN LATHES"

## Will Put the Same Degree of Efficiency Into *Your* Shops as They Have in Many Others



TWO SIZES—16", Swing 18¼" and 18", Swing 20¼"

Because they are constructed "right" of the best material, workmanship and design, and therefore are adaptable to all conditions, whether it be work requiring accuracy to the highest standards or for the heavy duty where power, strength and rigidity are required.

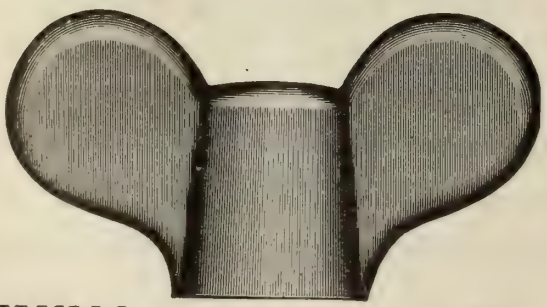
Convince yourself of these facts! Let us send you complete specifications of this superior lathe and the names of some of the larger concerns who are using "LEHMANN LATHES" for better results.

***We know you are interested, so don't put off writing us. Do it to-day. Now!***

**LEHMANN MACHINE COMPANY,** 612 S. BROADWAY, ST. LOUIS, U. S. A.

CANADA FOUNDRIES & FORGINGS LIMITED

DROP FORGED STEEL

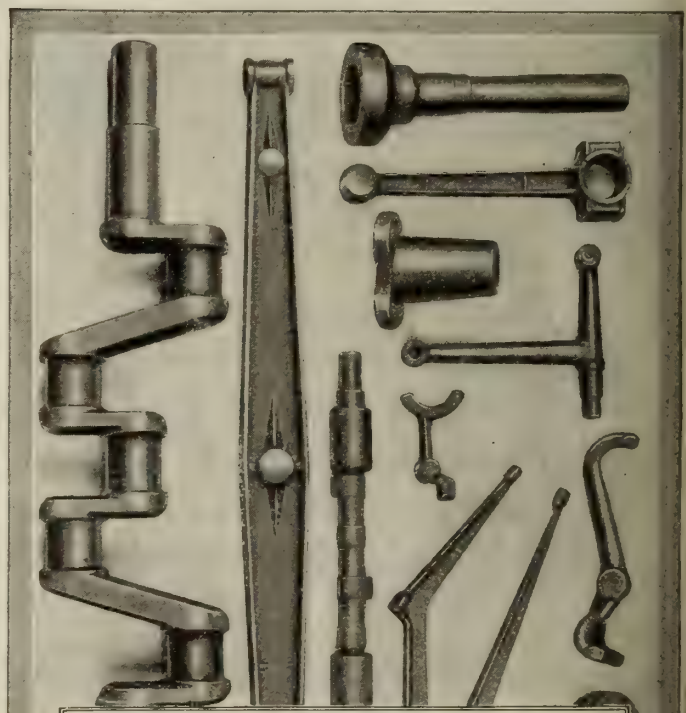


WING NUTS

EYE NUTS

*All Sizes*

Canadian Billings & Spencer Plant
Welland



DROP FORGINGS

One of the Largest and Best Equipped Plants anywhere.

F. & S. Co. Quality & Service

Consult us as to your requirements.

Dominion Forge & Stamping Co., Limited
Walkerville, Ontario
Toronto Office - Excelsior Life Building

# WE HAVE TESTED THEM FOR YOU

PNEUMATIC MOTOR HOIST



*In sizes for lifting 1,000 to 6,000 lbs.*

Thor

## PNEUMATIC and ELECTRIC TOOLS

When you put THOR Tools on your work you are not "trying them out." Every minute mechanism in THORS is tried, tested, improved and perfected before it comes to you. All left for you is to decide, with the assistance of our expert mechanical department, the tool best adapted to your particular work. Hundreds of plants, knowing the reliability and tested merit of THORS, have adopted them as standard equipment.

**Send for detailed information or Service Engineer to call.**

## INDEPENDENT PNEUMATIC TOOL CO.

MONTREAL TORONTO 600 W. Jackson Blvd., Chicago VANCOUVER WINNIPEG

# DUNBAR SPRINGS

## ACCURACY ASSURED

You can always depend upon Dunbar Springs being accurate. Before proceeding with any order the first few springs are carefully tested and checked up for this very purpose.

Seventy-two years' experience making flat and spiral springs of every description enables us to furnish you with springs of the highest quality, that can be depended upon under all conditions.

Send blue prints for estimates.

**The Dunbar Brothers Co.**

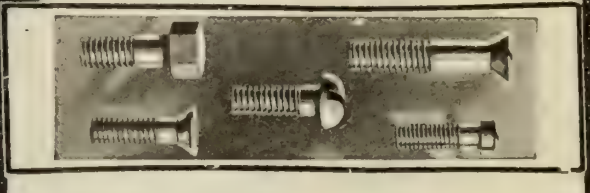
BRISTOL, CONN.



# Wood Screw Making Machinery

SEND FOR CATALOGUE

Series



For sixty years we have constantly manufactured machinery for making screws, always studying to improve and refine our product.

**Write or Wire us.**

Cable address: "Cook," Hartford, U.S.A.
Codes: Liebers'
Western Union

**Asa S. Cook Co.**
**Hartford, Conn.**


*If interested tear out this page and place with letters to be answered.*

# *If It's for the Shop or Factory*

# STRELINGER'S

## Have It

Our stock consists of a great many items and covers a broad field.

No matter whether you have a machine shop, a factory, a mill, a warehouse, a tinsmith shop, a plumbers' and steamfitters' shop, a garage, a woodworking shop, a welding and cutting shop, or you are a contractor or engineer, or are in any one of many other lines of business, we have equipment that you use, and you owe it to yourself to let us figure on your requirements.

We are here to serve you to the best of our ability. You can count on *good quality*, *low prices*, and *fair treatment*, when you deal with us.

We earnestly solicit your inquiries.

## THE CHAS. A. STRELINGER CO.
## OF CANADA, LIMITED

*Machinery - Tools - Shop Supplies*

126 FERRY STREET - WINDSOR, ONTARIO

# OAKITE CLEANS!



## *Oakite Cuts Cleaning Material Costs in Half*

THIS Tool Factory recently adopted Oakite materials for cleaning pliers (wire cutters) before pickling and plating, for the following reasons:

The oil, milling compound, rust and scale, removed in one hour instead of 1½ hours formerly required.

¾ lb. Oakite material cleans each lot of 100 pliers more satisfactorily than 1½ lbs. chip soap previously used.

The pliers are now put through cleaning operation at a saving in materials averaging ***one-half former cost.***

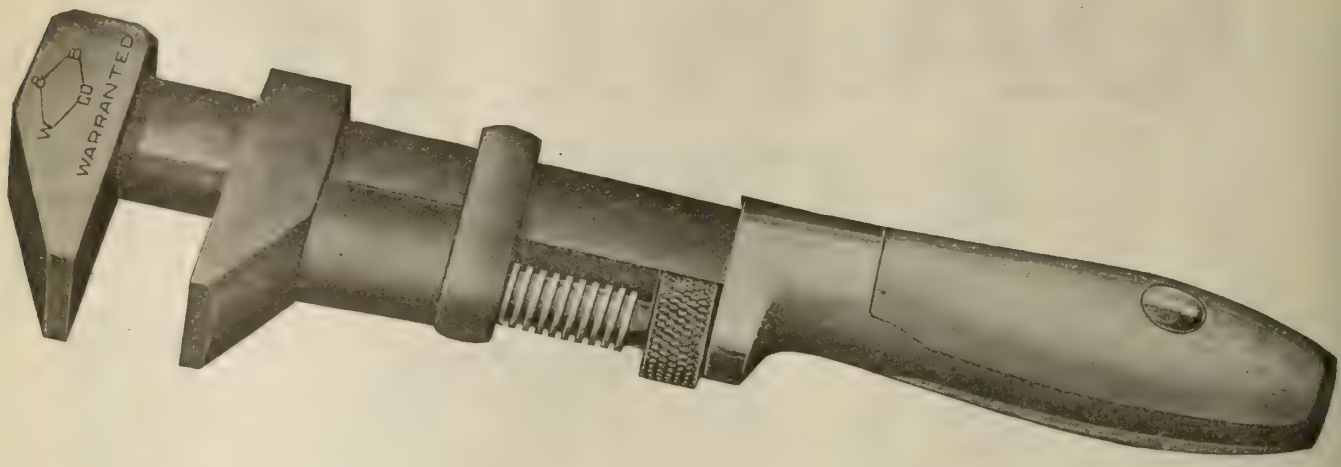
This advertisement is one of a series based on actual occurrences. n. w.

Results: Formerly impossible to avoid discoloration after plating around center bolt and nut in pliers. This weakness now eliminated. Production is speeded up by cut in cleaning time. Desirable saving in cleaning costs is effected.

***May We Serve You, Too?***

**OAKITE** MANUFACTURED BY
OAKLEY CHEMICAL CO.
44 THAMES STREET · NEW YORK


*If interested tear out this page and place with letters to be answered.*




"W & B" Screw Wrenches are dependable tools for the heaviest duty because into each of their parts is put the skill and experience—the "know how"—gained during nearly half a century of wrench manufacture.

They contain no weak member. With head and bar drop-forged in one piece from specially selected steel, extra heavy jaw thoroughly case-hardened and an accurately made, solid steel screw, each part contributes its individual share toward the assured, dependable strength of the complete tool.

Two models—"Railroad Special," with malleable iron handle, and Machinists' Knife Handle (illustrated above) are the strongest and best heavy duty screw wrenches made. Six sizes—6 to 21 inches.

A third model—"Agricultural"—is supplied at a lower price where the maximum of strength and service is not necessary. Five sizes—6 to 15 inches.

***Ask for catalog***

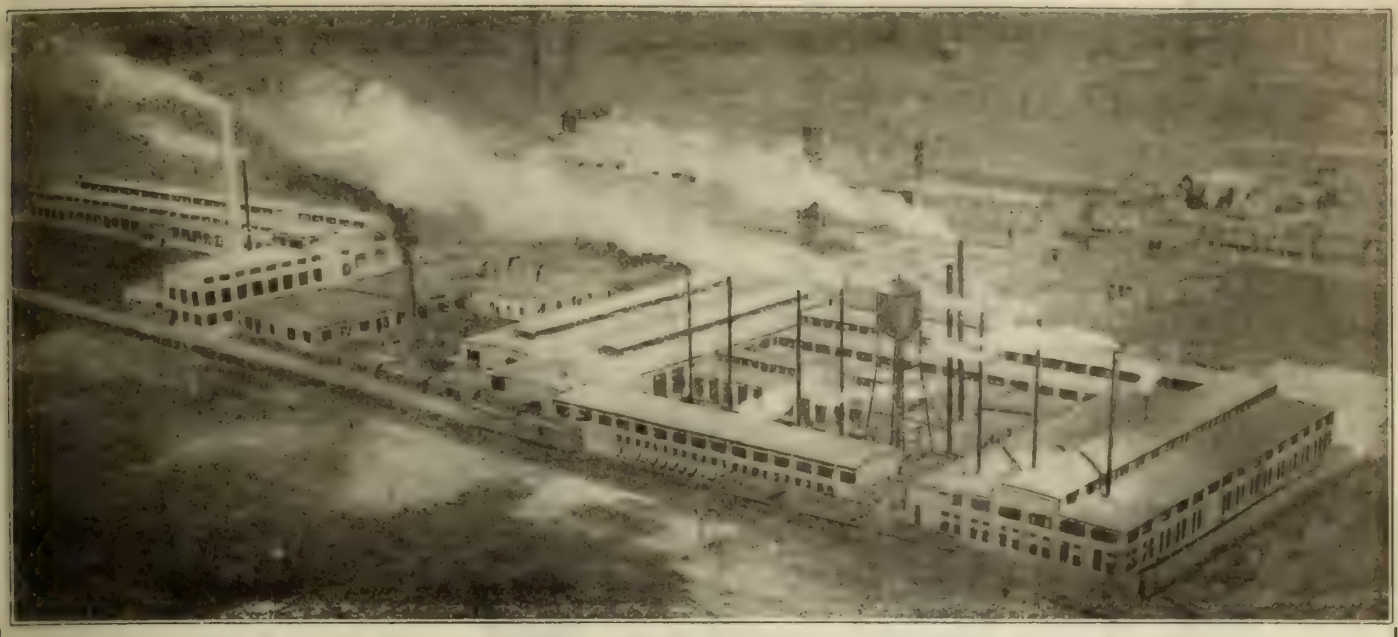
# J. H. WILLIAMS & CO.

**LIMITED**

***"The Wrench People"***

**Formerly Canadian Division of The Whitman & Barnes Mfg. Co.**

**45 Thorold Road, ST. CATHARINES, Ontario**



*Brown's Copper and Brass Rolling Mills, Limited, New Toronto*

# Beaver Brand Metals

## Copper, Brass, Bronze, Gilding Metals, Phosphor Bronze, Muntz Metal and Nickel Silver

*In Sheets, Rolls, Plates and Rods*

Beaver Brand Products are standard for consistent quality and reliability. The prices are reasonable and our Service quick and dependable.

COPPER & BRASS
BROWN'S
QUALITY
ROLLING MILLS

Become better acquainted with Beaver Products. Send us a trial order and be convinced.

*Made in Canada*

## Brown's Copper and Brass Rolling Mills, Ltd.

NEW TORONTO, ONTARIO, CANADA

*If interested tear out this page and place with letters to be answered.*

# 1/3 to 1/2 Reduction in Milling Cost

This will be the result of taking small milling jobs from your big millers and putting them up to

## The U.S. MILLER

*The Miller for Small Work*



A small machine takes up less space, requires less power, is easier to operate and is more accurate.

**The Paramount Miller of its size.** Drop us a line for full details.

**United States Machine Tool Company**
Cincinnati, Ohio, U.S.A.

# Buried in the Work and Broke!



Next time a tap breaks below the surface of a large casting, don't let some makeshift method of removing it injure the thread and waste half an hour of valuable production time. Instead—



## Walton it Out in a Jiffy

And save the casting.

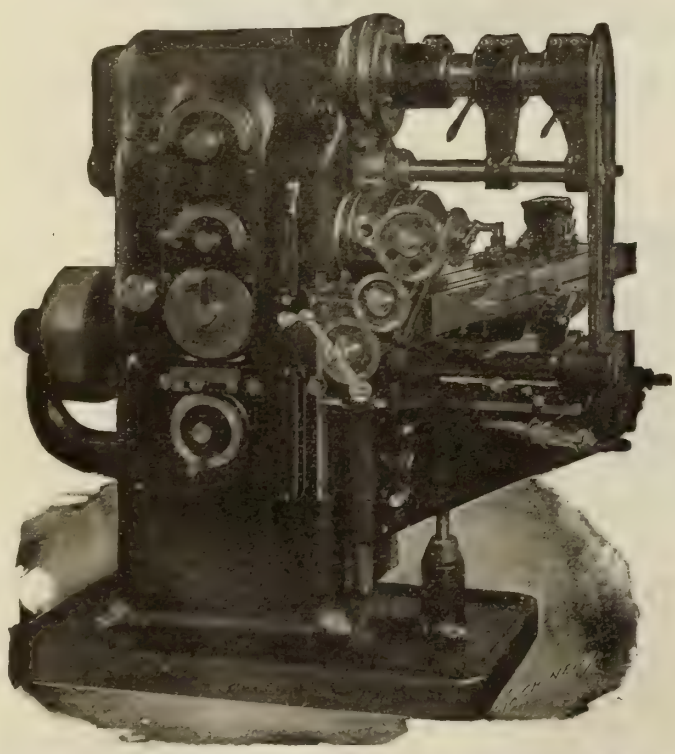
Special analysis steel fingers of the Walton Extractor drop into the flutes of the broken tap—and grip. Then a few turns of a wrench applied to the squared end of the Extractor backs out the buried tap.

**Sixty-day trial offer** proves the Walton Extractor pays for itself.

Write.

**The Walton Co.**
Hartford, Conn.

*For work requiring the utmost accuracy—*



# ROCKFORD MILLERS

have established an enviable reputation among prominent manufacturers for accuracy, simplicity in construction and ease of operation. That they have been able to do this is credited to the great care exercised in their design, and the high-grade workmanship used in their construction.

All feeds on the Rockford are controlled by one lever — the main spindle is instantly adjustable by a single nut, and the operator can complete a job without leaving the front of his machine. These are a few of the points that have made the Rockford a favorite with the men as well as their employers. We would like to tell you more about these machines. Write us for full information.

**Rockford Milling Machine Co.**
**Rockford, Ill.**

*Canada: Rudel-Belnap Machinery Co.*
*Toronto, Ont.*

FOREIGN REPRESENTATIVES:—Great Britain, A. A. Jones & Shipman, Ltd., Leicester, England. France and Belgium, Louis Besse, Paris, France. Italy, and Colonies, Societa Anonima Adler & Co., Milano. Scandinavia, Rylander & Asplund, Stockholm, Sweden. Spain, and Portugal, Casamitjana Hermanos, Barcelona, Spain. Australia, Selson Engineering Co., Melbourne, Australia. Russia, M. Mett Engineering Co., Petrograd, Russia.

# LA SALLE

**Has an Advantage Over Other Grinders**

There is some outstanding feature of all La Salle Grinding Machines that lends it exceptional productive ability.
The American Drill Grinder is especially adaptable for grinding twist, flat and three-lipped drills, because it has automatic lip rest and caliper jaw device, which assures proper clearance on all sizes of drills automatically. Send for descriptive matter covering our entire line of grinding machinery.



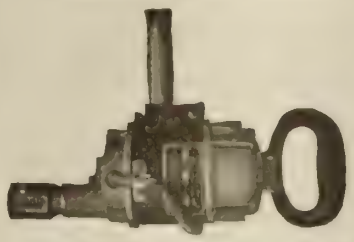
American Drill Grinder
For Wet or Dry Drill Grinding 1/8" to 2¼". Also 1/8" to 3½" dia.

**LA SALLE TOOL CO.**
La Salle, Illinois, U.S.A.

Represented in Canada by
**A. R. Williams Machinery Co., Ltd.**
64-66 Front Street W., Toronto
Halifax St. John, N.B. Montreal Winnipeg Vancouver

# U. S. Electric Drills and Grinders

**Save Time, Labor and Money**



They can be attached to any lamp socket.

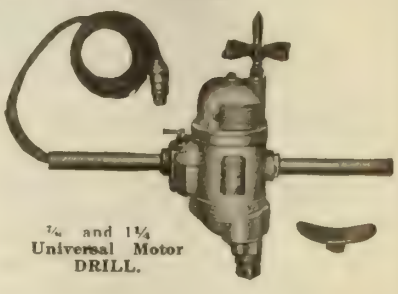
For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

3 SIZES
3-16 in., W.G.T., 6 lbs.
¼ in., W.G.T. 9 lbs.
⅜ in., W.G.T. 12 lbs.

All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



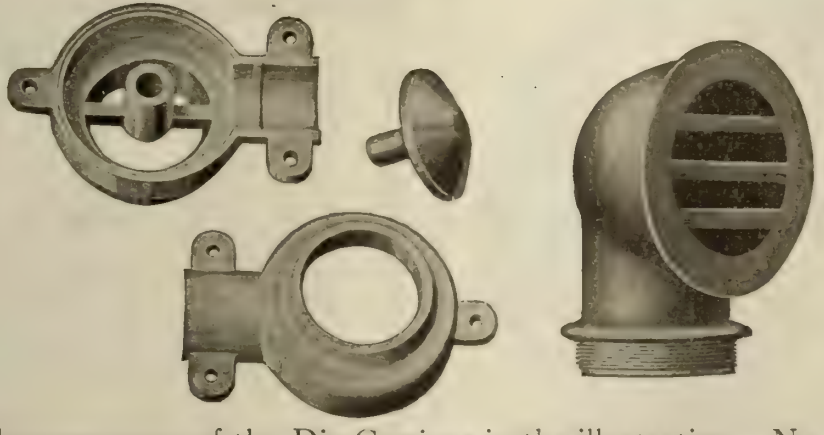
¼ and 1¼ Universal Motor DRILL.

For Sale By
**The Canadian Fairbanks-Morse Co., Limited**
Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver

**THE UNITED STATES ELECTRICAL TOOL CO.**
CINCINNATI, OHIO

# DIE-CASTINGS

**DOEHLER PROCESS**



**MADE IN CANADA**

Note the smooth appearance of the Die-Castings in the illustration. No burrs—no rough spots. Cored holes are perfectly round and centred. Require practically no machining

**SEND BLUE PRINTS TO US FOR ESTIMATES**

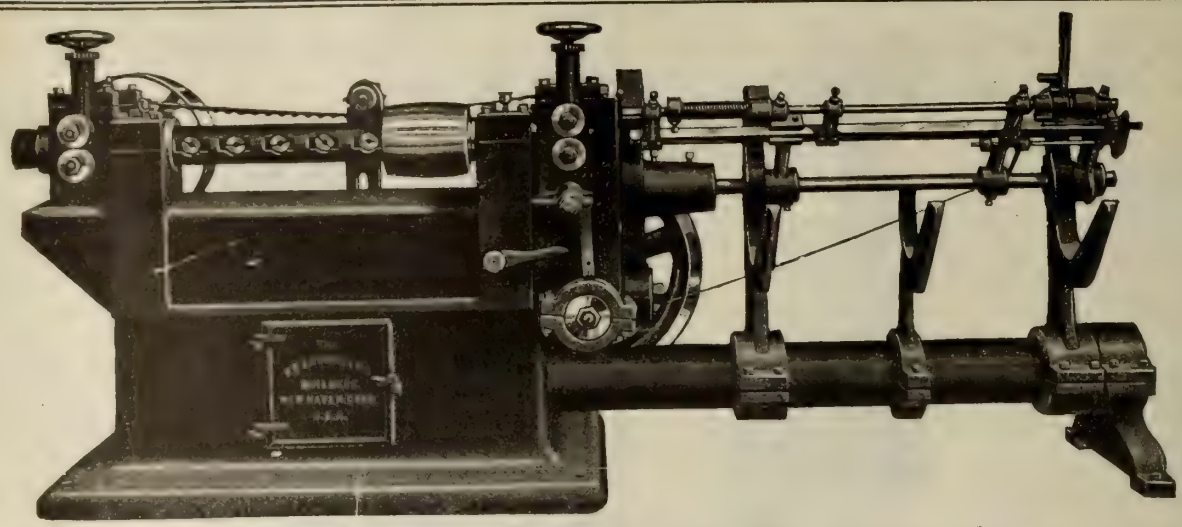
*Manufactured by*



**Tallman Brass & Metal Limited**
**HAMILTON, ONT.**




*If interested tear out this page and place with letters to be answered.*



**Perfect Wire Straightening Quickly and Profitably Done on Our**

# Automatic Wire Straightening and Cutting Machine

Just put your coil of wire on the reel, adjust the rolls and dies, and set the gauge for the length you want. The machine does the rest—thousands of feet per day, perfectly straight and cut to accurate lengths.

**Catalogue tells more about them, and we will be glad to send you a copy.**

## THE F. B. SHUSTER CO., New Haven, Conn.

FORMERLY JOHN ADT & SON ESTABLISHED 1886

*ALSO MAKERS OF STRAIGHTENERS FOR SQUARES, HEXAGONS, FLATS, ETC.*

ON THE LISTS OF ADMIRALTY, WAR OFFICE, CROWN AGENTS FOR COLONIES, ETC.

Manufacturers of EXTRUDED BRASS and BRONZE RODS and SECTIONS.

HOT BRASS and BRONZE STAMPINGS and PRESSINGS.

GUN METAL, PHOSPHOR BRONZE, BRASS and WHITE METAL INGOTS.

CHILL CAST PHOSPHOR BRONZE BARS.

PHOSPHOR COPPER and PHOSPHOR TIN.

## McKechnie Brothers, Ltd.

COPPER SMELTERS

BRASS ROD, STAMPINGS AND METAL MANUFACTURERS

ROTTON PARK STREET

## BIRMINGHAM, ENGLAND

We stock in Montreal Free Turning Brass and Bronze Rods, suitable for high speed Turning both in Round and Hexagon.

We shall also be pleased to quote for shipments direct from Birmingham, shipping in two weeks' time.

**Sole Canadian Agents:**

## Thomas Moore & Son

**224 Lemoine Street, Montreal**

***We excel in quantity production***

## CANADIAN ATLAS CRUCIBLE STEEL Co. LIMITED

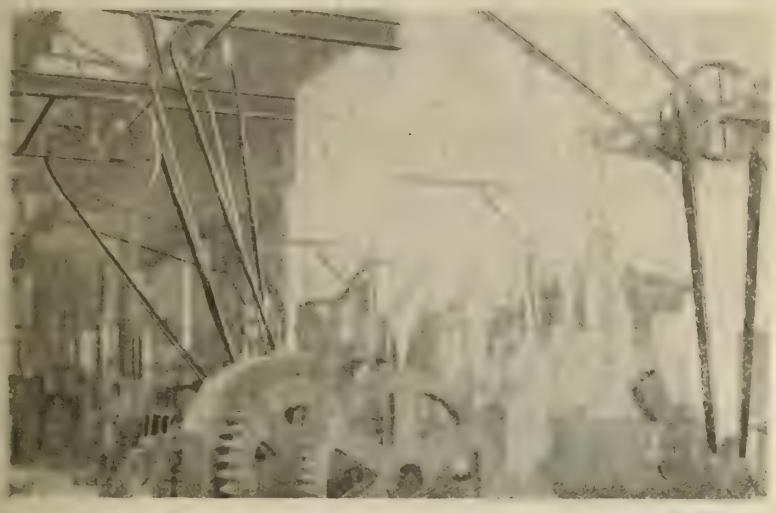
**Made in Canada**

## L-XX HIGH-SPEED
## ATLAS TOOL STEELS
## ATLAS ALLOY STEELS

**Hot Rolled, Forged Blocks and Discs**
**Cold Drawn Steel and Drill Rod**

GENERAL SALES OFFICE:
**133 Eastern Avenue, TORONTO, ONT.**
Works: WELLAND, ONT.
Sales Offices and Warehouses :
TORONTO, ONT. MONTREAL, QUE. WINNIPEG, MAN.

# Solid Woven Belting



Solid Woven Hair Belting
Driving Heavy Machine Tools

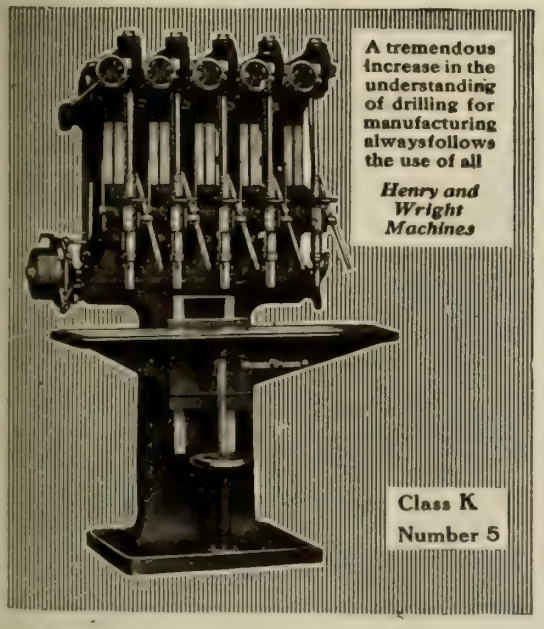
## Solid Woven
## Cotton
## Hair
## Twintex

*These beltings will solve your driving problems and save you money.*

**SUMNER & CO.**
108 WORTH ST.
**NEW YORK**

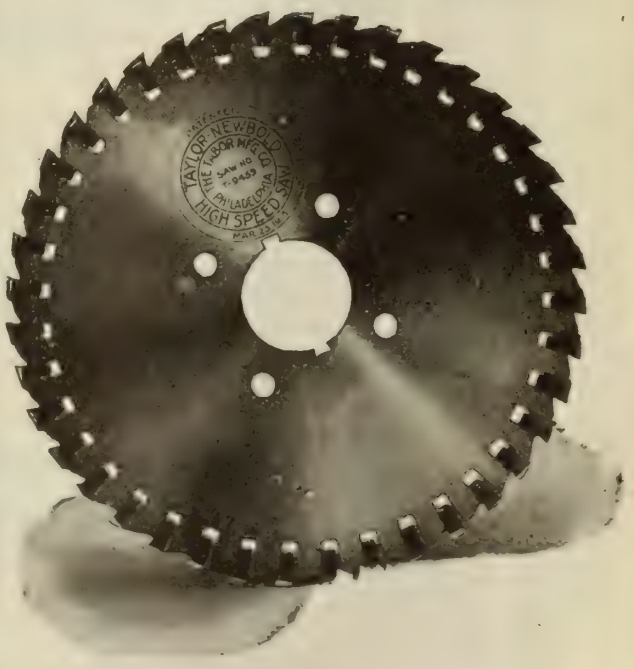
Representative for Eastern Canada
GEORGE F. SHEPPARD
702 Southam Bldg., Montreal

## HENRY & WRIGHT
### Drilling Machines



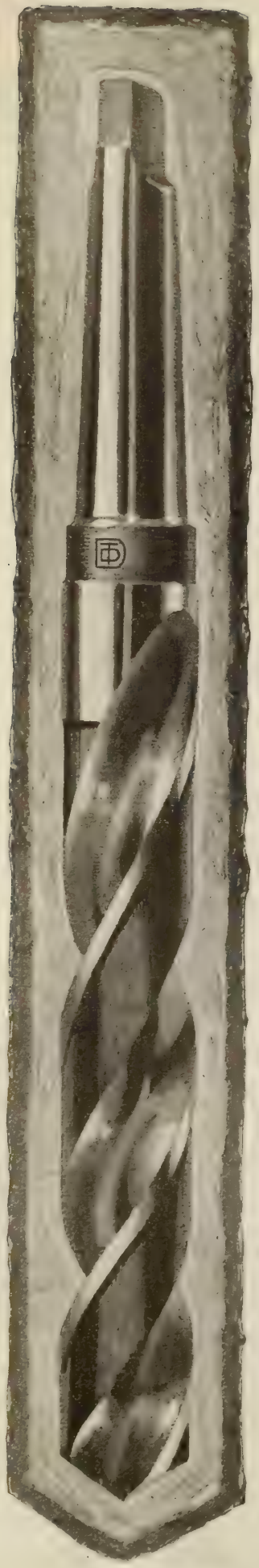

**The Henry & Wright Mfg. Co.**
Hartford, Conn.
New York Office: 136 Cedar Street
Canadian Fairbanks-Morse Co., Montreal, Toronto, Winnipeg; A. R. Williams Machinery Co., Toronto, St. John, N.B.; H. W. Petrie, Ltd., Toronto; Williams & Wilson, Montreal; Rudel-Belnap Machinery Co, Montreal; Canada Machinery Corp., Galt, Ont.; Geo. F. Foss Machinery & Supply Co., Montreal; General Supply Co., Montreal.

THE IMPROVED
## TAYLOR-NEWBOLD




INSERTED TOOTH COLD SAW
WRITE FOR BULLETIN T-S
**Tabor Mfg. Co., Philadelphia, Pa., U.S.A.**


*If interested tear out this page and place with letters to be answered.*



# HOLES for 1921

## Will Be Drilled Faster and Truer

with

# CANADIAN-DETROIT TWIST DRILLS

CUT down the cost per hole by specifying them on your next order.

We make milled drills of all types and sizes.

We also manufacture the famous DD rolled drills, in all sizes from ½ inch to 1½ inches, specially designed for drilling drop forgings and hard alloy steel castings. The Double-D combines the strength of the forged drill with the accuracy and uniformity of the milled type. The rolling process, which we control exclusively, gives greater density to the steel, without introducing the rough inaccuracies of hammering. Try DD drills on the toughest operation in your plant and watch them "hog in."

*We invite comparative tests.*

CANADIAN-DETROIT TWIST DRILL COMPANY, LIMITED

WALKERVILLE, ONTARIO

# "SPECIALS"

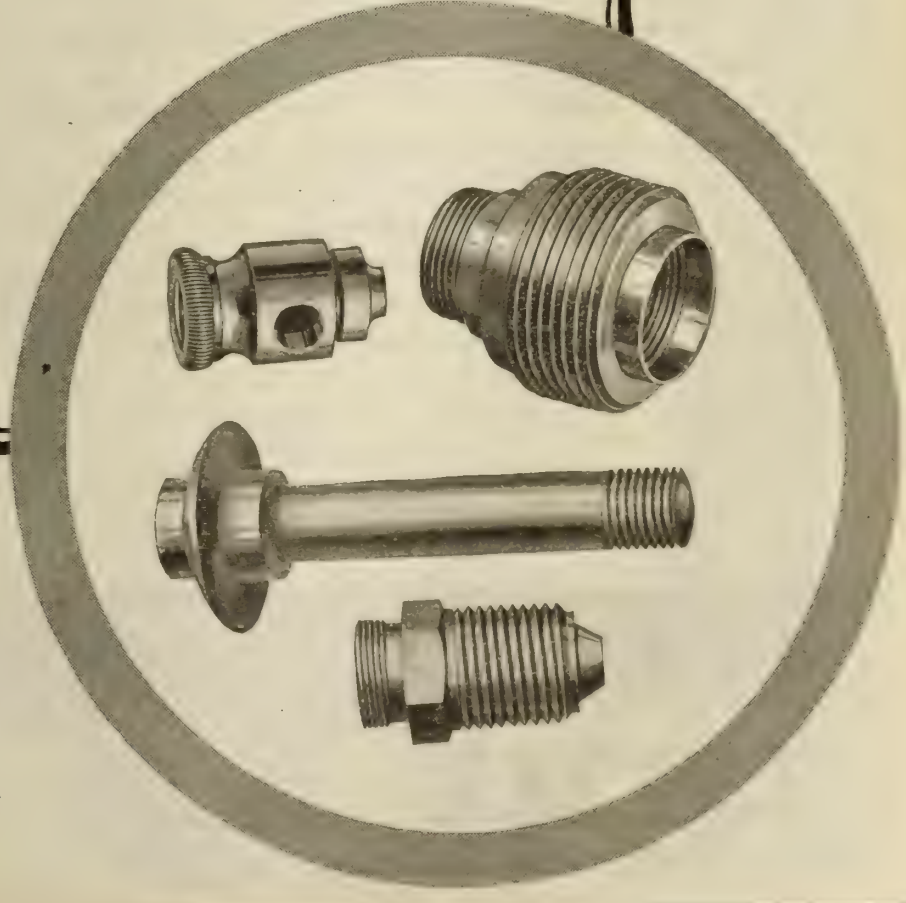
Screw machine product up to 2¼" diameter to customers' specifications. Hardened and ground product to specifications.

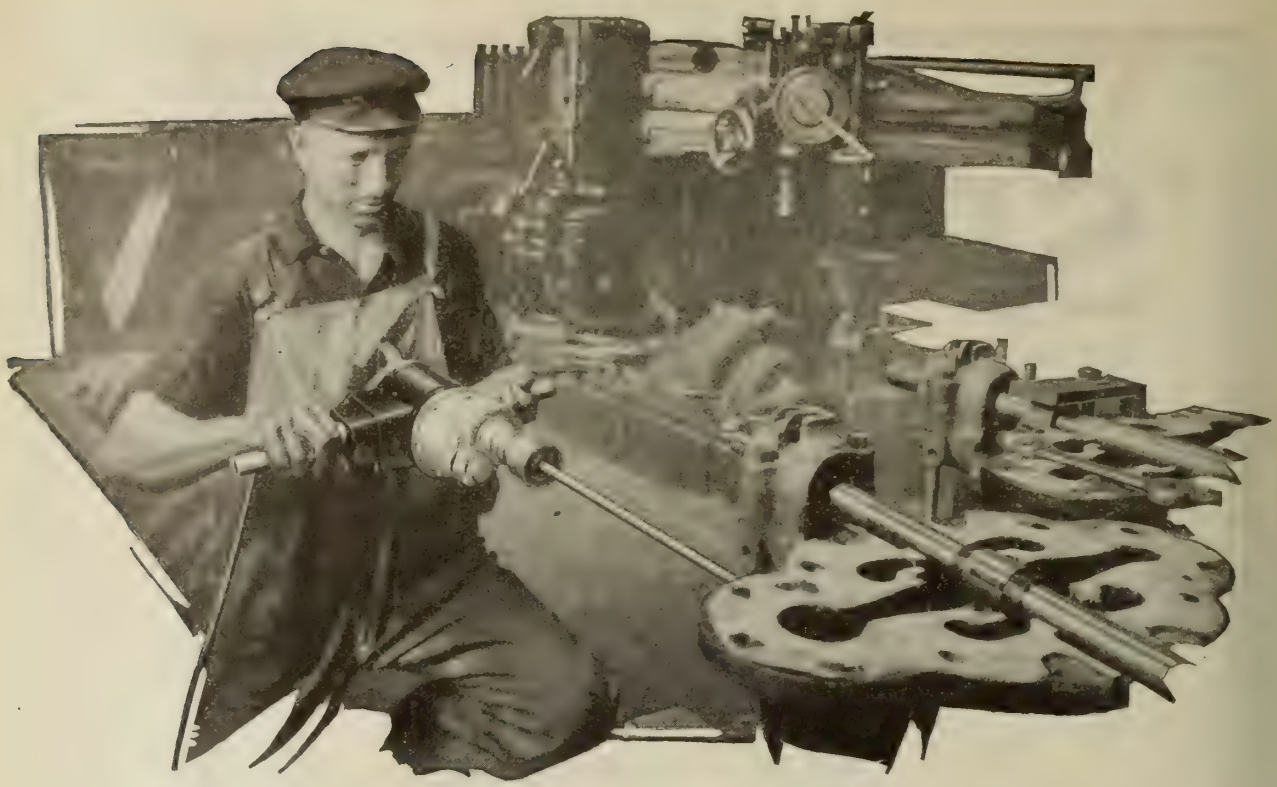
## STANDARD

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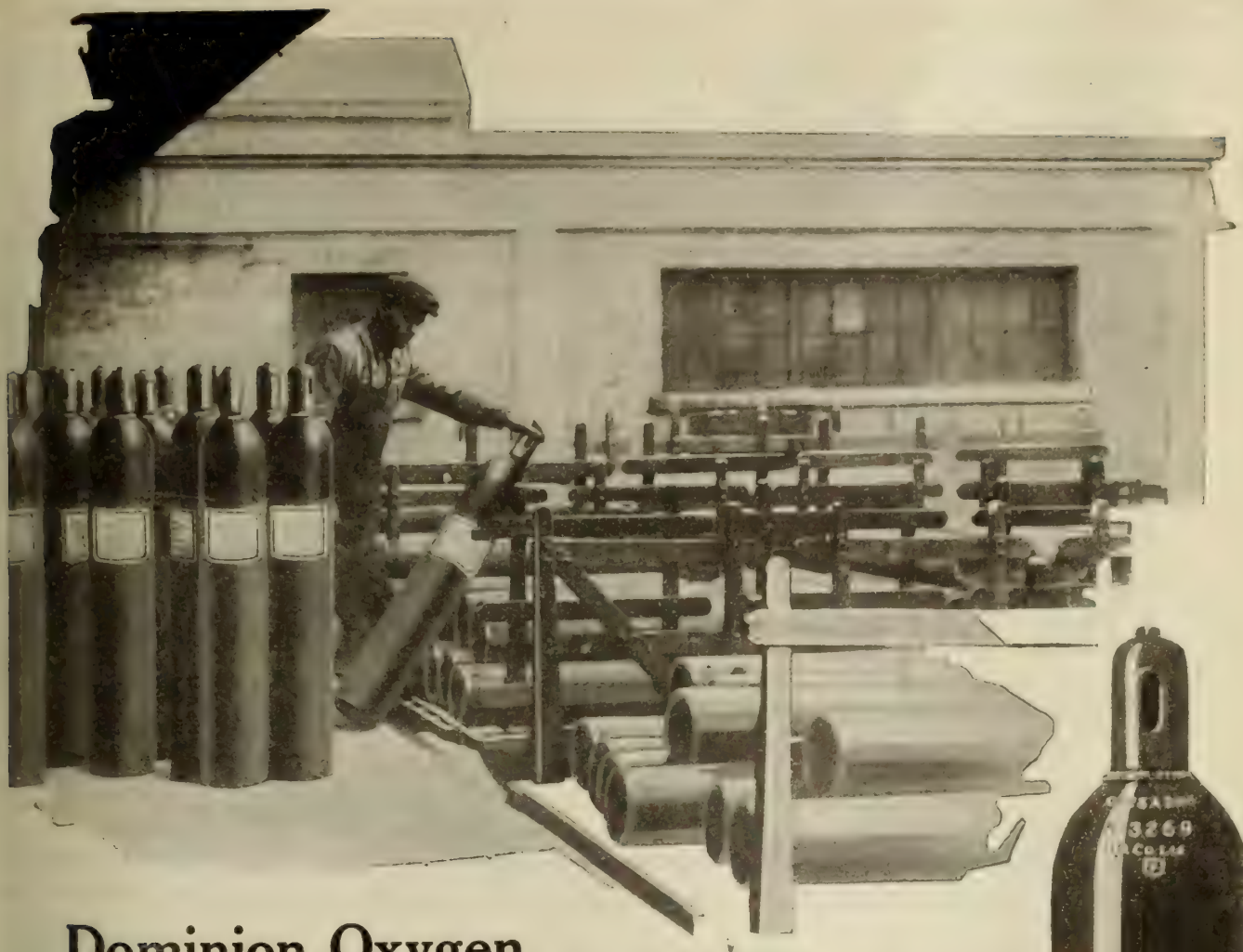
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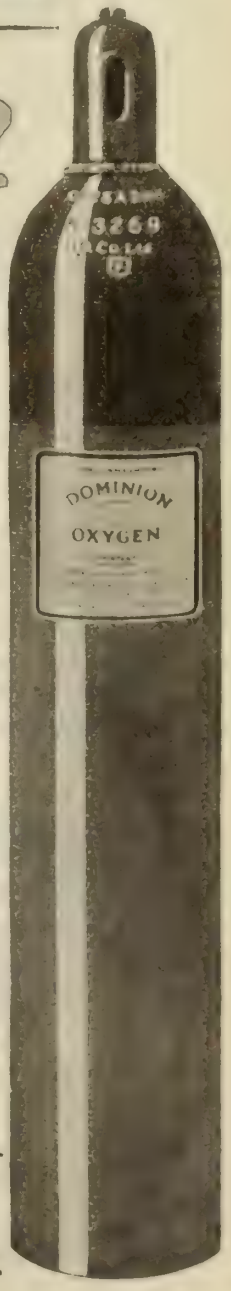
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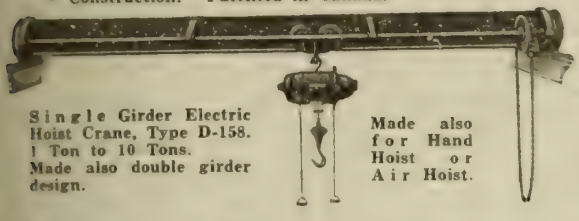


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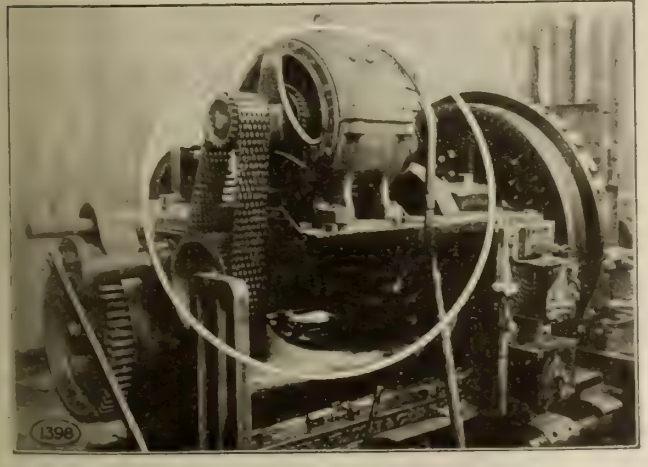
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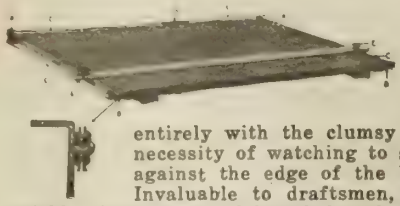
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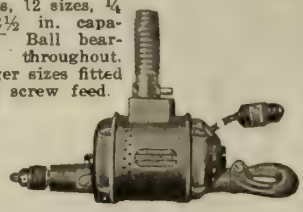
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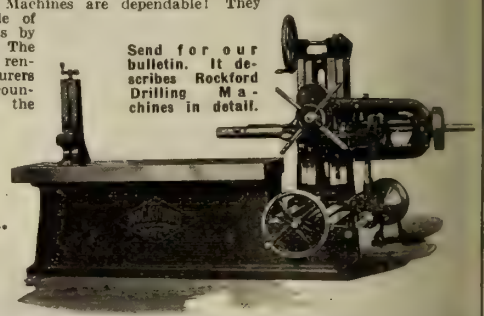
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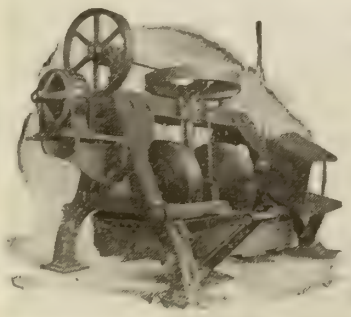
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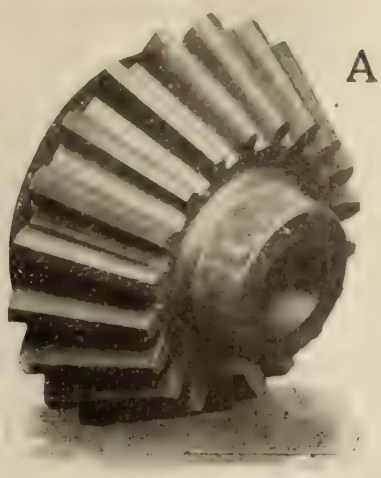
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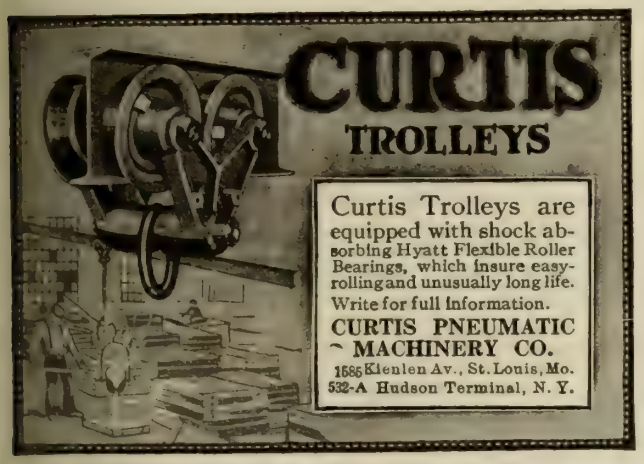


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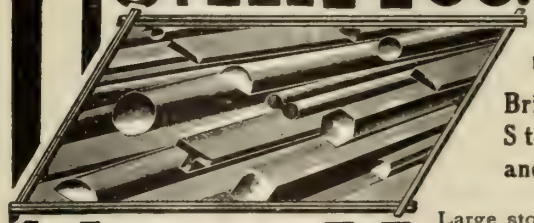
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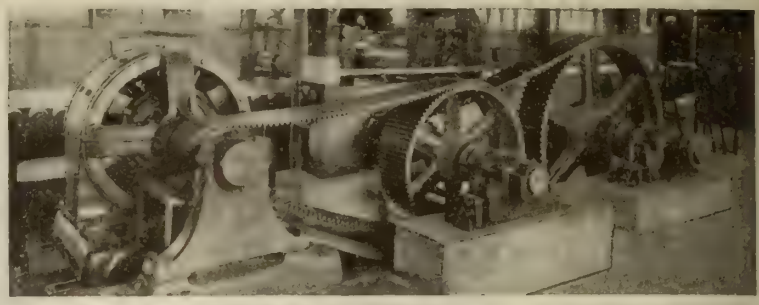
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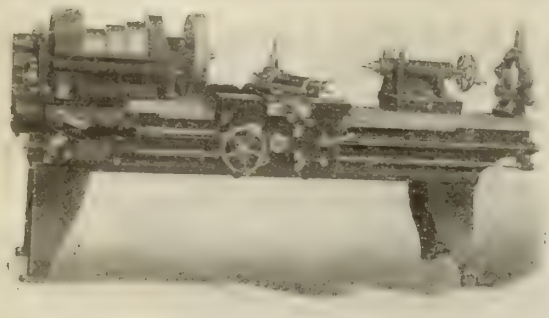
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**Balls, Brass, Bronze and Steel**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian SKF Co., Toronto, Ont.
Pilot Steel & Tool Co, Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

**Barrels, Tumbling**
Baird Machine Co., Bridgeport, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Bars, Boring**
Armstrong Bros. Tool Co., Chicago, Ill.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis
Madison Mfg. Co., Muskegon, Mich.

**Bars, Boring, Portable**
Underwood Corp., H. B., Philadelphia, Pa.

**Bars, Bronze Cored**
Moore & Son, Thos., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

**Bars, Steel**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Canada Foundries & Forgings Co., Welland, Ont.
Can Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Illingsworth Steel Co, John, New York City, N.Y.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Pilot Steel & Tool Co., Montreal, Que.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Wilkinson & Kompass, Hamilton, Ont

**Bearings, Ball**
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Railway Roller Bearing Co, Syracuse, N.Y.

**Bearings, Bronze**
Tallman Brass & Metal Co, Hamilton, Ont.
Railway Roller Bearing Co, Syracuse, N.Y.

**Bearings, Die-Cast**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Tallman Brass & Metal Co, Hamilton, Ont.

**Bearings, Journal**
Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metal Co, Hamilton, Ont.

**Bearings, Roller**
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

**Belt Cement**
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

**Belt Clamps**
Graton & Knight Mfg. Co., Worcester, Mass.

**Belt Dressings and Fillers**
Aikenhead Hardware Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.

**Belt Fasteners**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Belt Lacing**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que

**Belt Lacing Machines**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
McLaren Belting Co., J. C., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Belt Tools**
Graton & Knight Mfg. Co., Worcester, Mass

**Belting, Chain**
Can Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co Montreal, Que.
Morse Chain Co, Ithaca, N Y
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Belting, Fabric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can Consolidated Rubber Co., Ltd., Montreal, Que.
Goodyear Tire & Rubber Co of Can., Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
McLaren Belting Co., J. C., Montreal, Que.
Sumner & Co., New York City.

**Belting, Leather**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Goodhue J. L. & Co., Danville, Que
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co, J. C., Montreal, Que.
Smith Belting Co., Toronto, Ont.
Sumner & Co., New York City.
Tullis & Son, Ltd., John, Glasgow, Scot

**Belting, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co, Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.
Quaker City Rubber Co., Philadelphia, Pa.

**Belts, Abrasive**
Carborundum Co., Niagara Falls, N.Y.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.

**Bench Countershaft Standards**
Ford-Smith Machine Co., Hamilton, Ont.

**Benches, Work**
Aikenhead Hardware Ltd., Toronto, Ont.

**Bending Machines, Power**
Bertram & Son Co, Ltd, The John, Dundas, Ont.
Bertrams Ltd, Edinburgh, Scotland.
Brown, Boggs & Co, Ltd, Hamilton, Ont.
Garlock-Walker Mchy Co, Toronto, Ont.
Ryerson & Son, Jos. T, Chicago, Ill.
Williams Machinery Co, A. R, Toronto, Ont.

**Bins, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Blocks**
Ford Chain Block Co, Philadelphia, Pa.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Chain (See Hoists, Hand)**
Aikenhead Hardware Ltd., Toronto, Ont.
Ford Chain Block Co, Philadelphia, Pa.
Morris Crane & Hoist Co, Ltd, Niagara Falls, Ont.
Wright Mfg. Co, Lisbon, Ohio

**Blocks, Die**
Canada Foundries & Forgings Co, Welland, Ont.
Canadian Atlas Crucible Steel Co, Ltd, Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Illingsworth Steel Co, John, New York City, N.Y.

**Blocks, Pillow**
Can. Link-Belt Co., Toronto, Ont.

**Blowers**
Can. Blower & Forge Co., Ltd., Kitchener.
General Combustion Co. of Can., Ltd, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sturtevant Co., B F, Boston, Mass.

**Bolt and Nut Machinery**
Acme Machinery Co, Cleveland, Ohio
Bertram & Son Co, Ltd, The John, Dundas, Ont.
Garlock-Walker Mchy Co, Toronto, Ont
Greenfield Tap & Die Corp., Galt, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co, Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Bolt and Nut Machinery, Automatic**
National Acme Co, Cleveland, Ohio.

**Bolts and Nuts**
London Bolt & Hinge Works, London, Ont.
Morrow Screw & Nut Co, Ltd, John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Petrie, Ltd, H W, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont

**Bolt Threading Die Heads**
Jones & Lamson Machine Co, Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa

**Boosters**
Sturtevant Co, B F, Boston, Mass

**Boring and Turning Mills, Vertical**
Armstrong Whitworth of Canada, Ltd, Montreal, Canada
Bertram & Son Co, Ltd, The John, Dundas, Ont.
Garlock Walker Mchy Co, Toronto, Ont
Gisholt Machine Co, Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.

**Boring, Drilling and Milling Machines, Horizontal**
Armstrong Whitworth of Canada, Ltd Montreal, Canada
Bertram & Son Co, Ltd, The John, Dundas, Ont.
Canada Machinery Corp, Galt, Ont
Garlock-Walker Mchy Co, Toronto Ont.
Gisholt Machine Co., Madison, Wis
Herbert Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa
Universal Boring Machine Co., Hudson, Mass.

**Boring, Drilling and Milling Mach., Vertical**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada
Canada Machinery Corp, Galt, Ont.
Garlock-Walker Mchy Co, Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co, Ltd., R, Galt, Ont
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W, Toronto, Ont

**Boring Heads**
Aikenhead Hardware Ltd., Toronto, Ont.

**Boring Tools**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Gisholt Machine Co., Madison, Wis

**Brakes, Magnetic (for electric furnaces)**
Volta Mfg Co, Welland, Ont

**Brass**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Bricks, Fire**
Elk Firebrick Co of Can, Ltd, Hamilton, Ont.

**Bridges**
Hamilton Bridge Works Co, Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que

**Broaching Machines**
Bilton Machine Co, Bridgeport, Conn
Garlock-Walker Mchy Co, Toronto, Ont.

**Bronze**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Bronze, Phosphor**
British Smelting & Refining Co, Ltd, Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.

**Bucket Carriers, Pivoted**
Can. Link-Belt Co., Toronto, Ont.

**Buffing or Polishing Machines (See Polishing and Buffing Machines)**
Can. Hanson & Van Winkle Co, Ltd, Toronto, Ont.
Ford-Smith Machine Co Hamilton Ont
Petrie, Ltd., H. W., Toronto, Ont.
U S. Electrical Tool Co., Cincinnati, O

**Bulldozers**
Bertram & Son Co, Ltd, The John, Dundas, Ont.
Canada Machinery Corp, Galt, Ont.
Garlock-Walker Mchy Co, Toronto Ont
Ryerson & Son, Jos. T, Chicago, Ill.

**Burners, Oil and Gas**
Can Hauck Burner Co, Port Hope, Ont
General Combustion Co of Can, Ltd, Montreal, Que.
Rockwell Co W S, New York City

**Bushings**
Fisher Motor Co, Ltd, Orillia, Ont.
Morrow Screw & Nut Co, Ltd, John, Ingersoll, Ont

**Calipers**
Brown & Sharpe Mfg Co Providence, R I.
Goodell & Pratt Co, Greenfield, Mass
Starrett Co., L. S, Athol Mass.

**Cams**
Canada Foundries & Forgings Co, Welland, Ont.

**Can-Making Machinery (See Sheet Metal Working Machinery**
Bliss Co, E W, Brooklyn N Y
Brown, Boggs & Co, Ltd, Hamilton Ont.
MacKinnon Steel Co, Sherbrooke, Que

**Cars, Ore**
MacKinnon Steel Co, Sherbrooke, Que.

**Castings, Aluminum**
Canada Electric Castings Co, Ltd, Orillia.
Can. Hanson & Van Winkle Co, Toronto, Ont.
Canada Metal Co, Ltd, Toronto, Ont
Electric Steel & Engineering Co, Welland, Ont
Tallman Brass & Metal Co, Hamilton, Ont

# BUYERS' DIRECTORY

**Castings, Brass and Bronze**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
International Machinery & Supply Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Copper**
Can. Hanson & Van Winkle Co., Toronto, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Marine**
Can. Steel Foundries, Montreal, Que.

**Castings, Die Molded**
Electric Steel & Engineering Co., Welland, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Ferro-Alloy**
Can. Steel Foundries, Montreal, Que.

**Castings, Iron**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Electric Steel & Engineering Co., Welland, Ont.
Fleck Ltd., Alexander, Ottawa, Ont.
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Hyd. Press**
Can. Steel Foundries, Montreal, Que.

**Castings, Monel Metal**
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

**Castings, Naval Bronze**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Nichrome**
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Nickel**
Can. Hanson & Van Winkle Co., Toronto, Ont.

**Castings, Semi-Steel**
Davidson Mfg. Co., Thos., Montreal, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

**Castings, Steel**
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

**Cements, Iron**
Smooth Mfg. Co., Jersey City, N.J.

**Centering Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Chains (See Sprockets and Chains)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chains, Driving**
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chasers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chemists**
Toronto Testing Laboratory, Toronto, Ont.

**Chucking Machines**
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Chucks, Drill**
Jacobs Mfg. Co., Hartford, Conn.

**Chucks, Drill and Tap**
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Goodell & Pratt Co., Greenfield, Mass.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Lathe**
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Magnetic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**
Columbia Hdwe. Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

**Cleaners, Metal, Waste, General**
Oakley Chemical Co., New York, N.Y.

**Clocks, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Clutches, Friction**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**
Can. Link-Belt Co., Toronto, Ont.

**Collars, Shaft or Set**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

**Collets**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compressors, Air**
Curtis Pneumatic Machinery Co., St. Louis, Mo.

**Compressors, Air and Gas**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**
Ford-Smith Machine Co., Hamilton, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Copper**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Cored Bronze Bars**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Cotter Pins**
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Counterbores**
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Countershafts**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Couplers, Car and Locomotive**
Can. Steel Foundries, Montreal, Que.

**Couplings, Flexible**
Holden Co., Ltd., Montreal, Que.

**Couplings, Rigid**
Bernard Industrial Co., A., Fortierville, Que.

**Couplings, Shaft**
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

**Cranes, Electric**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Cranes, Hand (See Hoists, Hand)**
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

**Cranes, Locomotive**
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Cranes, Traveling**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Crank Pin-Turning Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia, Pa.

**Cutters, Flue**
Holden Co., Ltd., Montreal, Que.

**Cutters, Gear**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Milling**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Milling Machine Co., Cleveland
Elliott & Whitehall Tool Co., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Cutters, Stay Bolt**
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Thread**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.

**Cutting-Off Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Cutting-Off Machines, Pipe (See Pipe Cutting and Threading Machines)**
Landis Machine Co., Inc., Waynesboro, Pa.
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Cutting-Off Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Pilot Steel & Tool Co., Montreal, Que.

**Cutting Oil Filters (See Oil Filtering Systems)**
Bowser, S. F., & Co., Ltd., Toronto, Can.
**Cataract Refining Co., Toronto, Ont.**

**Cutting, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

**Dealers, Machinery (See Searchlight Section)**
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Deckle Straps**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Diamonds, Black and Rough**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond, Carbon and Bortz**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Desmond-Stephan Co., Hamilton, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Wheel Trueing Tool Co., Detroit, Mich.

**Diamond Crossings**
Can. Steel Foundries, Montreal, Que.

**Die-Castings**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Dies, Pipe-Threading**
Jones & Lamson Machine Co., Springfield, Vt.

**Die Sinking Machines, Automatic**
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

**Die Sinkers**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Screw and Thread Cutting**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

**Dies, Forging**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

# BUYERS' DIRECTORY

**Dies, Hammer**
Kinnear & Hillier, St. Catharines, Ont.

**Dies, Self-Opening, Adjustable**
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Lassila Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Vaster Tool Co., Waynesboro, Pa.

**Dies, Threading-Opening**
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Lassila Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Disc Cement**
Ritchey Supply Co., Toronto, Ont.
Wilcox Abrasives Co., Chicago, Ill.

**Dividing Heads**
Ackworthe Ltd., John, Birmingham, Eng.
Dickson Fred. C., Machinery Co., Chicago, Ill.
Ford Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Dogs, Lathe and Milling Machine**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drafting Boards and Tables**
Dawson Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Drafting Materials**
American Lead Pencil Co., New York City, N.Y.
Dawson Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Dressers, Grinding Wheel**
Carborundum Co., Niagara Falls, N.Y.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford Smith Machine Co., Hamilton, Ont.
Jones Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Drill Headers**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drill Rods**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Drill Speeders**
Canada Machinery Corp., Galt, Ont.

**Drilling Machine Heads**
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

**Drilling Machines, Automatic**
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

**Drilling Machines, Bench**
Beacon Engineering Co., Tipton, England.
Can. Blower & Forge Co., Ltd., Kitchener.
Goodell & Pratt Co., Greenfield, Mass.
Henry & Wright Mfg. Co., Hartford, Conn.
High Speed Hammer Co., Rochester, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Electric and Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Gang**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drilling Machines, Heavy Duty**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Multiple Spindle**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

**Drilling Machines, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Drilling Machines, Portable**
Haskins Co., R. G., Chicago, Ill.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Radial**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Toomey Inc., Frank, Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Drilling Machines, Sensitive**
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
High Speed Hammer Co., Rochester, N.Y.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Turret**
Gisholt Machine Co., Madison, Wis
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

**Drilling Machines, Vertical**
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Drills, Center**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Drills, High Speed Twist**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co., Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.
Taylor Tool Co., J. A. M., Toronto, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Drills, Twist and Flat**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Dust Handling Equipment**
Can. Blower & Forge Co., Ltd., Kitchener.
Sturtevant Co., B. F., Boston, Mass.

**Electrical Instruments**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Electrical Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O.

**Elevating Trucks (See Trucks)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Elevators and Conveyors**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Emery Cloth**
Wausau Abrasives Co., Chicago, Ill.

**Emery Wheels (See Grinding Wheels)**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Carborundum Co., Niagara Falls, N.Y.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
International Machinery & Supply Co., Montreal, Que.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Engines, Capstan**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Engineers, Mechanical**
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.

**Expanders, Tube**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Eyeglasses, Safety (See Goggles, Safety)**
Prest-O-Lite Co. of Can., Toronto, Ont.
Willson Goggles, Inc., Reading, Pa.

**Fans, Electric**
Can. Blower & Forge Co., Ltd., Kitchener.
Northern Electric Co., Montreal, Que.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Exhaust**
Can. Blower & Forge Co., Ltd., Kitchener.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Ventilating**
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Fibre**
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**File Handles**
Ingersoll File Co., Ltd., Ingersoll, Ont.

**Files and Rasps**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Filing Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Filler, Iron (See Cements, Iron)**
Smooth Mfg. Co., Jersey City, N.J.

**Fire Extinguishers**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Fittings, Pipe**
International Malleable Iron Co., Guelph, Ont.

**Flexible Shafts**
Aikenhead Hardware Ltd., Toronto, Ont.
Haskins Co., R. G., Chicago, Ill.

**Flux, Galvanizing**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Fluxes, Welding**
L'Air Liquide Society, Toronto, Ont.

**Forging Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.

**Forgings, Drop**
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd., Toronto, Ont.

**Forgings, Hammer**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.

**Foundry Equipment**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Foundry Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Frogs, Spring or Rigid**
Can. Steel Foundries, Montreal, Que.

**Fuel Oil Burning System**
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Heat Treating Coal**
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Oil and Gas**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Bellevue Industrial Furnace Co., Detroit.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces and Ovens, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces, Tempering and Annealing**
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furniture, Machine Shop**
Garlock-Walker Mchy. Co., Toronto, Ont.
Ministry of Munitions, London, Eng.
National Engineering Co., Sarnia, Ont.

**Gages, Comparator**
Jones & Lamson Machine Co., Springfield, Vt.

**Gages, Dial**
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont.
Perdue, W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass.

**Gages, Measuring (See Tool Work)**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Q.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Gages, Recording**
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.

# BUYERS' DIRECTORY

**Gages, Snap, Thread and Cylindrical**
Ackworthie, Ltd., John, Birmingham, Eng.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co. of Canada, Ltd., Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co. of Canada, Ltd., Dundas, Ont.

**Gages, Standard**
Armstrong Whitworth Co. of Can., Ltd. Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis, Ind.
Elliott & Whitehall Tool Co., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.

**Gages, Thread**
Ackworthie, Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Garnet, Emery and Flint Paper and Cloth**
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Gas, Coal Compressed**
L'Air Liquide Society, Toronto, Ont.

**Gas, Compressed**
Prest-O-Lite Co. of Can., Toronto, Ont.

**Gaskets**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

**Gear Blanks**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear-Cutting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

**Gear Testing Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Gears, Cast**
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

**Gears, Cut**
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hamilton Gear & Machine Co., Toronto, Ontario.
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Gears, Dressed**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Gears, Forged**
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Gears, Herringbone**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

**Gears, Machine Moulded**
Can. Steel Foundries, Montreal, Que.

**Gears, Rawhide (See Gears, Cut)**
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear, Silent Chain**
Gardner & Son, Robt., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Can. Link-Belt Co., Ltd., Toronto, Can.
Hans Renold of Canada, Ltd., Montreal, Quebec.

**Gears, Worm**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.

**Generators, Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Generators, Electric**
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Goggles, Safety**
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

**Grab Buckets**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Grease Cups, Pressed Steel and Brass**
Can. Winkley Co., Ltd., Windsor, Ont.

**Greases, Lubricating**
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

**Grinding Discs**
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Grinding Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Grinding Machines, Abrasive Belt**
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Automatic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Bench**
Aikenhead Hardware Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Goodell & Pratt Co., Greenfield, Mass.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co., Waltham, Mass.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Grinding Machines, Center**
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines Chaser**
Jones & Lamson Machine Co., Springfield, Vt.

**Grinding Machines, Cutter and Reamer**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Cylindrical**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Die**
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

**Grinding Machines, Disc**
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Drill**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Face**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Floor and Tool**
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.
Wilkinson & Kompass, Hamilton, Ont.

**Grinding Machines, Internal**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Manhattan Machine & Tool Works, Grand Rapids, Mich.

**Grinding Machines, Portable**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Carborundum Co., Niagara Falls, N.Y.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Haskins Co., R. G., Chicago, Ill.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wilkinson & Kompass, Hamilton, Ont.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Power Oscillating Tool**
Herbert Ltd., Alfred, Toronto, Ont.

**Grinding Machines, Ring Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Snagging**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Surface**
Garlock-Walker Mchy. Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machinery, Tool Post**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wilkinson & Kompass, Hamilton, Ont.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Universal**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Machine Co., Greenfield, Mass.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co., Waltham, Mass.

**Grinding Wheels**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, Ind.
Carborundum Co., Niagara Falls, N.Y.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
International Machinery & Supply Co., Montreal, Que.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Guards, Machinery and Window**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Gun-Barrel Machinery**
Steinle Turret Machine Co., Madison, Wis.

**Hack Saws, Power**
Ackworthie, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, Ind.
Clemson Bros., Hamilton, Canada.
Garlock-Walker Mchy. Co., Toronto, Ont.
Goodell & Pratt Co., Greenfield, Mass.
Lyman Tube & Supply Co., Montreal, Que.
McKenzie Machinery Co., Guelph, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hammers, Chipping**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hammers, Drop**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

**Hammers, Electric**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Hammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Ryerson & Son, Jos. T., Chicago, Ill.

**Hammers, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bradley & Son, Inc., C. C., Syracuse, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
High Speed Hammer Co., Rochester, N.Y.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.

**Hammers, Rivetting**
Cleveland Pneumatic Tool Co., Toronto Ont.
Ryerson & Son, Jos. T., Chicago, Ill.

**Hangers, Shafting**
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F Montreal, Que.
Terry & Co., John C., Birmingham, Eng
Williams Machinery & Supply Co., A. R Montreal, Que.

**Hardening, Case-Hardening and Tempering**
Hamilton Gear & Machine Co., Toronto Ont.

**Hardness Testing Apparatus**
Shore Instrument Co., Jamaica, N.Y.

**Hobbing Machines**
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hobs**
Armstrong-Whitworth of Canada, Ltd Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R I
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Hoists, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Volta Mfg. Co., Welland, Ont.

**Hoists, Hand**
Lyman Tube & Supply Co., Montreal, Que
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Hoists, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Holders-On, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill

**Hose, All Kinds**
Quaker City Rubber Co., Philadelphia, Pa

**Hose, Flexible**
Gutta Percha & Rubber, Toronto, Ont.

**Hose, Industrial**
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Hose, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Foamite Firefoam Co., Hamilton, Ont.

**Hose, Steam, Suction, Water**
Quaker City Rubber Co., Philadelphia, Pa.

**Hose, Steel**
International Machinery & Supply Co., Montreal, Que.

**Hydraulic Leather**
Graton & Knight Mfg. Co., Worcester, Mass.

**Hydraulic Machinery**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Stewart & Co., Duncan, Glasgow, Scot.

**Index Centers**
Dickow, Fred. C., Machinery Co., Chicago, Ill.

**Igniters, Gas Engine**
Canada Foundries & Forgings Co., Welland, Ont.

**Indicators, Speed and Test**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, Ind.
Brown & Sharpe Mfg. Co., Providence, R.I.

**Insultion**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Jacks, Hydraulic**
International Machinery & Supply Co., Montreal, Que.
Norton, A. O., Boston, Mass.

**Jacks, Planer**
Armstrong Bros. Tool Co., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

**Jigs and Fixtures (See Tool Work)**
Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que.
Crescent Machine Co., Ltd., Montreal, Q.

# BUYERS' DIRECTORY

isher Motor Co., Ltd., Orillia, Ont.
ord-Smith Machine Co., Hamilton, Ont.
isholt Machine Co., Madison, Wis.
amilton Engineering Service, Ltd., Hamilton, Ont.
apid Tool & Machine Co., Lachine, Que.

**reseating Machines**
Machine Co., Bridgeport, Conn.
& Whitehall Tool Co., Galt, Ont.
Walker Mchy. Co., Toronto, Ont.
Mfg Co., Muskegon, Mich.
Ltd H. W., Toronto, Ont.
& Whitney Co., of Canada, Ltd., Dundas, Ont.
Inc., Frank, Philadelphia, Pa.

**ire, Machine**
Drawn Steel Co., Hamilton, Ont.
Walker Mchy. Co., Toronto, Ont.
Mfg Co., Muskegon, Mich.

**ives, Machine**
& Co., Inc., E. C., Indianapolis, I.
anada Machinery Corp., Galt, Ont.
Canada Saw Co., Montreal, Que.

**url Holders**
att & Whitney Co., of Canada, Ltd., Dundas, Ont.

**cing Leather**
per Belt Lacer Co., Grand Rapids, Mich.
ain Belting Co. of Can., Montreal, Que

**mps, Electric**
ederal Eng'r'ng Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**the Attachments**
anada Machinery Corp., Galt, Ont.
Machine Co., Torrington, Conn.
Machine Co., St. Louis, Mo.
Ltd H. W., Toronto, Ont.

**the Pans, Portable**
anada Machinery Corp., Galt, Ont.

**the Tools**
rmstrong Bros. Tool Co., Chicago, Ill.
an. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
isholt Machine Co., Madison, Wis.
Machine Co., Torrington, Conn.

**thes, Automatic and Semi-Automatic**
Whitworth of Canada, Ltd., Canada
isholt Machine Co., Madison, Wis.
erbert Ltd., Alfred, Toronto, Ont.
& Lamson Machine Co., Springfield, Vt.
cDougall Co., Ltd., R., Galt, Ont.
ational Acme Co., Cleveland, Ohio.
elnie Turret Machine Co., Madison, Wis.

**thes, Bench**
chibald & Co., Chas. P., Montreal, Q.
att & Whitney Co., of Canada, Ltd., Dundas, Ont.

**thes, Boring**
ertram & Son Co., Ltd., The John, Dundas, Ont.
anada Machinery Corp., Galt, Ont.
elnie Turret Machine Co., Madison, Wis.

**thes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)**
Machine Tool Co., Cincinnati, Ohio.
ertram & Son Co., Ltd., The John, Dundas, Ont.
anada Machinery Corp., Galt, Ont.
isholt Machine Co., Madison, Wis.
& Lamson Machine Co., Springfield, Vermont
cDougall Co., Ltd., R., Galt, Ont.
cKenzie Machinery Co., Guelph, Ont.
son & Son, Jos. T., Chicago, Ill.
elnie Turret Machine Co., Madison, Wis.
arner & Swasey Co., Cleveland, Ohio.

**thes, Engine**
rchibald & Co., Chas. P., Montreal, Q.
ertram & Son Co., Ltd., The John, Dundas, Ont.
anada Machinery Corp., Galt, Ont.
ss Machinery & Supply Co., Geo. F., Montreal, Que.
alock-Walker Mchy. Co., Toronto, Ont.
ardinge Bros., Inc., Chicago, Ill.
erbert Ltd., Alfred, Toronto, Ont.
ooley Machine Co., Torrington, Conn.
olly, R. S., Toronto, Ont.
ehmann Machine Co., St. Louis, Mo.
cDougall Co., Ltd., R., Galt, Ont.
inistry of Munitions, London, Eng.
iver Machinery Co., Grand Rapids, Mich.
etrie, Ltd., H. W., Toronto, Ont.
ockford Lathe & Drill Co., Rockford, Ill.
oelefson Machine & Tool Co., Toronto, Ont.
yerson & Son, Jos. T., Chicago, Ill.
idney Machine Tool Co., Sidney, Ohio.
relinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
arbolt Lathe Co., Jackson, Mich.
illiams Machinery & Supply Co., A. R., Montreal, Que.

**thes, Extension and Gap**
ertram & Son Co., Ltd., The John, Dundas, Ont.
anada Machinery Corp., Galt, Ont.
isholt Machine Co., Madison, Wis.
cDougall Co., Ltd., R., Galt, Ont.
iver Machinery Co., Grand Rapids, Mich.

**thes, Heavy Duty Projectile Boring**
ertram & Son Co., Ltd., The John, Dundas, Ont.
lashill Wire Machy. Co., Ltd., Montreal.
Sidney Machine Tool Co., Sidney, Ohio.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio.
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Polishing (See Polishing and Buffing Machines)**
Ford-Smith Machine Co., Hamilton, Ont.

**Lathes, Relieving**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Lathe, Universal Hand**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Lathes, Screw-Cutting**
Jones & Lamson Machine Co., Springfield, Vt.

**Lathe, Speed and Hand**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.

**Lathes, Spinning**
Terry & Co., John C., Birmingham, Eng.

**Lathes, Threading**
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

**Lathes, Vertical Turret**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

**Lathes, Wood Turning**
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Lighting Fixtures**
Northern Electric Co., Montreal, Que
Tallman Brass & Metal Co., Hamilton, Ont.

**Linoleum Mill Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Liquid Air Plants**
L'Air Liquide Society, Toronto, Ont.

**Lockers, Clothes**
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

**Lubricants**
Cateract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Lubricating Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can

**Machinists' Small Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Goodell & Pratt Co., Greenfield, Mass.
Ker & Goodwin Machine Co., Brantford, Ont.
Ministry of Munitions, London, Eng.
National Machine Tool Co., Racine, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Ryerson & Son, Jos. T., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Mandrels, Expanding**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Mandrels, Solid**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Measuring Machines**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Metals, Alloy**
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Ministry of Munitions, London, Eng.
Moore & Son, Thos., Montreal, Que
Pilot Steel & Tool Co., Montreal, Que
Tallman Brass & Metal, Ltd., Hamilton, Ontario.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Metalite Cloth**
Ritchey Supply Co., Toronto, Ont

**Micrometer Calipers**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont

**Milling Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont

**Milling Machines**
Brown & Sharpe Mfg. Co., Providence, R.I

**Milling Machines, Automatic**
Bilton Machine Co., Bridgeport Conn
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng

**Milling Machines, Bench**
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng

**Milling Machines, Hand**
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

**Milling Machines, Horizontal and Planer Type**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal Q
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Milling Machines, Plain**
Bilton Machine Co., Bridgeport, Conn
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng
Toomey Inc., Frank, Philadelphia, Pa.

**Milling Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Milling Machines, Universal**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Mchy. Co., Toronto, Ont
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis
Oliver Machinery Co., Grand Rapids, Mich
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford Ill.
Roelefson Machine & Tool Co., Toronto, Ont
Ryerson & Son, Jos T., Chicago, Ill.
Toomey Inc., Frank, Philadelphia, Pa.
Williams Machinery & Supply Co., A R., Montreal, Que.

**Milling Machines, Vertical**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

**Monel Metal**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Motors, Electric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Moulded Rubber Goods**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Nickel, Bars, Sheets, Wire, Etc.**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Nickel Plating Outfits**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Nickel Silver**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Nitrogen**
L'Air Liquide Society, Toronto, Ont.

**Nut Tappers (See Bolt and Nut Machinery)**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

**Nuts, Finished and Semi-finished**
Galt Machine Screw Co., Galt, Ont.

**Nuts, S.A.E., Plain and Castellated**
Galt Machine Screw Co., Galt, Ont.

**Oil Filtering and Storage Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oil Storage Engineers**
Bowser, S. F., & Co., Ltd. Toronto, Can.

**Oils**
Canadian Oil Companies, Ltd., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Hole Covers**
Can. Winkley Co., Ltd., Windsor, Ont.

**Oils, Soluble**
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Stones**
Carborundum Co., Niagara Falls, N.Y.

**Oxygen**
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

**Oxy-Acetylene Apparatus**
L'Air Liquide Society, Toronto, Ont.

**Packing, Hydraulic**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.
Gutta Percha & Rubber, Toronto, Ont.
International Machinery & Supply Co., Montreal, Que.

**Packing, Rod and Steam**
Quaker City Rubber Co., Philadelphia, Pa.

**Packing, Steam**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.
Gutta Percha & Rubber, Toronto, Ont.
International Machinery & Supply Co., Montreal, Que.

**Paper Mill Conveyors**
Bertrams Ltd., Edinburgh, Scotland.

**Patents**
Fetherstonhaugh & Co., Ottawa, Ont.
Marion & Marion, Montreal, Que.

**Pans, Wet and Dry**
Frost Mfg. Co., Chicago, Ill.

**Pattern-Shop Machinery (See Woodworking Machinery)**
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Patterns, Wood and Metal**
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Wraggis Pattern Works, Galt, Ont.

**Penstocks, Steel**
MacKinnon Steel Co., Sherbrooke, Que.

# BUYERS' DIRECTORY

**Phosphor Tin**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Photographic Duplicating Machines**
Commercial Camera Co., Providence, R.I

**Pipe Bending Machines**
American Pipe Bending Machine Co., Boston, Mass
Underwood Corp., H. B., Philadelphia, Pa
Williams Machinery Co., A. R., Toronto, Ont.

**Pipe Cutting and Threading Machines**
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**
Landis Machine Co., Inc., Waynesboro, Pa.

**Pipe Fitters' Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa.

**Piston-Ring Machines**
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Planers, Parallels**
L. & P. Mfg. Co., Niagara Falls, Ont.

**Planing Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Toomey Inc., Frank, Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

**Planing Machines, Rotary**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Pneumatic Tools**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
International Machinery & Supply Co., Montreal, Que.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng

**Pressed Steel Parts**
Ackworthie, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Streiinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Presses, Drop and Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Foot and Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

**Presses, Forcing**
Atlas Press Co., Kalamazoo, Mich.
Niagara Machine & Tool Works, Buffalo, N.Y.
Stewart & Co., Duncan, Glasgow, Scot.

**Presses, Hydraulic**
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Niagara Machine & Tool Works, Buffalo, N.Y.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

**Presses, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Protractors**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Propellers**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Pulleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal and Fibre**
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Pulp and Paper Mill Equipment**
MacKinnon Steel Co., Sherbrooke, Que.

**Pumps, Automobile Tire**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Pumps, Barrel and Boiler-feed**
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coalant**
Trahern Pump Co., Rockford, Ill.

**Pumps, Geared and Hand**
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

**Pumps, Lubricant and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener
Jardine & Co., A. B., Hespeler, Ont.

**Punches, Power**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Toledo Machine & Tool Co., Toledo, Ohio

**Punching Machines, Horizontal**
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Racks, Cut**
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**
Holden Co., Ltd., Montreal, Que.

**Reamer Holders**
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

**Reamers, Expanding**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Reamers, Solid**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co., Montreal, Que.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Reamers, Taper**
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Taylor Tool Co., J. A. M., Toronto, Ont
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Recorders, Temperature**
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Recorders, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Rheostats**
Northern Electric Co., Montreal, Que.

**Resistance Materials**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Respirators**
Willson Goggles, Inc., Reading, Pa.

**Rivets**
Parmenter & Bulloch Co., Gananoque, Ont.

**Rivet Heaters**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.
Ryerson & Son, Jos. T., Chicago, Ill.

**Riveting Machines**
Bilton Machine Co., Bridgeport, Conn.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**
Stewart & Co., Duncan, Glasgow, Scot.

**Rolls (Rubber Covered)**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rudder Frames, Steel**
Can. Steel Foundries, Montreal, Que.

**Rubber Goods, Mechanical**
Quaker City Rubber Co., Philadelphia, Pa.

**Rules, Steel**
Chesterman & Co., Ltd., J., Sheffield, Eng

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R.I

**Rust Preventatives**
Oakley Chemical Co., New York, N.Y.

**Sand Paper**
Wausau Abrasives Co., Chicago, Ill.

**Sand Equipment**
Can. Link-Belt Co., Toronto, Ont.

**Sand Mills**
Frost Mfg. Co., Chicago, Ill.

**Sand Rammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Saw Frames and Blades, Hack**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Sawing Machines, Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Ryerson & Son, Jos. T., Chicago, Ill.

**Sawing Machines, Power Hack**
Ackworthie, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Saw Sharpening Machines**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saw Tables, Universal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
McKenzie Machinery Co., Guelph, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Hot and Cold**
Atkins & Co., Inc., E. C., Indianapolis, I
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Saws, High Speed Steel**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Metal Band**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saws, Metal, Power**
Clemson Bros., Inc., Hamilton, Ont.

**Saws, Metal Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

**Saws, Milling**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Saws, Screw Slotting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Swing Cut-off**
Oliver Machinery Co., Grand Rapids, Mich.

**Scales**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal, Q.

**Screens**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Screw Driving Machine**
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Screw Extractors**
Cleveland Twist Drill Co., Cleveland, O.

# BUYERS' DIRECTORY

**Bew Machine Work**
...ines Co., Wallace, Bristol, Conn
...k Co., Asa S., Hartford, Conn.
...ional Acme Co., Cleveland, Ohio.
...man Brass & Metal Co., Hamilton, ...nt

**Bew Machinery, Wood and Lag**
... Co., Asa S., Hartford, Conn.

**Bew Machines**
... & Sharpe Mfg. Co., Providence, R.I.

**Bew Machines, Automatic**
... Walker Mchy. Co., Toronto, Ont.
... Ltd., Alfred, Toronto, Ont.
... Acme Co., Cleveland, Ohio.

**Bew Machines, Plain or Hand**
... Machine Tool Co., Cincinnati, Ohio.
... Tap & Die Corp., Galt, Ont.
... Ltd., Alfred, Toronto, Ont.
... & Lamson Machine Co., Springfield, ...mont
... & Whitney Co., of Canada, Ltd., ...das, Ont.
...rer & Swasey Co., Cleveland, Ohio.

**Bew Plates**
...enhead Hardware Ltd., Toronto, Ont.
...enfield & Co., Inc., Rock Island, Que.
...enfield Tap & Die Corp., Galt, Ont.
...dine & Co., A. B., Hespeler, Ont.

**Bews, Cap and Set**
... Machine Screw Co., Galt, Ont.
... Screw & Nut Co., Ltd., John, ...ersoll, Ont.
... Acme Co., Cleveland, Ohio.

**Bews, Machine**
... Co., Wallace, Bristol, Conn.

**Bews, Safety Set**
... Co., Wallace, Bristol, Conn.
... Machine Screw Co., Galt, Ont.
... Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Bond-Hand Machinery**
**(See Searchlight Section)**
... H. W., Toronto, Ont.

**Barators, Moisture and Oil**
... S. F. & Co., Ltd., Toronto, Can.
... Ingersoll Rand Co., Ltd., Sherbrooke, Que.

**Barators, Oil and Waste**
... S. F. & Co., Ltd., Toronto, Can.

**Bfting**
... Foundries & Forgings Co., Welland, Ont
... Drawn Steel Co., Hamilton, Ont.
... Steel Co., Ltd., New Glasgow, N.S.
... & Kompass, Hamilton, Ont.
... Machinery Co., A. R., Toronto, ...nt
... Machinery & Supply Co., A. R., Montreal, Que.

**Bpes, Cold-Drawn Special Steel**
... Steel Co., Hamilton, Ont.

**Bping Machines**
...ada Machinery Corp., Galt, Ont.
... Machinery & Supply Co., Geo. F., Montreal, Que.
... Machine Co., Torrington, Conn.
...erbert Ltd., Alfred, Toronto, Ont.
... R. S., Toronto, Ont.
... Mfg. Co., Muskegon, Mich.
... Dougall Co., Ltd., R., Galt, Ont.
...ensile Machinery Co., Guelph, Ont.
...elefson Machine & Tool Co., Toronto, ...nt
... & Mills Co., Cincinnati, Ohio
... Inc., Frank, Philadelphia, Pa.
... Lathe Co., Jackson, Mich.
... Machinery Co., A. R., Toronto, ...nt

**Bpers, Wood**
... Machinery Co., Grand Rapids, Mich.

**Bars, Hand**
... Blower & Forge Co., Ltd., Kitchener.

**Bars, Power**
... Co., E. W., Brooklyn, N.Y.
... Boggs & Co., Ltd., Hamilton, Ont.
...nada Machinery Corp., Galt, Ont.
... Blower & Forge Co., Ltd., Kitchener.
... Co., Inc., D. H., Buffalo, N.Y.
... & Co., Duncan, Glasgow, Scot.
... Machine & Tool Co., Toledo, Ohio.
... Machinery Co., A. R., Toronto, ...nt

**Baring Machines, Angle, Iron Bar & Gate**
... Ltd., Edinburgh, Scotland

**Bed Metal Working Machinery**
... Co., E. W., Brooklyn, N.Y.
... Boggs & Co., Ltd., Hamilton, Ont.
...arlock-Walker Mchy. Co., Toronto, Ont.
...erbert Ltd., Alfred, Toronto, Ont.
... Co., Inc., D. H., Buffalo, N.Y.
... & Co., John C., Birmingham, Eng
...ndo Machine & Tool Co., Toledo, Ohio.

**Bets, Nickel, Resist, Alloy**
...ternational Nickel Co. of Can., Ltd., Toronto, Ont.

**Bets, Nickel, Monel and Fibre**
...ational State Fibre Co. of Can., Ltd., Toronto, Ont

**Bse Frames, Locomotive**
... Steel Foundries, Montreal, Que.

**Bting Attachments**
... Smith Machine Co., Ltd., Hamilton, Ont
...arney & Trecker Co., Milwaukee, Wis.
...ersmith Mfg. Co., Milwaukee, Wis.
...ations Acme Co., Cleveland, Ohio.

**Slotting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

**Solders**
British Smelting & Refining Co., Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Canada.

**Special Machinery and Tools**
Brown Engineering Corp., Ltd., Toronto.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Spectacles, Industrial**
Willson Goggles, Inc., Reading, Pa.

**Springs**
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

**Sprockets and Chains**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Squares**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Stamping, Metal**
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Elliott & Whitehall Tool Co., Galt, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Stamps, Steel**
Diamond Saw & Stamping Works, Buffalo, N.Y

**Stairways, Wrought Iron**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Steam Specialties**
Crane Ltd., Montreal, Que.

**Steel Plate**
Dom Foundries & Steel, Hamilton, Ont.

**Steels, Tool**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa

**Steel, Cold-Rolled Strip**
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.

**Steel Castings**
Dom Foundries & Steel, Hamilton, Ont

**Steel Forgings**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Steel, Shafting and Free Cutting Screw**
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

**Steel, Sheet**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Illingsworth Steel Co., John, New York City, N.Y.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

**Steel, Tanks**
Can. John Wood Mfg. Co., Toronto, Ont.

**Steel, Stainless**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steels, Alloy, Open Hearth and Electric**
United Alloy Steel Corp., Canton, Ohio.

**Steels, Alloy and Carbon**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q
Illingsworth Steel Co., John, New York City, N.Y.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steels, High-Speed**
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q
Illingsworth Steel Co., John, New York City, N.Y.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel, Magnet**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel, Structural**
MacKinnon Steel Co., Sherbrooke, Que.

**Steel Tubing, Close Joint and Welded**
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

**Stern Frames, Cast Steel**
Can. Steel Foundries, Montreal, Que.

**Stools, Shop**
Ministry of Munitions, London, Eng

**Straightening Machinery**
Bertrams Ltd., Edinburgh, Scotland
Ryerson & Son, Jos. T., Chicago, Ill.

**Studs**
Galt Machine Screw Co., Galt, Ont.

**Surface Plates**
Bilton Machine Co., Bridgeport, Conn.

**Swaging Machines**
Atkins & Co., Inc., E. C., Indianapolis, I

**Switches, Railway**
Can. Steel Foundries, Montreal, Que.

**Switches and Switchboards**
Northern Electric Co., Montreal, Que.

**Tablets, Bronze, Memorial**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Tachometers**
Aikenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

**Tanks, Steel**
MacKinnon Steel Co., Sherbrooke, Que
Can. John Wood Mfg. Co., Ltd., Toronto, Ont.

**Tanks and Pumps, Oil**
Bowser, S. F. & Co., Ltd., Toronto, Can
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

**Taper Cutting Dies**
Jones & Lamson Machine Co., Springfield, Vt.

**Tap Holders**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taper Pins**
Galt Machine Screw Co., Galt, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Tapes, Measuring**
Chesterman & Co., Ltd., J., Sheffield, Eng
Starrett Co., L. S., Athol, Mass

**Tapping Machines and Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass

**Taps and Dies**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
International Machinery & Supply Co., Montreal, Que
Jardine & Co., A. B., Hespeler, Ont
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Taylor Tool Co., J. A. M., Toronto, Ont

**Taps, Collapsing**
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio
Victor Tool Co., Waynesboro, Pa

**Teeth, Dredge Bucket**
Kennedy & Sons, Wm., Owen Sound, Ont

**Testing Metals and Materials**
Toronto Testing Laboratory, Toronto, Ont.

**Thermometers**
Bristol Co., Waterbury, Conn.

**Thread-Cutting Tools**
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vermont
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

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**Threading Machines**
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Murchey Machine & Tool Co., Detroit, Mich.
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National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Thread Lead Testing Machines**
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Thread-Rolling Machines**
Bliss Co., E. W., Brooklyn, N.Y.

**Tongs**
Hepburn Ltd., John T., Toronto, Ont.

**Tool Cases**
Rice Lewis & Son, Ltd., Toronto, Ont.

**Tool Holders**
Armstrong Bros. Tool Co., Chicago, Ill.
Bilton Machine Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Markers, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Tool Posts, Lathe**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Steels for all Purposes**
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Vanadium Alloys Steel, Latrobe, Pa.

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Wright Mfg. Co., Lisbon, Ohio.

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National Steel Car Corp., Ltd., Hamilton, Ont.

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National Electro Products, Toronto, Ont.
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Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Canada, Ltd., Toronto, Ont.
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Union Carbide Co. of Can., Welland, Ont.

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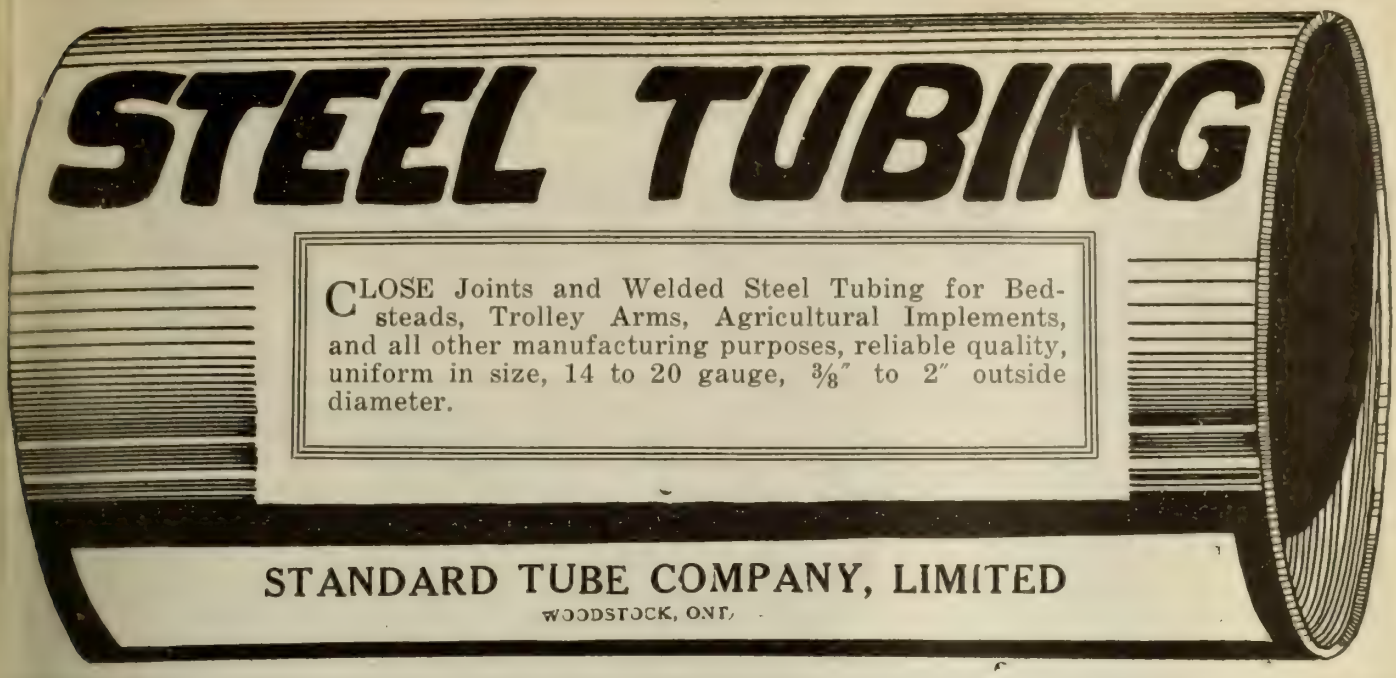
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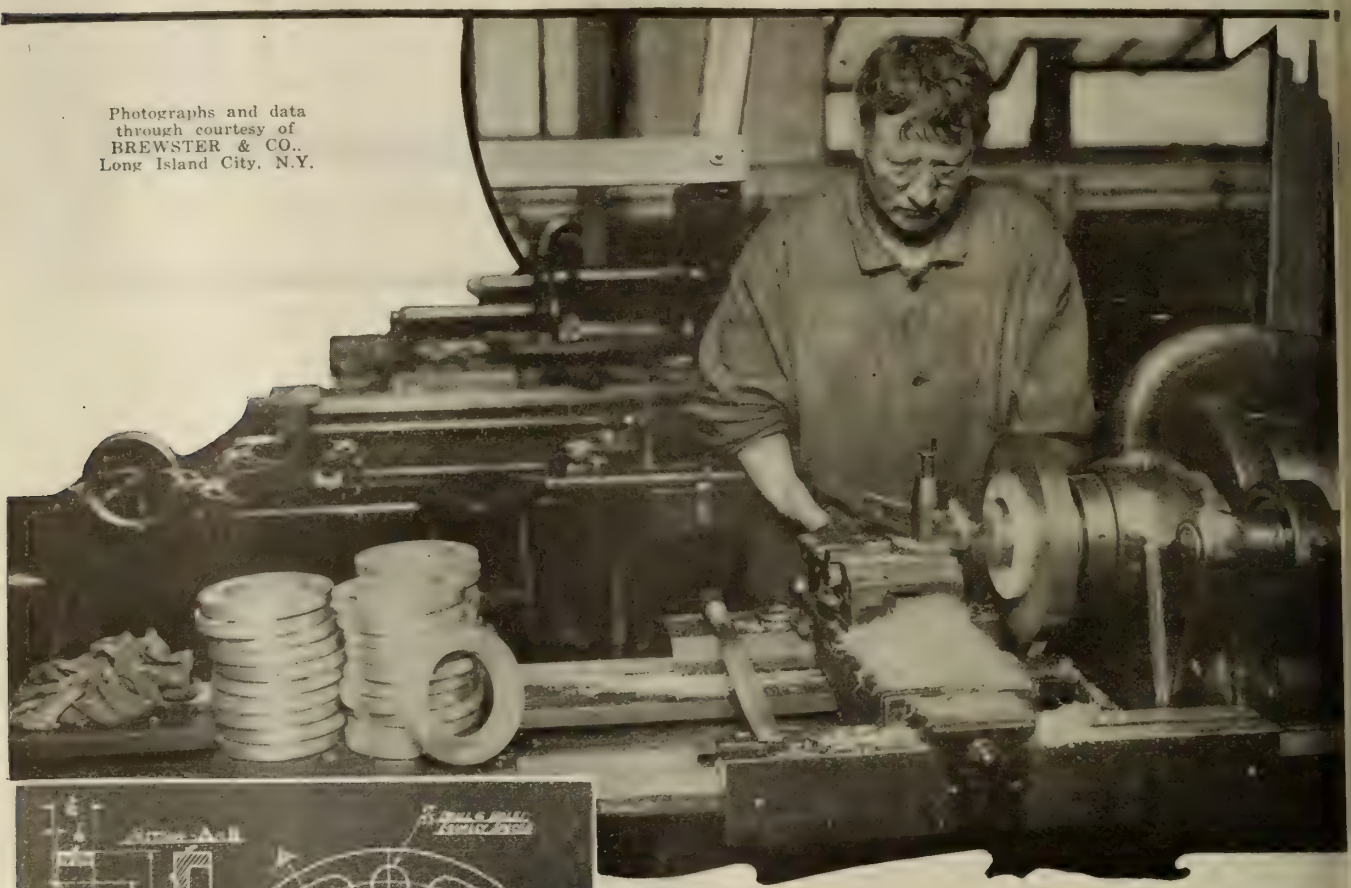
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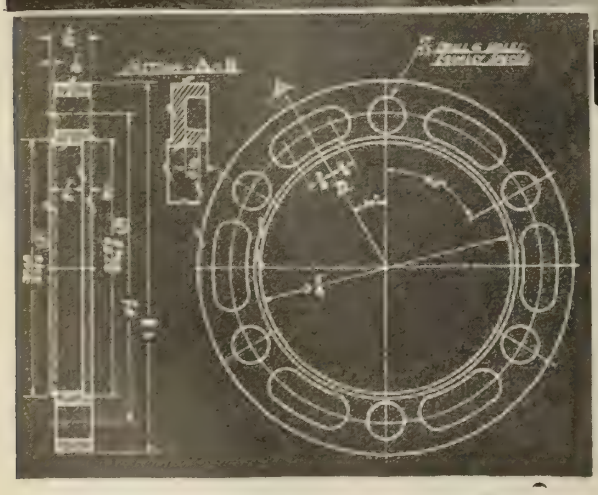

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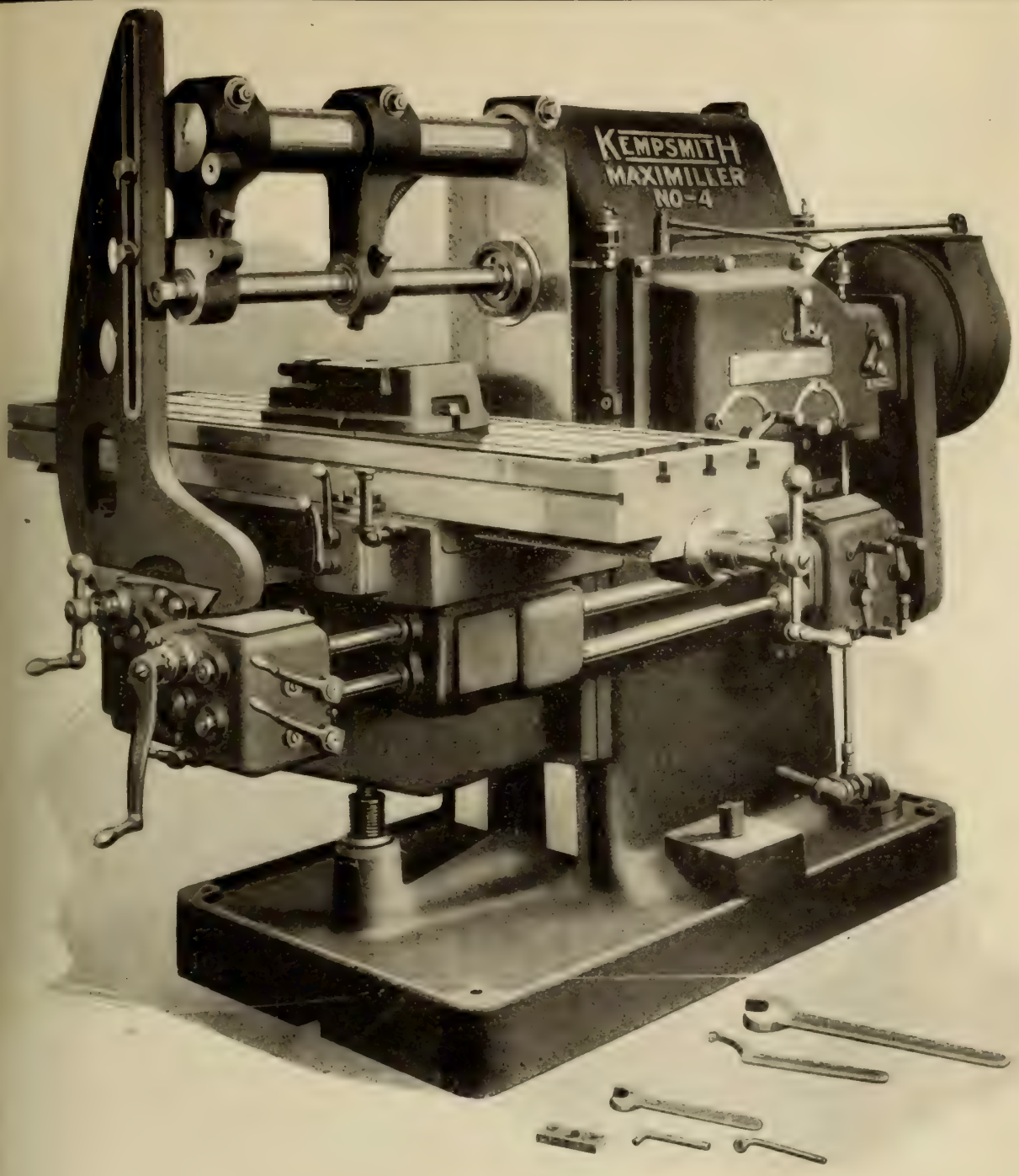
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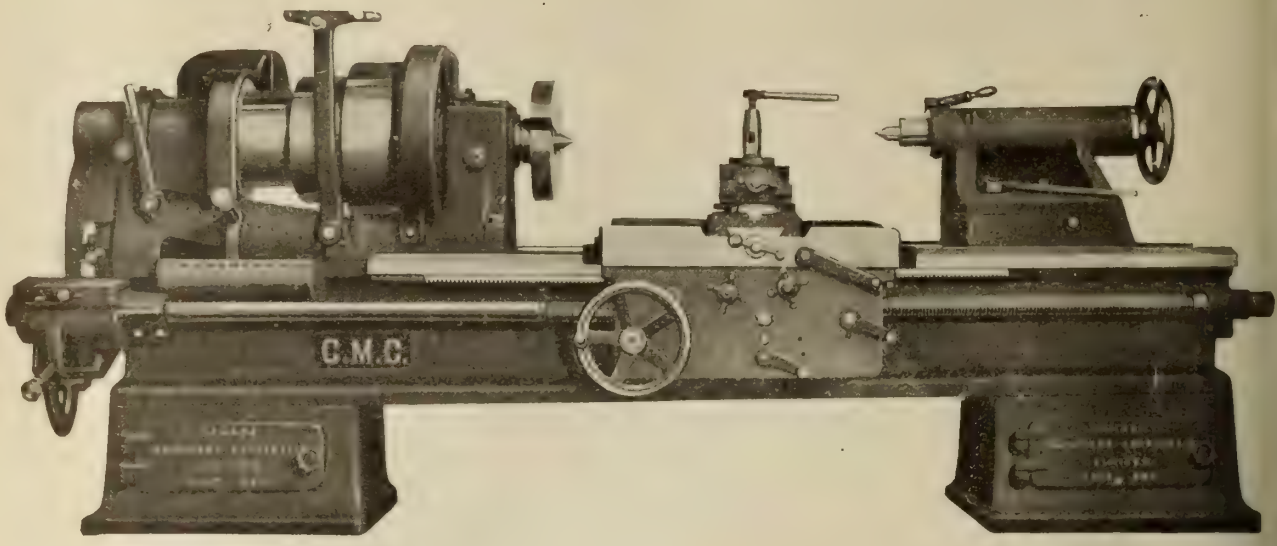
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Notice the extra wide cones on the headstock. Wide cones mean more power and more power means greater production and larger profits. The special belt shifter placed on the headstock in front of the cones prevents any danger of injury to the operator when changing belts from one step to another, this shifter being fitted with a self-locking pin which centers the belt over each cone as desired. A corresponding shifter on the countershaft completes this safety first attachment.

*FURTHER PARTICULARS AND PRICES ON REQUEST.*

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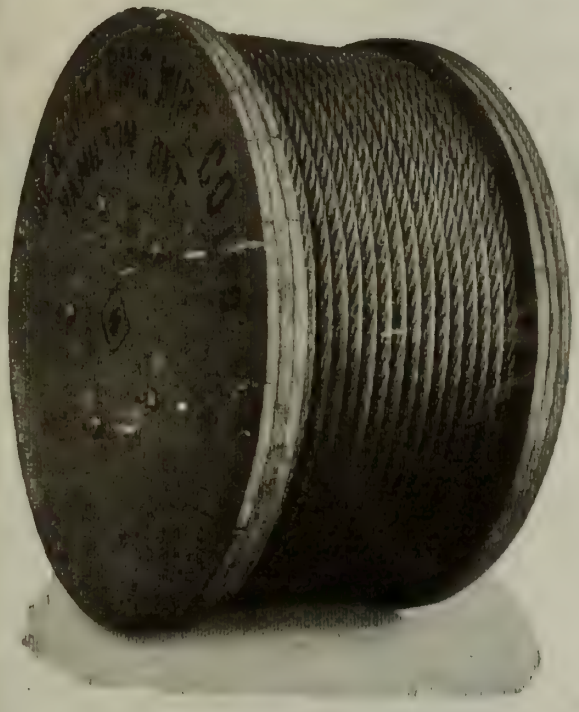
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# CANADIAN MACHINERY AND MANUFACTURING NEWS

Vol. XXV., No. 6 | Published by the MacLean Publishing Company, Limited, Toronto | February 10, 1921 | $4.00 a Year Subscription Price


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The eccentrically relieved blades are stronger than others, do not chatter, and produce a smoother hole. The hand, shell and fluted chucking reamers have interchangeable nuts, screws and wrenches. The bottom of a hole can readily be faced.

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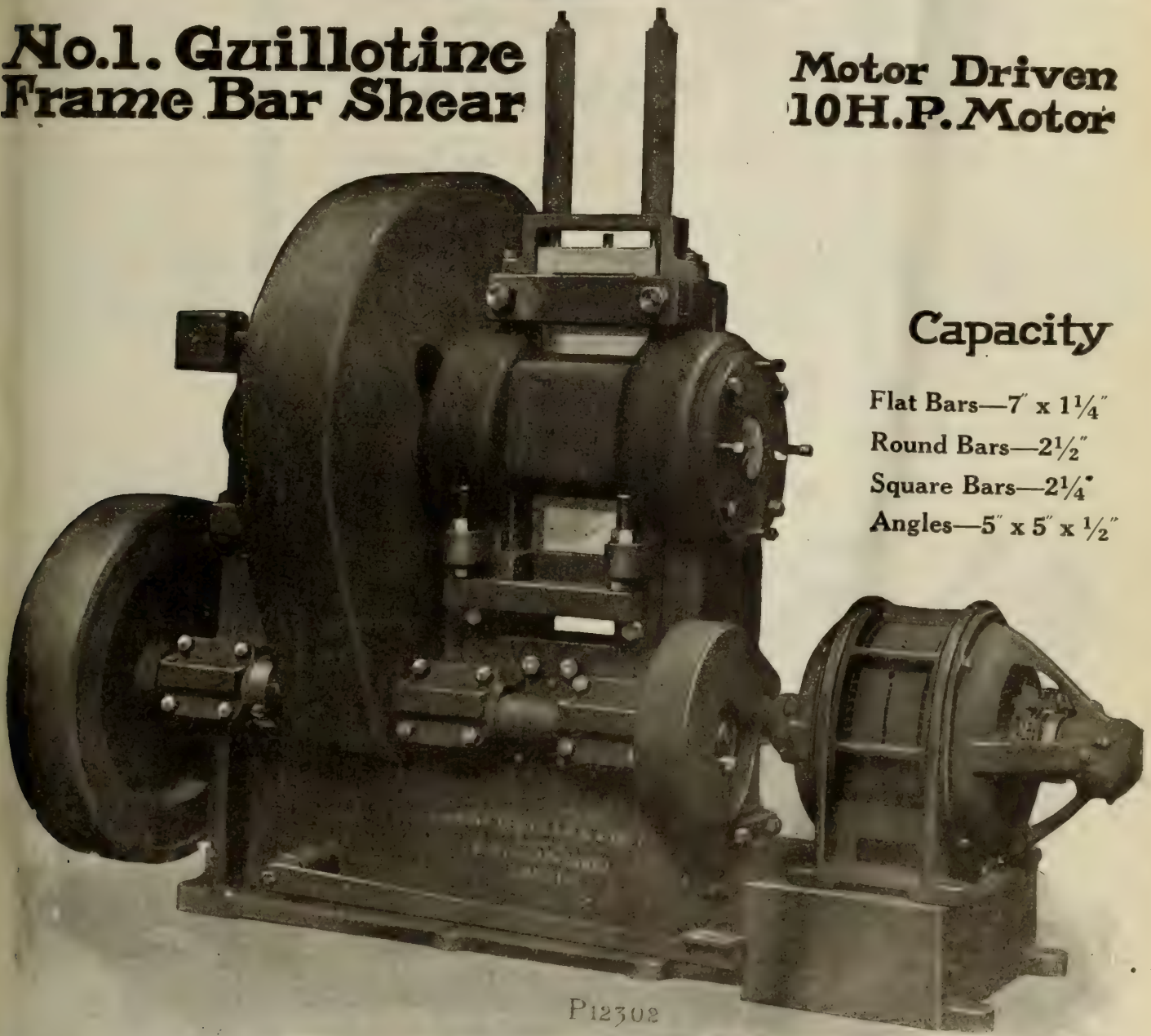
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# The BERTRAM Page

## MACHINE TOOLS

**No. 1. Guillotine Frame Bar Shear**

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**Capacity**

Flat Bars—7″ x 1¼″
Round Bars—2½″
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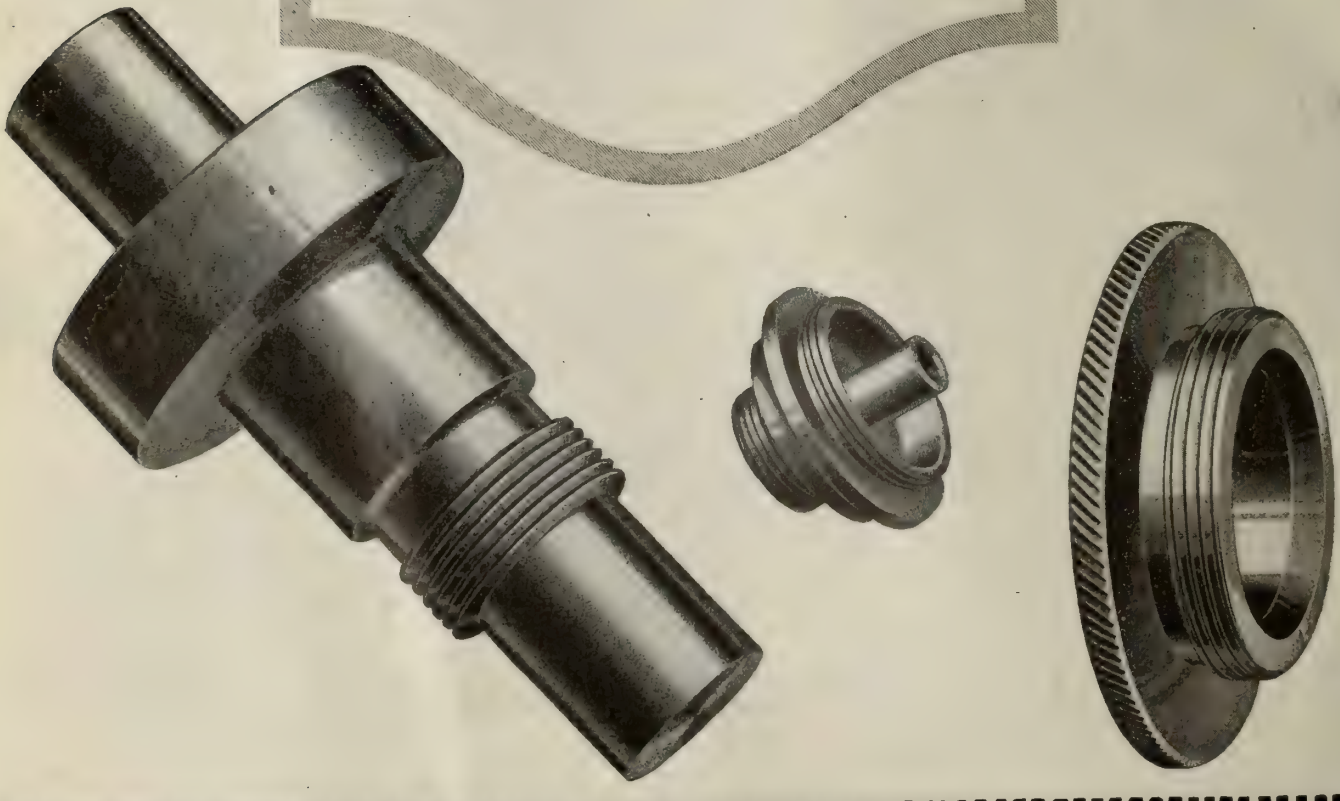
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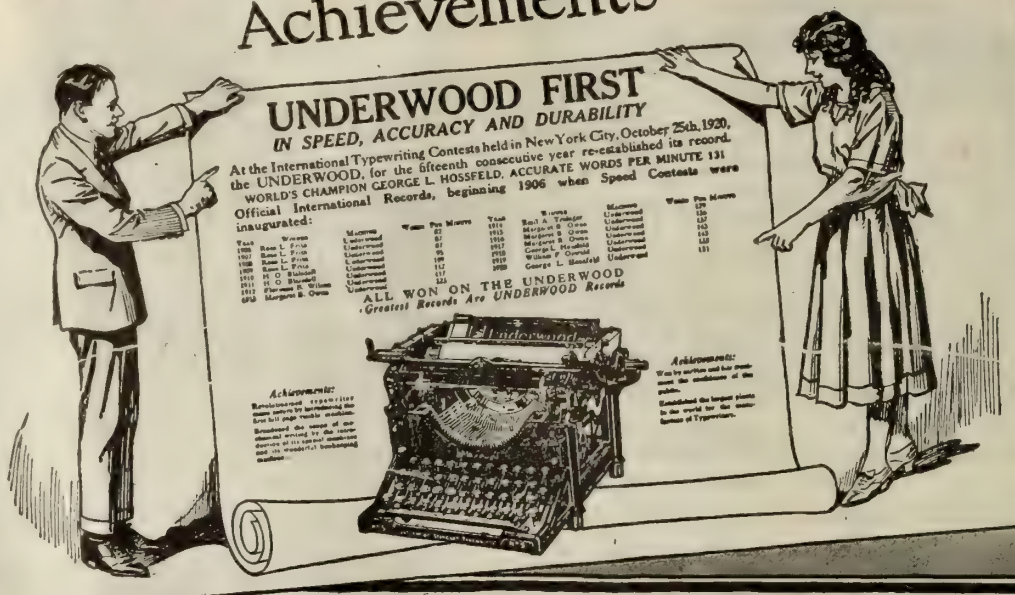
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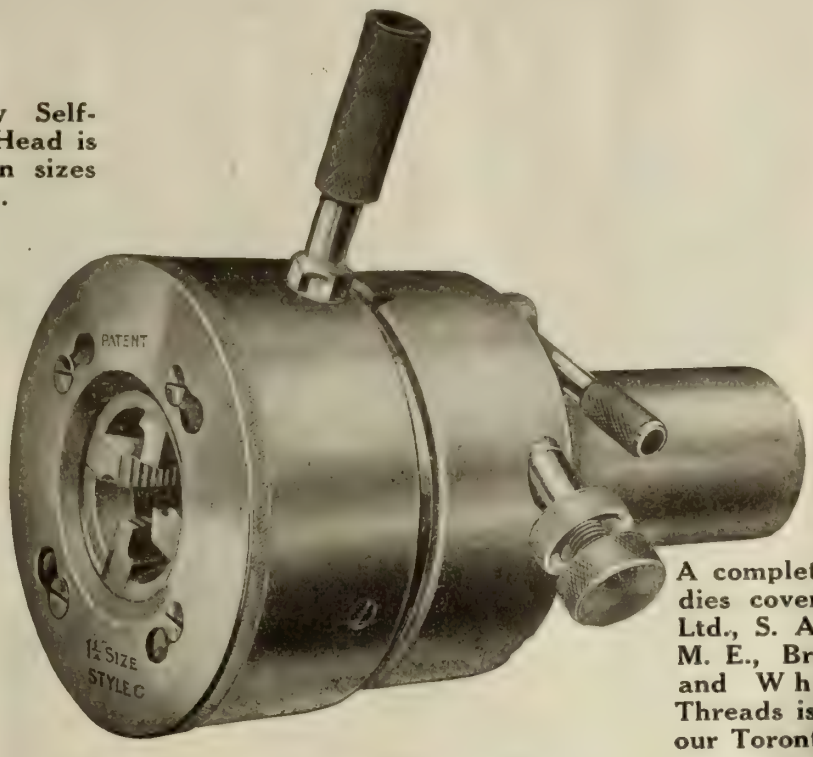
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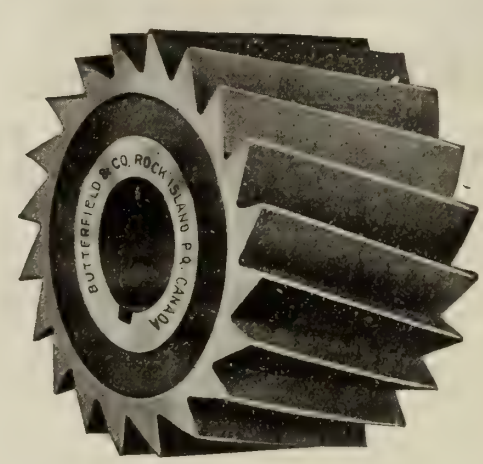
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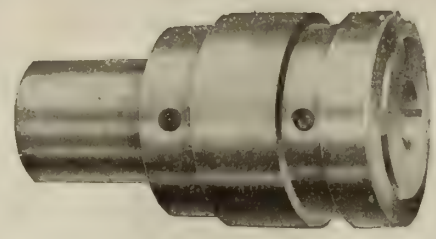
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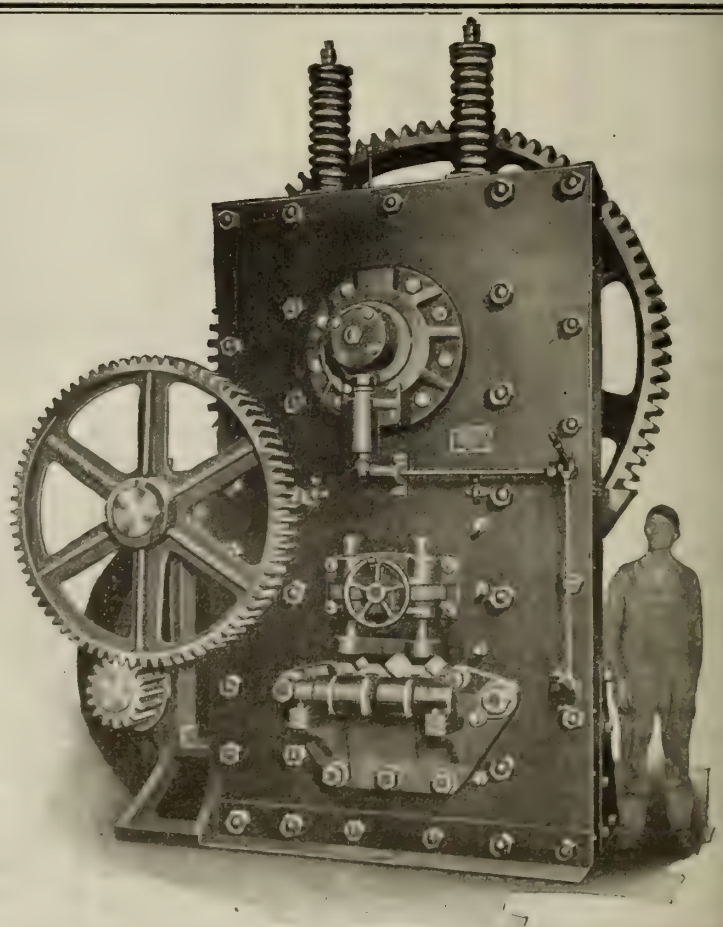
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**Any Thickness** **Any Lengths**

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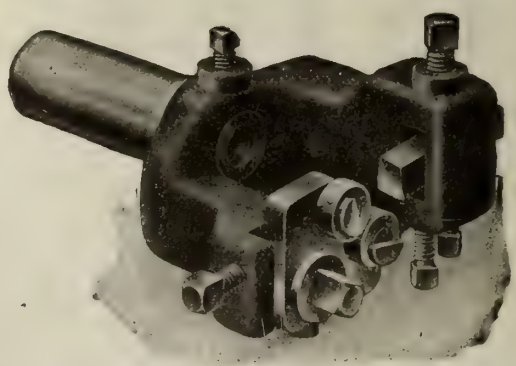
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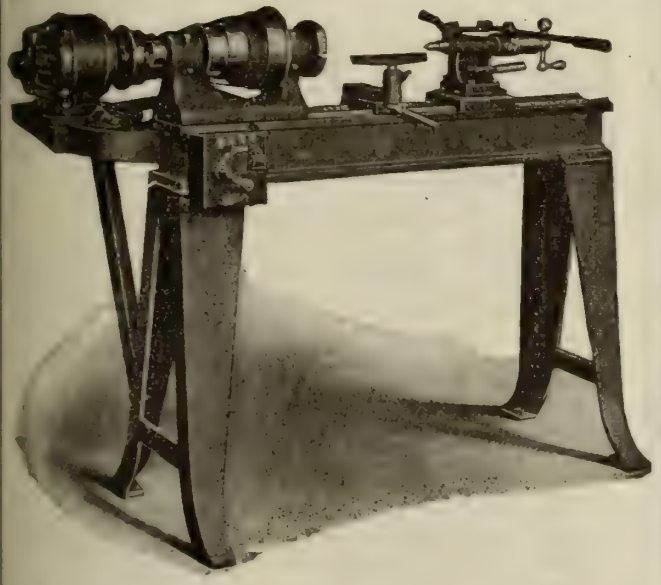
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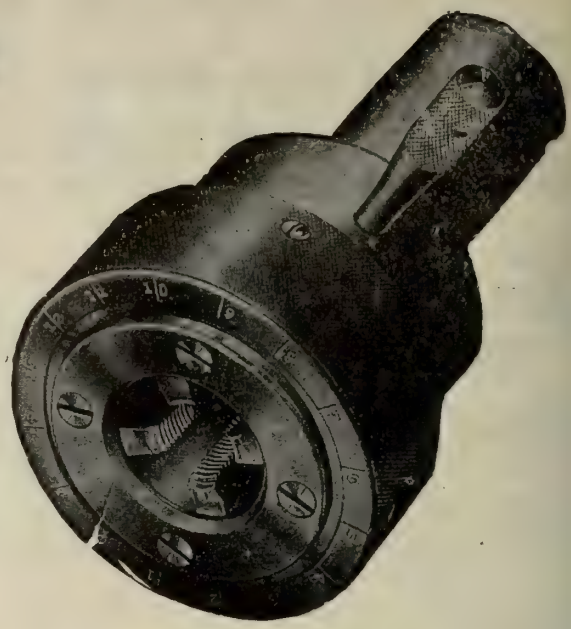
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American Drill Grinder For Wet or Dry Drill Grinding 1/8" to 2¼". Also 1/8" to 3½" dia.

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Canadian orders for Perfectype Special Type "A" Cutwelding Torches with 90 degree cutting head and 2 cutting tips, standard angle welding head and 5 welding tips of pure red copper will be delivered, duty and postage prepaid, from nearest jobber at the special price of $65.00.

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Time is expensive when a machine is standing idle, waiting for repairs.



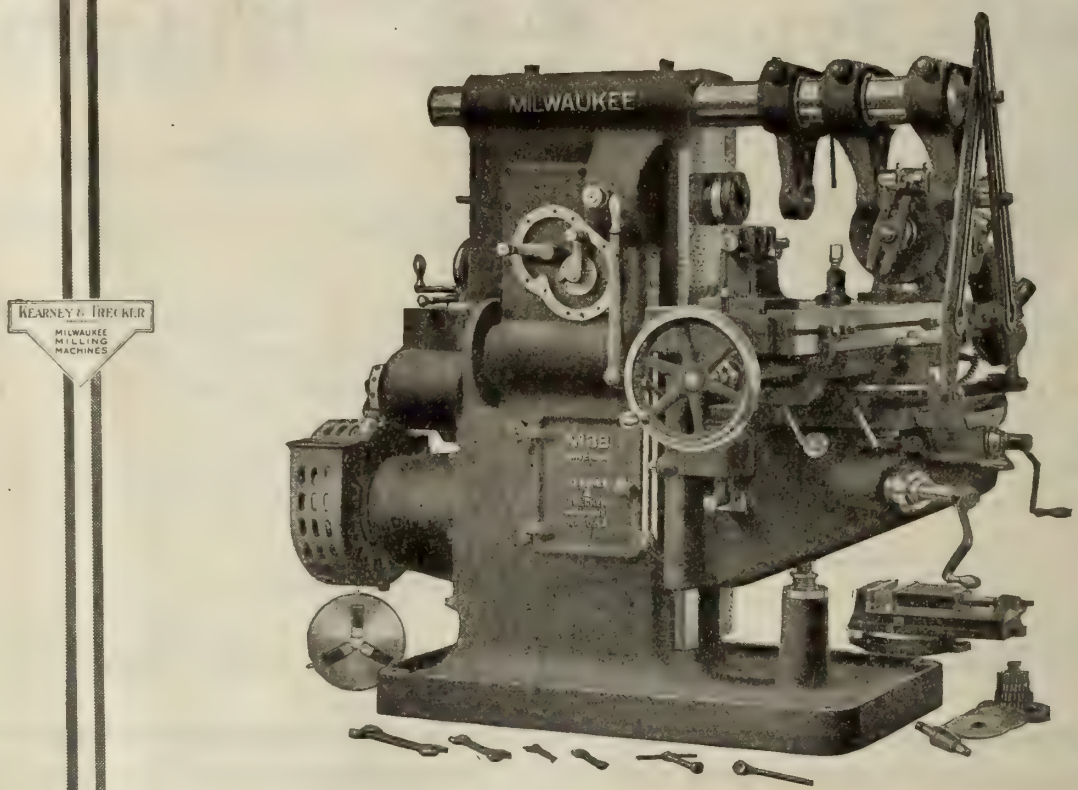
On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

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**Distinctive Tool-Room Milling Machines**

IT is the correctness of design and construction that makes Milwaukee Universal Milling Machines the efficient tools that they are. These machines are built to the closest limits and only the most advanced methods of precision are employed by expert craftsmen in their manufacture.

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# Robertson Process Metal

## *For Permanent Replacement*

*Permanent roofs at minimum cost! Siding that lasts for years!* That's what you get in Robertson Process Metal. The illustrated sample shows *why*. A specially annealed steel core is covered with (a) Asphalt (b) Asbestos (c) Waterproofing. The inherent qualities of these protective coatings insure a long life of usefulness.

Robertson Process Metal assures quick replacement of old, worn-out roofs and siding. It can be erected speedily and economically. The work can be accomplished without interruption to plant operation. It is unaffected by salt sea air, moisture or strong acid and alkaline fumes. It makes frequent painting an unnecessary expense. It saves on *first cost* and *maintenance cost*.

If your factory roofs need replacement, use Robertson Process Metal for permanence and economy. For the same reasons, use it for other building purposes. A sample like that shown will be sent you upon request, together with interesting literature. Write for them. You incur no obligation.

H. H. ROBERTSON COMPANY, Limited, Sarnia, Ontario
*General Sales Office:* Drummond Building, Montreal
*Branch Office:* Kent Building, Toronto

*Agencies:* Canadian Asbestos Company, Montreal and Toronto; Jamieson Engineering Company, Ltd., London Building, Vancouver; R. Y. Kilvert & Company, Builders Exchange Building, Winnipeg; Gandy & Allison, No. 3 North Wharf, St. John, N. B.; General Sales & Engineering Company, Metropole Building, Halifax, N. S.

# ROBERTSON PROCESS

TRADE MARK REG. U. S. PAT. OFF.

## METAL FOR ROOFING AND SIDING

*If interested tear out this page and place with letters to be answered*



*Showing installation of Skinner Bros. (Baetz Patent) Heaters in foundry of Best Foundry Co., Bedford, Ohio. Note extensive area served.*



# Heat Your Plant at least cost

The Skinner Bros. (Baetz Patent) Heating System provides a constant and uniform distribution of heat, at less cost than any known system now in use.

As no distribution pipes or ducts are required, installation cost is 15 to 50% less than any other system. Power consumption is only 20% of the capacity of power units supplied with the average installation. Maintenance costs are lower because of the compactness and centralized design of the heating coil. No special foundation required other than provided by ordinary floor construction. Requires less floor space than any known system, and is easily installed by common labor. Is portable in the fullest sense of the word and can therefore be easily relocated in any part of the plant.

The Baetz principle follows natural laws in every case and is therefore positive and simple in its heating. Read the brief description at the left, under the heading "Mechanical Features."

## *Mechanical Features*

The Skinner Bros. (Baetz Patent) Heating System consists essentially of a large steam pipe coil compactly mounted above a centrifugal fan-wheel, both housed as a single unit within a heavy structural and sheet-steel casing.

Either exhaust or live steam (of high or low pressure) is conducted through the coil, and the cool air near the floor level, or from the outside, is exhausted by the fan and impelled around and through the various coil sections. The air, after thus being warmed, is discharged at low velocity through the outlet hood into the open building space. No galvanized iron ducts or pipes are used for air distribution, and as the air is not discharged under high pressure, it does not disturb floor dust nor create uncomfortable drafts.

The warm air is not confined to a zone immediately surrounding the heaters, but the heat penetrates to the furthest corners of the open area and maintains an even, comfortable average temperature at all points.

Made in six styles and sizes. Where no steam plant is available, we supply our direct-fired type DF, in two styles and sizes.

Operated by any power available — motor, either belted or direct, engine or line shafting.

## *Sold Under Positive Guarantee*

Send for pamphlet No. 50, describing various uses, and for No. 80, giving list of installations. If possible, send blue print or pencil dimension sketch of building to be heated and state steam pressure available to enable our Engineering Department to quote on the proper size required.

**Skinner Bros. Mfg. Co., Inc.**

1438 S. Vandeventer Ave., St. Louis, Mo.

Minneapolis, Minn. Buffalo, N.Y.
Detroit, Scherer Bldg. New York, Flatiron Bldg.

Skinner Brothers Mfg. Co., 1438 S. Vandeventer Avenue, St. Louis, Mo.

Please send us your illustrated booklet and full particulars on Skinner Bros. Heating Systems.

Firm.....

Address.....

Attention Mr.....

Can you use steam?.....

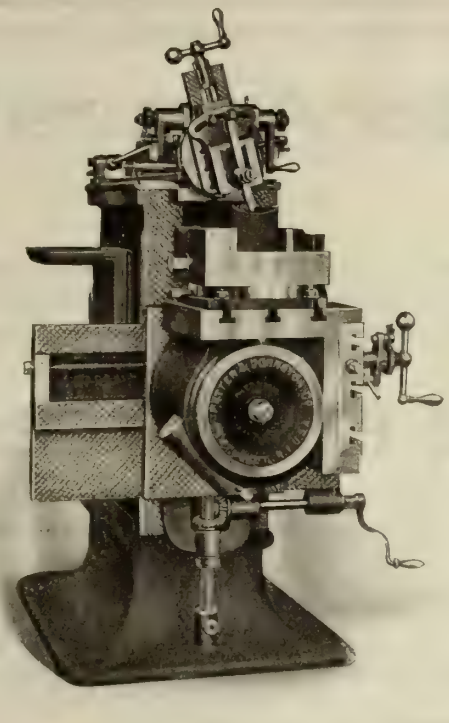
For what purpose building used—

.....

# SKINNER BROS.

## BAETZ PATENT. HEATING SYSTEM

# UNIVERSAL SHAPING MACHINES



**15" Type**

Swivel table with auxiliary tilting side.

Power down feed on any angle.

Automatic feed stop.

Graduated collars on tool head feed screw and table feed screw.

Swivel vise with graduated base.

**24" Type**

Swivel table with auxiliary tilting side.

Power down feed on any angle.

Automatic feed stop.

Graduated collars on tool head feed screw and table feed screw.

Swivel vise with graduated base.

Swivel table raised and lowered by power.

No special vises or fixtures needed; the Universal features of these machines take care of everything, making them particularly adapted to:—

**Die Work**
**Tool Making and**
**General Manufacturing**

*Canadian Offices:* POTTER & JOHNSTON MACHINE CO.

## ROELOFSON MACHINE & TOOL CO., LIMITED

*Head Office and Show Rooms:*
*11 Wellington Street East,* TORONTO, CANADA

# HANNA

IRON ORE - PIG IRON

*Sales Agents:*

Cleveland Cincinnati Pittsburgh Toronto Buffalo Detroit

# Heat Under Accurate Control

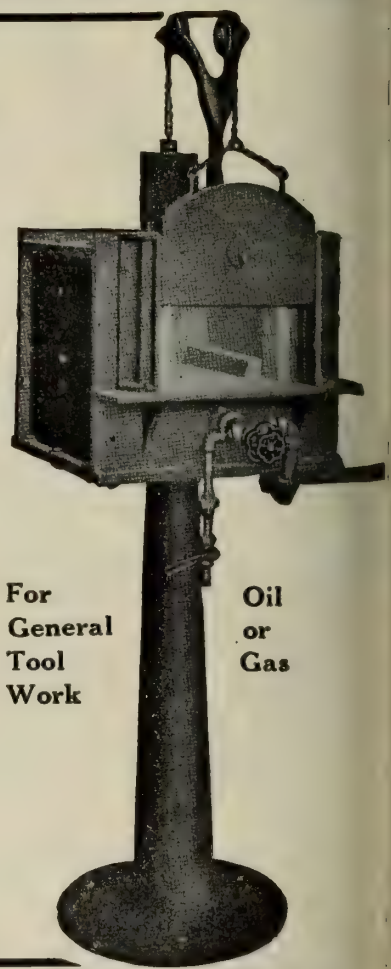
Here is an important factor in the heat treatment of metals. An intense heat, rapidly developed, and always under accurate control of the operator, is a feature that distinguishes

## BELLEVUE FURNACES

These tool forges are particularly adapted for the requirements of the small machine shop for annealing and tempering dies, cutters, reamers, etc.

Combustion is perfect and no flames come in contact with material. Built to stand the highest temperature. Doors are properly counterbalanced. In every way BELLEVUE FURNACES meet with the demand for durability, efficiency and convenience.

**Let us advise you about your heat-treating problems**



**For General Tool Work**

**Oil or Gas**

## Bellevue Industrial Furnace Company

**Julius C. Hinz, President**

**703 Bellevue Ave. - Detroit, Mich.**

***Representative in Canada: H. W. PETRIE, LIMITED, Toronto, Canada***



# STEEL PLATE CONSTRUCTION

**Oil Storage, Gasoline Tanks, Air Receivers, Pneumatic Water Supply Tanks, Smoke Stacks, Boiler Breeching, Riveted Steel Pipe, Bins and Hoppers.**

**THE**

# TORONTO IRON WORKS

**LIMITED**

***HEAD OFFICE: ROYAL BANK BLDG.***

**TORONTO**

***WORKS: CHERRY STREET***

# SIMONDS
## HACK SAWS

HIGHEST QUALITY STEEL—FOR MACHINE
OR HAND USE—BEND BUT DO NOT BREAK

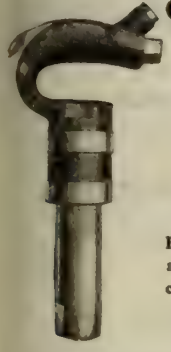
**SIMONDS CANADA SAW CO. LIMITED**
ST. JOHN, N.B. MONTREAL, QUE. VANCOUVER, B.C.

# Cleveland Sand Rammers
## FOR FLOOR, BENCH, PEIN AND FLASK RAMMING

Cleveland Sand Rammers are made in several sizes and weights, and are adapted for all kinds of Foundry Ramming.

The Piston Rods are packed with a resilient packing which prevents any dirt from entering piston chamber and working parts—They are fitted with either Round or Flat Rod as required. Cleveland Rammers are light in weight, have high speed and practically no vibration, making them ideal foundry tools.





## CLEVELAND CHIPPING HAMMERS

For Foundry Work. Are furnished in any required size or weight for grey iron or steel castings; they have high speed, and are adapted for fast chipping now required by piece-workers.

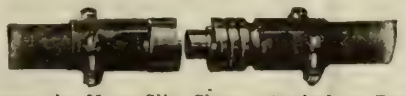


## CLECO PRESSURE-SEATED AIR VALVES AND BOWES AIR HOSE COUPLINGS

**Are Standard Equipment Everywhere**

***Both Valves and Couplings are pressure tight.***

**Bowes Couplings are instantly connected or disconnected.**



**Bowes Couplings are absolutely air tight under all pressures.**

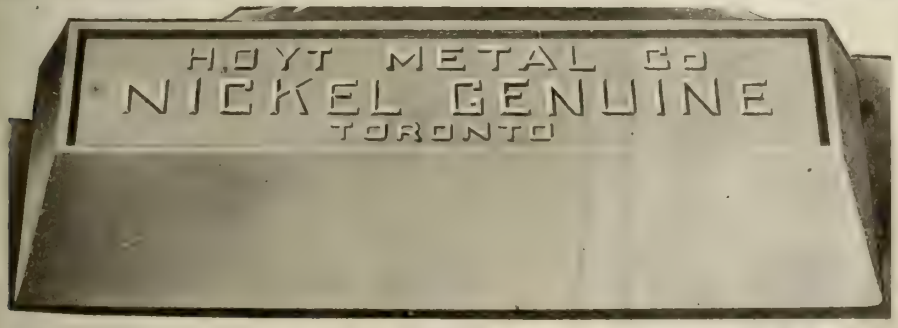
Above cut shows the Never-Slip Clamp attached to Bowes Coupling.

IN STOCK:—RIVETING HAMMERS, DRILLS, REAMING, TAPPING AND FLUE-ROLLING MACHINES, CORNER DRILLS, PORTABLE AND BENCH GRINDERS, PRESSURE-SEATED AIR VALVES, ETC.

**Write for Bulletins 43-44-46 and**

***ADDRESS ALL INQUIRIES TO:***

**CLEVELAND PNEUMATIC TOOL CO. OF CANADA, LIMITED**
84 CHESTNUT STREET, TORONTO, ONT. 337 CRAIG ST. W., MONTREAL, QUE.




Hoyt's Nickel Genuine Babbitt For the Severest Duties And Highest Speeds

**HOYT METAL COMPANY**
MONTREAL TORONTO WINNIPEG

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# Dunbar

## Springs *for* Every Use

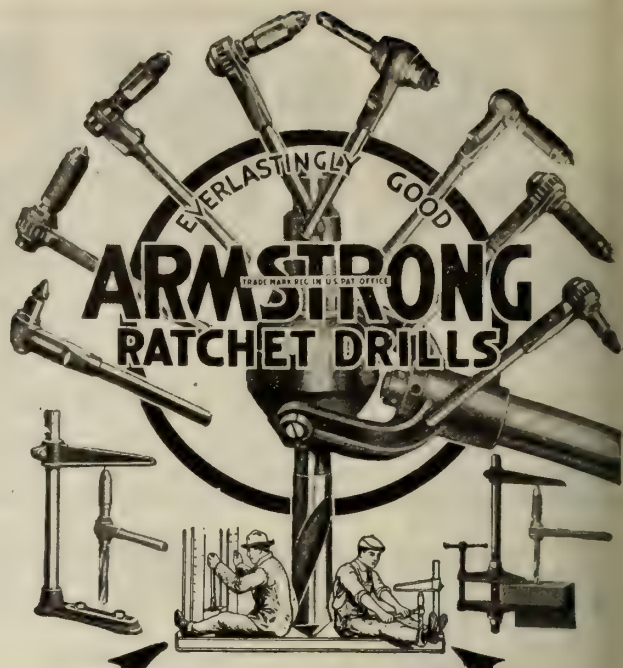
We have been making springs of all kinds for 70 years. Let us advise you when in difficulty.



Tell us the purpose for which the spring is intended, and experts will gladly co-operate to see that you get the design best suited to the purpose.

Dunbar Springs are thoroughly tested for accuracy and quality. Send us specifications, for estimates.

**THE DUNBAR BROS. CO.**
BRISTOL, CONN.




## BEST BECAUSE
## ALL STEEL HARDENED

Spindle, Nut and Screw made of Bar Steel. Body drop-forged. Long lasting under hardest use.
Write for free catalogue.

**Armstrong Bros. Tool Co.**
"The Tool Holder People"
335 N. Francisco Ave., Chicago, U. S. A.

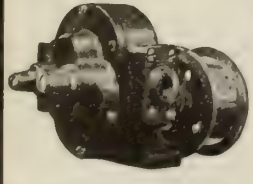
REG. TRADE MARK
# TRAHERN
REG. U.S. PAT. OFF.

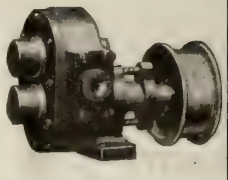
## ROTARY GEARED PUMPS

You can't beat the ROTARY GEARED Pump for supplying cutting compound to Machine Tools. The Rotary Geared construction is correct—and that is half the battle.

Any capacity up to 16½ G.P.M. Low speed, insuring long life. Smooth, forceful stream free from pulsation. Operate in either direction. Supply may be shut off without stopping pump. Will operate against 100 lbs. pressure and will not lose prime.

**TRAHERN PUMP DIVISION**
*Geo. D. Roper Corporation*
ROCKFORD, ILL.
U.S.A.







## Increased Output
and
## Lower Operating Costs

follow the use of

**P.H. and IMPERIAL FILES.**

P H

IMPERIAL

*"They Cut Faster and Wear Longer."*

**Be File-Wise.**

INGERSOLL FILE COMPANY, LIMITED.

John Morrow Screw and Nut Company Limited,
Sole Distributors,
Ingersoll, Ontario.

**INGERSOLL**


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# STEEL CASTINGS

We shall be glad to supply, in addition to our General Catalogue, literature on

Steel Castings — Lithographed Ware
Galvanizing — Enamelled Signs
Wire Goods
Stoves

Made by the Acid Electric process up to fifteen tons. Castings made by this process are free from blow holes, easy to machine, and superior in every way to ordinary Steel Castings.

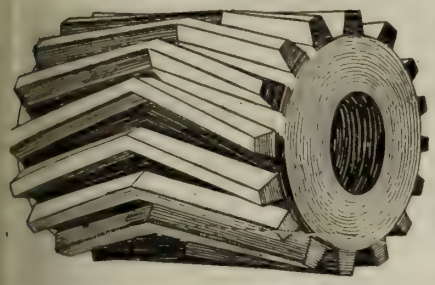
Castings supplied for shipbuilding, cars, locomotives, all classes of machinery, etc.

The Thos Davidson Mfg Co Limited

Head Office: Montreal.

Branches: Toronto and Winnipeg

Steel Foundry Division: Lachine Canal, Turcot.



DAVIDSON'S STEEL CASTINGS MADE IN CANADA SEAL OF DURABILITY

# DAVIDSON

# STEEL CASTINGS

QUICK DELIVERIES

**High Carbon Steel**
**Manganese Steel**
**Chrome Steel**
**Mild Steel**

QUALITY GUARANTEED

Sizes—½ lb. to 5,000 lbs. each

**THE WILLIAM KENNEDY & SONS,**
*LIMITED*
OWEN SOUND, ONTARIO
ESTABLISHED 1860

SKINNER CHUCKS

## Built For Production Not For Price



The Skinner Geared Pattern Drill Chuck has no superiors and few, if any, equals. It is as accurate as it is convenient. The gears being enclosed beneath the surface, there is no danger of pinched fingers.

Made of steel throughout, this chuck is operated by hand, the final grip being secured by a mere turn of the wrench.

THE SKINNER CHUCK COMPANY
NEW BRITAIN, CONN U S A
ESTABLISHED 1887
NEW YORK OFFICE: 94 READE ST.
SAN FRANCISCO OFFICE: RIALTO BLDG.
LONDON OFFICE: 139 QUEEN VICTORIA ST., LONDON, E.C.4.

DORMER BRAND



*Manufacturers:*

## The Sheffield Twist Drill & Steel Co., Ltd.

Works: Summerfield Street, Sheffield.

To **PROMOTE TRADE** within the **EMPIRE, CANADIAN MANUFACTURERS** will find that **"DORMER BRAND DRILLS"** meet all requirements. **QUALITY DRILLS** for quick drilling—USE **"DORMER."**

Sheffield Engineering Supplies, Limited,
230, Craig Street West,
Montreal, Canada.

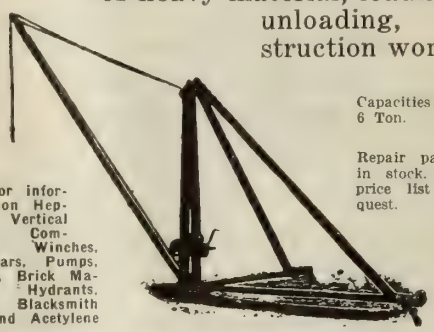
## *High Twist* DORMER BRAND *Speed Drills*


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*Stop Production-halts with a*

# HEPBURN SCOTCH DERRICK

Every time your men stop from their regular work to give somebody a lift, valuable time is lost. You can prevent these losses by adding a **Hepburn Scotch Derrick** to your equipment. It will prove invaluable for the handling of heavy material, loading and unloading, construction work, etc.



Capacities ½ Ton to 6 Ton.

Repair parts always in stock. Standard price list upon request.

Write for information on Hepburn Vertical Engines, Compressors, Winches, Cut Gears, Pumps, Derricks, Brick Machinery, Hydrants, Valves, Blacksmith Work and Acetylene Welding.

**JOHN T. HEPBURN, LIMITED**

*Engineers and Iron Founders*

18-60 VAN HORNE STREET, TORONTO, ONTARIO

**A Safe Place for Everything on**

**DENNISTEEL**

*Made in Canada*

**Steel Shelving**

This floor-space saving, fire-proof equipment is a genuine labor saver. It means less steps for your men—more time for production.

We also make

Steel Lockers, Steel Cabinets, Steel Bins, Steel Safes, Steel Chairs and Stools, Steel Lavatory Compartments, etc.

Ornamental Iron and Bronze. Commercial Wirework of all kinds. General Builders' Ironwork.

Write for folders.

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THE DENNIS WIRE AND IRON WORKS CO. LIMITED

LONDON

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DENNISTEEL *Made in Canada*

# DUNCAN STEWART & CO., LIMITED

**LONDON ROAD IRON WORKS, GLASGOW**

***Established 1864***

## STEELWORKS PLANT

**and**

## HYDRAULIC MACHINERY

Patent Rolling Mills, All types and sizes.

Bloom, Slab, Billet and Plate Shears, Steam Hydraulic and Electrically Driven.

Hot Saws.

Ingot Stripping Cranes.

Steam Hammers.

Tube Drawbenches.

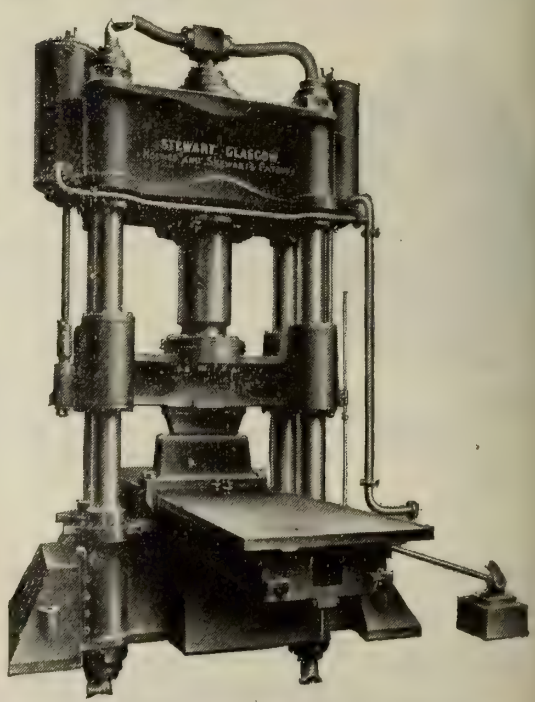
Patent High Speed Steam Hydraulic Forging Presses, 150 to 12,000 tons.

Armour Bending Presses.

Troughing Presses.

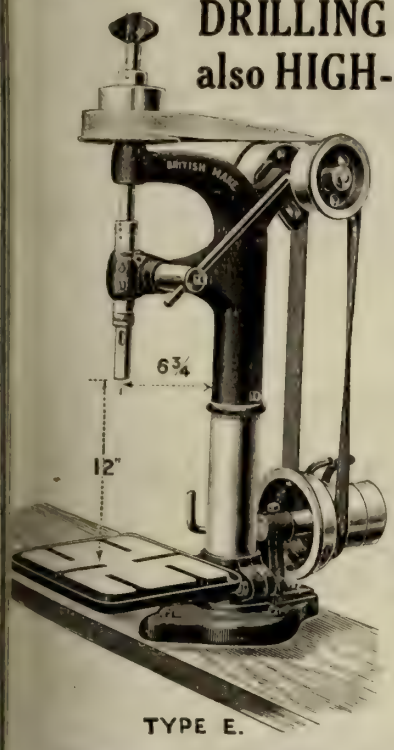
High Pressure Hydraulic Pumps.

Accumulators.




**1200-Ton Steam Hydraulic Forging Press**

## SENSITIVE BENCH and PILLAR DRILLING MACHINES also HIGH-CLASS BALL BEARING DISC and TOOL GRINDERS



TYPE E.

TEN DIFFERENT TYPES, ALL FROM STOCK

Telegrams:—
"BEACO TIPTON"
ENGLAND

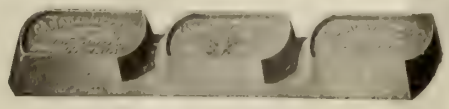
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ABC 5th EDITION

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WE DID IT FOR YOU YEARS AGO



IMPERIAL GENUINE




For Heavy Engines and Extraordinary Hard Work

**HARRIS HEAVY PRESSURE**

THE COPPER COATED CAKE

For Donkey Engines, Saw Carriages, Small Motors, Transmission Line Shafting and all steady heavy pressure duty.



**Matchless**

Suitable For Slow-Moving Bearings

Write For Prices

**THE CANADA METAL CO., LIMITED**
TORONTO HAMILTON MONTREAL
WINNIPEG VANCOUVER

# Monel Metal Castings

## For Anti-Corrosive and Superheat Service

*Made in Canada by*

## CANADIAN DRIVER-HARRIS CO.
WALKERVILLE, ONT.
American Office and Works
Chicago-Detroit Harrison, N. J. England-France


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# OXYGEN AND HYDROGEN
## (ELECTROLYTIC)

National Electro Products Limited is the largest manufacturer of Electrolytic (pure) Oxygen and Hydrogen in Canada.

WE PRODUCE GASES EXCLUSIVELY BY ELECTROLYTIC DECOMPOSITION OF WATER

We are, therefore, in a position to furnish Oxygen and Hydrogen far superior to like gases made by any other process.

After Exhaustive Tests We Have Decided to Handle the Well-Known

The Torch for Welders PUROX (OXYGEN / HYDROGEN) Who Want the Best!

## WELDING AND CUTTING TORCHES

Our entire organization—technical and sales—is always at your service.

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LIMITED

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MONTREAL SALES OFFICE AND FACTORY
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Lasalle 508

TORONTO FACTORY
295 Dufferin Street
Park 7656



# DOMINION GRINDING WHEELS

*Meet Modern Requirements*




Every grinding job should have its particular kind of grinding wheel. There's a Dominion Wheel for every operation in your shop—a wheel made of suitable abrasives of exact grade and grain.

Dominion Wheels are **made in Canada**—they rank in **quality** with the leading imported wheels. Put them to the test.

**Dominion Abrasive Wheel Co., Limited**
MIMICO, ONT.

# IMPERIAL CARBIDE




**For Welding Cutting and Lighting**

HIGHEST GAS YIELD IMPERIAL CARBIDE MADE IN CANADA

It insures **effectiveness** and **economy** by **invariably** producing acetylene gas of **unusual purity.**

**Manufactured by**

**Union Carbide Co. of Canada, Ltd.**
WELLAND, ONTARIO

**Large Stocks maintained at convenient distributing centres throughout Canada**


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# LINCOLN ARC WELDER

## Don't Shut Down Your Plant

**Time will tell**—eventually the constant wear and tear and steady usage will tell on some part of one of the machines in your plant. It will give 'way. If this should happen will you have to "shut down?"

Prevention is the only thing, and a Lincoln Electric Welder is the modern preventative.

You will, no doubt, be interested to know that with the Lincoln Arc Welder repairs on boilers and machine parts can be successfully and permanently repaired in a few hours—by any other method such repairs would take days.

We will gladly send an expert to your establishment and have him demonstrate the various uses of the Lincoln Electric Welder. By doing so this places you under no obligation and costs you nothing. To-morrow the "break" may occur; phone now to Adelaide 7200 and ask us about it.

"LINK UP WITH LINCOLN
FOR
PERFORMANCE AND SERVICE"



**The Lincoln Electric Co. of Canada**

Head Office and Works
136 John Street, Toronto

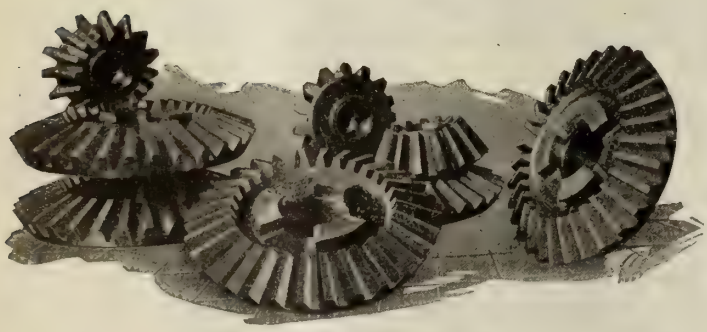
Montreal Branch:
Coristine Building

# Bevel Gears




with

## Correctly Cut Teeth



Write us for
All Kinds of Gears

## Hamilton Gear & Machine Co.

Van Horne St. TORONTO

## CANADIAN ATLAS CRUCIBLE STEEL Co. LIMITED

**Made in Canada**

## L-XX HIGH-SPEED
## ATLAS TOOL STEELS
## ATLAS ALLOY STEELS

**Hot Rolled, Forged Blocks and Discs**
**Cold Drawn Steel and Drill Rod**

GENERAL SALES OFFICE:
**133 Eastern Avenue, TORONTO, ONT.**
Works: WELLAND, ONT.
Sales Offices and Warehouses :
TORONTO, ONT. MONTREAL, QUE. WINNIPEG, MAN.

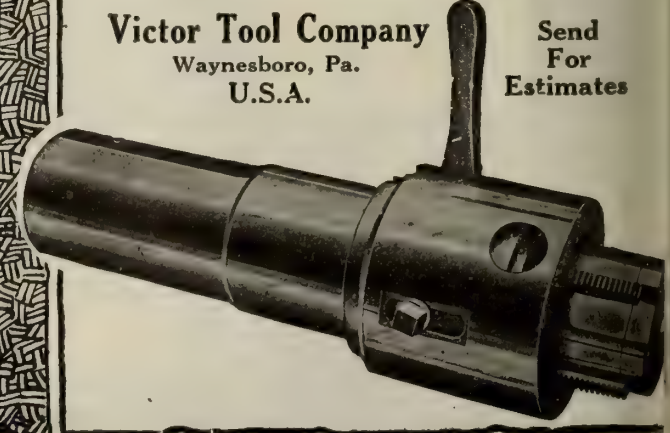
## We wanted something original—this is what we got

"BOTH of these operations and half another — I'll show you later—completed in the time our old taps took to do one; that, I guess, is why we continue to use your Victor Collapsible Taps."

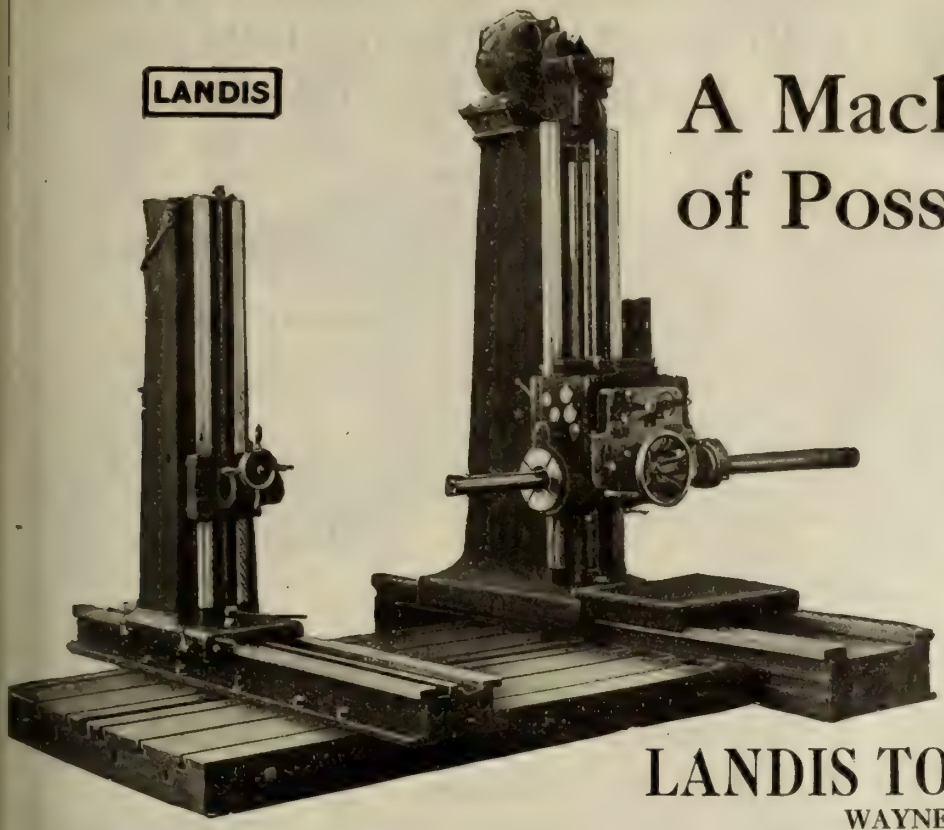
It was the often-heard story of time saved, of costs lowered, of all threads clean and smooth. And it was pleasant to hear.

**Victor Tool Company**
Waynesboro, Pa.
U.S.A.

**Send For Estimates**



LANDIS



# A Machine of Possibilities

The Landis Boring, Drilling and Milling Machine is a sensitive yet powerful tool. It is equally adaptable to fine finishing or heavy, bulky work.

In multi-operation jobs, one set-up of the work is usually sufficient. This assures economy by greatly increasing productive results.

*Let us give you full details.*

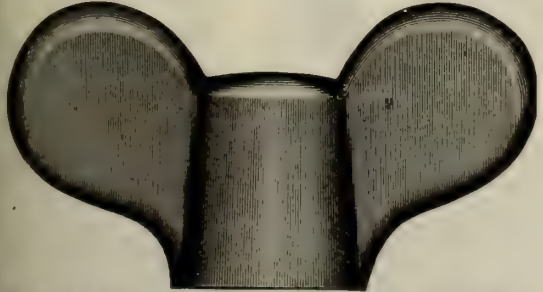
## LANDIS TOOL COMPANY

WAYNESBORO, PA.

New York Office: 50 Church St.

CANADA FOUNDRIES & FORGINGS LIMITED

## DROP FORGED STEEL



WING NUTS

EYE NUTS

*All Sizes*

Canadian Billings & Spencer Plant

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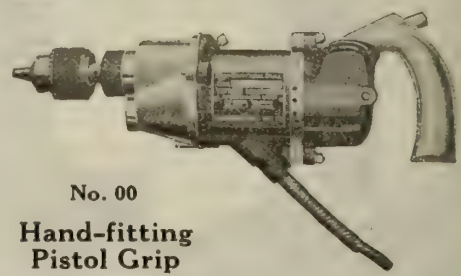


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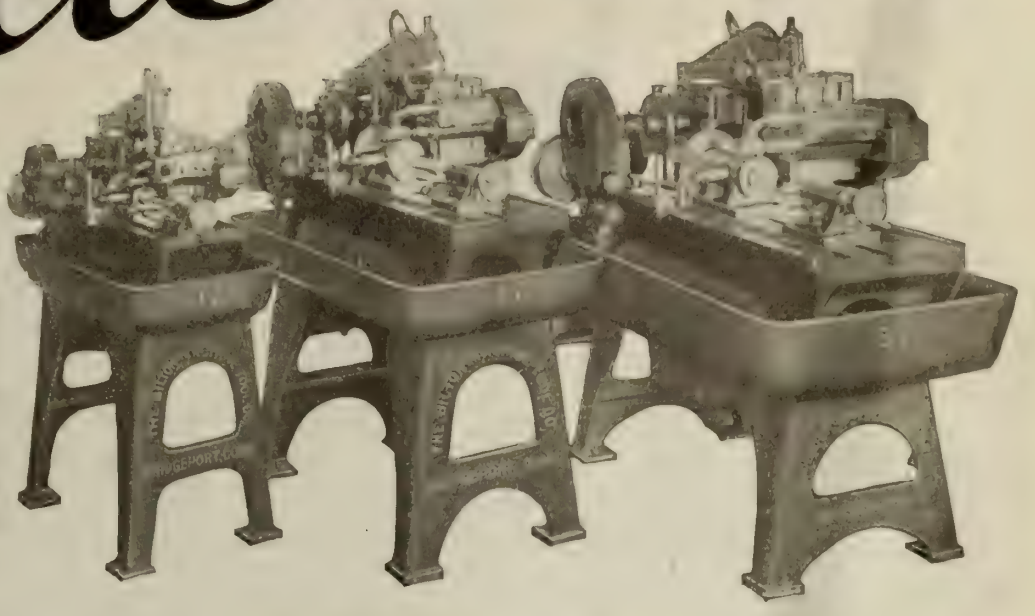
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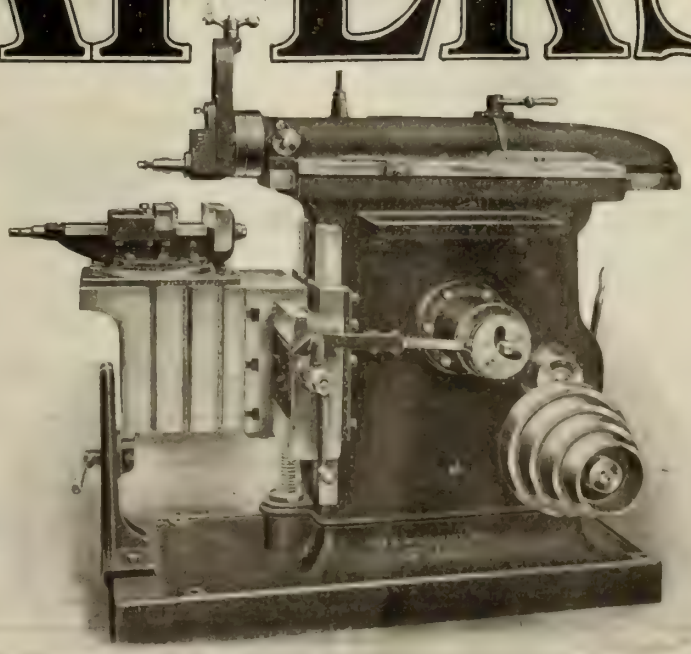
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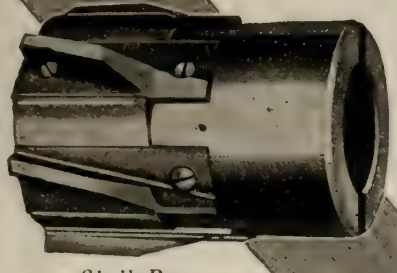
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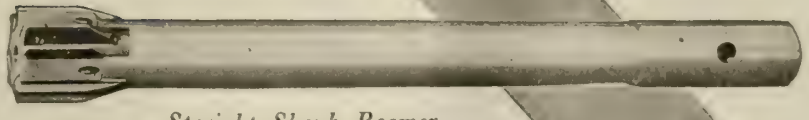
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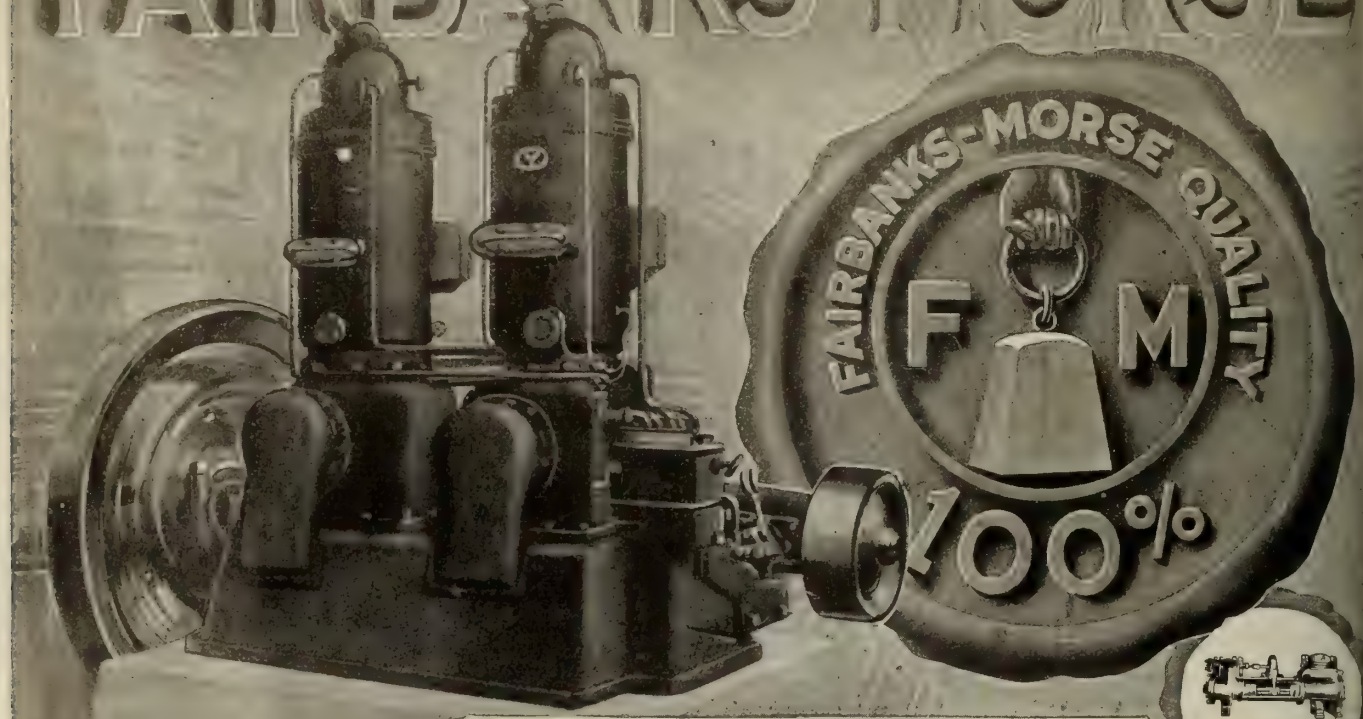
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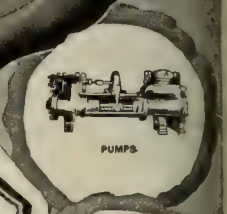
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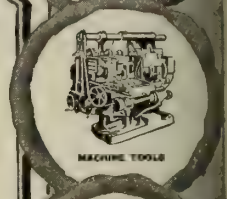
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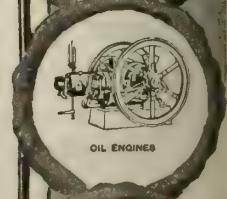
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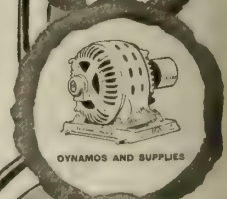






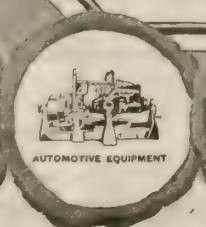




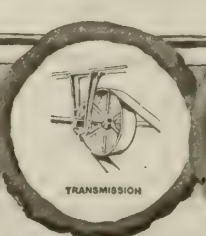


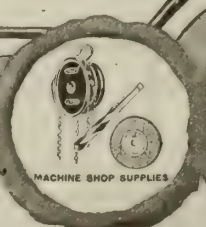


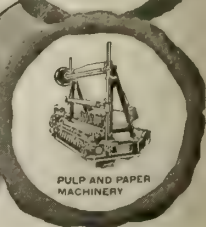










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CANADIAN MACHINERY
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OL. XXV. No. 6 February 10, 1921

# Making One Thousand Milling Machine Saddles

## Equipment Necessary to Produce One Thousand Saddles Every Year. Pattern Work is Taken Up, Also Various Machining Operations, Cost of Machine Tools and Other Vital Points.

By DONALD A. HAMPSON

N the November 11th issue of Canadian Machinery we published an article by John S. Watts, dealing ith the manufacture of 1,000 milling achine saddles per year. This article reated considerable interest and diver- ity of opinion. The present article ives another reader's views of the prob- m, and the information contained here- should be carefully read, then filed or future reference. Mr. Hampson, he present author, commences his rticle as follows:

To every production problem there are wo or more answers. Given the design, the problem starts with the pattern, goes from there to the foundry, stops briefly at the tool room, then broadens out into a machine shop job of magnitude and precision.

There are three hundred working days in the year, but every production man knows that in ordinary life it is not safe to count on more than ninety per cent. of the "on paper" production per unit of time, and no executive wants to skin through on a schedule that makes no allowance for the unforeseen and the inevitable; therefore, we will map out a schedule on a basis of 250 working days per year, which calls for a production of four completed saddles a day.

Machine shop jobs may be done in several different ways. Speaking broadly, none but an egotist would say that his way was the best, for according to conditions of equipment, finance, and labor, what might be good practice in one plant would be impractical in another. But each plant, in adopting methods suited to its peculiar conditions, might turn out the same grade of accurate work at a profit to itself, and, if each obtains the same production, then each may be said to have adopted the best practice

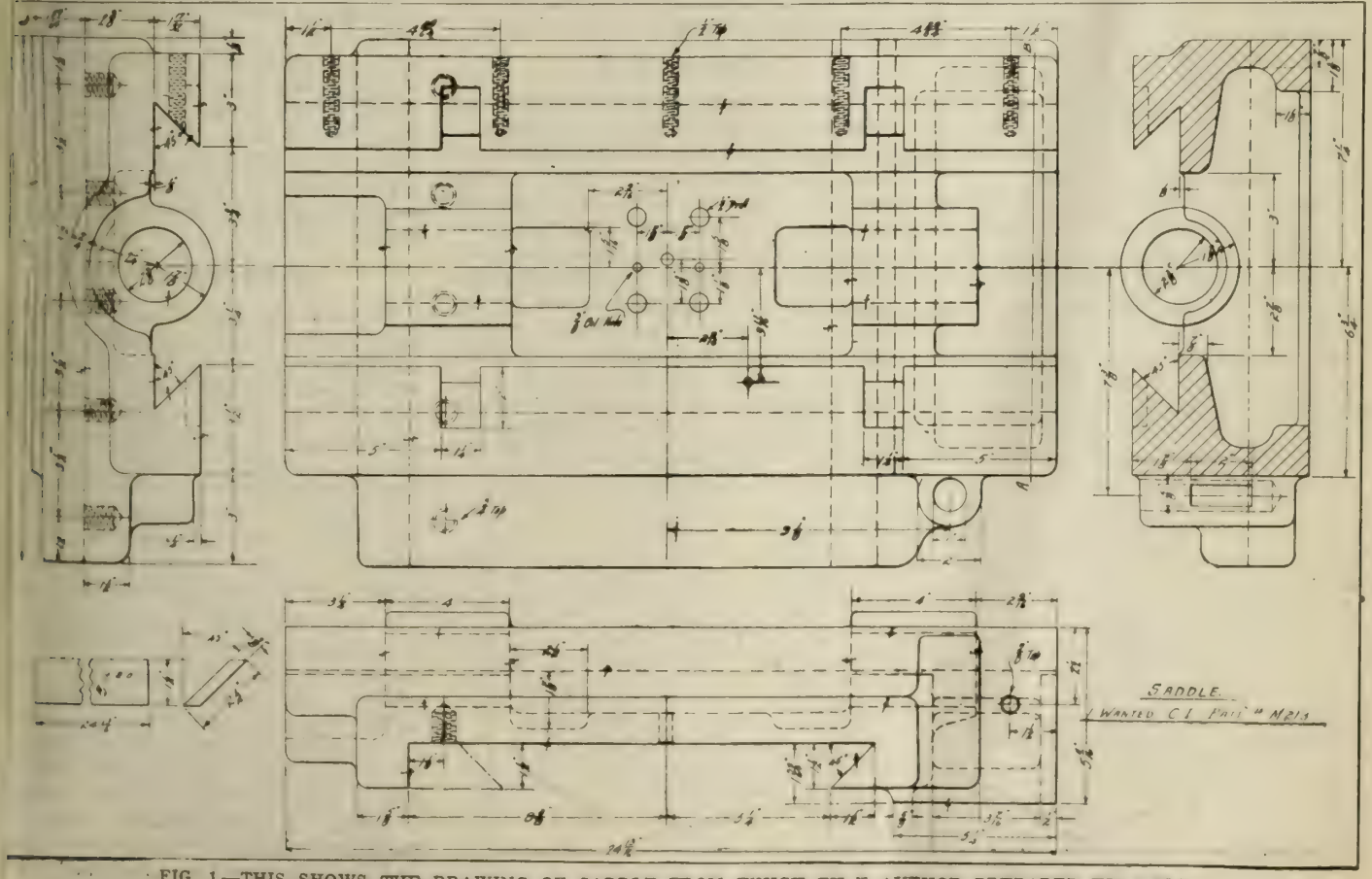



FIG. 1.—THIS SHOWS THE DRAWING OF SADDLE FROM WHICH TH E AUTHOR PREPARED HIS DATA.

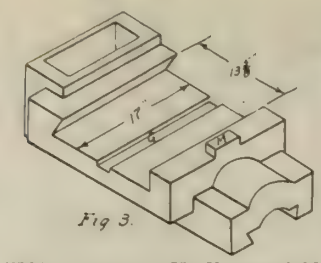
for itself. The problem varies also in whether a given part is to be made in an existing plant on tools already there, or whether the plant is newly tooled for just this piece; the former is generally the case.

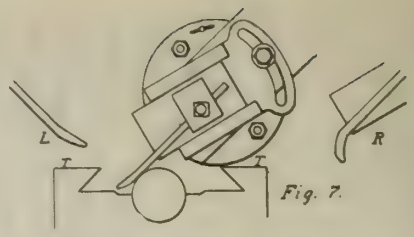
### Planer Work

Planer work forms the foundation upon which nearly all machinery is built, particularly is this true of machine tools. The most accurate planers and the best men are considered essential to the production of the faces, slides, and vees of all machine tools. In the face of keen milling machine competition, planer work has lost but little of its prestige—at least, for finishing cuts. The fault to be found with milling machine work comes from (1) spring of the mandrel, (2) cutter passing on and off the work surface, (3) improper grinding of cutter or inaccuracy of spindle, which makes a setting from a gage unreliable. If the miller is stopped during a cut, the first two mentioned faults may appear as a mark deeper than the rest of the machined surface, condemning it as a first class piece of work.

However, the scarcity of skilled mechanics, competition, and the lessons taught by the manufacture of automobiles, all distract the production man away from planer work. There is a "standard" method of doing high class planer work, and this will be considered first as a means of getting out the milling machine saddles. Then, a method by which unskilled men can do a goodly part of the work on simple machines will be taken up—a method in which the work is resolved into simple, single operations within the capabilities of low grade labor. The latter method will be of greater interest because of the present prices of machine tools—new planers of the sizes needed for this job costing from $4,000 to $8,000, and for a production of four saddles a day not less than three planers are required.

Figure 2 is a perspective of the miller saddle right side up. No matter how complete line drawings may be, or how well able one may be to visualize the thing they represent, a drawing in perspective or a free hand sketch will bring up points that may be wholly overlooked in long study of the original drawings. Perspectives are of invaluable assistance to those who design tools and fixtures for manufacturing.




FIGS 3 AND 7—ILLUSTRATING A FEW OF THE AUTHOR'S SUGGESTIONS.

Returning to the first step in production—that of pattern-making. It is necessary to get out one wood pattern from which may be obtained castings in aluminum which are to be machined all over to form permanent patterns that the foundry will use for production. Even if they would stand up under long daily abuse, wood patterns would soon lose their shape so that the machine shop would be seriously retarded; good castings are hard to get under any conditions, and the best of patterns should be provided to leave no source of criticism open on that point. Rejected castings, both foundry and machine shop losses, may run from one-half to five per cent. of the total, and for these it will be necessary to make others, so that it will be required to mould four saddles every day with an additional one about once a week. If the plant's foundry uses moulding machines it will be easy to exceed this production—if all the moulding is hand work, and that is well organized, one pattern will suffice, while, if the foundry organization is more or less disrupted, two patterns will be required.

### Pattern Work

Figure 4 shows how the pattern, or patterns, will look. It is cast hollow to save weight and expense and is machined all over on its exterior surfaces, with a slight draft on the vertical faces, making the side which is uppermost in Fig. 4 the smaller. This drawing shows the pattern upside down for the sake of clearness. With the exception of the guides that fit the knee of the milling machine, the entire mould is made in the drag. Four dry sand cores are used to form the undercuts and various irregular parts, and these are shown as part of the pattern: Cores 1 and 2 are made in the same box and their location is made easier by the two prints which are extensions of the cut-outs in the top of the casting. These two cores are placed first. Core 3 makes both of the feed screw holes as well as a portion of the center floor. It is made in one piece to better align the holes. Core 4 is the last one placed before the mould is closed. This core forms the space for the gear driving parts. So made, the pattern is an easy one to draw, and the cores all lie on solid sand. The preliminary wood pattern is a duplicate of the one shown, with the added allowances for finishing and contraction.

The foundry work sholud be carried on some weeks ahead of the machining, both to avoid any possible delays to the shop, and to allow the castings to season themselves a trifle. Each casting must be thoroughly cleaned and inspected before it is shipped in to the shop. If there is no sand blast available, the castings should be run for a time in a tumbling barrel. Where a foundry has a sand blast, it has compressed air, and this may be utilized for pneumatic chipping with a gratifying saving over hand work. Before getting into production, sample castings are made, to determine if everything is all right, and there is just the right allowance for finishing up. The locating points for the first operations are checked up at this time, to make finally sure that all the first workman has to do is to "clamp her down and start a cut."

### The All-Planer Method

Through the use of proper fixtures, by simplifying the movements, and by curtailing some of the universal features of a planer, the saddles may be planed in half the time, and that with only an intelligent laborer properly instructed, instead of a skilled machinist. Fig. 5 illustrates the fixtures for the first operation, which is rough planing the under side. The scheduled production, being four per day, the various operations in multiple should be in units of four each.

A cast iron base plate P, about 90 in. in length, is arranged to fasten to the planer table and to take four of the saddles laid crosswise. One saddle is shown in position and near it the fixtures for another. It is far better to use a false work table, for thus the constant sliding (and peining) of rough castings is put on a more accessible part, and the slow process of sliding bolts along and cleaning long slots is avoided. And

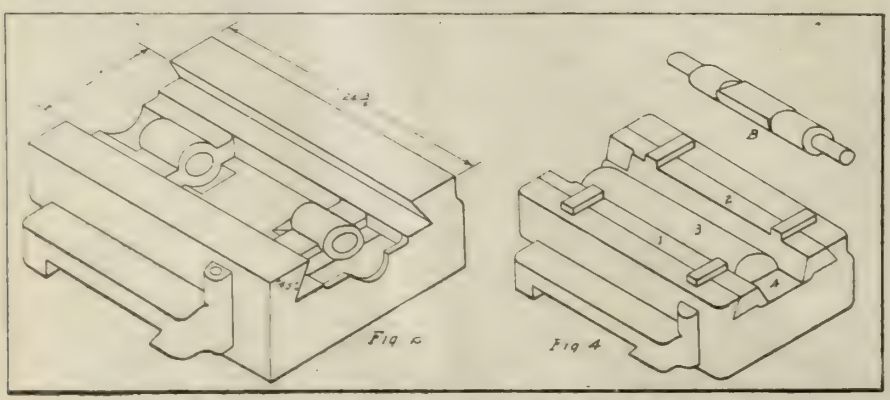



FIG. 2.—THE PATTERN, AS THE AUTHOR WOULD HAVE IT.

bolt slots rarely line up well for a string of castings.

Returning to the drawing. There are four shallow grooves cast at right angles to the direction of the cut. These not only assist in levelling up, they afford clearance for the two hubs which are higher than the straight faces of the saddle. The castings are located from the most important faces, i.e., the miller) table vees. The locating blocks C carry steel castings with machined faces guided in short machined slots in the base P. There are two symmetrically tapered sides, and as these pieces are pushed towards each other, they accurately locate the saddle at points on its greatest length. When in position, the blocks are tightened, becoming stops for the work as well. Four clamps hold the saddles down—all but the end clamps draw on two saddles at once.

When a set of castings has been finished, the nuts are loosened and the nine bolts alongside A are slid out of their slots. A slight movement, and the castings are free of the rear clamps and may then be picked up with a hoist, or pulled further forward on shop trucks for delivery elsewhere. Cleaning the surface of the base plate P is almost nothing, for the castings are brushed off before the bolts are loosened, and there is very little dirt to fall in the short slots on the operator's side. The next set of saddles should be put on and clamped in half an hour, as an outside figure.

All the nuts on the fixture are of the same size and hardened, and the screw in the tool block should be changed to the same size. This makes one wrench the only tool the workman needs, aside from the gauge, and he should be forbidden the use of anything else. There are four plugs of hard steel—E E—set in the plate P under each saddle and these are a full thirty-second above the general surface, not enough to interfere with handling the castings, but high enough to serve as leveling spots, and it is on these spots only that any packing up is done, either with slips of paper or tin.

For this first operation a 30 x 30 x 8 ft. single head planer will be required. This will cost around $4,000. The fixtures described can be made for a minimum of $100, though work of this kind varies widely in cost under different wage scales and according to the amount, or absence of, system in the particular shop. Two sets of saddles—eight pieces—should be roughed out per day with this equipment.

The roughing operation finishes all the surfaces within one sixty-fourth of an inch. Fig 5 B shows the tool setting gauge which is clamped to the front end of the plate P. This gauge is a grey iron casting whose top face forms one of the setting surfaces and on which are screwed and dowelled the blocks for gauging the 45 deg. and the 90 deg. faces as well as the extreme height. The tools are set to the different faces of the gauge, using a paper feeler betweeen tool and gauge.

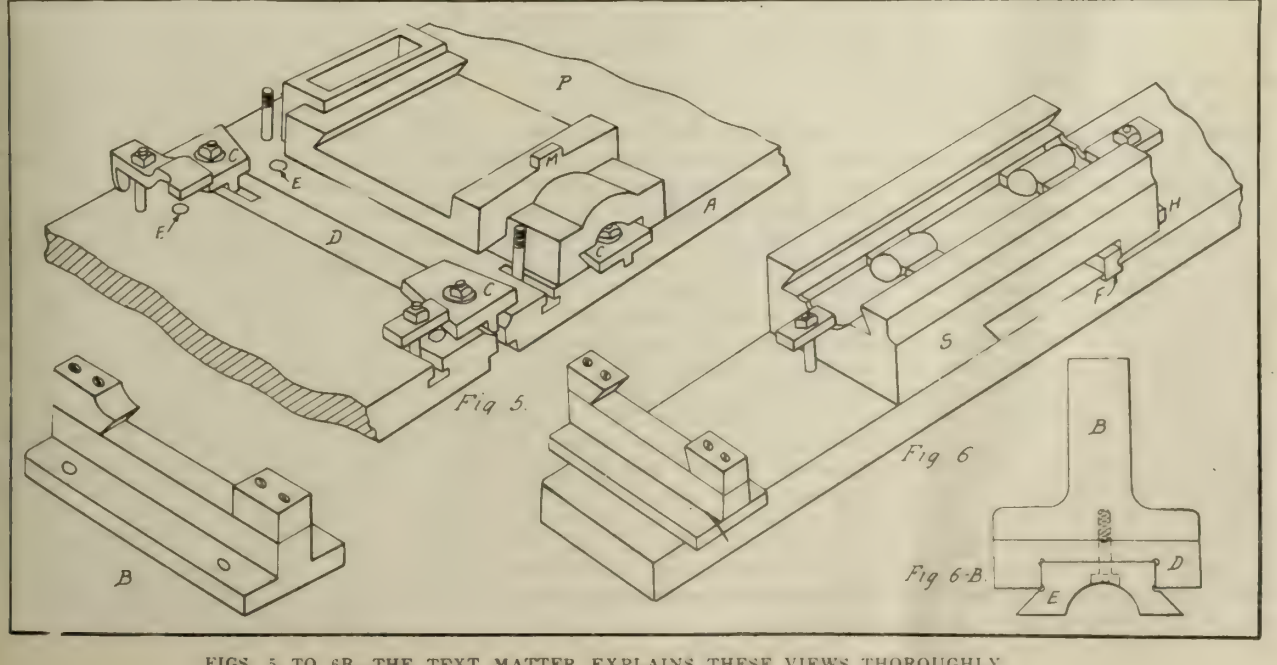
Three slight changes in the original design could be made to facilitate machining. The vertical surface of the saddle, marked S in Figs. 1 and 6, should be machined. It will aid materially in subsequent operations to do this, and it will add a degree of refinement to the assembled machine of which it becomes a part. A planer boss, M in Figs. 3 and 5, is of utmost importance in setting up the castings for several operations, and it would not detract from the finished piece to leave it after the work is done. Thirdly, a groove G in Fig. 3 will save time and tools in cutting, the broad flat under surface, if not permissible as a slight clearance on the finished piece, it will nevertheless save time if this is cast an inch wide and half or two-thirds depth.

### Second Operation

Fig. 6 details the layout for the second operation, that of the surfaces on which the table itself travels. Here again a false table for the planer is used, but this one is ridiculously simple, its top surface being broken by only five studs, four right angle bars F, and eight posts H, which carry safety set screws to keep the saddles against the bars F, in addition serving as spacers betweeen castings. A tool setting gauge is provided, of similar construction to that in Fig. 5.

This operation requires a 24 x 24 x 10 planer, preferably with two heads on the cross rail. Its cost will be about the same as the other planer. A narrower planer would do this work, but most of the shops prefer to pay for a little more width between housings with so long a table. The fixtures shown will cost $70 or more. They provide for four saddles in a string, and they should turn out two full loads a day. Setting up is very simple. The under side of the casting is planed, one end a hollow square and the other the spot M offering a three-point bearing that requires a minimum of packing up under it. There is a planed edge to go next to the bar F, and two safety set screws to hold it so in line, while laterally the castings are placed so the face S is "felt" even with the edge of the false table. Five clamps hold down the pieces. In case the suggestion to plane S is adopted, the castings have to be set overhanging the edge.

Workmen's gauges for the job are made up as shown at Fig. 6-B, consisting of a cast iron handle B and two hardened steel pieces, D and E, of such a shape that they may be readily ground on all important faces. A similar gauge



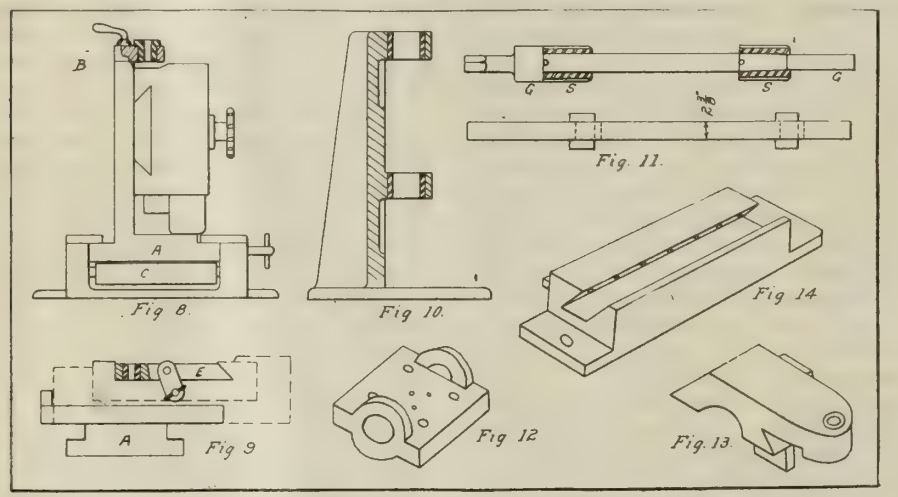

FIGS. 5 TO 6B THE TEXT MATTER EXPLAINS THESE VIEWS THOROUGHLY.

is made for checking the planing of the bottom surfaces of the saddle. The estimated cost of the two vee gauges and those of the tool setting is placed at $60.

Taking up the actual cutting of the top of the saddle, it is found that the screw bosses are rather in the way. However, this is not as bad as it seems, for there is width of clearance next them. Referring to Fig. 7, the planer head is set at 45 deg., and a taper dowel put in, so that the exact location is quickly found without depending on graduations. The clapper block is stripped of the usual tool fixtures and is provided with an extension for tool support which is slotted for the tool, and fitted with a single clamping screw. Tools, tipped with high speed steel and ground to gauge, are provided in duplicate, and these are ground on the top only, always maintaining the same shape. With this equipment, tool setting is not a matter of guess work, nor subject to the whims of the operator, hence the time has to use or loose pieces or unnecessary nuts to tighten, the greater is the production.

The saddles are now roughed out all over, if possible. This part of the work should be kept a month in advance of the rest, so that the castings may be given a chance to season. The best time for this is after the outer skin has been removed. A piece of this shape and weighing nearly 300 lbs. will not warp much, but even if it changes as much as a piece of paper, that little must be taken into account and the planer hand, in setting up for the finish cuts, must pack up closer than this.

Our two roughing planers are placed side by side, but facing in opposite direction with the operator's sides together. One man can then attend to both machines very nicely, though there will be times when a helper can be used to advantage in loading and unloading. This way it is possible to get eight complete saddles a day from two machines, one planer hand and a helper. There is a greater




FIGS. 8 TO 14 (INCLUSIVE)—SHOWING VARIOUS MINOR OPERATIONS.

is cut to a minimum and uniform results are secured.

Another point: With two heads on the rail, each may be left permanently set at its own 45 deg. angle, with the left head presenting its tool as seen at L, Fig. 7. It is unnecessary to swing the right hand head back to zero to plane the top faces T, for by having a tool as shown at R, the work may be done equally as well. In case no two head planer was available, much the same system would be followed. The slot in the clapper block would have to be in the middle, two holes for the 45 deg. locating pin would be provided, and the planer head stripped of the unnecessary bolts and nuts that have to do with the angular adjustments and the clearance swivel, leaving just the three shown. These three left, the tool post screw, the table shifting dogs, and the nuts on the table fixture, all use the one wrench. This latter principle should be followed throughout, for a careful study of workmen will prove that the fewer tools he

area to cut on the under side, but there is so much better chance to get at it, so it can be done as quickly as the top.

### Finish

Coming to the finishing cuts. Two more planers are required. If the shop were doing nothing but making one size of saddle, it might be possible to get along with just the two planers, though it is doubtful if the yearly production could be obtained by any method without a third planer part time. The chances are that more than one size of machine is being built, in which case it is better to keep planers for finishing alone. For finishing, it will pay to have two false tables or plates similar to those of Figs. 5 and 6. One will be identical with that of Fig. 6, the other will be like Fig. 5, but with a single cross piece taking the place of the two tapered blocks, the cross piece aligning the work and taking the thrust of the cut.

The tool setting gauges will be like those used for roughing out, and there will have to be another set of gauges for the vees. Finishing tools will be similar to the roughers but keener, and those for the V sides must have sharper points. Feeds will also be less. The drawing shows sharp corners, but it is safe to assume that the sharp male edges on both the table and the saddle can be taken off to a ⅛ inch flat. It it better so from every standpoint, and then the corners at the bottom of the V may show a slight fillet. Finish planing will take about a third longer than roughing, and it is safer to put one man on each planer, holding him strictly accountable for results.

### Minor Operations

A number of miscellaneous operations follow the planer work. There is probably more chance for ingenuity here than on the planer work. The work is mostly drilling and tapping. Except for the larger drill screw holes, it would be possible to do all of this drilling with an electric drill, and to tap by hand. This would avoid considerable jig expense and some handling of saddles on and off the drill press, but it would take longer to do the work. A radial drill or an upright drill of around 30-inch size will do the work. The writer prefers the upright drill because of its fixed center, and ease of operation.

Fig. 8 shows the jig for drilling and tapping the set screw holes. There is a base that bolts to the drill press table. It carries six rollers C, on which travels the right angle piece A, which is located by the pin at the right points according to the set screw spacing. The saddles are held upright by two hand clamps, and the drill guided by bushings in the removable piece B. After the holes are drilled, the drill is removed, a tap inserted, and the holes threaded as A is run back to the loading station. The drill press, of course, must have a tapping attachment. A quick change chuck should also be added.

Fig. 9 shows a similar operation for the bottom gib holes. Another casting A is made for the same base, runs on rollers, and is indexed the same way. Its upper portion is a short section of a V slide. The saddle is placed on this and needs no other fastening. A jig piece E carries drill bushings and is held in place by its fit and end stops, one of the latter swinging.

To bore the screw holes, the fixture in Fig. 10 is clamped to the table. A three or four lip twist drill is the simplest tool to clean out the hole ready for reaming (on cheap work, this would make a very fair hole in one operation). The saddle is located and fastened by simple parts, omitted for the sake of clearness on the drawing. The two tools shown in Fig. 11 finish the holes and ends. The upper one is the reamer built up of two shell reamers and a ground shaft. This could be used in the machine by changing bushings, but the

writer prefers this to be a line reamer, used by hand, cutting at S and S, and guided by the parts G and G running in blocks which fit the saddle vee. The other tool is a facing bar that is guided by the finished holes, and uses standard cutters that are changed for the reverse facing. A gauge for this must be made. It may be of heavy sheet metal, hardened and ground.

In the center of the saddle is a group of small holes that are best included in one jig as shown by Fig. 12. This is a cast iron block containing the seven bushings—it drops into the depression in that part of the saddle and is located by passing short pieces of shaft through the large holes into the counterbores shown.

A one inch pin is employed for the feed throw-off and the hole for this is made by the jig in Fig. 13. This slides in the table vee and is located for distance by the strap butting against one finished end of a screw boss, and it is secured by a temporary set screw in the end hole. A somewhat similar jig serves for the ⅝ inch tapped hole on the side.

The above enumerated tools will cost between $500 and $600 with high speed cutters. The drill press will cost about $700 and it should be able to take care of all this work with a good operator. The large holes for the screw could be done more conveniently on a horizontal boring machine, but this job alone would occupy it but a fraction of the time.

The table gib is planed on the edges in the fixture of Fig. 14. Several are placed in at once, and a planer cut run over them. If this part is cast iron, it will require facing on the flat sides first by customary methods.

### The Drilling Method

The group of drawings included by Fig. 15 illustrate the milling machine method of roughing out saddles. With the exception of the cutter in No. 6, the fixtures and cutters would answer for a full line of sizes in case the manufacturer was making them, and the equipment is capable of producing the same if required. Some manufacturers might use the miller method entirely, and make but the one cut across each face, this serving as both roughing and finishing. The results would be very close, but there is no disputing the fact that the job would not have the accuracy of the second operation method as done on a planer. The comparison would be like that of war tools and pre-war tools.

Lincoln millers of the planer type will do this work as well as plain millers and they cost a great deal less. The five millers required can be bought new and leave half of the price of the vertical miller, for operation 6, for what one 30 x 30 x 8 planer would cost. Fixtures, arbors, and high speed cutters will cost approximately $650. In the drawings T is the miller table. The

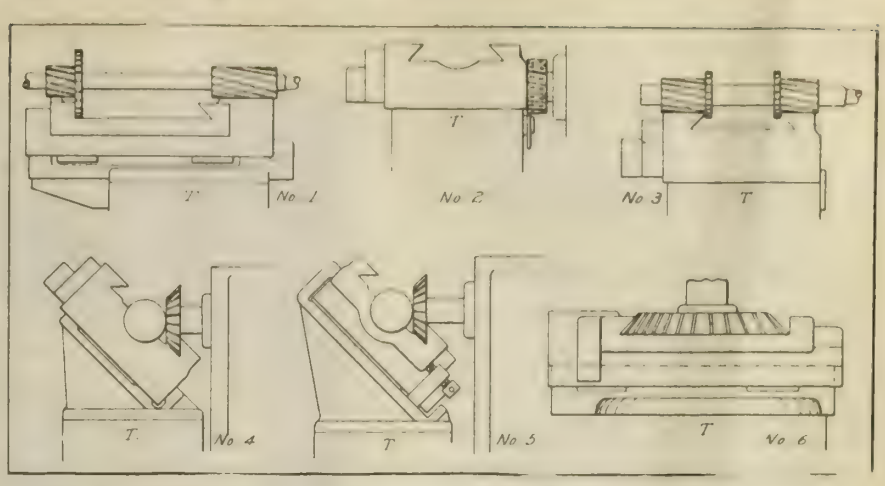



FIG. 15.—THE MILLING MACHINE METHOD OF ROUGHING OUT SADDLES.

clamping bolts and straps are omitted. These are arranged for either one wrench, or hand operation, and to swing or lift out of the way, so there is a clean straightaway for moving the casting on and off.

The drawings explain themselves. Each face as it is cut becomes the bearing surface for the next operation. Nos. 4 and 5 show how the upper vees are machined—the work is held in both cases from the same locating surfaces, and the writer speaks from experience that this is the method that will take all the curse out of a 45 deg. bevel. No. 6 is the method of doing the under vee. This is on a vertical miller, using a cutter with inserted blades (which may be home made), and holding the work by a fixture whose upper part is like the vees of the table. A straddle mill in the gang of No. 1 squares the corner and vertical side so the angular end mill merely scrapes off a finish at this point.

These planer millers should be arranged in a row and timed so that each will finish a piece ready for the next machine. In this way there will be no floor to floor handling, for there should be either a conveyor system or a metal topped table between machines so that the operator can slide the parts along without assistance. At two places along this "railroad," the casting has to be turned over, which may be accomplished by a simple rig. To get the castings up in the 45 deg. position, the conveyor rolls are stepped from horizontal to 45 degrees and the twist is made in a short distance. This railroad is arranged so that the castings cannot fall off. The castings are delivered on the starting end of the line, and the table of the first machine runs right up to this point, then the track begins again where the table travel ends. The casting is removed, and the table run back by hand. One operator can easily attend to three machines, and at a feed of half an inch per minute two castings per hour can be produced on each machine.

### BENDING PIPE

Bending pipe is by no means a simple task. There is always a right and a wrong method. In bending large pipe you should fill the pipe with dry sand and plug the ends. Heat to a red heat in localities to be bent, then bend. Be sure that the sand is dry. Where bends are slight it is often unnecessary to use sand or rosin. The object of sand or rosin is simply to keep the sides of the pipe from collapsing, or, to prevent reduction of flow area. If wet sand is used, and if the ends are plugged, the pipe may burst when heated, due to the steam pressure generated.

Rosin is also good. But there is a "right way" and possibly several wrong ways to use it. For example: A mechanic was recently bending a pipe, and he first of all filled the pipe with rosin, plugged the ends, and heated the pipe at the place where he wanted to bend it. He watched for a "red heat" just as he would had he filled the pipe with sand. The result was of course a violent explosion.

The correct way to use rosin is to pour it into the pipe and allow it to cool and harden. As soon as the rosin is hard, bend the pipe cold. Don't heat it. Then after the pipe is bent, heat the pipe all over sufficiently to melt and remove the rosin.

**Production Foundry Ready.** — Dominion Motor Castings, Limited, of Windsor, have about completed the equipment of their new foundry and expect to be in operation within a fortnight. The foundry has a molding floor of about twenty thousand square feet, and a production capacity of 35 tons of gray iron castings. The equipment is of the latest type and includes at present Osborn machines on the molding floor, McDougall rumblers, Sterling grinders, Preston sand riddles, with much more to be added. The whole plant is designed primarily for high production rather than jobbing purposes. The officials are: President, A. Morrell, formerly of Windsor Machine Company; vice-president, R. P. Marintette; secretary-treasurer, C. A. Ripley.

# *Turret Lathe Applications*

The tooling necessary for machining an engine cylinder, a clutch cone, a clutch cone gear, and a peculiar shaped tractor driving axle arm.

*By J. H. Moore*

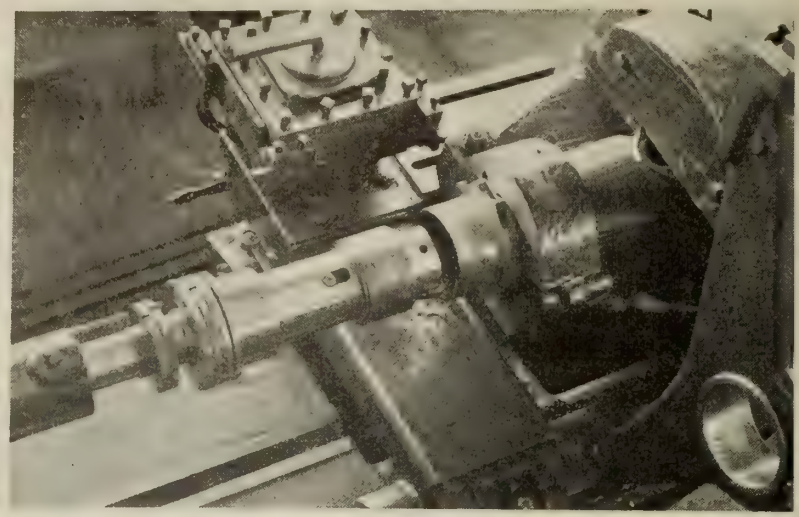


FIG. 3.—A CLOSE UP OF THE CYLINDER IN THE LATHE

IN the present article we will take up a few more examples of work performed on Gisholt turret lathes. The first of these examples is shown at Fig. 1. The piece illustrated is a cylinder used on the Liberty truck engine, and the machining of the same demands some clever tooling. At Fig. 2 we see a complete view of the equipment, while at Fig. 3 is shown a closer view of the expanding boring bar used in finishing the enlarged chamber at the bottom of the cylinder. This bar is depicted at the point of entering the cylinder. Fig. 4 illustrates the tool layout adopted in finishing this cylinder, which is made from semi-steel.

Having explained these essential points let us follow, step by step, the method used in completing this piece. The work is held securely in a special fixture made to suit the shape of the casting. The general design of this chuck can be noted at Fig. 3. This fixture is bolted to the regular chuck of the machine. At the front portion of this fixture there is a hinged arm that encloses the cylinder, after it is mounted in position. A pin is inserted at the chuck end of the fixture, this pin centering and locating the cylinder. Fig. 4 illustrates this clearly. The segment of cast iron, shown at the top of fixture, is simply placed there to counterbalance the weight of the lower part of the fixture.

The surfaces A, B, C, D and E are now rough machined with the tools F and G in the toolpost. Simultaneously the bore H of the cylinder is rough bored with the cutters shown in the head of the boring bar at position 1 of the turret. This bar is supported by means of a steady rest, this rest being shown in diagram form at Fig. 4. It has a bushing in it that fits the outside of the bushing J shown mounted on the bar.

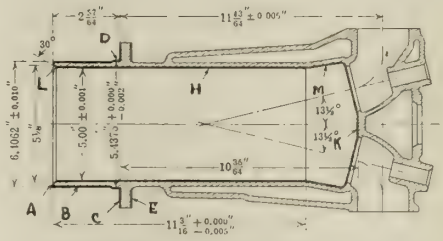



FIG. 1.—SECTIONAL VIEW OF THE ENGINE CYLINDER TO BE MACHINED.

Reference to Fig. 4 should make all these points clear.

The bore H is next finished with a cutter held at position 2 of the turret. The bar which contains this cutter is supported in similar manner to the one already described. The bore H is now reamed by means of the reamer shown at position 3 of the turret.

The next step consists of rough facing the bottom K of the cylinder. This is really called the combustion chamber and the operation is performed by means of the cutter held in the bar held in position 4 of the turret. This bar is provided with a bushing that is steadied by the bore of the cylinder itself.

The surfaces K, L, A, B, C and D are next finished with cutters held in the facing head and bar mounted at position 5 of the turret. The bore of the cylinder at M is now bored with cutters held in the bar shown at position 6 of the turret. These cutters enlarge the bottom, or dome of the cylinder as it is often termed. The cutters are of the expanding type, so that having entered the cylinder, and reached the bottom, they are spread, in this way machining the enlargement. The bar used for this operation is provided with a ball thrust collar which is connected with the cutters in such a manner that when the collar strikes the end A, and the bar still continues to feed in, the cutters are expanded. The collar we speak of is clearly shown at Fig. 3.

The under side of the flange E is next

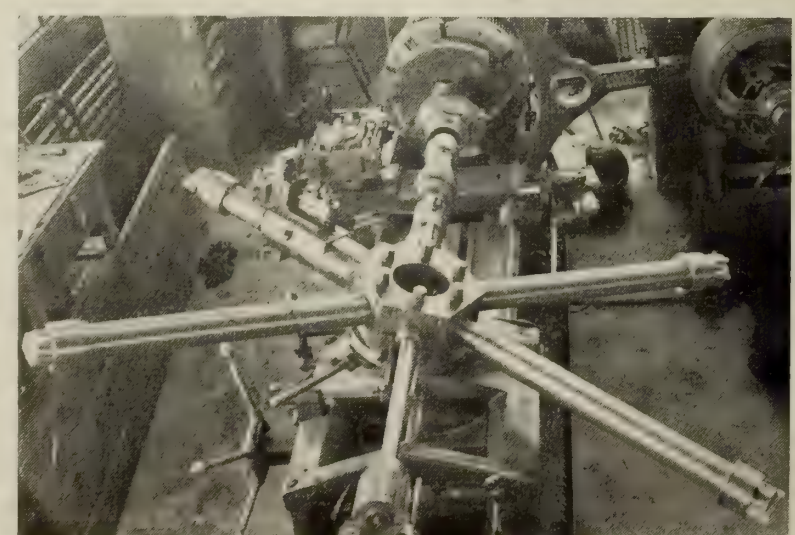


FIG. 2.—A TOP VIEW OF THE TOOLING EQUIPMENT USED ON PIECE AT FIG. 1.

finished with the tools held in the holder O in the toolpost. This completes the cylinder, and the total time of all operations is 25 minutes floor to floor time.

### Clutch Cone Gear

The next example is that of a clutch cone gear, shown at Fig. 5. The surfaces to be machined are depicted by means of heavy lines, and the work is completed in two operations. Figs. 6 and 7 show the first and second operations respectively, while Fig. 8 illustrates the style of taper boring head used for boring this gear. Referring to Fig. 6, it will be noted that in the first operation the cone is held by its large conical end next to the chuck. Special chuck jaws are bored to fit the outside tapered surface, and in this operation the hub is

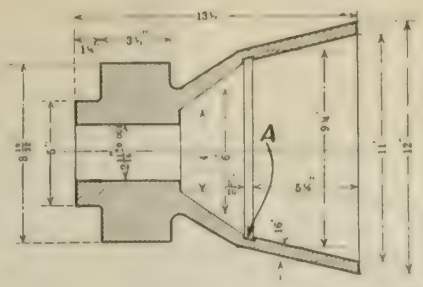



FIG. 5. SECTIONAL VIEW OF CLUTCH CONE GEAR.

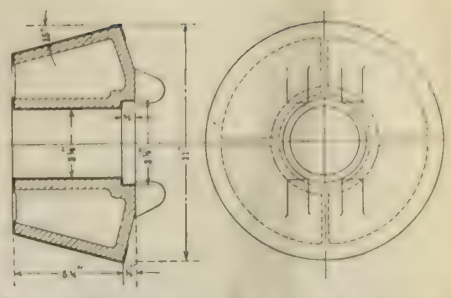


FIG. 9 SECTIONAL VIEW OF THE CLUTCH CONE.

turned by tools in the toolpost. On this being completed, the inside tapered surface is bored with the tool depicted at Fig. 8. The inside and outside are bored and turned simultaneously as can be noted at Fig. 7. In this photograph both

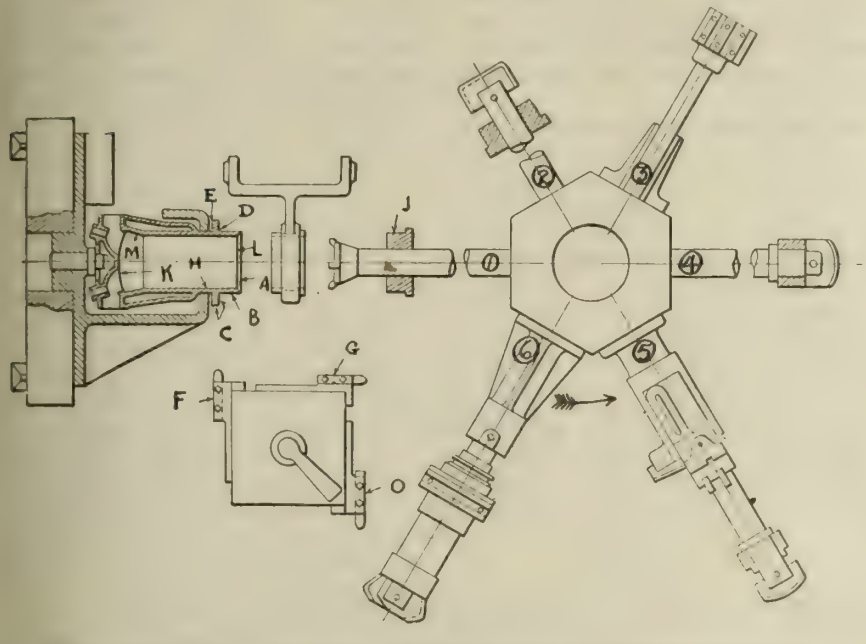



FIG. 6.—LAYOUT OF TOOLS FOR FINISHING THE CYLINDER SHOWN AT FIG. 1.

faced, the hole bored and the front end and outside of the gear are machined.

The work is now turned around and held as shown at Fig. 7. In this case the machined outside surface of the gear is gripped, and the work held in position with soft jaws. The outside tapered surface of the cone is rough and finish the turret tools and the toolpost are shown in action.

It will be noted that a clutch cone part is shown in section at Fig. 8. This is done in order to make clear the action of the special taper boring head. The cone shown in the illustration is of slightly different design, but in the main the principle is the same. The taper for the friction is bored with a single point tool which is properly guided to produce the correct angle. In action here is what occurs: A pilot enters the bushing on which the clutch cone is centered. This guarantees that the friction cone will be concentric with the hub. A ball thrust bearing is provided at B, and this bearing bears against the end of the bushing in the chuck, in this way preventing the pilot from entering further into the hole.

In this way the tool is properly located with relation to the tapered surface. As the head is fed forward over the pilot, a pin resting against the angular surface C guides the tool in at the proper taper, the slide holding the tool being forced down by a spring as the head feeds inward.

The recess shown at A, see Fig. 5, is cut with the tool held in the long tool holder shown in the toolpost at the front in Fig. 7. This recess must be made in the way to provide clearance for the tool in the taper boring head mounted in the turret. The complete time on both these operations is 60 minutes.

### The Cone

Let us next consider the cone used on the gear just described. The piece is shown at Fig. 9. This piece is finished on all surfaces shown in heavy lines and the material is cast iron. Two operations are necessary to complete the part, and Figs. 10 and 11 illustrate both operations on this piece. In the first operation, see Fig. 10, the cone is held in the chuck by means of special chuck jaws which grip it on the inside at the small

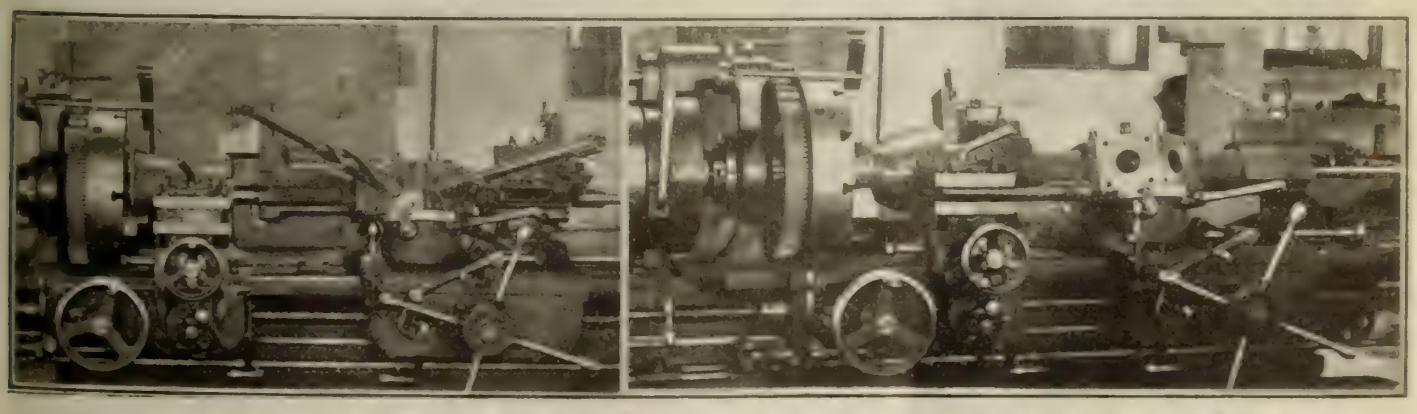


FIG. 6.—TOOLING USED ON FIRST OPERATION OF CLUTCH CONE GEAR.

FIG. 7. THE SECOND OPERATION ON THE SAME PIECE.

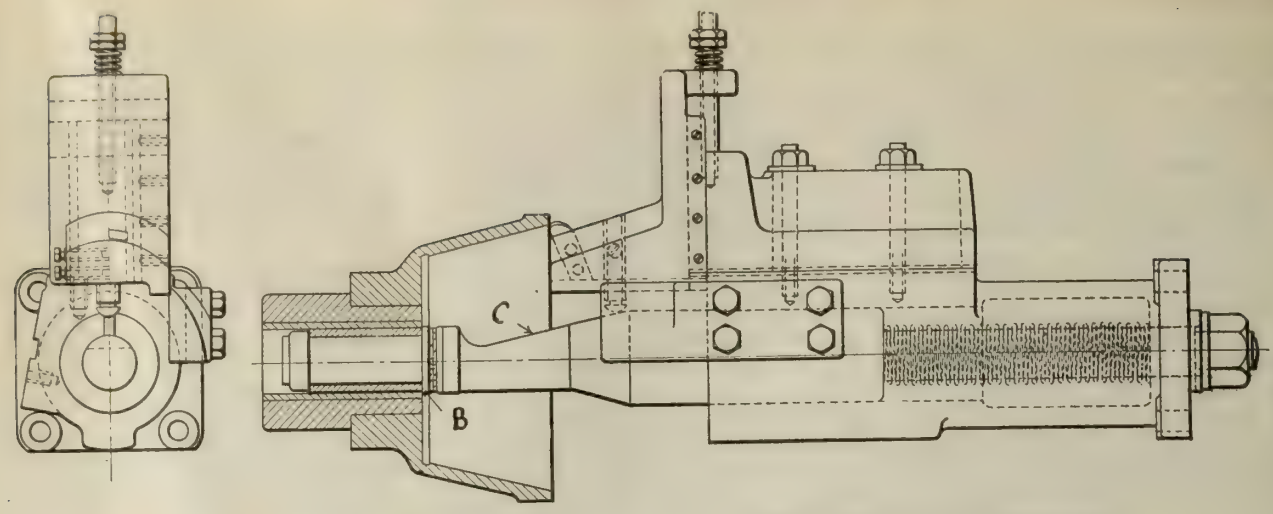



FIG. 8.—DETAILS OF TAPER BORING HEAD USED IN BORING THE CLUTCH CONE GEAR.

end of the taper. The outside of the cone is then rough and finish turned with tools held in the toolpost. At the same time the inside is rough and finish bored, also reamed by the various tools in the turret.

The work is held by soft chuck jaws in the second operation, and is gripped on the outside of the large end of the tapered surface. This is clearly shown at Fig. 11. The small end of the cone is then faced by a tool held in the toolpost, this completing the operation. The total time required for both these operations is 25 minutes.

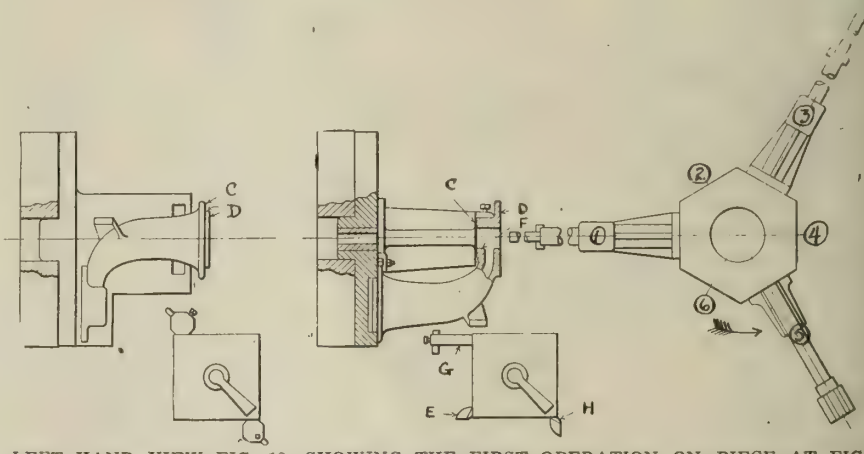
### Tractor Driving Axle Arm

The remaining example in the present article is shown at Fig. 12. This piece is what is known as a tractor driving axle arm, and is machined on a 24-inch lathe. It can be readily understood that the chief difficulty in handling a piece of this nature is the deciding on the best method of holding. The arm is made from cast iron and is machined on the surfaces indicated by the heavy lines.

In the first operation the work is held on a special angle plate as shown at Fig. 13. It will be noted from this view that the work is held in vee blocks. The piece is now rough and finish machined on the surfaces C and D. This is accomplished with tools held in the toolpost, the time required for this work being nine minutes.

The tool layout for the second operation is shown at Fig. 14. This work consists of boring the hole in the outward end of the arm and facing the flange. The rear side of hub at C is also faced. The work is first placed in a special fixture, which is clearly shown at Fig. 15. The piece is held by clamps that force the finished bottom flange against the chuck plate. In addition to this, an auxiliary supporting clamp is used, this steadying the arm near the end where it is machined. The flange shown at D in Fig. 14 is next rough faced by means of the tool E in the toolpost.

The hole F is now rough bored with the cutters held in the bar at position 1




LEFT HAND VIEW FIG. 13, SHOWING THE FIRST OPERATION ON PIECE AT FIG. 12. THE OTHER VIEW, FIG. 14, SHOWS THE SECOND OPERATION.

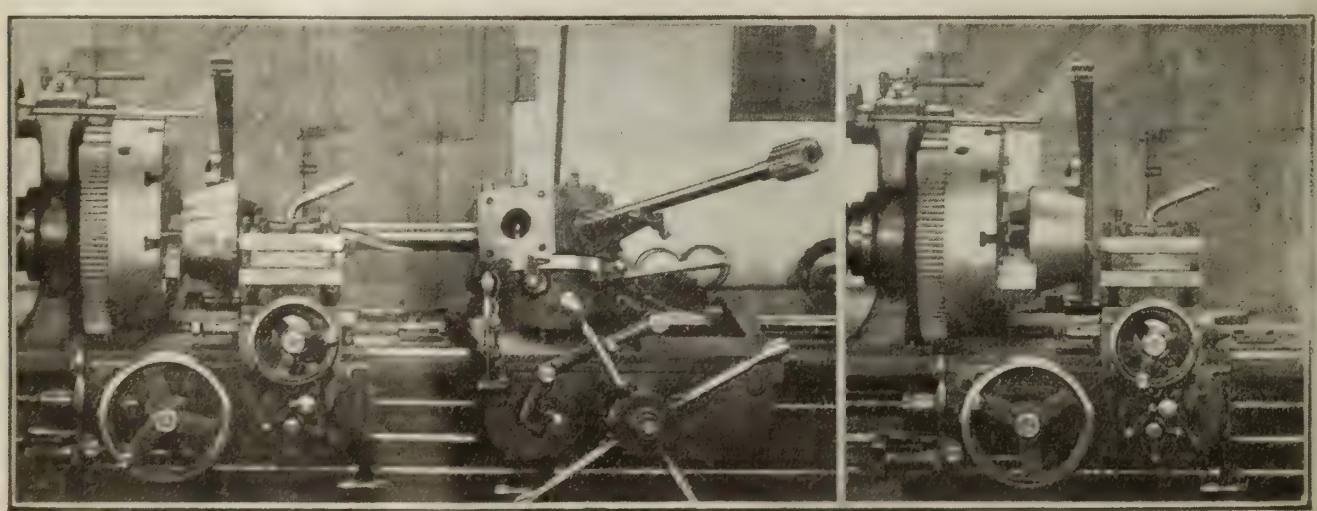


FIG. 10.—THE FIRST OPERATION ON THE CLUTCH CONE.

FIG. 11.—THE SECOND OPERATION ON THE SAME PIECE.

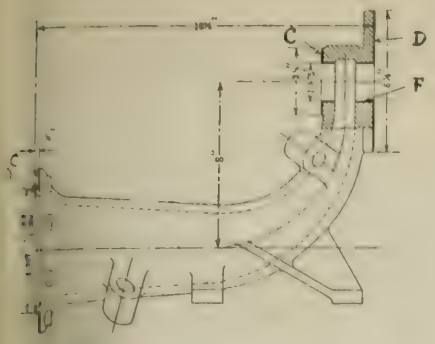



FIG. 12. HERE IS A PECULIARLY SHAPED PIECE TO MACHINE ON A TURRET LATHE.

of the turret. The same hole is finish bored by the bar at position 3 of the turret. After the finish boring it is reamed with the reamer at position 5 of the turret. After this, the face D is finished with the tool H in the toolpost, the rear face C of the hub is next faced with a tool held in the bar G mounted in the toolpost. This bar can be clearly seen at Fig. 15. The total time for this second operation is 9 minutes.

In a later issue we will show still further examples of work performed on these lathes.

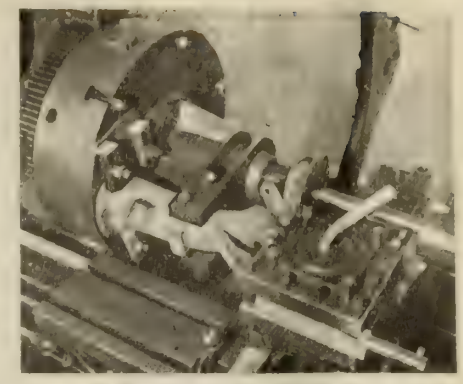


FIG. 15. A DETAIL VIEW SHOWING THE WORK HOLDING FIXTURE.

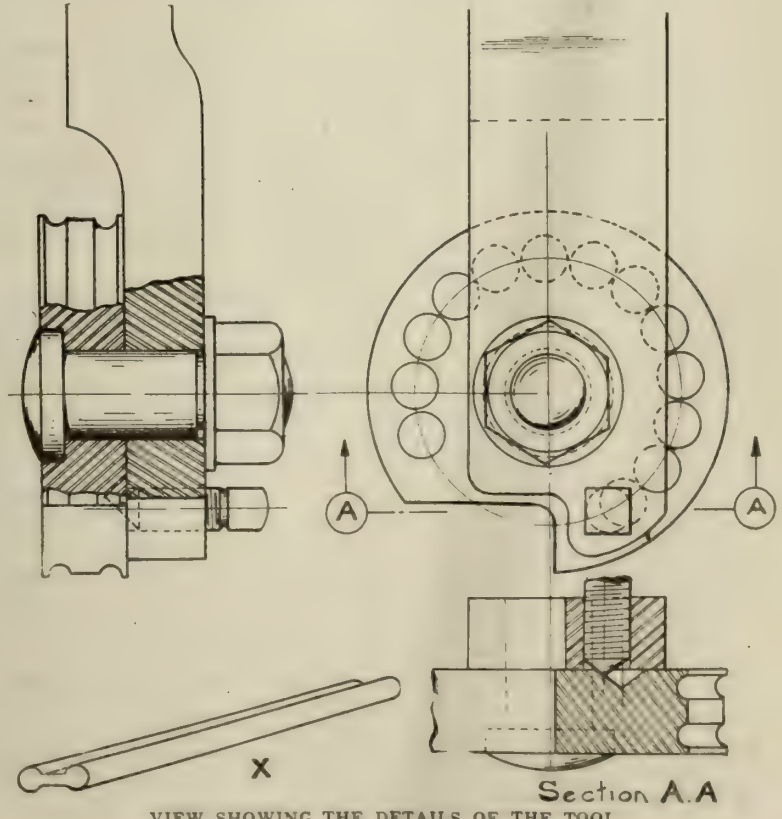
# A Shaper Form Tool of Interesting Design

By TYKE

FORM tools can be successfully and economically used in the producing of duplicate pieces even though nly a few parts are required. By few, f course, we mean at least a hundred, s less than that quantity makes the ini- ial cost of the tool almost prohibitive.

Some time ago we had a few hundred trips to make of the form shown at X." Several methods were tried with aried success, until the writer hit upon he idea of using a form tool in the haper. Previous to this a single con- ave radius tool had been used in the haper but this tool has received a lot f abuse by the different ideas of grind- ig the same; then again, the centre of he circular portion of the strips had to e reasonably accurate, and it was found iat this dimension varied considerably ccording to who had the work in hand. s these strips were wanted from time time, and any lapse of time between ne lot being made up and another re- ilted in an alarming amount of varia- on in the form of same, it was de- ded to make up a form tool as shown the accompanying sketch. One fea- ire of this particular tool that is of terest, and saved considerable time nd trouble, is the method of backing p the tool proper against the shock it ceives upon coming in contact with e work, and of the almost hair-like justment of the cutting edge. This as accomplished by having a circular ries of countersinks on one side of the ol, and having a hardened set-screw ss through an extended portion of the lder at the proper radius from the tre. It will readily be seen that by ewing this set-screw in until its nt just enters the countersink the ular tool is backed up against the pact which takes place when in tion.

Again, after grinding face of tool, it as found that the cutting edge could brought to its proper position by merely giving the set-screw a half turn or so and thereby bringing the cutting edge a little more forward, after which the centre stud nut was tightened up. This special adjustment was found particularly useful when setting the tool in the first instance, as the proper angle of clearance could be easily and quickly arrived at without taking the tool out of the clapper box. Granted, any radial movement of the form tool made a slight variation of the form produced, but this was not of any great importance as the job in question did not call for any microscopical accuracy. After the strips were shaped on both sides, having a pin just strong enough to support it, the strap portion was broken off and the strip placed edgewise in the vise and any fin remaining on the strip was merely shaved off, using one radius of the form tool only. When the tool had been in use some considerable time and frequent grindings resulted in the set-screw registering in the countersink to its full depth, a little more was ground off and the screw point when passed into the next countersink. No doubt the same idea can be utilized in some other form and it is with this in mind that the idea has been passed along.




VIEW SHOWING THE DETAILS OF THE TOOL.

# The Use of Chains and Other Lifting Gears

THE department of internal affairs in London, England, have issued a pamphlet dealing with the use of chains and other lifting gears. This subject is dealt with in considerable detail, but the data to follow form the portion that we believe will be of especial interest to our readers.

The safe working load for chains is given, in tons, as six times the square of its diameter. This differs from the American rule, which is $2.8d^2$—this giving a factor of safety of 4.5. Descriptions of the various types of chain and attachments are given, and the table, as shown in this article, is used to illustrate the safe loads that can be put upon two-legged slings, with the legs at various angles.

The pamphlet also includes some remarks on the testing, inspection and annealing of chains, and concludes with the following summary of precautions:—

(1) Chains and other appliances used for lifting purposes should be obtained from reliable manufacturers. The maximum working load and the purpose for which the chain or appliance is to be used should be clearly stated when ordering.

(2) No chain or other appliance should be used for lifting or similar purposes unless—(a) A test certificate has been obtained from the manufacturers showing the proof load to which it has been subjected and the name of the person responsible for the test; (b) a guarantee has been obtained from the manufacturer as to the quality of the material used, and that the chain or appliance has been thoroughly examined by a competent person after testing and found free from flaws, defects or deformation.

(3) The necessary information should always be available for any person using a chain or other appliance, to enable him to ascertain the safe working load for such chain or appliance.

(4) The maximum working load for any short or close-link chain should not exceed $6d^2$ tons, when used under normal conditions without shock; $5d^2$ tons, where there is any special danger to life or limb, or $3.5d^2$ tons where the chain is subjected to shock or heavy wear, or is used for lifts of molten metal or heated liquid; d being the diameter in inches of the iron of the chain. The maximum working load for a long-link chain should not exceed two-thirds of that for a short-link chain of the same diameter.

(5) When chain slings with two or more legs are used with the legs inclined, care should be taken to ensure that the maximum load in each leg does not exceed that given in recommendation 4 of the table shown.

(6) When the actual weight of an article to be lifted is not known, an approximate computation should be made, and lifting appliances should be used which allow an ample margin of safety.

(7) Load indicators and overload detectors should be used in connection with lifting appliances, especially jib or derrick cranes, whenever reasonably practicable.

(8) Slings or other chains should never be shortened by tying knots in them, and wood or other suitable packing should be provided to prevent the links coming in contact with corners of loads of hard material.

**Safe Working Loads for Two-legged Slings.**

| Chain diameter inches | Safe working loads in tons and cwt. for given angles between legs. 0 deg. | 30 deg. | 60 deg. | 90 deg. | 120 deg. | 150 deg. |
|---|---|---|---|---|---|---|
| 3/16 | 0-8 | 0-8 | 0-7 | 0-5 | 0-4 | 0-2 |
| ¼ | 0-15 | 0-14 | 0-13 | 0-10 | 0-7 | 0-3 |
| 5/16 | 1-3 | 1-2 | 1-0 | 0-16 | 0-11 | 0-5 |
| ⅜ | 1-13 | 1-12 | 1-9 | 1-3 | 0-16 | 0-8 |
| ½ | 3-0 | 2-17 | 2-12 | 2-2 | 1-10 | 0-15 |
| ⅝ | 4-13 | 4-10 | 4-0 | 3-6 | 2-6 | 1-4 |
| ¾ | 6-15 | 6-10 | 5-17 | 4-15 | 3-7 | 1-14 |
| ⅞ | 9-3 | 8-17 | 7-18 | 6-9 | 4-11 | 2-7 |
| 1 | 12-0 | 11-11 | 10-7 | 8-9 | 6-0 | 3-1 |
| 1⅛ | 15-3 | 14-12 | 13-2 | 10-14 | 7-11 | 3-18 |
| 1¼ | 18-15 | 18-2 | 16-5 | 13-5 | 9-7 | 4-16 |
| 1⅜ | 22-13 | 21-17 | 19-12 | 16-0 | 11-7 | 5-17 |
| 1½ | 27-0 | 26-1 | 23-8 | 19-1 | 13-0 | 6-19 |
| 1⅝ | 31-12 | 30-1 | 27-8 | 22-8 | 15-16 | 8-3 |
| 1¾ | 36-15 | 35-9 | 31-16 | 25-19 | 18-7 | 9-9 |
| 1⅞ | 42-3 | 40-14 | 36-10 | 29-16 | 21-1 | 10-17 |
| 2 | 48-0 | 46-8 | 41-11 | 33-18 | 24-0 | 12-7 |
| 2⅛ | 54-2 | 52-6 | 46-18 | 38-5 | 27-1 | 13-19 |
| 2¼ | 60-15 | 58-12 | 52-12 | 42-19 | 30-7 | 15-13 |
| 2⅜ | 67-12 | 65-6 | 58-12 | 47-16 | 33-16 | 17-8 |
| 2½ | 75-0 | 72-9 | 65-0 | 53-0 | 37-10 | 19-7 |

(9) Sling chains and other lifting appliances, when not in use, should be stored under cover and kept on suitable racks or pegs.

(10) Every chain or appliance used for lifting purposes should be marked with an identifying letter or number, either on the chain or appliance or on a tablet attached thereto.

(11) All chains and other lifting appliances should—(a) If used for lifting in connection with molten metal or molten slag, be examined at least once in every month and be annealed at least once in every six months; or (b) if used in connection with lifting machinery or plant operated mechanically or electrically, or used for lifting in metal foundries other than that mentioned in paragraph (a) above, be examined at least once in every three months and be annealed at least once in every twelve months; or (c) if used for classes of lifts other than those mentioned in (a) and (b) above, e.g., in connection with hand cranes, be examined at least once in every six months and be annealed at least once in every two years; or (d) if used for holding down any crane or other lifting machinery upon a stage or platform should be examined as far as reasonably practicable, in situ, at least once in every three months, and be fully examined and annealed at least once in every twelve months, unless the nature of the operations preclude such examinations and annealing.

(12) A chain or other appliance should not be used for lifting its maximum working load if the wear at any part exceeds 10 per cent. of the nominal dimension of that part, or for lifting any load if it has been subjected to a severe shock or is deformed or otherwise injured.

(13) A chain or other appliance which has been altered or repaired should be re-tested before use.

(14) A record with full particulars should be kept of every chain or other lifting appliance.

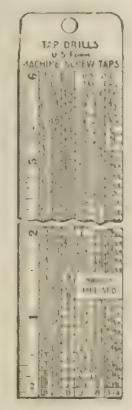
## OVERHEATING ALUMINIUM

While it is important to maintain a low-pouring temperature for casting aluminium alloys, it is equally important to avoid overheating the metal in the furnace charges. Doubtless some advantage is gained when overheated melts are allowed to cool to the correct pouring temperature, and part of the danger of overheating is minimized by so doing. Nevertheless, continues the Engineer, for aluminium, overheating is very objectionable because of the rate of dissolution of iron from cast iron melting pots and of the reduction of silica from clay crucibles, as well as absorption of gases from the local atmosphere. For molten metals, the absorption of gases increases with rising temperature, this being possibly due to the fact that metals form loose compounds with hydrogen and nitrogen. The absorbed gases are often held by the metal until solidification starts, when they are liberated and cause unsoundness. Hence an overheated melt would contain more absorbed gases than one not overheated, and it would be expected that castings poured from the former would be more unsound than those poured from the latter.

Switzerland is one of the principal producers of aluminium. In 1918 this country exported 10,500 tons of raw aluminum, to a value of 51,000,000f. To the figures stated must be added 2,000,000f. of bar and sheet aluminium, 6,500,000f. of technical appliances, and 3,200,000f. of other articles in aluminium. With the end of the war in 1919 the export of aluminium technical articles fell off while that of household items was doubled. The latter exports rose to a value of 6,200,000f., of which one-fourth went to Italy and one-fifth to France.

# Have You Tried This Contest Yet? If not--- Do so Now

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.



The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

## What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

We purpose making our contest a little more puzzling. 18 correct lists were received for the twelve queries appearing in the Jan. 20th issue. This places us in a difficult position. Who should get the prize?

After deliberation we have awarded the prize to W. O. Bird, Edmonton, Alta. In a previous issue Mr. Bird sent us a correct list of names, but was a few days late in submitting them. We, therefore, think we shall be acting in accordance with the wishes of our readers in sending him the scale on this occasion.

In future contests the following plan will be adopted. We will place the correct lists face down on the desk and allow some neutral party to pick out one of the lists as the winner. This arrangement will eliminate the date and distance problem for all time, and is fair to all.

**CONTEST FOR FEBRUARY 10TH ISSUE**

**Contestants are required to write us, stating to which advertisements we refer in this number.**

1—What to do if accuracy is of prime importance.
2—How to get the highest rate of production with the smallest amount of lost time.
3—A product easily handled.
4—Something that runs in self-oiling bronze bearings.
5—Something that has been absent for some time.
6—How to cut down expense.
7—A product that requires no special fixtures.
8—Something that gives high speed with practically no vibration.
9—A product that keeps primed.
10—A product said to be a big time-saver.
11—Something that refuses to spurt.
12—A product that is both solid and adjustable.

**These are Correct Answers for List from January 20th Issue:**

1—Walton Co.
2—Wallace Barnes Co.
3—Brown & Sharpe Mfg. Co.
4—National Acme Co.
5—Brown & Boggs Co., Ltd.
6—Jones & Lamson Machine Co.
7—The L. S. Starrett Co.
8—Clemson Bros., Inc.
9—Ritchie Supply Co.
10—Northern Electric Co., Ltd.
11—The Holden Co.
12—Morse Chain Co.

## Closing Date for This Contest is March 3rd.

# Interesting Examples of Vertical Milling

By J. H. MOORE

EXAMPLES of vertical milling machine practice will be shown in this article, but for the benefit of those not familiar with the particular machine on which these various operations are performed, we will briefly discuss the machine itself rather than the work performed. The type of miller shown at Fig. 1 is known as the No. 8 Herbert vertical mill, and is made in the Edgwick shops of the Alfred Herbert, Ltd., Coventry, England. They have given us the following data regarding these machines:

The spindle has a clutch drive, and an external taper for mounting large face milling cutters. The arbors are secured by a draw-bolt. The power is transmitted to the spindle by two eyes. The gearing can be thrown in and out of action without the use of spanners. For heavy cutting the drive is through a large spur gear. The main spindle bearing is of phosphor bronze with adjustment for wear. The pulley runs upon a sleeve so that none of the pull of the belt comes upon the spindle. The sliding head is balanced and has quick adjustment by pilot wheel for setting and fine adjustment by hand wheel for putting on the cut. The fine adjustment has a large adjustable index disc. The various handles are brought well out to the front so as to be easily accessible. A locking lever is provided for clamping the spindle slide, and a stop with screw adjustment for regulating its position.

The steady bracket for carrying the lower end of the arbor is arranged to swing out of the way when not in use. It has two positions vertically so as to come close to the main table or the circular table, according to which is in use. It may be raised and lowered by connecting it to the sliding head, a convenient device being provided for this purpose. A profiling roller can be attached to the steady bracket when desired. The holder for the profiling roller has screw adjustment for putting on the cut, and is quite independent of the arbor support, which can therefore be used to support the cutter when profiling. All gears are enclosed.

### Main Tables

The flush-top table is provided with ample channels for containing and carrying away the lubricant, a covered way being provided from end to end. Both longitudinal and cross movements have self-oiling slides. The transverse slide is guided by a raised tongue in the centre and is held down by gib plates on the outside edges of the base—the guiding of the slide thus being performed by the central tongue, which, being long in proportion to its width, gives a smooth working slide. Automatic feeds are provided both to longitudinal and transverse movements. Both feeds are reversible from the front of the machine and have automatic and dead stops. The dead stops are arranged to act after the automatic stop, rendering it impossible to break anything by feeding into the dead stop. The longitudinal feed nut is adjustable for wear, and the thrust of both feed nuts is taken by ball thrust bearings. The feed is varied by a patent dial feed motion. To obtain any feed the dial is simply rotated until the number corresponding to the feed required comes opposite the pointer, no other moveemnt being required. The various feeds are all obtainable with any of the spindle speeds.

The cross feed and longitudinal feed hand wheels are at the front of the machine, and the hand wheel controlling the vertical motion of the spindle head is brought well out to the front. All three motions can be operated without the workman changing his position. This feature renders the machine particularly suitable for irregular work such as die sinking. All the movements have large, easily read, adjustable graduated index discs.

### Actual Work Performed

Having touched briefly on the mechanical features, let us consider various applications of the machine to typical milling work. At Fig. 1, is shown one of these millers machining a die. Most of the dies produced on the machine shown are of the drop forging type, but where a mill is used for continually reproducing dies as they wear out, a special attachment can be attached which works as follows:

First, a wooden pattern is made, and a former is cast from this pattern. Of course the former is a duplicate shape of the die desired, and is so shaped that it can be bolted on an angle plate on the machine, and can be adjusted for height. A guide pin is made to follow the former, feeding by hand automatically, according to the cuts to be taken. This makes it possible to mill a die approximately the same as the former without spoiling it by relieving too much metal.

Fig. 2 illustrates an example of actual practice in their own shop. The work

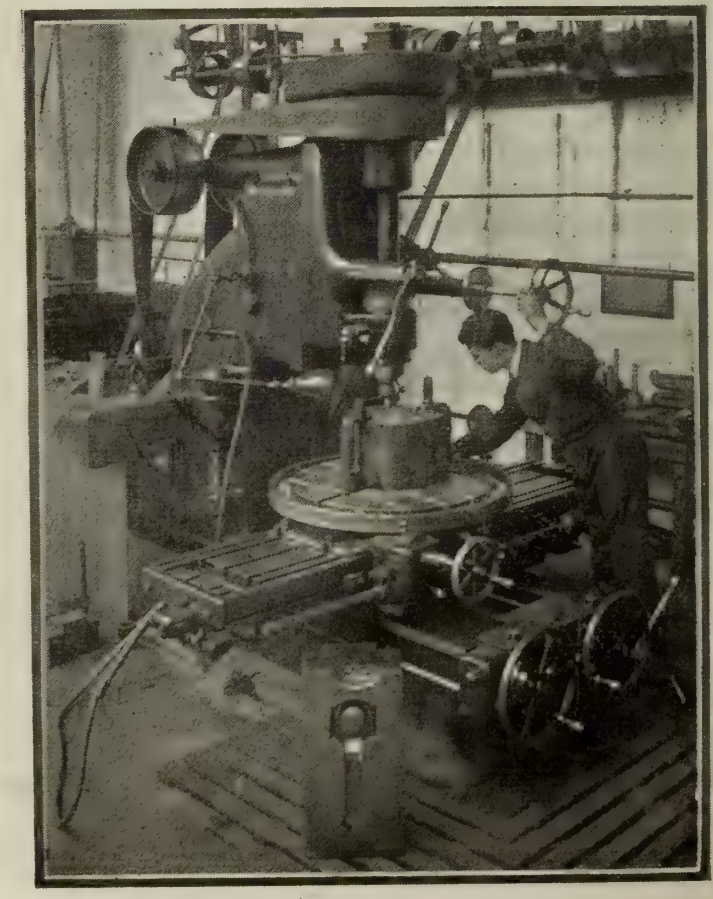


FIG. 1.—DIE SINKING ON A VERTICAL MLLER.



FIG. 2.—MILLING STOP ROD BRACKETS.



FIG. 3. MILLING THE TOP FACE OF MACHINE CABINETS.

being performed is that of milling the stop rod brackets for their No. 9 combination turret lathe. It will be noted that the brackets are clamped directly to the table with ordinary shop clamps. The inserted tooth face cutter shown in photograph is 4 inches in diameter, and runs at 57 r.p.m., the feed being 5⅜ inches per minute. About 36 castings are machined on both sides between grindings of the cutter.

Fig. 3 depicts how this concern mills the top of cabinets for their No. 9 turret lathes. These pieces are clamped directly to the table, and are machined with a 12-inch inserted tooth face cutter which runs at 19 r.p.m. A feed of 5⅜ inches per minute is employed.

Another example of Herbert practice is shown at Fig. 4. In this case the operation is that of milling the facings on the sud trays for their No. 1 hexagon turret lathes, and a 12-inch inserted tooth face cutter is used. The cutter runs at 19 r.p.m. and has a feed of 5⅜ inches per minute.

### The Last Example

The remaining example is shown at Fig. 5, and depicts the use of the circular table, on top of the regular table. The nature of the work is clearly seen, also the method of clamping. An inserted tooth cutter is used on this work. In conclusion let us quote what this concern have to say regarding the use of this type of machine for die sinking.

"Die sinking is perhaps the most awkward and difficult of milling processes.

"In die sinking the cutters have to be continually changed. Their direction of travel is constantly altering and the depth of cut is continually varying from moment to moment. Whilst the horizontal machine is broadly the machine for straight cuts and repetition work as by gang or form cutters, the vertical machine is to our mind the machine for variety. It will drill holes, mill faces, edges, slots and undercuts. It will mill at the bottom of recesses and sometimes has to perform most or all of these operations on the same article. It is easily manipulated and the cutters are cheap and easily maintained. Vertical milling is usually a cheap operation. Fixtures for holding the work are simple and easy to set; the actual milling being practically continuous."

### NEW FUEL

A new compound fuel, named thermalene, has been produced by Karl Wolf, of Zurich. It is a mixture of acetylene and vaporized oils, and is claimed to have important advantages over other gases as a fuel for high temperatures. As now manufactured, the generating mixture, consisting of alternate layers of calcium carbide and crude oil absorbed in sawdust, is packed in tin cans, the largest yielding 200 cubic feet of gas. The addition of water liberates the acetylene, and the heat of the reaction converts the oil into vapor. The two gases are cooled and purified, ready for use in the pipes. The gas mixture is not corrosive or poisonous, has an inoffensive odor and is not liable to cause explosions. At normal temperature, thermalene, which is somewhat heavier than air, is liquefied by a pressure of 1,500 pounds or 1,600 pounds per square inch.

Premises have been leased at Kingsville, Ont., by the McIllroy Belting & Hose Co., Hammond, Ind., for their Canadian branch.

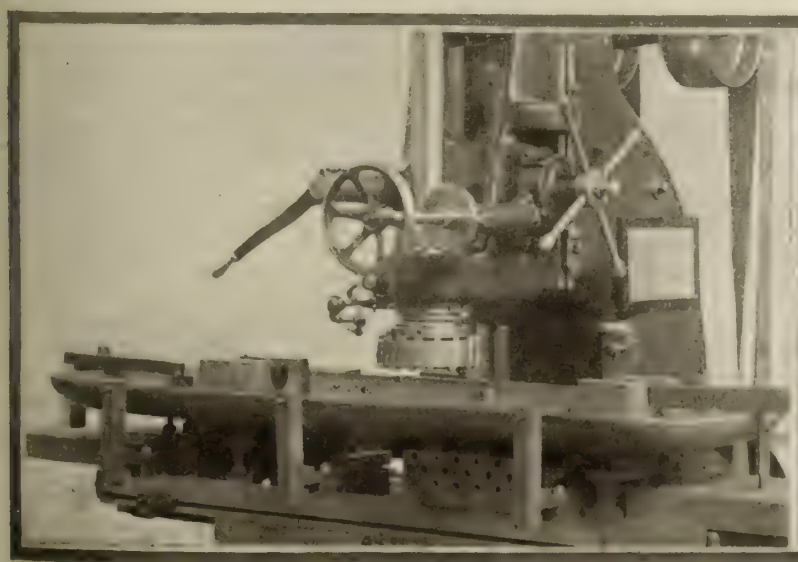


FIG. 4.—MILLING THE FACINGS ON SUD TRAYS FOR TURRET LATHE.

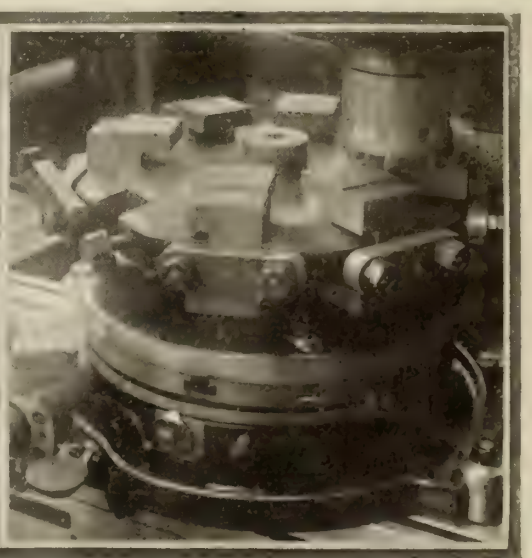


FIG. 5.—USING THE CIRCULAR TABLE TO INCREASE PRODUCTION.



# WELDING AND CUTTING



## The Canadian Welding Society Develops

### At the Second Meeting of This Society Nominations for Officers Were Held, Later Plans Arranged and Provisions Made for the Formation of Branches Throughout Canada

THE second organization meeting of the Canadian Welding Society was held in the L'Air Liquide Society offices, Toronto, Canada, on January 26th. Matters of considerable importance were transacted, and the meeting adopted the constitution and by-laws as placed before those present.

Nominations for officers and members of the board of directors were made, with the following results:

**For President**

A. M. Barry, vice-president, St. Lawrence Welding Co., Ltd.; Prof. H. E. T. Haultain, Mechanical Engineering Department, University of Toronto; W. H. Wood, Canadian manager, Commercial Acetylene Supply Co., Inc.

**For Vice-President**

F. Borys, commercial manager, L'Air Liquide Society; R. H. Combs, general manager, Prest-O-Lite Co. of Canada, Ltd.; J. F. Crowley, Ontario sales manager, Davis-Bournonville Co.; F. J. Hamilton, manager, Canadian John Wood Manufacturing Co., Ltd.; T. Jones, works manager, Canadian Vickers Limited; H. E. Mussett, sales manager, Canada Carbide Co., Ltd.; C. Royer, manager, Welding & Supplies Co.

**For Directors**

A. M. Barry, vice-president, St. Lawrence Welding Co., Ltd.; F. Borys, commercial manager, L'Air Liquide Society; A. Girouard, Montreal manager, L'Air Liquide Society; D. N. Griffiths, sales department, Union Carbide Co. of Canada, Ltd.; F. J. Hamilton, manager, Canadian John Wood Manufacturing Co., Ltd.

Prof. H. E. T. Haultain, Mechanical Engineering Department, University of Toronto; J. G. McCarty, Canadian manager, Metal & Thermit Corp.; A. J. MacDougall, vice-president, National Electro Products Limited; S. L. Montgomery, sales manager, Prest-O-Lite Co. of Canada, Ltd.; H. E. Mussett, sales manager, Canada Carbide Co., Ltd.; R. E. Smythies, Engineering Department, Lincoln Electric Co. of Canada, Ltd.

W. F. Thatcher, general manager, Dominion Oxygen Co., Ltd.; R. A. Witherspoon, vice-president and general manager, Canada Carbide Co., Ltd.; W. H. Wood, Canadian manager, Commercial Acetylene Supply Co., Inc.

The elections are to be by letter ballot, everyone sending in his membership application form being eligible to vote at this first election. Application blanks, ballot forms, and information regarding the society are to be mailed very shortly to all those in Canada who should be interested.

The society wishes to point out that it is almost impossible to get in touch with all prospective members. Therefore, no one is to feel slighted if he does not receive further information. Merely write to Canadian Machinery or to the society, and all necessary forms will be sent.

It has been decided to hold the first annual meeting on March 15 in Montreal, and at that meeting the ballots will be opened. This means that all letters should reach Toronto not later than March 13.

One of the most important items regarding the society is the provision made for the formation of sections or branches throughout Canada.

Any group of fifteen or more men eligible for any class of membership may make application for the formation of a section. These sections may be in a city or part of a city or any town, village or part or all of any province or district. In fact, no definite limits are made on geographical location. It is hoped that before the first annual meeting, applications will be received for the formation of sections in Hamilton, Montreal, Toronto, and Vancouver, possibly from others, for there cannot be too many. Anyone interested in the formation of a section should write the society.

The society will place few restrictions on the sections. The main thing is that the section by-laws must not conflict with the aims of the society, and that none of the sections shall develop into labor organizations. The society will refund to each section 50 per cent. of all membership dues received from members enrolled in that section. Also each section will be entitled to elect a member of the board of directors of the society.

The society is to meet twice a year, but no restrictions are placed on the sections. In fact, it is proposed that they meet at least once a month. At these meetings papers may be read from men prominent in the welding industry, discussions may take place regarding the outstanding welding problems, or anything of a similar nature. This phase of activity is left largely to each individual section.

Officers of the society, however, will lend all possible aid to the sections. The secretary will assist in the compilation of by-laws, in arranging for papers to be read, etc. While certain restrictions are placed on members in the various classes in the society, these restrictions do not necessarily need to be included in the section by-laws. Each section is to make its own rules regarding this point.

The greatest latitude is to be given to the sections in the conduct of their own affairs, and it is hoped that all branches and the main body may be able to work together for the general advancement and betterment of the welding industry in Canada.

The meeting held in Toronto, while of necessity somewhat limited as to attendance, showed the strongest interest.

It was also the opinion of those present that while everything could not be done the first year, still the society should be gotten under way without delay and should carry out whatever was possible, and that even the smallest activities would be of benefit.

Those present at the meeting were as

follows: A. M. Barry, vice-president, St. Lawrence Welding Co., Ltd.; F. Borys, commercial manager, L'Air Liquide Society; P. F. Briggs, welding instructor, Toronto Technical School; S. E. Brock, Canadian General Electric Co., Ltd.; J. H. Carson, manager, National Electro Products Limited; R. H. Combs, general manager, Prest-O-Lite Co. of Canada, Ltd.; J. F. Crowley, Ontario sales manager, Davis-Bournonville Co.

D. N. Griffiths, sales department, Union Carbide Co. of Canada, Ltd.; F. J. Hamilton, manager, Canadian John Wood Mfg. Co., Ltd.; L. H. Holman, manager, Engineering Services Limited; Jas. Honan, sales department, Dominion Oxygen Co., Ltd.; E. J. Houghton, sales department, L'Air Liquide Society.

W. M. Leith, sales department, Dominion Oxygen Co., Ltd.; A. McDougall, engineering department, L'Air Liquide Society; A. J. MacDougall, vice-president, National Electro Products Limited; H. T. Madge, oxy-acetylene welder, C. N. R. Leaside Shops; J. C. Minns, sales department, Canadian General Electric Co., Ltd.

J. Moss, advertising manager, L'Air Liquide Society; H. E. Mussett, sales manager, Canada Carbide Co., Ltd.; F. J. Padbury, manager, Toronto Welding Co.; J. N. Robinson, managing editor, Canadian Welding Journal; C. Royer, manager, Welding & Supplies Co.; R. E. Smythies, engineering department, Lincoln Electric Co. of Canada, Ltd.

F. Staddon, sales department, L'Air Liquide Society; A. A. Stewart, secretary, Canadian Welding Journal; J. Sykes, electric welder; L. Sykes, sales department, L'Air Liquide Society; W. F. Thatcher, general manager, Dominion Oxygen Co., Ltd.; F. G. Tripp, Canada Carbide Co., Ltd.; W. H. Wood, Canadian manager, Commercial Acetylene Supply Co., Inc.; D. L. Wright, L'Air Liquide Society.

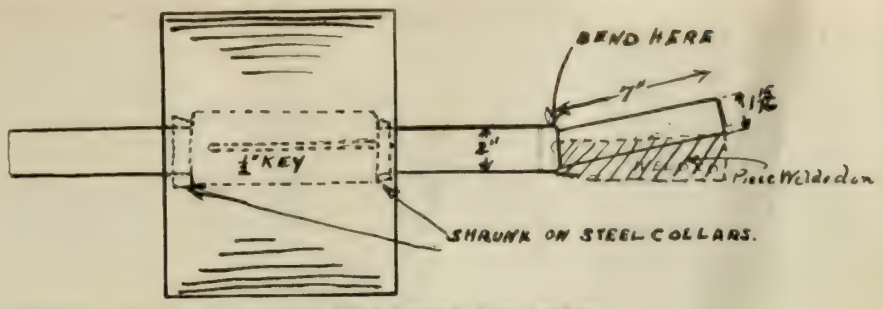



DIAGRAM OF ROTOR AND SHAFT.

## STRAIGHTENING ROTOR SHAFT

Recently I was given a job straightening a 2 in. rotor shaft, which was bent right at shoulder on pulley end, and as I thought it would be next to impossible to straighten it without taking shaft out of rotor, and as it is quite a job to take same out and place it again, I did it in novel way, which may interest some of our engineers.

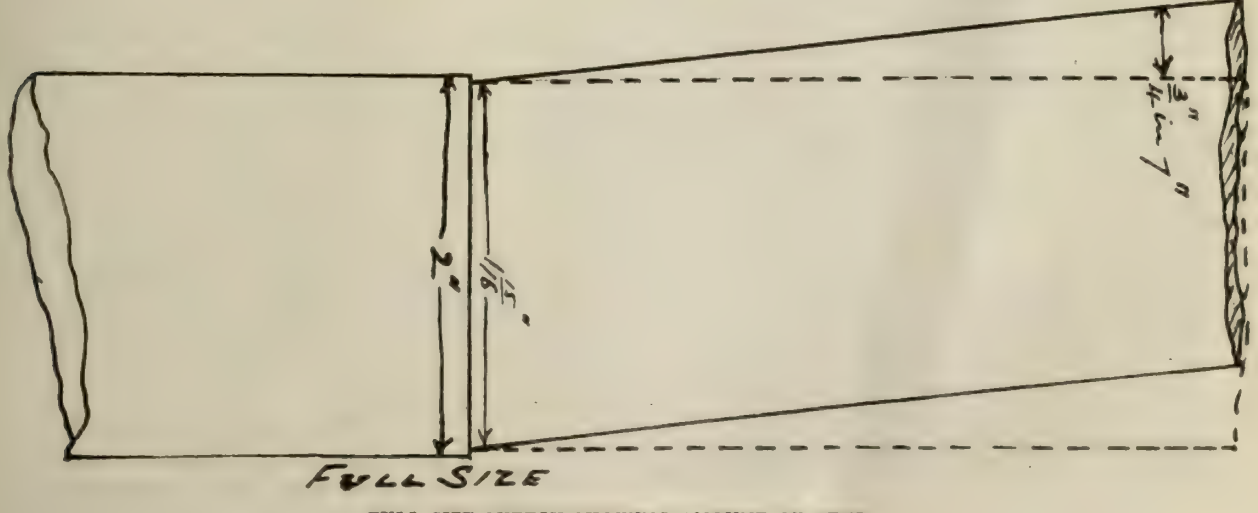
The rotor shaft in question was bent in transit by the railway company and was out about ¾ in. As our readers well know only .008 inch is allowed between stator and rotor laminations, so it is seen that rotor shaft must be perfectly straight.

I did not care to heat it nor hammer it, so we had one side built up with electric arc welding process, then rotor was set up in lathe, welded end in steady-rest, faced and new centre put in, and then shaft turned to 1-64 oversize and then ground to exact size; it was then impossible to tell any defect nor that shaft had ever been welded. Operation took six hours and rotor never got hot enough to melt solder out of rotor rings.

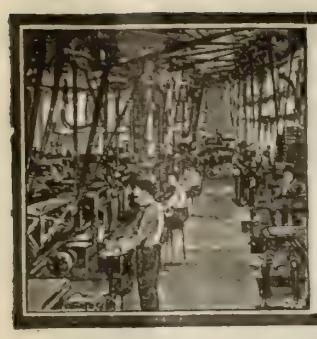
ERNEST QUIST.

The idea shown above is quite satisfactory as regards truing the shaft. It does nothing, however, to relieve the strain set up on the fibres of the shaft at the shoulder, where it was bent. We think that the rotor could have been protected by a shield from radiant heat and the shaft warmed at the bend by a blow torch and straightened up by pressure. It could then have been heated to a dull red for two or three inches each side of the bend, and allowed to cool, after which it could have been trued up in the lathe. The insulation would not have been damaged in this way, and the molecules of the metal would have been returned to their normal condition. As it is a certain amount of initial stress is present when no load is on the shaft, and this the welding would not help. We would like to hear some opinions from our readers on this.—Editor.

Can you imagine a house built of straw? The French are really thinking of building straw houses to remedy the present housing crisis. The proposal is said to have emanated from an expert in textiles, who has invented a process for making bricks from compressed straw. The framework of the house is made of wood, and the walls are built up of blocks of straw. Owing to the lightness of the material, there is no need for deep foundations, and the whole building can, it is said, be completed in a month. It is stated that the straw preparation is no more inflammable than are bricks. The first straw house has already been built at Montargis, and if it proves a success it is possible that, owing to the rapidity with which such houses can be built, the new invention may be utilized in the devastated regions.




FULL SIZE SKETCH SHOWING AMOUNT OF BEND.



# DEVELOPMENTS IN SHOP EQUIPMENT



## INTERNAL GRINDING MACHINE

The Heald Machine Co., Worcester, Mass., has added another machine to its present line of grinders. This new machine is known as the No. 80. The front view of the machine is shown at Fig. 1.

The workhead of the machine is driven by a cross belt through the base from a cone pulley giving three speeds. It is arranged to swivel, and is graduated to 45 degrees, or 4-inch taper to the foot.

The main drive pulley is connected to its shaft through a friction clutch and provided with a brake, both of which are so connected with the wheel-slide that when the latter is drawn back both the work and the pump are automatically stopped. At the same time, and without attention from the operator, a small guard swings over the grinding wheel to protect the operator from injury due to accidental contact. No time need be lost in gauging the work, or in substituting another piece for the finished one.

The wheel-slide, or table, is reciprocated by a pinion at the upper end of a vertical shaft, driven through a double friction clutch under control of the operator. By shifting a single lever the traverse is changed from power to hand movement without the possibility of both being engaged at the same time. This enables the operator, as soon as the grinding wheel is clear, to run the slide back quickly for the purpose of gauging or removing the work. This table slides upon flat and V ways. The power traverse may be set to any desired point of reversal. The table drive is through a two-step cone, thereby providing two rates of wheel traverse.

At the wheel end the spindle runs in a bronze tapered bearing that allows for adjustment to compensate for wear. At the pulley end a ball bearing is provided. The wheel-heads are made up as complete units, each having its own pulley, thereby insuring correct spindle speeds. A section through one of these wheel-heads is shown at Fig. 2.

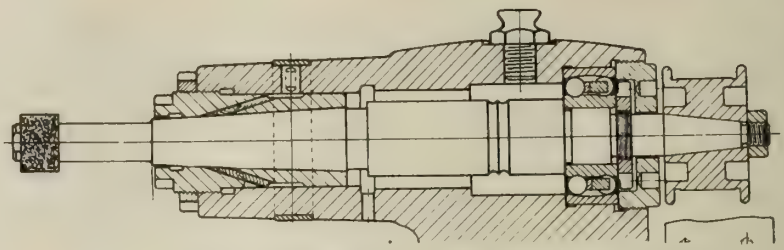
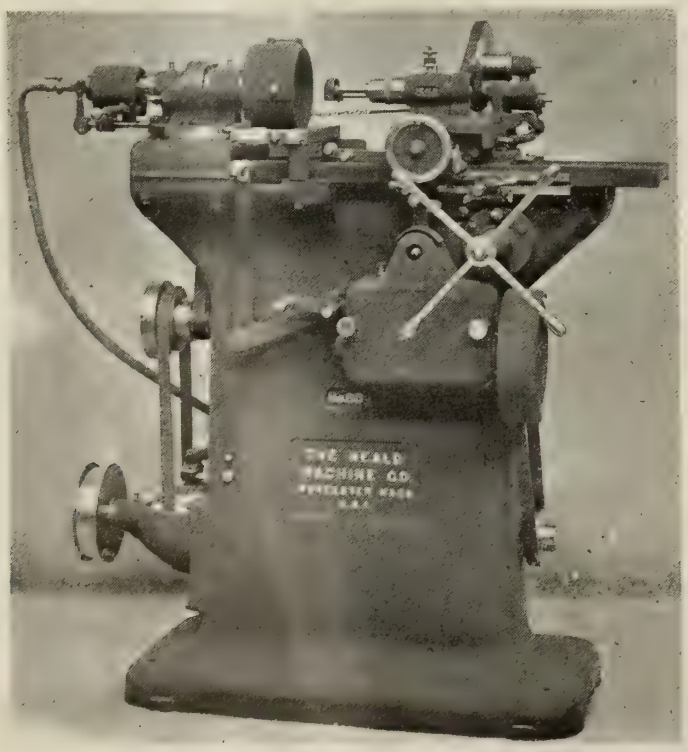


FIG. 2.—SECTIONAL VIEW OF ONE OF THE WHEEL HEADS.

The cross-slide may be operated by power feed or by hand, and the power feed is so calibrated as to work to half thousandths of an inch on diameters. The overhead countershaft, supplied with the machine, has an idler to keep an even tension on the belts.



GENERAL VIEW OF THE GRINDING MACHINE.

## MULTIWHIRL COOLER

The Griscom-Russell Company, 90 West street, New York City, manufacture a device for the cooling of oil used in the lubrication of turbine bearings, reduction gears or quenching oil in the heat treating of steel. In either case the oil is constantly circulated through the cooler, thus maintaining the oil at a constant temperature and permitting the continued use of the original quantity of oil and its maintenance at the proper viscosity for efficient results.

The apparatus takes its name from the whirling path of the oil, which path is accomplished by the use of the helical baffle which directs the oil in its flow without appreciably retarding its progress. This baffle also serves to bring the oil into intimate contact with the cooling surface and it insures a high rate of heat transfer.

The shell is of cast iron and the tubes of seamless drawn brass or copper, expanded into a fixed tube plate at one end and into a floating head at the other, which latter permits expansion and contraction without strain on the tube joints.

## AUTOMATIC TUMBLING BARRELS

The Ideal Concrete Machinery Co., Cincinnati, Ohio, have placed on the market an automatic tumbling barrel

that is a decided departure from the ordinary style of barrel.

This barrel has the action of the regular type, but it tumbles much faster.

It can be loaded automatically from ground level and discharges the work directly into buckets or buggies, without stopping the barrel. Much time is saved in loading and unloading the barrel, also in tumbling.

The work can be held in the drum as long as desired, and the operator can at all times see the progress of the tumbling, thus ensuring that it will not be over tumbled or not tumbled enough. The barrels can be furnished for exhaust tumbling, wet tumbling, also equipped with slats for separating trimmings. The illustration shows a 36 by 60-inch barrel equipped with exhaust, and these barrels can be furnished in the following sizes: 24-in. x 30-in., 36-in x 48-in., 36-in. x 60-in., 42-in. x 60-in., 48-in. x 60-in.

The shell of the mill is made of ¾-in. steel plate, rolled true to size and butt welded. The drum heads are castings ¾-in. thick and protected from wear by steel bands shrunk around the running track. They are also equipped with ¾-in. removable wearing plates on the inside. The drum revolves on chilled iron rollers 12 inches in diameter. These rollers are rigidly fastened to the roller shafts, which run in flexibly hung Hyatt roller bearings. The journals of the roller shafts are case hardened.

The frame of the machine is built of heavy angle iron, well stiffened with gusset plates and hot riveted. The power loading skip is raised by a 14-inch contracting band hoist and an automatic stop prevents the loading skip from being hoisted too far.

These tumbling barrels are adapted for tumbling bolts, nuts, stampings, drop forgings and small castings, either grey iron, steel, malleable or brass.

## ROTARY MILLER

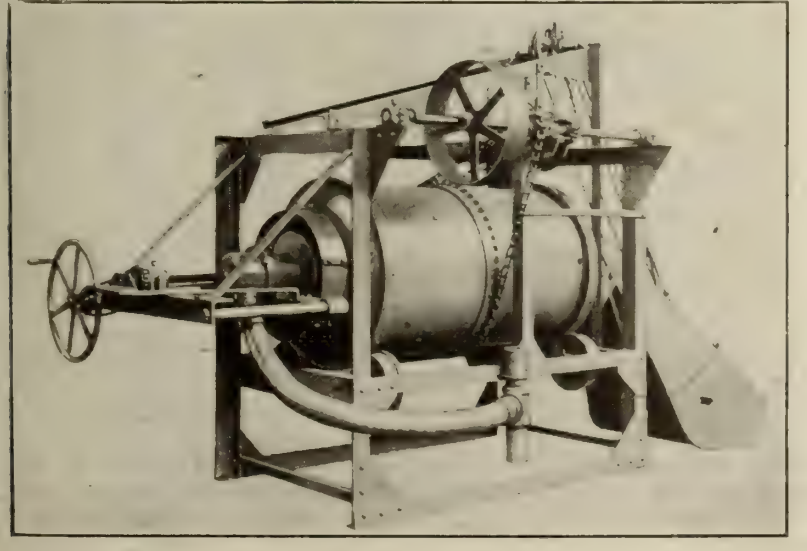
The Craftsman Tool Co., Conneaut, Ohio, have placed on the market a line of continuous rotary millers. These machines are somewhat similar in design, and the No. 3 size, which is the largest, is provided with two rocker arms and driving pulleys. This insures greater power and at the same time enables the operator to make two adjustments for depth of cut and two separate operations can be handled by the machine at the same time.

Parts up to 2½ inches in diameter, and up to 6 inches in length, can be handled on this machine. Thirty feeds are provided, and the machine is equipped with compound feed gears. A glance at the illustration will show the machine's general appearance.

These machines are used for castellating, screw slotting, slab milling, straddle milling, plain milling, etc. The work is milled by being fed into the chuck as it rotates, each jaw being full as it comes under the cutter the operation is thus continuous. As each independent jaw of the chuck approaches the cutter it is closed automatically by the two roller bearings between which it passes. The work at the same time resting upon the central plate is thus held in positive position while being machined. As the work leaves the cutter the chuck in turn automatically opens and the parts drop from the chuck and pass from the machine through a chute which makes the machine semi-automatic.

In castellating the nuts have to pass through the chuck three times but due to the fact that the operation is a continuous one the production is very satisfactory, ranging from 1,200 slots per hour on ½-inch nuts up to 2,100 slots per hour on ¼-inch nuts. This insures a production of 400 to 700 complete nuts per hour.

The machine is equipped with a pump and a lubricant tank in the base. Attached to the right is a metal container for holding the parts to be milled which has a capacity for a half day's run.



GENERAL VIEW OF AUTOMATIC TUMBLING BARREL.



VIEW SHOWING THE CLAMP IN USE.

## DRILL CLAMP

The Poyser-Bucher Co., Canton, Ohio, have placed on the market a drill clamp and support, which is shown in the accompanying illustration. This clamp was designed to do away with the use of the gooseneck, or as it is called, the old man, and where is the mechanic who hasn't said things about the old man?

This clamp, by means of one adjustment, will drill a hole in the top, bottom, or web of an I beam, and as the photograph is self explanatory we need say nothing further.

## PORTABLE DRILL

The Wodack Electric Tool Corporation, Chicago, have developed a new automatic stop drill.

This portable drill is motor driven, using either alternating or direct current and automatically stops when not in use. This is due to the fact that the current contact functions through a spring lever in the handle which is released as soon as the pressure of the operator's grip is removed, much on the same order as the valve on a pneumatic hammer or on the same principle as the "dead man" grip controller used by the elevated railway system in Chicago.

This drill is the development of fifteen years of experiment and is made in six sizes: 3-16, 5-16, 3-8, 1-2, 5-8 two speed, and 3-4 inches.

In addition to the drill, this concern are manufacturing a portable grinder equipped with the same style of control. These grinders are made in three sizes, depending on the wheel capacity, 3x½, 4x1, and 8x1 inches.

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## Know What You Burn

THE throwing of a quantity of magnesium (which had become hard and unfit for commercial use) into the furnace under the boiler in the plant of a Montreal concern resulted in an explosion that caused the death of one man and serious injury to three others.

Cases such as this one are seldom recorded in the annals of industrial hazard, but nevertheless, it exemplifies the great danger that lurks in the wake of the thoughtless or careless actions of persons indirectly responsible for the lives of many others, who, at stated periods, are more or less dependent on one or more men for the safety of their person.

Firemen and engineers in charge of boilers should have a greater sense of their responsibilities than was shown in this particular instance. While greater care must necessarily be exercised in burning the refuse around a chemical plant, the use of the furnace as a receptacle for all kinds of rubbish is a practice that should be strictly guarded against. Unless instructed by the man in charge of the furnace, no one other than the fireman should be permitted to throw any refuse upon the fire. Even though the rubbish be perfectly acceptable as fuel, the opening of the furnace door to throw the material in may result in greater loss than the heat units obtained from the stuff or the convenience of getting rid of it. In the case here cited, the slight damage to the building and the small number of injured persons, was doubtless due to the fact that the shock to the building was considerably lessened by the explosion wrecking the large skylight in the boiler room, thus preventing the full force of the concussion from coming on the more solid portions of the room. Had the boiler been more compact and bricked in, the result might have been more disastrous.

Where it is customary to burn refuse in a furnace the fireman should have full knowledge of what the rubbish consists of and if there is anything there that he has doubts of, it should be his duty to refrain from putting it on the fire. Where a boiler under pressure is concerned it is not well to "take a chance."

## The Other Firm

HAVE you heard this phrase any place? "I don't think it's time for us to buy yet," or "I don't think prices are right yet to go ahead with that undertaking."

Of course you have. In fact these twin phrases are becoming so common that they are going to be part of our business vocabulary.

If this attitude is maintained it may be found that it will be a very difficult matter to get started or to go on. The longer that the markets are left alone the harder will it be to get service.

It is time that we started thinking about the other man's business and interests a little. Would it do any particular harm, for instance, to stop and think some day that your business would be as good as a spring tonic now to the firm you were thinking of ordering from?

Suppose half a dozen firms, thinking of making purchases in the machine tool market, should drop in and remark that they were ready to go ahead now, believing that prices were fairly well on the way to a basis where they would stay for some time. Don't you suppose it would have an influence on the trade?

It is a dangerous thing to withhold your business too long.

Right now, by making a sacrifice to go ahead with some line of work, you are serving a double purpose. You are getting something necessary done and at the same time you are doing a good service to other lines of industry that need orders now.

It won't hurt you a bit to think a little about the interests of other people this year.

## The Strikes of the World

WE read of a little strike here and others there and to some extent we have seen the local waste of these movements. It is not often that a person has the opportunity of taking a world-wide view of the situation and getting some idea of the strike waste of the entire world for a given period.

Most of the figures given below are from the Manchester "Guardian," and although they cover the ground fairly well, there are no doubt many hours and days that could be added.

These figures are for the first six months of 1920:—

| Country— | Persons Affected | Days Lost |
|---|---|---|
| Germany | 1,866,358 | 18,201,660 |
| Italy | 1,781,250 | 21,650,200 |
| France | 1,186,670 | 19,358,400 |
| Great Britain | 1,117,040 | 6,926,900 |
| U.S.A. | 958,700 | 11,287,400 |
| Spain | 724,700 | 11,630,100 |
| Australia | 303,400 | 7,602,000 |
| Sweden | 180,070 | 4,779,170 |
| Belgium | 176,940 | 2,096,340 |
| Austria | 97,540 | 902,900 |
| Egypt | 95,000 | 441,000 |
| India | 90,000 | 1,780,000 |
| Poland | 81,000 | 429,900 |
| Switzerland | 73,380 | 2,753,160 |
| Holland | 63,000 | 795,300 |
| Argentina | 61,100 | 659,400 |
| Balkan States | 45,000 | 2,176,000 |
| South Africa | 41,000 | 809,000 |
| Denmark | 17,200 | 241,800 |
| Portugal | 13,150 | 235,050 |
| Czecho-Slovakia | 3,800 | 29,300 |
| Norway | 1,400 | 28,000 |
| Ireland | 100 | 2,000 |
| Total | 8,977,798 | 114,814,980 |
| **Industries—** | **Persons Affected** | **Days Lost** |
| Mining | 1,631,100 | 20,831,800 |
| Iron and metal | 1,377,830 | 20,791,850 |
| Textiles | 303,500 | 4,441,200 |
| Timber | 242,840 | 3,932,340 |
| Stone | 61,900 | 775,200 |
| Leather and paper | 40,080 | 624,620 |
| Building trades | 808,000 | 15,004,000 |
| Tailoring and cleaning | 160,500 | 2,467,300 |
| Food and luxury | 248,814 | 3,779,520 |
| Printing | 48,200 | 498,200 |
| Shipping | 1,540,174 | 17,454,050 |
| Chemicals | 269,900 | 5,566,800 |
| Steel | 184,110 | 1,072,560 |
| Agriculture | 1,975,800 | 16,819,000 |
| Unenumerated | 85,050 | 756,540 |
| Total | 8,977,798 | 114,814,980 |

# *The Fundamental Conditions Are Sound*

"ONE thing that has impressed me is the fact that buyers who are placing business now are taking advantage of discounts. They have the money at their disposal and I believe when they are satisfied that prices are right they will buy."

That is a report from the machine tool trade this week.

Another—One of the offices in the steel trade that handles a nice big tonnage every year reports a large number of inquiries, very few of which have been turned into orders. They are not being withdrawn, but they are going to be gone on with as soon as prices come within the estimate they have in mind on what the undertaking will stand.

Some of these inquiries are not new. They have been in the market before and are put in again now with the idea of finding out if there is any improvement in the situation.

But they come from a very wide range of industries. They call for structural shapes, bar mill products, sheets, ties, etc. The people asking for these prices are not concerned in the matter simply from the point of securing quotations for the sake of knowing market tendencies. They could get this information with much less effort.

They are following the markets because they have plans in mind, and they stand ready and prepared to launch them just as soon as they believe it will be to their advantage to do so. These inquiries represent definite future business and although an office may get a bit tired at times of nursing these along, the real salesman never discounts the importance of them.

Just this week Canadian Machinery asked W. H. Whitaker, of the Goold, Shapley & Muir Co., Brantford, if there was anything on the business horizon of his company that he could interpret as pointing to a more favorable business tendency.

Mr. Whitaker admits right at the start that it is quite a proposition "to give you optimistic material to sow broadcast in the hearts and minds of the general public, particularly to some person who is trying to sell the farmer something that he does not now need and which he seldom, if ever, buys in January and February."

On top of this, Mr. Whitaker seems to nurse an opinion that the farmers—perhaps through the U.F.O.—are engineering a buyers' strike. In other words they are not lugging home as many gas engines and windmills as they should.

But let it pass at that. When the Brantford manufacturer gets over his preliminary hurdles he has this to say:

"Even at that, our sales organization in Eastern Canada here did more business during the month of January, 1921, than we did in January, 1920. We are not blowing about it, because we did not do very much business in either period, but all these difficulties to the contrary, this Canada of ours is the best ever.

"The fundamental, underlying conditions for prosperity are sound and before 1921 lapses we are going to see, in the writer's judgment, a return to normal business and conditions, when, if we are industrious and thrifty, we are likely to be happy and some of us are going to be happy even in the meantime—and we all should be."

Another manager, speaking of this same condition, states his belief in the fact that "we have seen the worst. We can tell it in our own business. It may seem poor optimism to tell you that things are not getting any worse, but it is an absolute way of looking at the case. We do not deny that business is below normal, but we know from a close scrutiny of our records that the bottom of the hill has been reached. It is going to be slow going up for a while, but it is sure and certain. If there is any optimism of the worthwhile kind in that, you are welcome to it."

The cartoon on this page gives the idea. It is worth looking at. The traffic cop "Optimism and United Effort" can put his hand up and stop Old Man Gloom better than any other force that can be brought to the rescue and these forces can also take the hand of the rather timid chap "Business" and get him across the street in safety.

The more people who get out and get in behind that cop the bigger and stronger the officer will be and the less chance of the lad "Business" getting run over.

Now, then, let's get out and help that cop.

## THE NEW TRAFFIC COP




—Toledo "News-Bee."



# MARKET DEVELOPMENTS



# Trade Quiet In Most of the Markets This Week

## Pittsburgh Reports Production Easing Off Even at Some of the Corporation Mills—New York Machine Tool Market Still Has Resales on Hand—Many Inquiries in Toronto District

THE machine tool markets are not making any rapid move toward recovery. Inquiries continue to hold first place over actual orders taken. Dealers report that some sales are being made and one of the signs they consider very encouraging is the way in which settlement is made for sales made. There seems to be enough capital to take advantage of all the discounts.

The exchange problems between various countries continue to be a source of bother, particularly as the machinery of several nations is finding its way to the Canadian market again after an absence of some years. The belief is expressed that there will continue to be a certain amount of instability until such time as arrangements are made to stabilize the value of the currency of the world.

The steel market is quieter than it has been for months. January was somewhat of a disappointment to the warehouses, although a large amount of material came into the country to actual orders. Some of this material has been on the books of the Steel Corporation for over 14 months and it is considered a favorable sign that it has stayed "good" all this time.

Steel merchants are concerned just now with getting rid of their surplus stock. They are drawing on their present stocks almost entirely. Some of the trade that should be good this time of year is being curtailed. Earlier in the season several firms send in orders for boiler tubes and have since cancelled or cut down, with the result that several yards have more tubes on hand than they had bargained for.

The scrap metal market remains inactive, but dealers generally look for a recovery in copper before the iron and steel varieties pick up, basing their belief on the ground that right now red and yellow metals are being sold for less money than it takes to produce them.

## MONTREAL TRADE SHOWS NO CHANGE—BUYING IS STILL SMALL

Special to CANADIAN MACHINERY.

MONTREAL,—Feb. 10, 1921. — Analyzing the present industrial situation brings out the fact that the physical features of business have changed but little, but the process of fusing the component factors is proceeding slowly, but surely. Business shows slight fluctuations, inasmuch as some plants are curtailing operations while others, particularly the smaller shops, are reporting better conditions and more work.

### Prices Steady on Light Demand

"There has been no change of late nor do we anticipate any marked departure from the present activity for some weeks or perhaps months." This impression of one dealer is, apparently, general among steel men throughout the district, although none of them seem disheartened over the prospect. As this particular dealer stated:—"Our business is quite satisfactory, and while we cannot say we are rushed with orders, we continue to do a steady trade from the warehouse, not heavy it is true, but in face of existing conditions there is little to complain of. There are very few in the steel business, to-day, that did not foresee such a time as the present, and there should not be many that are seriously put out by the temporary falling off in demand for steel commodities. This depression had to come and it will eventually prove to re-establish business on a saner and more healthy foundation." The feeling is still prevalent among many users of steel that lower prices will be a development of the spring business, and it is thought that the leading mill interests in the States hold the key to the situation, and if the Steel Corporation sees fit to readjust the wage scale, to provide lower selling figures, the general lowering of prices will be a logical consequence. There has been no price changes in the local market and those quoted are quite firm, even though business is not brisk.

### Exchange Absorption Quite General

"Inquiry is such as would lead one to believe that business is pending, but the actual sales resulting from these leads are relatively small." This is how one of the local dealers sized up the situation, and remarks of others are along the same lines. Some of the smaller dealers require to keep hustling to maintain business on a paying basis, but some of the larger houses report fairly good returns from salesmen's efforts, although the volume is not heavy. The supply end is most active but occasional placements for large tools are made. Hope was expressed that the railroads would be in the market for equipment, but this, apparently, has been deferred for some months. The absorption of the exchange or some part of it is now more general among American firms doing business in Canada.

### Buying Only What They Need

Dullness in old materials continues as a feature of present trading. Local dealers see little in current inquiry that would give the impression that the early future would see any marked improvement over past weeks. "We cannot say we are discouraged, although business is not sufficient to meet running expenses, but this period through which we are now passing had to come some time and the sooner we accept this the sooner will the time come when normal conditions will be resumed." The inactivity of many plants, particularly in the metal working industry, has reacted on scrap metals and the volume of business now carried on is exceptionally light. "The quoting of prices," said the dealer, "matters very little just now, as this factor seldom influences the trade. Material is acquired only when needed and they pay the price asked." Slight revisions, downwards, have been made in old material prices. The quotations, however, can only be considered as nominal.

# BELIEVE WORST HAS HAPPENED

### Inquiries Are Becoming More Numerous, but the Orders Are Not Being Closed

TORONTO.—There is this to be said, there is still money in the country. A machine-tool dealer mentioned this morning that he had made some sales during the month just closed, and when it came to terms and settlements he was surprised to find that in all cases they were ready to take advantage of all the discounts.

Those who study the markets closely, and take in all the conditions they can find, believe that the matter of international exchange has more to do with business than anything else. "We will have to arrive at some understanding before we can get very far in any one direction," was the opinion of a large dealer this week. "Now that other countries are getting in shape to put their products on this market we find that we are more or less at sea in figuring out where they stand in our money and what we can do to meet their prices. This tendency is likely to become worse instead of better."

Most of the houses that sell in this market have fairly large stocks on hand just now, and in that way are able to make very quick deliveries in almost any line that may be called for. In fact some of them have stocks on hand that are away and above anything previously carried.

Some of the offices report that inquiries are coming in more frequently, but they are not being turned into actual business at anything like the rate the dealers would like to see. The railroads have been buying very sparingly, considering the fact that general impressions led the trade to believe they would be in the market for good-sized lists.

Dealers do seem to agree on one thing, viz., that the worst has happened in the trade in this country, and from now on there should be some form of recovery, although they claim this is going to be more gradual than they had hoped for, and it may take some time before a normal amount of business is coming their way.

### In Small Amounts

Dealers in small tools are looking for something a little better after a number of firms have finished taking their annual inventories. Stocks have been allowed to run down without any replacement buying being done. One of the dealers claimed that it was becoming an obsession with some firms to buy from hand to mouth. There were fairly large concerns sending the boy down now for one or two drills of a certain size which they wanted to do some special job that had turned up. Hardware stores that carry small tools are doing the same thing and are drawing in small lots on the dealers rather than buy up a larger stock. Prices of small tools are unchanged.

Tool steels are easier in price, and shipment on English steels is very prompt. The English makers are preparing to make a bid for the Canadian market. One report this week tells of a small piece of very special steel being ordered and delivered in less than four weeks, and the claim is that this time is being made on a number of orders that are going over now.

### In the Steel Market

The average steel merchant is out to sell now, and not to buy. He is taking in small shipments of such lines as he may need, but in the main he is out to get his stock down. The past season has been a peculiar one, and the element of speculation entered more into the trading than ever before. Steel merchants had the option of buying in the spot market or doing without, and every time they took on a shipment of premium material they increased the element of speculation in their business, and the chances of getting caught with a loaded warehouse when the drop in prices came. Getting rid of stock is the big consideration just now. One of the dealers stated to Canadian Machinery this morning, "You can call it what you like, but as far as our own case is concerned we are trying to liquidate, and that word expresses it best of anything. Not that we have been caught overloaded, but we must get ready to do business on the new levels."

A case in point indicates how some of the firms have been waiting for deliveries from the Steel Corporation. At one of the warehouses this morning they were unloading small channels and angle iron that had been booked over fourteen months ago. The fact is that shipments of this can be had at comparatively short notice now, and it looks as though the corporation were out looking for business.

"One of the best features we find in connection with our business just now," stated another dealer, "is the way in which business has stayed sweet on our books waiting for delivery." This office reported that shipments of over a half million dollars worth of business had gone through in the month of January, and much of it had been waiting for months.

There are a number of inquiries in some of the steel offices, some of them for very fair tonnages, and representing a very wide range of operations. It is hard to tell exactly how much of this is going to be turned into real business, the dealers themselves believing that much of it is sent out to try out the market, and find whether there has been any improvement over a figure that may have been secured a few months ago. It indicates a willingness on the part of the buyers to come into the market when they consider that things have reached the proper stage.

Seasonable buying is not up to the old market in the steel trade this year. For instance, the boiler tube trade has been more or less of a disappointment. Firms earlier in the season gave fairly large orders for repair work, but since then they have cut their orders severely, and many warehouses are left with the goods on their hands.

### Scrap Market the Same

Nothing has developed to change the scrap metal situation. Prices are away down, but even so they are only nominal, and can hardly be put up as absolutely

## POINTS IN WEEK'S MARKETING NOTES

**Pig iron is now being quoted in Toronto district at $39.25 for No. 1. This price has been made necessary owing to the low prices quoted by the United States furnaces.**

**Material was being taken in at some of the Toronto warehouses this week that had been ordered from the United States Steel Corporation over fourteen months ago.**

**New York machine tool markets show very little improvement and a number of resale machines are still on the market there at quite a reduction from previous prices.**

**A large number of inquiries have been received by the steel trade in this district. Some of them undoubtedly are for the purpose of comparing present prices with quotations previously made.**

**There is no improvement in the scrap metal trade, although dealers look for an improvement in copper. They claim it is now being sold at a price below the cost of production.**

**Most of the steel merchants are engaged just now in getting rid of as much of their stock as possible, and are taking in very little material.**

**The sale of boiler tubes has been somewhat of a disappointment this year. Earlier in the season fairly large orders were placed, but these have since been curtailed considerably.**

**Some sales of pig iron have been made by United States producers at as low as $29 and there seems to be a move under way to force the price to $25.**

correct, because there is no trading, and trading is the one thing most necessary to establish a price. "We look to see reds and yellows coming back soon," was the view of one dealer this morning, "because right now coppers are selling below what it actually costs to make them. In other words, copper in ingots cannot be turned out at to-day's prices. On the other hand, iron and steel are still money makers and their sale price includes a margin of profit—in some cases a very good margin. Copper has had its bumps and is due to come back. That movement may start very shortly, although I am free to say there is nothing so far this week to indicate that recovery is near."

## PIG IRON SELLS NOW AT $39.25 TON

**Furnaces Still Working From Old Materials That Were All High-Cost**

Pig iron is now being quoted at $39.25 in Toronto—that is for No. 1 foundry. The last price was $43.65, and the price above that was over the $50 mark.

Working as they are from old materials the chances are that the makers of pig iron in Canada are not making much money out of the new price. They are using ore that came down last season and the same can be said of their coal and coke. Were they able to take advantage of present-day prices they would be able to go ahead on a much more satisfactory basis. For instance, the present price of Connellsville coke is around $5.50, while it is certain that Canadian stacks are melting with coke that has cost them well above that figure.

Pig iron is being sold on a smaller basis than usual. Firms are buying in 50-ton or car lots, and are not stocking for future usage.

## MANY RESALES ON NEW YORK MARKET

**Machine-Tool Trade Is Making a Slow Recovery in a Listless Market**

Special to Canadian Machinery

NEW YORK, Feb. 10.—The machine-tool industry is making a very slow recovery from the period of depression, which apparently has passed its worst stage. There has been for a few weeks a slight betterment both in inquiries and orders, but the total volume of orders being booked throughout the country is far from what might be termed a normal business.

Of course, the real reason for the failure of the machine-tool trade to pick up, as some expected it would about February 1, is that many manufacturers who use machine tools are still in that position where they have more shop equipment than they can keep busy. Moreover, the credit situation is not clearing up as readily as was hoped for, and on many of the current purchases time payments are asked for even though the total amount of the purchase does not run into large figures.

Much of the current business is in the nature of "bargains." Used machines and new machines offered for re-sale are being sold much more freely than are machines to be shipped from manufacturers' plants. Quite a number of brand new machines are on the market at prices at least 25 per cent. below those quoted by the machine-tool builders. Many of these machines were bought for export and the orders were cancelled before the machines left this country. In cases where the tool builders declined to accept cancellations the tools are being offered for sale.

While there is some improvement in the demand for tools, the closing of orders is still rather difficult. In this the competition of used tools and the re-sale of tools, mentioned above, is a factor.

Many machine-tool builders in this country are still carrying large inventories of raw materials, finished and unfinished parts, castings, etc., and the question of making reductions in selling prices to attract new business is of vital importance to them. Drastic reductions would cause some of these companies a loss too large to be borne; hence the hesitation about making price adjustments which buyers seem to expect without taking into consideration all of the facts.

## STEEL MILLS FINDING SOME OF THEIR COLLECTIONS VERY SLOW

Special to Canadian Machinery

PITTSBURGH, Feb. 10. — Production of pig iron is down to a rate of about 27,500,000 gross tons a year, this comparing with a rate of about 28,700,000 tons in January, 32,150,000 tons in December and 36,850,000 tons in the year 1920 as a whole.

Actual productive capacity may be estimated at 45,000,000 or 46,000,000 tons a year, so that the present rate of operation is about 60 per cent. of capacity. In one way this is a low rate, but it must be remembered that a number of times operations in the iron and steel industry have gotten down to 60 per cent., and merely in a time of ordinary depression or relaxation, without there being such great unsettlement in the world as now exists.

Just now there is no occasion to think of the rate of production increasing. There is no sign that it is going to do that in the near future, or until fundamental conditions have greatly improved. Rather the trend is very decidedly downward, and unless there is a complete reversal in affairs there will be a much lower rate in the course of the next two or three months. Very likely there will be some improvement in demand here and there, but the rate, as a total, will decrease. Only a small proportion of the merchant furnaces are now in blast, so that there is not much room left there for decrease. As to the furnaces of independent steel works, they are, as a whole, running a little better than the attendant steel works, so that there may easily be some decrease in that quarter. The great point, however, is the Steel Corporation, whose operations have been altogether phenomenal. The corporation is running about three times as great a proportion of its capacity as are the independents, and that, of course, cannot continue indefinitely. It is a marvelous thing that while four months ago the independents began to decrease production on account of the supply of specifications beginning to run thin, the corporation has in those four months operated at a higher rate than it did in the preceding four months. In December the Steel Corporation blew in five blast furnaces and blew out one, while in January it blew in two and blew out one, so that it is now running five more furnaces than at the close of November. At some time, and probably very soon, the Steel Corporation's production of pig iron and steel will begin to fall off sharply.

While the present rate of pig iron production, 27,500,000 tons a year, is only 60 per cent. of existing capacity, it is just equal to the output in 1910, which was 27,300,000 tons, while that was approximately the full capacity in 1910. There was sustained demand throughout the year, largely against old contracts. All the consuming industries were working well and requiring more iron and steel than ever before. Now there is not a consuming industry that is in anything like normal position.

### Prices

Foundry pig iron has been offered by producers on the basis of $29 valley, or $1 under the market as previously quoted. Nothing at all has occurred in Bessemer and basic, which accordingly remain quotable at $32 and $30, respectively, at valley furnaces. All these prices, however, are nominal. An actual inquiry for a few thousand tons would undoubtedly bring out lower quotations, but no one is disposed to inquire.

Pig iron is simply unsaleable. The furnace men do not know whether consumers would be interested at any price at all, but some of them would like to develop this matter. Production cost is, of course, vitally involved. With costs as at present the furnaces might shade these prices a trifle, but not much. The

furnaces have not much leeway now that the market has declined as far as it has already, most of the production cost being involved in the costs of the raw materials. Two or three of the coke operators, perhaps more, are alive to the situation and are desirous of co-operating with furnace men to get costs down, expressing their willingness to figure out coke prices afresh, even when regular contracts are in force, if the furnace men can get other items of cost down so as to make much lower prices for pig iron and try whether such prices will enable pig iron consumers to get started consuming.

With the exception of plates, prices of finished steel products are well held at the Industrial Board level. In several of the commodities there is some shading, but not a great deal. The steadiness of the market does not betoken any real strength in the situation, the cause of the steadiness being rather that there is so little inquiry of a regularly competitive character that producers are not encouraged to name cut prices. Plates have been sold at 2.50 cents, against the Industrial Board price of 2.65 cents, and more orders could be placed at 2.50 cents, though it is to be noted that the Steel Corporation and some of the independents are adhering strictly to the 2.65-cent price. Other commodities may be quoted at Industrial Board prices as follows: Bars, 2.35 cents; shapes, 2.45 cents; standard steel pipe, 57½ per cent. basing discount; plain wire, 3.25 cents; wire nails, $3.25; blue annealed sheets, 3.55 cents; black sheets, 4.35 cents; galvanized sheets, 5.70 cents; tin plate, $7 per base box, 100-pound.

**The Future**

At the beginning of the year there were some predictions that the demand for steel products would experience a marked improvement about the second half of March, and that there would be fairly full demand by September or October, though these predictions were not made universally. Now, however, the predictions are less hopeful. There are practically none who definitely predict full employment even late this year.

Several causes brought about this change in expectations. One is that the price readjustment is not proceeding as rapidly as was expected. Observers took their cue from the declines in certain quarters, assuming that others would follow, but now it is seen that the lead is not followed as was expected. To illustrate, long ago clothing experienced sharp reductions, but groceries are not down in proportion even now. The wholesale price of pork dropped below the pre-war price, but the retail price has undergone little reduction. Then, coming home to steel, the independent steel producers came down to the Steel Corporation or Industrial Board level before the end of last year, but the prices of many finished wares produced from the regular rolled products have not declined in proportion. In the past week chain has been reduced from 7.25 cents to 6.75 cents base, with a decrease in the extra for the smallest sizes of .75 cent, but chain is still high relative to its raw materials. wire at 3.25 cents, rods at $57 and bars at 2.35 cents.

Partly on account of this slowness in price readjustment the expectation of broadening in demand for steel must be deferred. Another influence is the unsatisfactory credit situation, capital being scarce and borrowing difficult. The steel industry, which usually does a cash business, with excellent collections, now finds collections very poor in some quarters.

# MEN EXPECT CHEAPER LIVING TO KEEP UP WITH THE LOWER WAGES

Sydney, N.S.—Two thousand four hundred men are employed daily at the steel plant, compared with four thousand when the full staff is engaged. Three mills are operating, plate, blooming and billet.

An official stated that no new orders had been received and the outlook was none too roseate. However, the company is seeking business and it may be that should nothing new be booked word may be received from Montreal to manufacture stock which would be kept on hand until called for.

Saturday saw the last day of the first week at the plant under the new wage scale, marking a cut of 20 per cent. on the wages of "all employees of the Dominion Iron and Steel Company," according to the circular posted on January 8. The big drop of one-fifth of the total earnings of the workmen has not yet been felt except through the partial idleness up to now. The first pay envelopes with the new wages will be distributed in the course of this week and a true expression of the effect can hardly be estimated yet.

Employees spoken to are strangely silent on the subject. They seem to have nothing to say but their attitude seems to be that they have to put up with the situation, the only alternative being idleness.

There is no one who seems to think that the wages he has received has provided him with a margin with which to meet the sudden severe cut in income, and the general expression is that unless the promised reduction in costs of living at once takes place, it means privation this winter. The workers do not pretend to be able to keep up present expenses with only the new rates of wages to see them through. They are hoping for relief.

# MAY ESTABLISH STEEL INDUSTRY ON THE PACIFIC COAST SOON

Establishment of a large iron and steel industry in British Columbia backed by British capital has been announced. A recent issue of the British Columbia Gazette carried the notice of the formation of the Coast Range Steel, Limited, with an authorized capitalization of $15,000,000. The promoters claim that within the next few years $50,000,000 will be spent in establishment of a great steel industry on the lower mainland of British Columbia. They expect to start active construction of the plant within six months. Five Vancouver men have been named as provisional directors.

Three years ago the British Columbia Government offered a bounty of $3 a ton on pig iron produced in that province from native ore. After investigating the standing of the interests behind the Coast Range Company, the B. C. Government passed an order in council sanctioning an agreement between the Minister of Mines and the company. The British engineers have been investigating the adequacy of raw material resources and they have evidently made a favorable recommendation to their principals.

The period of reconstruction will be three years, during which $15,000,000 will be spent, so the industry cannot avail itself of the provincial bounty until the end of that time. Meanwhile preliminary work is being pushed. The location of the plant has not been definitely decided, according to men interested in the project, but the lower mainland appears to be the likely district for the site.

Mr. Henry J. Landahl, of Vancouver, one of the principal directors, declared that the $3 bounty on pig iron was a great inducement for the British interests. "If we have resources of iron, coal and limestone in British Columbia in quantities large enough to maintain an iron and steel industry, and of such quality as to insure our successful competition with the world, then it is assured that all the money necessary to create this industry is available," said Mr. Landahl.

"We are optimistic enough to expect that the time will come when British Columbia will take care of the iron and steel trade around the Pacific."

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**Open New Office.**—The Black & Decker Mfg. Co. have secured the services of A. J. Hopkins, who will act as their Canadian representative with offices at 392 St. James St., Montreal, Canada. Mr. Hopkins is well known to the automotive trade in Canada and is chairman of the Canadian Auxiliary of the Automotive Equipment Association.

# SELECTED MARKET QUOTATIONS

**Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.**

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 46 |
| Lake Superior, charcoal, Chicago | 40 50 |
| Standard low phos., Philadelphia | 33 25 |
| Bessemer, Pittsburgh | 33 96 |
| Basic, Valley furnace | 30 00 |
| Toronto price:— | |
| Silicon, 2.25% to 2.75% | 39 25 |

## IRON AND STEEL

| Per lb. to Large Buyers | Cents |
|---|---|
| Iron bars, base, Toronto | $ 4 75 |
| Steel bars, base, Toronto | 4 75 |
| Iron bars, base, Montreal | 4 50 |
| Steel bars, base, Montreal | 4 50 |
| Reinforcing bars, base | 4 75 |
| Steel hoops | 6 00 |
| Tire steel | 5 00 |
| Spring steel | 8 00 |
| Band steel, No. 10 gauge and 3-16 in. base | 5 50 |
| Chequered floor plate 3-16 aud heavier | 7 50 |
| Bessemer rails, heavy, at mill | 2 35 |
| Steel bars, Pittsburgh | 3 00-4 00 |
| Tank plates, Pittsburgh | 3 50 |
| Structural shapes, Pittsburgh | 2 45 |
| Steel hoops, Pittsburgh | 3 05 |
| F.O.B., Toronto Warehouse | |
| Small shapes | 5 00 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 3 48 |
| Structural shapes | 3 58 |
| Plates | 3 78 |
| Small shapes under 3-in. | 3 48 |

## FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

| | C.L. | L.C.L. |
|---|---|---|
| Montreal | 58½ | 73 |
| St. John, N.B. | 84½ | 106½ |
| Halifax | 86 | 108 |
| Toronto | 38 | 54 |
| Guelph | 38 | 54 |
| London | 38 | 54 |
| Windsor | 35 | 50½ |

## METALS

| | Gross. Montreal | Toronto |
|---|---|---|
| Lake copper | $19 00 | $19 50 |
| Electric copper | 18 50 | 19 00 |
| Castings, copper | 18 00 | 19 00 |
| Tin | 44 00 | 46 00 |
| Spelter | 8 00 | 9 00 |
| Lead | 7 25 | 8 00 |
| Antimony | 8 00 | 9 00 |
| Aluminum | 34 00 | 35 00 |

Prices per 100 lbs.

## PLATES

| | | |
|---|---|---|
| Plates, 3-16 in. | $ 5 50 | $ 5 50 |
| Plates, ¼ up | 5 00 | 5 50 |

### PIPE—WROUGHT

**Standard Buttweld Pipe**

Per 100 Ft.

| | Steel Blk. | Steel Galv. | Gen. Wrought Iron Blk. | Gen. Wrought Iron Galv. |
|---|---|---|---|---|
| ⅛ | $ 6 50 | $ 8 50 | $..... | $..... |
| ¼ | 5 31 | 7 41 | 5 91 | 8 01 |
| ⅜ | 5 31 | 7 41 | 5 91 | 8 01 |
| ½ | 7 10 | 8 63 | 7 95 | 9 48 |
| ¾ | 8 80 | 10 87 | 9 95 | 12 02 |
| 1 | 13 01 | 16 07 | 14 71 | 17 77 |
| 1¼ | 17 60 | 21 74 | 19 90 | 24 04 |
| 1½ | 21 04 | 25 99 | 23 79 | 27 84 |
| 2 | 28 31 | 34 97 | 32 01 | 38 67 |
| 2½ | 44 75 | 55 28 | .... | .... |
| 3 | 58 52 | 72 29 | .... | .... |
| 3½ | 74 06 | 90 62 | .... | .... |
| 4 | 87 75 | 107 37 | .... | .... |

**Standard Lapweld Pipe**

Per 100 Ft.

| | Steel Blk. | Steel Galv. | Gen. Wrought Iron Blk. | Gen. Wrought Iron Galv. |
|---|---|---|---|---|
| 2 | $32 01 | $ 38 67 | $35 71 | $42 37 |
| 2½ | 48 26 | 58 79 | 54 11 | 64 64 |
| 3 | 63 11 | 76 88 | 70 76 | 84 53 |
| 3½ | 75 90 | 92 46 | 85 10 | 101 66 |
| 4 | 89 93 | 107 55 | 100 83 | 120 45 |
| 4½ | 1 05 | 1 29 | 1 30 | 1 54 |
| 5 | 1 22 | 1 50 | 1 52 | 1 80 |
| 6 | 1 58 | 1 95 | 1 97 | 2 33 |
| 7 | 2 06 | 2 53 | 2 53 | 3 01 |
| 8L | 2 16 | 2 66 | 2 66 | 3 16 |
| 8 | 2 49 | 3 07 | 3 07 | 3 64 |
| 9 | 2 98 | 3 67 | 3 67 | 4 36 |
| 10L | 2 77 | 3 41 | 3 41 | 4 05 |
| 10 | 3 56 | 4 39 | 4 39 | 5 21 |

**Prices—Ontario, Quebec and Maritime Provinces**

## WROUGHT NIPPLES

4-in. and under, 50 per cent.

4½-in. and larger, 40 per cent.

4-in. and under, running thread, 20%.

Standard couplings, 4-in. and under, 20%

Dd., 4½-in. and larger, net.

## OLD MATERIAL

Dealers' Average Buying Prices

Per 100 Pounds.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $10 50 | $ 9 00 |
| Copper, crucible | 13 00 | 11 00 |
| Copper, heavy | 12 00 | 11 00 |
| CCopper wire | 12 00 | 11 00 |
| No. 1 machine composition | 13 00 | 9 75 |
| New brass cuttings | 7 00 | 8 00 |
| Red brass turnings | 8 00 | 8 00 |
| Yellow brass turnings | 7 00 | 6 00 |
| Light brass | 5 00 | 5 00 |
| Medium brass | 6 50 | 6 00 |
| Scrap zinc | 5 00 | 4 00 |
| Heavy lead | 4 50 | 4 00 |
| Tea lead | 2 50 | 2 00 |
| Aluminum | 15 00 | 10 00 |

| | Per Ton | Gross |
|---|---|---|
| Boiler plate | $11 00 | $12 00 |
| Heavy melting steel | 15 00 | 14 00 |
| Axles (wrought iron) | 25 00 | 20 00 |
| Rails (scrap) | 15 00 | 14 00 |
| Malleable scrap | 20 00 | 20 00 |
| No. 1 machine cast iron | 30 00 | 25 00 |
| Pipe, wrought | 8 50 | 8 00 |
| Car wheel | 30 00 | 25 00 |
| Steel axles | 20 00 | 18 00 |
| Mach. shop turnings | 8 00 | 6 00 |
| Stove plate | 23 00 | 20 00 |
| Cast boring | 8 00 | 7 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, 7-16 and up | Net list |
| Carriage bolts, ⅜" and less | 15 |
| Coach and lag screws | —20 |
| Stove bolts | 55 |
| Wrought washers | —25 |
| Elevator bolts | Net |
| Machine bolts, 7-16 and over | —5 |
| Machine bolts, ⅜-in. and less | —30 |
| Blank bolts | Net |
| Bolt ends | —5 |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | +25 |
| Machine screws, fl. and rd. hd., brass | Net |
| Machine screws, o. and fil. hd., brass | Net |
| Nuts, square, blank | +25 add $2 00 |
| Nuts, square, tapped | add 2 25 |
| Nuts, hex., blank | add 2 25 |
| Nuts, hex., tapped | add 2 75 |
| Copper rivets and burrs, list less | 10 |
| Burrs only, list plus | 35 |
| Iron rivets and burrs | 37½ and 5 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, bright | 67½ |
| Wood screws, flat, brass | 55 |
| Wood screws, O. & R., brass | 55½ |
| Wood screws, flat, bronze | 50 |
| Wood screws, O. & R., bronze | 47½ |

## MILLED PRODUCTS

(Prices on unbroken packages)

| | Per Cent |
|---|---|
| Set screws | Less 40% |
| Square and hexagon head cap screws | Less 30% |
| Round head cap screws | Plus 10% |
| Fillister head cap screws | Less 10% |
| Flat head cap screws | Net list |
| Button head cap screws | Plus 10% |
| Studs | Less 20% |
| Semi-finished nuts up to and including 1-in. | Less 35% |
| Semi-finished nuts 1⅛ to 1½" | Less 30% |
| Semi-finished nuts 1⅝ to 2 in. | Net list |
| Coupling bolts | Plus 10% |
| Taper pins | Less 40% |
| Planer bolts without fillet | Plus 40% |
| Planer bolts with fillet | Pus 50% |
| Patch bolts | Plus 80% |
| Hollow set screws | Plus 20% |
| Thumb screws | Less 35% |
| Thumb nuts | Less 65% |

## BILLETS

F.O.B. Pittsburgh.

| | Per gross ton |
|---|---|
| Bessemer billets | $43 50 |
| Open-hearth billets | 43 50 |
| O.H. sheet bars | 47 00 |
| Forging billets | 48 50 |
| Wire rods | 57 00 |

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails, base | $5 25 |
| Cut nails, base | 6 70 |
| Miscellaneous wire nails | 50% |

## ROPE AND PACKING

| | |
|---|---|
| Plumbers' oakum, per lb. | 0 10¼ |
| Packing, square braided | 0 38 |
| Packing, No. 1 Italian | 0 44 |
| Packing, No. 2 Italian | 0 36 |
| Pure Manila rope | 0 26 |
| British Manila rope | 0 20 |
| New Zealand hemp | 0 20 |

## POLISHED DRILL ROD

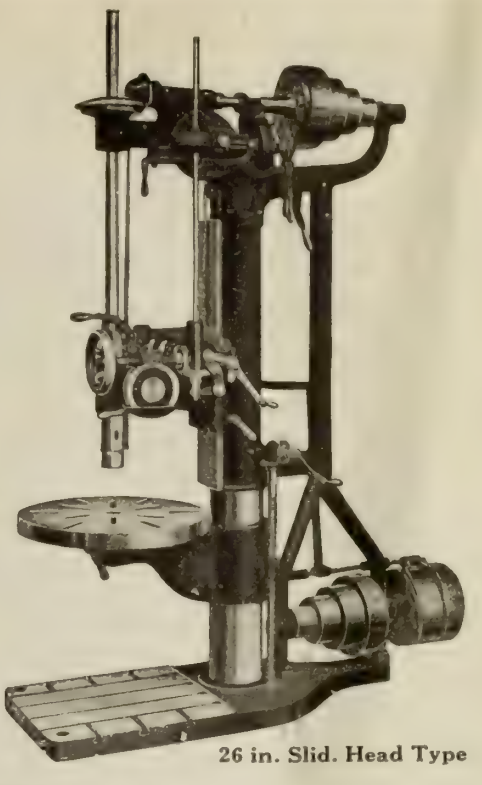
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|---|---|
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MONTREAL ST. JOHN, N.B. WINNIPEG VANCOUVER HALIFAX BUFFALO, N.Y.

# Two Novel Plans for Harnessing Niagara

By T. KENNARD THOMSON

THE report on a new plan, or rather two new plans, for securing power from Niagara, which is here given, s the work of an engineer of Canadian birth and training.

Mr. T. Kennard Thomson enjoys the honor of being the first Bachelor of Science in engineering to graduate from he University of Toronto. Following his graduation he was with the C. P. R. in construction work, and later went to New York to practise as a consulting engineer.

One of his greatest achievements was he building of the foundations for the Singer Building on Broadway at that ime the tallest building in the world. The fact that Mr. Thomson is a practical engineer, with a long and successful record in large undertakings, lends interest to the present scheme. The description of the plans in detail is given below.

Jan. 24, 1921.

To the Honorable Federal
Power Commission,
Washington, D. C.
Gentlemen:

We respectfully beg to submit that he greatest and most uniform and most needed water power resources n the world are in the Niagara River, and that we could obtain the maximum amount of power at the minimum of cost, from any further diversion of water from above the old Falls by our Goat Island plan, and that the best method of developing the maximum amount of power at the minimum of cost in the lower river is by an international dam at Foster's Flats, about 4 miles below the old falls.

While the Goat Island plan will be entirely within the United States, we believe that Canada would readily agree to an international development at that point, as it would obviously save money to the consumers on both sides of the line forever.

Our two projects do not interfere with any of the existing power companies in any way whatever.

Indeed, while we realize that the Governments should control the price for which the power will be sold, we realize the enterprise, the risk and capital which the five pioneer companies put into these original plants, and we therefore think that in fixing such prices, the pioneer companies should be allowed to charge a difference of say $10 a horsepower more than we do, if they so wish.

Neither Mr. Porter nor myself have any financial interest of any kind in any of the present companies.

We realize that no matter what power is sold for, it will always be worth what it cost to develop power by coal.

The cheapest power ever developed by coal in New York City before the war was by the New York Edison and New York Interborough, and it cost them an average of $32.19 a horsepower. That would be equivalent to $70 or $80 a horsepower in the State of New York now, and I was informed in December that it was then costing $90 a horsepower to develop by coal in Toronto.

We can develop two million horsepower at our new dam at Foster's Flats, at a cost of less than $100,000,000 or $50 a horsepower, and can do nearly as well at Goat Island. That means that we could sell for less than $10 a horsepower.

But, as there will never be enough water power to go around, if the manufacturers get our power at $10 or $15 a horsepower, they would have an unfair advantage over their competitors who had to pay $70 or $90 to develop power by coal.

The five pioneer companies developed 650,000 horsepower for $65,000,000 or $100 a horsepower. In doing this they attracted private capital to the extent of $650,000,000 or ten times what they spent themselves.

We claim, therefore, that it will be

Continued on page 60

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | $ 0 27½ |
| Solder, guaranteed | 0 29½ |
| Soldering coppers, lb. | 0 62½ |
| White lead, pure, cwt. | 17 00 |
| Red dry lead, 100-lb. kegs, per cwt. | 15 00 |
| Gasoline, per gal., bulk | 0 42 |
| Pure turp., single bbls., gal. | 1 20 |
| Linseed oil, raw, single bbls. | 1 00 |
| Linseed oil, boiled, single bbls. | 1 03 |
| Wood alcohol, per gal. | 2 75 |
| Whiting, plain, per 100 lbs. | 3 00 |

### CARBON DRILLS AND REAMERS

| | |
|---|---|
| S.S. drills, wire size | 40 and 5 |
| Can. carbon cutters, plus | 10 |
| Standard drills, all sizes | 40 and 5 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 and 5 |
| Bit stock | 50 |
| Ratchet drills | 10 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 50 |
| Sleeves | 50 |
| Taper pin reamers | 25 off |
| Drills and countersinks | Net |
| Bridge reamers, carbon | 50 |
| Centre reamers | 5 |
| Chucking reamers | Net |
| Hand reamers | 10 |
| High speed drills, list net to plus | 20 |
| Can. high speed cutters, net to plus | 10 |
| American | plus 40 |

### COLD ROLLED STEEL

[At Warehouse]

| | |
|---|---|
| Rounds and squares | $7.00 base |
| Hexagons and flats | 7.00 base |

### IRON PIPE FITTINGS

| | Black | Galv. |
|---|---|---|
| Class A | 60 | 75 |
| Class B | 26 | 36 |
| Class C | 17 | 26 |

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 7 50 | $ 7 50 |
| Sheets, blue ann., No. 10 | 6 50 | 6 50 |
| Canada plates, dull, 52 sheets | 13 00 | 13 00 |
| Can. plates, all bright | 14 00 | ..... |
| Apollo brand, 10¾ oz., galvanized | .... | ..... |
| Queen's Head, 28 B.W.G. | 13 00 | ..... |
| Fleur-de-Lis, 28 B.W.G. | 12 50 | ..... |
| Gorbal's Best, No. 28 | .... | ..... |
| Colborne Crown, No. 28. | .... | ..... |
| Premier, No. 28, U.S. | 10 00 | 10 00 |
| Premier, 10¾-oz. | 10 50 | 10 40 |
| Zinc sheets | 16 50 | 20 00 |

### PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13; 5-16, $11; ⅜ in., $10; 7-16 in., $9.80; ¼ in., $9.75; ⅞ in., $9.20; ¾ in., $9.30; ⅝ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

### ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13; 5-16 in., $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

**Prices per 100 lbs.**

### FILES AND RASPS

| | Per Cent. |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 32½ |
| Black Diamond | 27½ |
| J. Barton Smith, Eagle | 50 |
| McClennand, Globe | 50 |
| Delta Files | 20 |
| Disston | 40 |
| Whitman & Barnes | 50 |
| Great Western-American | 50 |
| Kearney & Foot, Arcade | 50 |

### BOILER TUBES

| Size | Seamless | Lapweld |
|---|---|---|
| 1 in. | $27 00 | $..... |
| 1¼ in. | 29 50 | ..... |
| 1½ in. | 31 50 | 29 50 |
| 1¾ in. | 31 50 | 30 00 |
| 2 in. | 35 00 | 30 00 |
| 2¼ in. | 35 00 | 29 00 |
| 2½ in. | 42 00 | 37 00 |
| 3 in. | 50 00 | 48 00 |
| 3¼ in. | ..... | 48 50 |
| 3½ in. | 63 00 | 51 50 |
| 4 in. | 85 00 | 65 50 |

Prices per 100 ft., Montreal and Toronto

### OILS AND COMPOUNDS

| | |
|---|---|
| Castor oil, per lb. | — |
| Royalite, per gal., bulk | 28 |
| Palacine | 31 |
| Machine oil, per gal. | 58 |
| Black oil, per gal. | 27 |
| Cylinder oil, Capital | 1.01 |
| Petroleum fuel oil, bbls., net | 11.2 |

### BELTING—No. 1 OAK TANNED

| | |
|---|---|
| Extra heavy, single and double | 15% |
| Standard | 15 and 10% |
| Cut leather lacing, No. 1 | 2 00 |
| Leather in side | 2 40 3 00 |

### TAPES

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES

| | |
|---|---|
| Polishing wheels, felt | $4 50 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, Turkish | 8¾ |
| Pumice, ground | 06 |
| Emery glue | 30 |
| Tripoli composition | 9½ |
| Crocus composition | 12 |
| Emery composition | 11 |
| Rouge, silver | 64 |
| Rouge, powder, nickel | 38 |

**Prices per lb.**

### ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | 8½ |
| Grits, 80 and finer | 6 |

**BRASS—Warehouse Price**

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 30 |
| Brass sheets, 24 gauge and heavier, base | 38 |
| Brass tubing, seamless | 42 |
| Copper tubing, seamless | 44 |

### WASTE

| | | | |
|---|---|---|---|
| XXX Extra | .21 | Atlas | .19 |
| Peerless | .22 | X Empire | .15 |
| Grand | .21½ | Ideal | .18 |
| Superior | .21½ | X Press | .13 |
| X L C R | .16½ | | |

**Colored**

| | | | |
|---|---|---|---|
| Lion | .13½ | Popular | .10 |
| Standard | .12 | Keen | .9 |
| No. 1 | .14 | | |

**Wool Packing**

| | | | |
|---|---|---|---|
| Arrow | .35 | Anvil | .22 |
| Axle | .28 | Anchor | .17 |

**Washed Wipers**

| | | | |
|---|---|---|---|
| Select White | .20 | Dark colored | .09 |
| Mixed colored | .10 | | |

**This list subject to trade discount f quantity.**

### RUBBER BELTING

| | | | |
|---|---|---|---|
| Standard | 10% | Best grades | 15 |

### ANODES

| | |
|---|---|
| Nickel | .55 to . |
| Copper | .38 to . |
| Tin | .70 to . |
| Zinc | .16 to . |

**Prices per lb.**

### COPPER PRODUCTS

| | Montreal | Toron |
|---|---|---|
| Bars, ½ to 2 in. | $35 00 | $37 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 40 00 | 44 |
| Copper sheet, tinned, 14 x 60, 14 oz. | 43 00 | 46 |
| Copper sheet, planished, 16 oz. base | 47 00 | 50 |
| Braziers', in sheets, 6 x 4 base | 39 00 | 42 |

### LEAD SHEETS

| | Montreal | Toron |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $10 50 | $14 5 |
| Sheets, 3½ lbs. sq. ft. | 10 25 | 14 0 |
| Sheets, 4 to 6 lbs. sq. ft. | 10 00 | 13 5 |

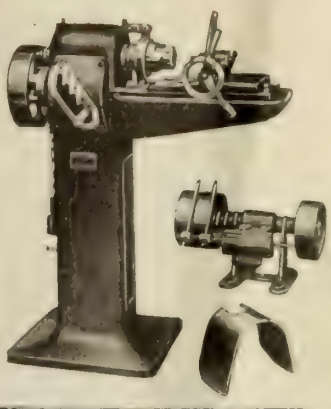
Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS

| | |
|---|---|
| Acid, boracic | $ .25 |
| Acid, hydrochloric | .03 |
| Acid, nitric | .10 |
| Acid, sulphuric | .03 |
| Ammonia, aqua | .20 |
| Ammonium, carbonate | .23 |
| Ammonium, chloride | .22 |
| Ammonium, hydrosulphuret | .75 |
| Ammonium sulphate | .30 |
| Arsenic, white | .18 |
| Copper, carbonate, annhy. | .35 |
| Copper, sulphate | .10 |
| Cobalt, sulphate | .20 |
| Iron perchloride | .62 |
| Lead acetate | .30 |
| Nickel ammonium sulphate | 16½ |
| Nickel carbonate | .30 |
| Nickel sulphate | .17½ |
| Potassium sulphide (substitute) | .40 |
| Silver Chloride (per oz.) | 1.15 |
| Silver nitrate (per oz.) | 1.10 |
| Sodium bisulphate | .13 |
| Sodium carbonate crystals | .04 |
| Sodium cyanide, 127-130% | .39 |
| Sodium hyposulphite per 100 lb. | 6.50 |
| Sodium phosphate | .15 |
| Tin chloride | .80 |
| Zinc chloride, C.P. | .30 |
| Zinc sulphate | .08 |

**Prices per lb. unless otherwise stated**

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## Every Shipment of Geometric Threading Machines Means Increased Production and Decreased Costs in the Shops Where They Are Consigned.

Small threaded parts are correctly duplicated in shortest possible time. These machines thread work which cannot be handled on the ordinary Screw Machine or produced economically in any other manner.

There are three sizes—½-inch, ¾-inch and 1½-inch. The threaded diameters range from ⅛-inch to 1½-inch inclusive.

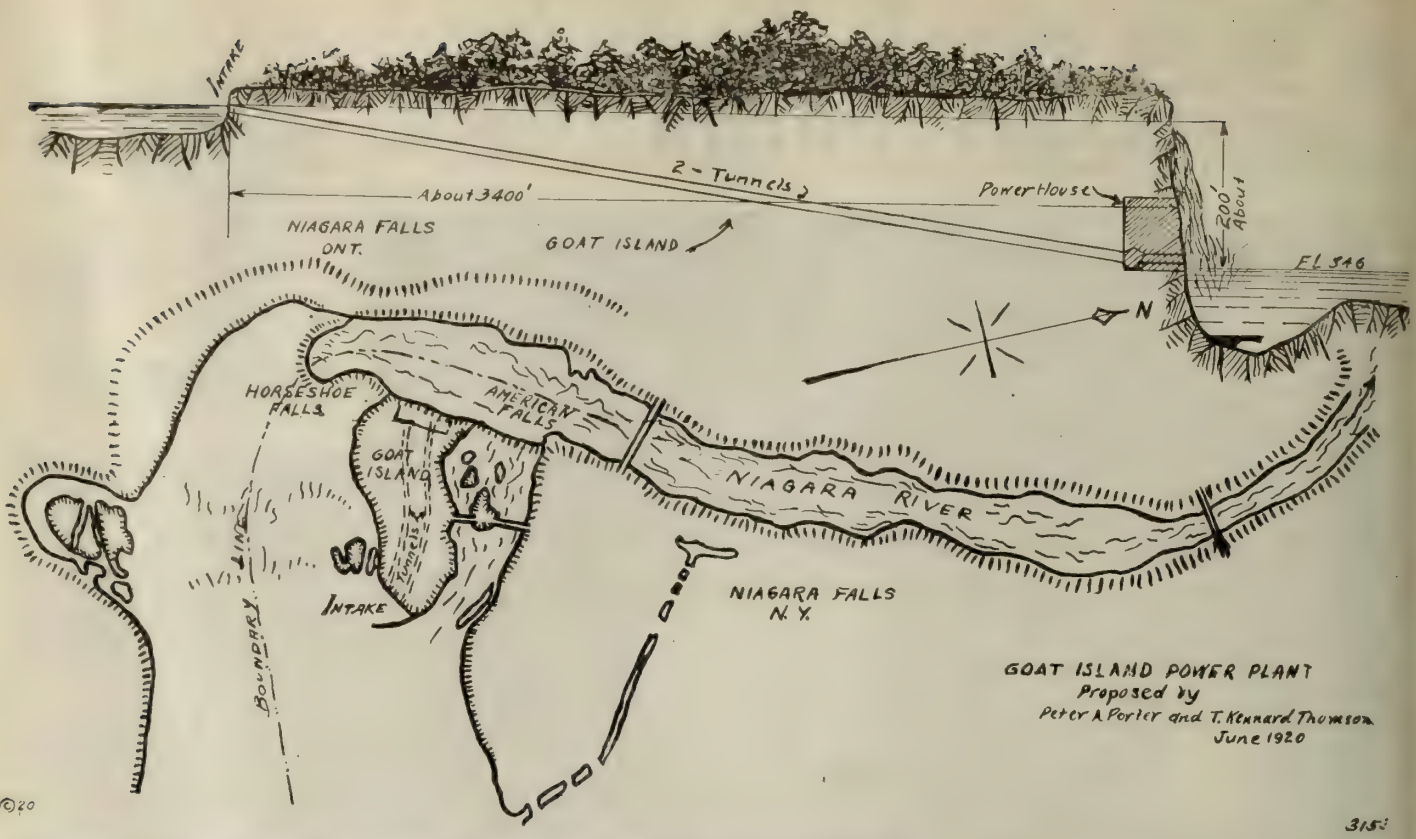
Make Screw Thread Cutting the most satisfactory operation in your plant.

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**NEW HAVEN CONNECTICUT**

***Canadian Agents:***

Williams & Wilson Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B., Halifax, N.S.
Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

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## TWO NOVEL PLANS FOR HARNESSING NIAGARA

Continued from page 57

very much better to allow us to develop power and sell it for use within 100 miles from the site, thereby building up the greatest manufacturing district in the world, than to try to distribute it at long distances with scattering results.

When first I started nearly ten years ago to agitate for this dam, people laughed at the idea that there would ever be a demand for 2,000,000 horsepower. In 1917 I wrote to the director of census, Hon. Samuel W. Rogers, asking him how much power was then in use in the State of New York, and what the normal rate of increase was. He sent me a very comprehensive reply, which summed up that we were then using over 3,000,000 horsepower a year in New York State and that the normal rate of increase was 10 per cent. or 300,000 a year. In other words, half of our dam which would go to the States would only supply one-third the amount of power then being used in the State of New York alone, or would only supply the additional demand for the next three years.

On the other hand I might state that Niagara power is now being distributed in Syracuse, 160 miles away, with a loss of less than 10 per cent. using a voltage of 60,000. By increasing this voltage to 110,000 the power is distributed on the Canadian side of the Detroit River about 250 miles. By doubling this voltage again, making it 220,000, the distance of transmission could again be doubled, making it 500 miles, with the same loss. By examining the enclosed diagram showing circles around Niagara Falls of 100, 200, 300, 400, and 500 miles, which area includes part of nineteen states of the Union and two provinces of Canada and contains 60 per cent. of the entire population of the United States and 80 per cent. of the entire population of Canada, it will be seen that all of these would then be within commercial reach of this power, although, as we have shown above, we would only have one-third the amount of power required by one state alone.

It might be stated that New York City alone uses between six and seven hundred thousand horsepower a year.

So the people on the frontier, especially in Canada, now realize that they want all the power that they can get developed.

Many people in Canada now realize that our proposed dam in Foster's Flats must be built sooner or later, and that when it is built, every cent spent on the Chippawa-Queenston Canal and similar diversions on either side of the River will have been so much money wasted, and I have not the slightest doubt that the Canadians will see the advisability of scrapping their canal, which I have been told is costing everywhere from $50,000,000 to $100,000,000 for the reason that no other plan or combination of plans will give within 1,000,000 horsepower as much as our dam will. And if Canada has half of that, it would be equivalent to 5,000,000 tons of coal a year at $10 a ton, making $50,000,000 a year. As soon as Canada is convinced, if she is not already convinced that she can get back the $50,000,000 a year, she will not hesitate to scrap the $100,000,000 plan if necessary.

As a matter of fact, however, it would not be necessary to scrap that or any of the other existing plants until they were worn out, but as our two projects are capable of using all the permissible water, such side issues simply add to the cost to the consumer forever. I have taken the liberty, Gentlemen, of going into such detail in the hope that you will not allow further partial developments on this side of the line, to thus add to the cost forever.

In addition, not only would such diversions greatly add to the cost forever, but, we are quite confident that any further diversion of water from the Rapids would result in an ice jam, which would probably destroy every plant in the River. My reason for this statement is that there is hardly enough water now going over the rocks in the Rapids to carry the ice away. As a proof of this statement; some dozen years ago, an ice jam was formed in the Rapids which only lasted eight hours, and kept the water back until it had done considerable damage to the power plants at the Falls, although such plants were at an elevation full 60 feet above the level of the water where the jam occurred, and when the jam broke, absolutely destroyed everything in the river below, all the way down to Lake Ontario for a height of over 20 or 30 feet above the original water level: wharfs, docks, trees, shrubs, buildings and everything being swept away. This jam was caused by a slight change in the wind at Buffalo, which held back the water for a short time, letting the ice pile up on the rocks in the Rapids.

An engineer making as drastic a statement as this should give more than one example. So I go back probably some

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Basic Malleable Foundry

## STEEL AND IRON BARS

## OPEN HEARTH STEEL SHEETS

## RAILROAD TRACK MATERIAL

Angle Bars Track Bolts Tie Plates Tie Rods Spikes

| SCREWS | WIRE | NAILS |
|---|---|---|
| Steel | Steel and Brass, Copper and | Wire |
| Brass | Bronze, Heavy and Fine, | Cut |
| Bronze | Bright, Annealed, Coppered, | Boat |
| Wood and | Galvanized, Tinned, Stranded, | Horseshoe |
| Machine | Steel and Copper Cable, | Shoe Nails |
| Screws | Barb, Woven Clothes Line | Tacks |

## POLE LINE HARDWARE

Pole Steps Cross Arm Braces Guy Clamps Guy Rods

| WROUGHT PIPE | FORGINGS | LEAD PRODUCTS |
|---|---|---|
| Black Pipe | Car Axles | Lead Pipe |
| Galvanized Pipe | Shape and Drop Forgings | White Lead |
| Nipples | Carriage and Automobile | Shot |
| Couplings | Hardware | Putty |

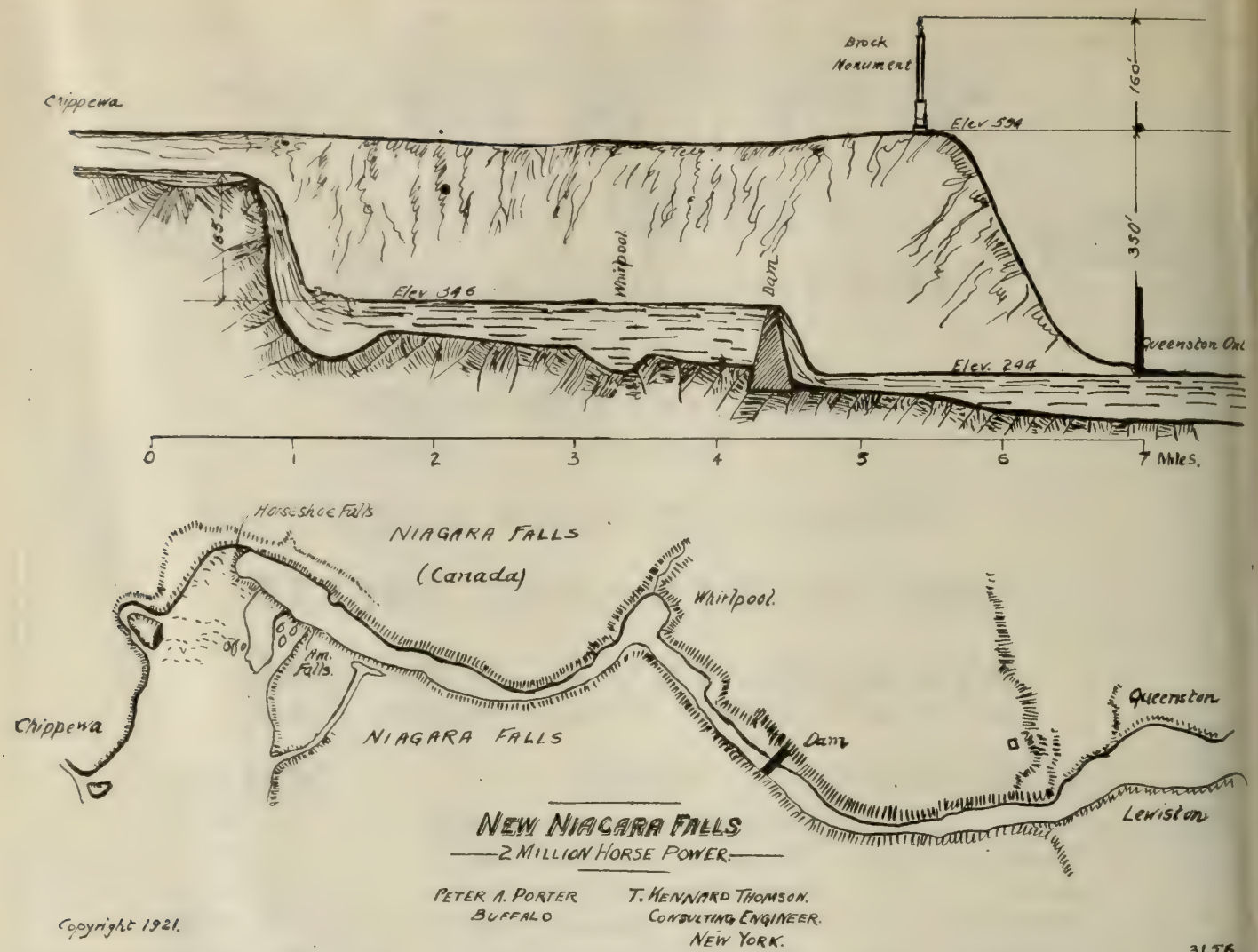
BLOOMS
BILLETS
PLOW BEAMS
ANGLES
CHANNELS

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## STEEL COMPANY
OF
## CANADA
LIMITED

HAMILTON MONTREAL

WIRE RODS
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RIVETS
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millions of years, when an ice jam probably diverted the Niagara River, causing it to turn a right angle thereby forming the whirlpool, cutting the brand new channel through the bed-rock.

By looking at the plan, it will be seen what an ideal location Foster's Flats is for the dam, for we can build the first part of the dam on dry land, carrying the base of the dam some 30 feet or more below the bed of the river and then divert the entire river through temporary openings at the bottom of the completed section of the dam, making it a comparatively simply matter then to dam the present channel of the river.

As we propose a dam with very flat slopes, about 700 feet base, it will be a very simple matter to handle the ice, as there will be nothing to prevent the ice from going right over the top of the dam, as there will be no sheer drop on the down stream side of the dam to undermine it, the ice simply sliding off on the flat incline. This design has been called a submerged weir. There will be a minimum depth of 135 feet above the dam and minimum flow of about 220,000 cubic feet per second, so there will be no obstruction arising from the ice.

### Goat Island Plan

A glance at the plan will show an inclined tunnel of 2500 feet. It does not need any engineering figures to prove that such a tunnel is cheaper than tunnels five or six miles long or the Chippawa-Queenston Canal which is 12 3-4 miles long. Furthermore, we do not lose the valuable head which, in case of the Chippawa-Queenston Canal, amounts to 16 feet. This tunnel can of course be extended far enough above Goat Island to take advantage of the entire head of the river, at and just above, the old falls, and furthermore it does not destroy any property or scenic beauty on Goat Island whatever.

These two projects together could develop about 4,000,000 horsepower a year, every ounce of which could be readily sold and it would be far better to sell it at the site, thereby developing great manufacturing centres and to pay enormous taxes to Canada and the States, so that all would derive equal benefits instead of taxing all for the benefit of a few.

At the same time the matter of canalization, and power, of the St. Lawrence River should also be started. While it is true that the bulk of the power of the St. Lawrence River belongs to Canada, the United States will benefit enormously by the canalization of the St. Lawrence River, as well indirectly from the development of the power.

For the development of 4,000,000 horsepower in the St. Lawrence River, and 4,000,000 horsepower in the Niagara River, or 8,000,000 horsepower together, or to be conservative say 6,000,000, which is equivalent to 6 million tons of coal a year, will mean that there will be ten Pittsburghs on the frontier. Such developments could not fail to benefit every town, village, and city in the United States and Canada. As a matter of fact, the United States will probably benefit by a 30-foot draft from Montreal to the Great Lakes to a much larger extent than Canada, as our country already has free use of the Canadian canals, and I have been informed often make more use of them than the Canadians. The profile will show that there are five lifts in the St. Lawrence River between Montreal and Lake Ontario, and these might possibly be cut down to 3 or 4.

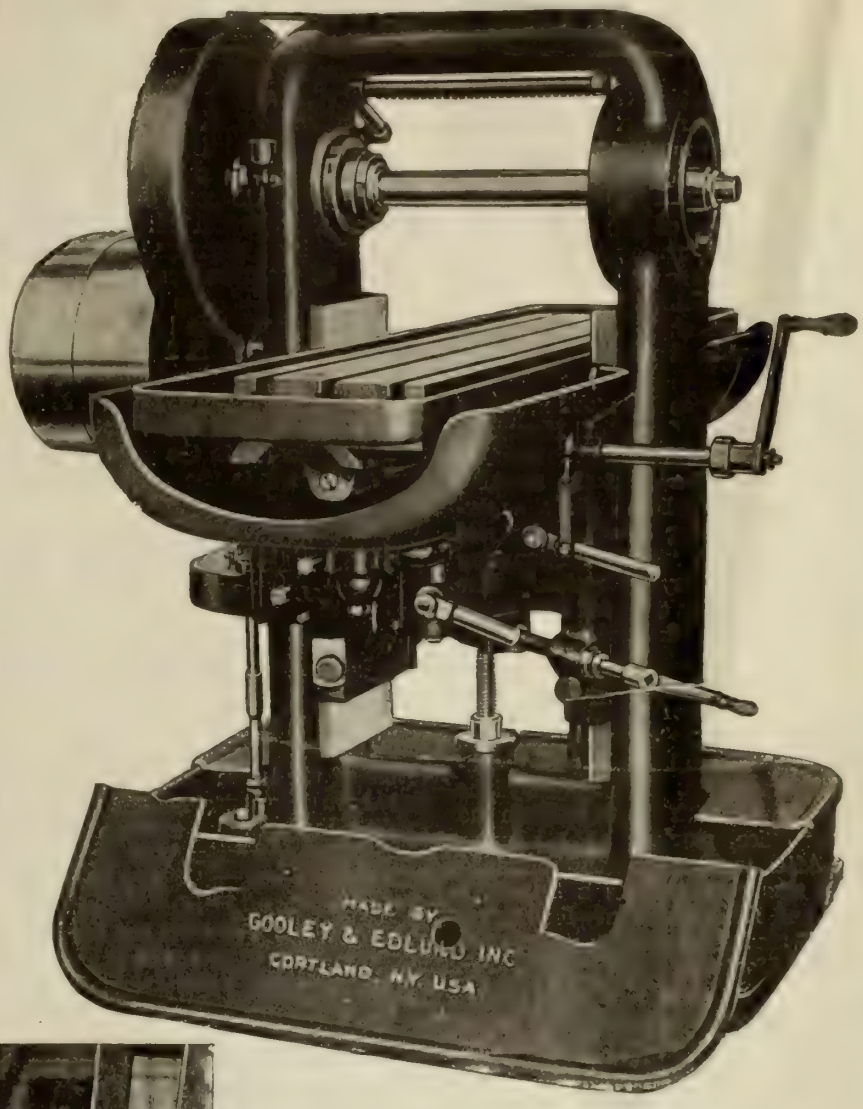
If the United States and Canada will get together and give us the rights to develop this power, we will give a 30-foot draft to the Great Lakes without charge to either government, and we will develop power, under government supervision as to the plans, construction, operation, taxes, selling price of power and our remuneration.

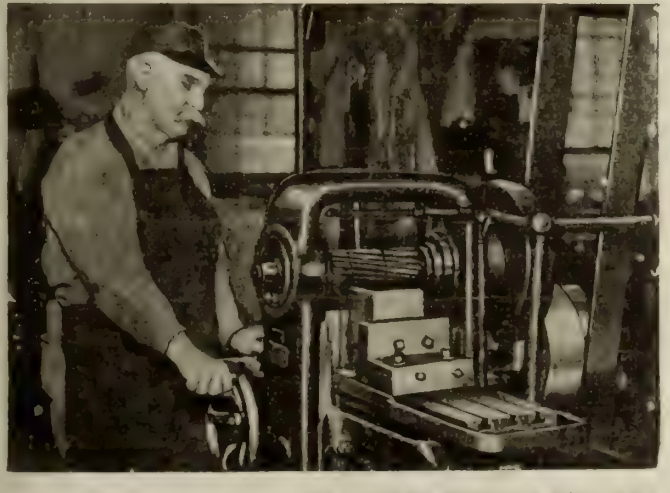
If this work were done by government ownership in the old sense of the word, God help the countries! On the other hand, it will be inconceivable to give a private monopoly worth $600,000,000 or so a year to any individuals. But if the

Continued on page 66

# Briggs Millers

## For Increased Production and Better Quality



THE Briggs Heavy Duty Miller was designed to handle many rugged jobs that ordinarily tie up the large, expensive millers. By turning out your milling work on a Briggs you get fine quality work, save operating time, and conserve power. Conservation of floor space, too, is a feature of the Briggs —the greatest Production Miller ever developed.

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**MONTREAL and WINNIPEG**

**GARLOCK WALKER**

*HIGH GRADE MACHINE TOOLS*

# The Week's Events in Montreal Industry

The Dominion Bridge Co. are remodelling a snow-plow for the city of Montreal West. The power is obtained by means of a caterpillar tractor.

---

A. M. Wiseman, of the staff of the British Trade Commissioner for Canada, in Montreal, has been removed to Ste. Anne de Bellevue Military Hospital near Montreal to undergo treatment for wounds received in the war.

---

At the regular monthly meeting of the Canadian Railway Club, of Montreal, held at the Windsor Hotel on the evening of the 8th, the feature of the meeting was the address by D. E. Blair, superintendent of rolling stock, Montreal Tramways Co., on "Some Engineering Features of Tramway Operation." The meeting was largely attended and many new members were admitted.

---

H. J. Dalton, who has been assistant auditor of agencies of the Canadian Pacific for the past eight years, has been appointed to succeed E. E. Lloyd as auditor of disbursements. Like Mr. Lloyd, he first saw service with the C. P. R. in the Winnipeg office, starting as a junior clerk. After two years in the Winnipeg office he was appointed as a travelling auditor, and for over twenty-four years was chief travelling auditor with headquarters at Montreal.

---

A very enjoyable evening was spent last Saturday by the staff members of the Montreal branch of the Canadian Fairbanks Co. and their friends, when a dance was given by the employees of the company. The patrons and patronesses were: C. J. Brittain, vice-president and general sales manager, and Mrs. Brittain; H. B. Walker, controller, and Mrs. Walker; and H. V. Cordell, manager, and Mrs. Cordell.

---

Escher Wyss & Co. have recently reorganized their Canadian organization. Mr. Th. Seidl, after an absence of several years, again returns to take charge of the Canadian business, and C. H. Withers, who has been looking after the business since 1917, will remain with the firm as assistant manager. The company manufacture large water turbines and hydraulic equipment; they also handle the lines of Messrs. Buhler Bros., of Uzwyl, Switzerland, makers of cement mills, brickworks, automatic elevators, and other specialties.

---

J. H. Trudell, of Montreal, has recently developed a new automatic train connector, and he has several constructed and installed at the plant of the Montreal General Tool Co. of Montreal for demonstrating purposes. The outstanding feature of the apparatus is the total absence of gaskets, the joints being metal to metal face, and the well-known rubber hose in the old connector has been replaced by an all-metal connection made of standard pipe and ball joints. A company has been organized for the manufacture of these devices.

---

Announcement has been made of the appointment of E. E. Lloyd to the position of assistant comptroller of the C. P. R. He succeeds the late W. J. Moule. Mr. Lloyd entered the services of the Canadian Pacific in the year 1887, starting as a clerk in the stores department in Winnipeg, and ten years later was appointed chief clerk in the stores department at Vancouver, remaining there until 1903, when he was transferred to the Montreal office of the same department and in the same capacity as chief clerk. In 1904 he was promoted to the office of chief clerk in the auditing of stores and mechanical accounts, and seven years later was elevated to the position of assistant auditor. In 1913 he was appointed auditor in the same department, and in 1918 he was promoted to auditor of disbursements, a position he held until his recent appointment to assistant comptroller.

## BRITISH FIRMS ARE GETTING IN SHAPE FOR EXPORT TRADE

The Department of Overseas Trade in Toronto furnishes the following information to Canadian Machinery regarding conditions in Britain:

With the reduction to more normal levels of the heavy home demand which has been the outstanding feature of trade since the war, manufacturers are showing an increasingly marked interest in overseas orders. The response to announcements by the Department of Overseas Trade of calls for tenders has become very gratifying, and the measure of interest now being taken is equally demonstrated by the numbers of visits to the department from representatives of all classes of firms seeking possible openings or general reports on overseas market conditions. The result is that very important foreign and colonial orders have recently been secured by United Kingdom firms, and that strong competition is being put up for others.

Although prices are still high, determined efforts are being made, with considerable success, to reduce them by improved organization, elimination of unnecessary human labor, standardization, massed production, and the increased employment of automatic plant. A noticeable result of these steps is that many firms have now been able to set aside small stocks, and, in addition to offering certain reductions in price, they can make firm quotations and give immediate delivery. This is especially the case in certain branches of machine tools, agricultural machinery, and gas and oil engine trades. Many firms whose order books are too full to permit of collecting stock, have made arrangements whereby certain percentages of their output are available for export.

Locomotive manufacturers, although for the most part still having good orders on their books or under execution, are prepared to consider others, and to begin building, in some cases, immediately. Delivery can generally commence about seven months after receipt of order. As an indication of ruling prices, first-class main line locomotives for passenger traffic range between £15,000 and £17,000, according to specification, and heavy goods locomotives from £11,000 upwards. One or two firms have actually stocks ready for delivery, especially of the industrial type, and a recent advertisement of one of the large firms shows that it could deliver a miscellaneous lot of 130 at once. With the growing improvement of the Scarab oil-burning installation, locomotives can easily be converted to use this fuel.

Wagon and carriage builders are quite busy, but practically all are able to look at new orders. Stocks are available in some cases, but for special requirements delivery can be made in anything about two months from receipt of order in the case of wagons, and in five to six months in the case of coaches.

Rails, except in standard sections, are scarcely to be had from manufacturerers in anything under eight months. Some merchants have good stocks of home rails, and recently have quoted for and secured large orders for immediate delivery.

General contractors for road, railway, dock, and other public works schemes have increased their plant and staffs and improved their organizations, and are in a favorable position to put up strong competition where financial guarantees are forthcoming. There are, however, many local schemes in hand, or under consideration, and for the most part it would appear that firms are open to consider only large contracts which would justify the expense and trouble of preparing plans, and sending out plant and staffs, and which would provide work for a considerable period. In order to secure their interest very full particulars,

# "MORROW"

*DRILLS*
*REAMERS*
*FILES*
*SCREWS*
*NUTS*

—Prompt Service
—Absolute Reliability

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## Upon the Health of your employees depend your profit and production



Don't be contented with half-way goodness or makeshift drinking arrangements.

**Throw out the germ-laden Drinking Cup !**

**Give your men a clean drink**

**PURO** (MADE IN CANADA) **SANITARY DRINKING FOUNTAIN**



Allows just the proper amount of cool, clean fresh water to come through the bubbler. No spurting, overflowing, no loss. "Puro" regulates itself. "Puro" saves 15% on water bills, too. You can attach it in a few minutes. Tell us how many men, how many departments and we'll tell you how much the cost will be.

**Puro Sanitary Drinking Fountain Co.**

*Canadian Agents :*

**McKENZIE BROS.**

888F St. Andre St., Montreal, P.Q.



## RATES FOR CLASSIFIED ADVERTISING

Rates (payable in advance): Two cents per word. Count five words when box number is required. Each figure counts as one word. Minimum order $1.00. Display rates on application.


including plans, specifications, and terms of payment, should accompany the notification of any such schemes open to tender. Factory plant, especially machine tools, woodworking machinery, tin-making equipment, food treating and preparing plant, including baking and confectionery machinery, printing machinery, etc., is comparatively plentiful, and, for many classes of these orders can be filled fairly promptly. Textile and chemical machinery trades are heavily committed, and, except in some of the smaller lines, considerable time would be required for delivery.

A number of comparatively new British lines are barbed wire and nail making machinery, concrete block making machines, automatic machinery for the manufacture of piano wrest pins, which were formerly made in Germany only, thrust boring plant, wave-power transmission tools, mechanical pickers, magnetic ore separators, etc.

The coal strike has been responsible, it is true, for the temporary partial closing of many concerns, and customers who desire their plant made to order will, no doubt, as a result, have to wait longer for delivery, especially in the case of heavier plant. It is, however, expected that within a short period the effects of the crisis will generally have passed and conditions will have become more normal.

## Trade Gossip

A pipe shop is being erected by Crane, Ltd., 83 Terauley St., Toronto.

The United Drug Co., 78 Broadview Ave., are building a $60,000 warehouse.

A $60,000 factory is being erected by the Decalcomania Co. of Canada, Ltd., 364 Richmond St., Toronto.

Tenders will be called shortly for erection of cold storage plant for Devine & Son, 394 Queen Street West.

A new foundry is being erected at a cost of $75,000 on Broad St., Ottawa, by the Beach Foundry Company.

A public garage is being planned by George Buschlen, Parkway Ave., to be erected on Queen St., Toronto.

The plant of the National Steel Car Company, Hamilton, Canada, will be closed for an indefinite period for stock taking.

The National Engineering Company, Limited, of Sarnia, Ont., are adding disc wheels to their list of products in the near future.

A thirty-acre site has been purchased by the Anglo-American Motors, Ltd., at Mimico, Ont., and a factory in ten units will be started shortly.

The first factory of its kind in Western Canada, the Britannia Wire Rope Company, Limited, commenced production at Vancouver recently. It is an all-British concern.

The Huron Specialty Castings Company, Clinton, Ont., will move to Goderich when their plant, which is now being constructed there, is completed.

The Dominion Bridge Co., Lachine Que., have received the steel contract for extension to factory at a cost of $50,000 for Standard Paint Co. of Canada, Ltd. 52 Victoria Square, Montreal.

It is reported that the executive offices of the International Harvester Co., Ltd. of Canada, are being removed from Chicago, Ill., to Hamilton, Canada, where the Canadian plant has been located for several years.

The Brantford Computing Scale Company, Limited, have acquired the Kerr & Goodwin plant in West Brantford, and will move their business there. Additions will be made to take care of the large volume of foreign business offered.

A new industry is to be started at Walkerton shortly, the Sterling Twine Company, Limited, who expect to be in operation some time this month. They will manufacture all kinds of commercial twines of various sizes, grades and qualities.

The Canadian Perfect Wheels, Limited, a recently incorporated company at Listowel, Ont., are remodelling their plant to the requirements of the modern wheel factory. They expect to be manufacturing in April and will produce automobile wheels, disc, wire and wood, and a general line of accessories, stamped work, etc.

### TWO NOVEL PLANS FOR HARNESSING NIAGARA

Continued from page 62

governments will give us the rights as above indicated, on the basis that we get so much remuneration if we develop power for say $15 a horsepower, less if it costs more than $15 a horsepower and much more for every dollar saved below $15, we would have all of the incentives of a private ownership without any of the objectionable features.

We therefore beg of you, Gentlemen, that you give us permission to develop the Goat Island plan, and that we also beg of you to arrange for an international agreement, treating the entire question as one unit, thereby saving untold millions to the future generations for they will undoubtedly have to pay not only for our two proposed projects in the future, but also for any and all of the minor diversions such as the Chippawa-Queenston Canal or tunnels on either side of the river.

We therefore respectfully state that we think you have it in your power to create the greatest industrial centres in the world, the results of which would be so far reaching that there is scarcely a country in the world that would not be benefited.

Respectfully submitted,

(Signd.) T. Kennard Thomson.

## Personals

. C. Crow, sales manager, the Can- a Metal Company, Limited, Toronto, is making a business trip to the coast. H will be away about a month and will spend some time at the Winnipeg and V couver plants.

L. Clark, president and manager of P fect Machine Company, Galt, an ag- ssive booster, has been chosen as p sident of Galt Board of Trade. Al- dy plans are being discussed for a p gressive year.

. M. R. Fairbairn, who has just been ected president of the Engineering In- tute of Canada, was born in Peterboro 1873 and has attained a premier posi- n in the engineering world. After a rse at the School of Practical Science . Fairbairn went first as an assistant the Department of the Interior, when became engineer in charge of con- uction of the Montreal Park and Is- d Railway. In 1900 he joined the con- uction department of the C. P. R. and years later was raised to the post of sistant chief engineer, while in 1918 was appointed chief engineer of the P. R. Other officers elected were: ssrs. H. G. Acres and W. J. Francis, vice-presidents. The following were cted as councillors: F. P. Sherwood d K. B. Thornton, Montreal; S. S. iver, Quebec; G. B. Dodge, Ottawa; C. Kirby, St. John, N.B.; Prof. C. R. ung, University of Toronto; R. Dob- n, Peterboro; A. C. D. Blanchard, Niag- a Falls; H. B. R. Craig, Windsor; W. . Scott, Winnipeg; H. S. Carpenter, Re- na; S. G. Porter, Lethbridge, and H. L. hnston, Armstrong, B.C.

## Catalogues

### NEW CIRCULAR

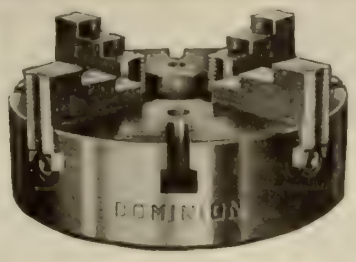
The Oliver Instrument Co., Adrian, Mich., ave issued a circular illustrating and scribing their sawing, filing, and lapping achine. The literature shows how these achines can be used for sawing and fil- g articles from carbon, bakelite, card- oard, fibre, soft and hard rubber and ather. This, of course, in addition to s regular metal working uses.

### INTERESTING BOOK

The Taylor Instrument Co., Rochester, Y., have issued a very attractive Jan- ary issue of The Tycos-Rochester. This s a little book devoted to things scientific, nd, of course, deals more or less with yco equipment. It proves interesting eading, however, apart from its trade lavor.

### TOOL AND SPECIAL STEELS

The Vulcan Crucible Steel Co., Aliquip- a, Pa., have issued a catalogue on tool teels and special steels. This book not nly shows the classes and types of steels manufactured, but includes photographs howing the plant, equipment, etc. Some ery valuable information to those in- erested in steels also forms a part of this nteresting booklet.


# DOMINION CHUCKS

STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY



## All Screws Are Reversible

SCREWS are made of the best grade steel. Both ends are broached and are heat treated after machining. They are reversible, so that either end may be used, are large enough in diameter to stand the torsional strains applied by operator when setting up his work. They are made to give the best service—and may be depended upon to stand up under the hardest usage.

DOMINION STEEL PRODUCTS CO. LIMITED
*Engineers • Manufacturers*
BRANTFORD, CANADA


### INTERESTING CATALOGUE

The Mason Regulator and Engineering Co., Ltd., Montreal, P.Q., have issued a new catalogue of their products. Every means of condensing the information has been adopted and the data have been made short and concise as possible. In other words it is a condensed catalogue. Should a reader of the book desire further information he is told how to secure it from the larger specialized catalogues published by this firm.

### CRANE CATALOGUE

The Herbert Morris Crane and Hoist Co., Ltd., have sent us a copy of their catalogue, No. 76. This book is of the loose-leaf type and contains some valuable data on crane installations. Chain blocks of various types are shown, and illustrations of different uses for the same are scattered throughout the pages. These cover practically all industries and are in themselves a lesson on the use of chain blocks.

Different types of trolleys and I beam runways are next given, these also being well illustrated from actual installations. Hand operated overhead cranes, overhead travelling cranes, travelling gantry cranes, jib cranes, ash hoists, barrel slings, motor driven trolley hoists and motor operated electric cranes are also shown, each style of equipment being illustrated in actual use. This book is actually a handbook on cranes in general.

### GRINDER CATALOGUE

The Blanchard Machine Co., Cambridge, Mass., have issued a new catalogue, No. 16, dealing with their high power vertical surface grinder, and this book supersedes all earlier editions. The various types of drives are shown by illustration, and examples of work machined by their grinders is depicted. This is followed by a general description of the machines, together with specifications, etc. Their magnetic chucks are also discussed, together with the continuous reading caliper attachment as used on their machines.

### CHUCK CATALOGUE

The Skinner Chuck Co., New Britain, Conn., have issued a new catalogue dealing with their line of chucks. This booklet is called "Chucks and Their Uses" and starts off by telling a story of the origin of chucks. The use and care of modern chucks is then gone into. A list of dont's concludes the contents of this interesting booklet and mechanics in general should read these don'ts as they happen almost every day and are points easily avoided.

### NEW CATALOGUE OF LATHE CHUCKS

The Cushman Chuck Company, of Hartford, Connecticut, have prepared a new catalogue for 1921. For several years past their catalogues have been practically re-issues of one that was prepared in 1914, only with the exception that the 1914 list prices were revised in 1917.

There are many pages with useful information for all who have occasion to use lathe chucks, and parts of such are arranged under the following headings: Outfits for lathes; How to increase the efficiency of lathe chucks and prolong their usefulness; how chucks are attached to lathes; dimensions of intermediate flange plates; repairs and replacement parts.

### NEW CATALOGUE

The Hanson Clutch and Machinery Co., Tiffin, Ohio, have issued a new general catalogue C 3. This booklet is intended as a handy reference for anyone using or contemplating using friction clutches. The application of their clutches is shown.

# Classified Opportunities

## MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

## POSITIONS WANTED

DRAUGHTSMAN (PERTH COUNTY) DESIRES change. Have had general experience of ten years. Am first-class practical shop mechanic, age 30. Married. If you are in need of a young man of ability, who has risen by merit only, let us arrange an interview. Address Box 747, Canadian Machinery. (c6m)

## AGENCIES WANTED

SOLE AGENCIES WANTED BY WELL-known, reputable and established English engineering firm, represented all over the world, for Contractors' or Municipalities' small Engineering equipment, which must be first-class, competitive in price, and in constant large demand. British made and patented preferred; if Colonial or Foreign, privilege or manufacturing in England required. Big sales assured for the right Equipment. Write giving details to "Engineering," P.O. Box 1934, Montreal. (c8m)

## MACHINERY WANTED

WANTED—NEW AND RE-MANUFACTURED gas and gasoline engines, boilers, saw-mill machinery, planing mill and sash and door factory machinery. New and manufactured iron and wood-working machinery. Electric motors, dynamos, direct connected steam operated generators, portable electric tools. Builders' hoists, elevators. Box 739F, Canadian Machinery.

IF YOU HAVE IRON-WORKING OR WOOD-working machines for sale, or idle machine shop equipment, call or write Canada's largest dealers in new and used machinery. H. W. Petrie Limited, Toronto, Ont. (cfm)

WANTED — WOODWORKING MACHINERY and mining machinery, machine tools, boilers and steam pumps, alternating or direct current motors. Contractors' equipment. Apply Box 737F, Canadian Machinery.

PARTIAL LIST

**Machine Shop Equipment**

***At Extremely Low Prices***

LATHES—All sizes and lengths of bed. Special price quoted on rebuilt 20 in. x 8 ft. C.M.C.

AIR COMPRESSOR—8 in. x 8 in. Chicago Pneumatic.

TANKS—10 Tanks 10 ft. 6 in. diam. x 29 ft. 6 in. long. 19,000 gals.
3 Tanks, 10 ft. 0 in. diam. x 39 ft. 0 in. long, ⅜ in. Heads. 22,893 gals.
Full line of other Steel Storage Tanks, open and closed, all sizes.

PUMPS—1 Triplex Power Pump, 1½ in. x 6 in. Hydraulic Machy. Co. Also 1 in. x 5 in. West Tire Setter.
1—Centrifugal Pump, 2½ in. x 1½ in. Gould.
1—Gould Triplex Power Pump, 2 in. x 3 in.

Milling Cutters and Reamers, full assortment, all sizes and shapes, at less than half price. Send us your enquiries.

**Standard Equipment & Tool Works**

Dept. K. 507 St. James St.
Main 2286 MONTREAL (20)

## PATTERNS

TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (ctfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

**PATTERNS**

**Wragge's Pattern Works, 10 George St. South, Galt, Ont.,** Phone 1105 W. Equipped for best service in wood or metal patterns to any specification. Most reasonable prices. Expert workmanship. "Nothing ragged but the name." (cxxvi3m)

**Modern Marine Machinery**

Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

**MACHINE WORK WANTED**

We are equipped to handle all kinds of general or special machine work. All operations in our plant are done under the most careful supervision and we can satisfy you as to price. Always available for consultation.

**PERFECT MACHINE COMPANY, GALT**
Builders of Reliable Machinery.

**Grey Iron Castings**

Light and Medium-Bench and Floor Repetition Castings; Capacity 15 tons per day.
Expert Metal and Wood Pattern Work. Our advice and estimates will save you money.
Semi-finishing operations on Lathe or Grill on Castings supplied if required.
ASK US.
**THE KATIE FOUNDRY, GALT, ONT.**

**REGO WELDING *and* CUTTING APPARATUS**

Oxygen, Acetylene, and a complete line of Welding and Cutting Supplies.

**Carter Welding Co. of Toronto, Limited**
**7-11 Sheppard St., Toronto, Ont.**
**Phones: Adelaide 2841 and 1524**
(TF)

## FOR SALE

2—ROTARY STEAM DRIERS—6' DIAM. x 25 long; complete.
2—ENDLESS DOUBLE LEATHER BELTS, 13 x 50' total length each.
1—8" x 12" DOUBLE DRUM BEATTY HOIS and boiler.
1—6" x 12" DOUBLE DRUM BEATTY HOIS and boiler.
2—AIR COMPRESSORS, 800 FT. CAPACITY belted.
Box 752F, Canadian Machinery.

ELECTRIC MOTORS FOR PROMPT SHIPment, new and re-manufactured, fully guaranteed. 3 Phase, 25 Cycle.

| No. | H.P. | Volt. | R.P.M. | No. | H.P. | Volt. | R.P.M |
|---|---|---|---|---|---|---|---|
| 1 | ½ | 550 | 1,400 | 1 | 15 | 550 | 1,40 |
| 1 | 1 | 550 | 1,400 | 1 | 20 | 550 | 1,40 |
| 1 | 1¾ | 220 | 1,400 | 3 | 25 | 550 | 75 |
| 5 | 2 | 550 | 1,400 | 1 | 30 | 550 | 72 |
| 1 | 3 | 550 | 1,400 | 3 | 40 | 550 | 72 |
| 6 | 5 | 220 | 720 | 4 | 50 | 550 | 72 |
| 1 | 4 | 550 | 1,400 | 3 | 75 | 550 | 72 |
| 3 | 7½ | 550 | 1,400 | 1 | 150 | 550 | 72 |
| 10 | 10 | 550 | 1,400 | 1 | 200 | 550 | 72 |

Box 750F, Canadian Machinery.

**FOR SALE**

Perfected rotary engine valve, simple design, free from defects common in rotary valves. Patented Feb. 20, 1917. Can be inspected at and purchased from H. W. Petrie Limited, Toronto.

**FOR SALE**

Enclosed liquid fuel combustion apparatus capable of generating intense heat in pipes and confined passages for heating parts of internal combustion engines and for other uses; spark ignited; blower operated. Patented April 3, 1917. Can be inspected at and for sale by H. W. Petrie, Limited, Toronto.

**MACHINERY FOR SALE**

1—24" x 12' Canadian Machinery Lathe
2—22' x 10' Davies Lathes.
1—21" x 10' London Lathe.
6—20" x 8' C.M.C. Lathes.
1—18" x 8' Mueller Lathe.
3—19" x 8' C.M.C. Lathes.
1—18" x 8' London Lathe.
1—16" x 8' C.M.C. Lathe.
1—16" x 6' McDougall Lathe.
1—D-1 H. D. Colburn Drill.
2—No. 24 H. D. Foote-Burt Drills.
1—28" B. G. Barnes Drill.
1—22" B. G. Barnes Drill.
1—D.C. Compound Wound Generator, 110 Valts, 125 Amp.
2—No. 54 Perkins Sprue Cutters.
2—2" x 26" Pratt & Whitney Turrets.
1—10" x 52" Plain Landis Grinder.

**Write us for particulars and prices.**

**Box 751 F.**

**Canadian Machinery**

# Classified Opportunities





## Motor Generator Sets

**A.C., 2 and 3 phase, 60 cycle, D.C., 250 Volts**

| D.C. Generator | | | | A.C. Motor |
|---|---|---|---|---|
| K.W. | Make | R.P.M. | H.P. | Make. |
| 17½ | General Electric | 1800 | | General Electric |
| 25 | General Electric | 870 | 35 | Western Electric |
| 35 | Northern | 1200 | 50 | Western Electric |
| 50 | Allis-Chalmers | 1150 | 75 | Allis-Chalmers |
| 50 | Westinghouse | 1120 | 75 | Westinghouse |
| 75 | Crocker-Wheeler | 900 | 125 | General Electric |
| 100 | Sprague | 900 | 150 | Western Electric |
| 150 | General Electric | 900 | 225 | General Electric |
| 200 | Westinghouse | 870 | 290 | Westinghouse |
| 200 | Westinghouse | 575 | 300 | Westinghouse |
| 300 | Crocker-Wheeler | 1200 | 500 | General Electric |
| 400 | Thomson-Ryan | 360 | 600 | Crocker-Wheeler |

***Write for further particulars and details of 125 volt and 550 volt Motor Generators.***

## MacGOVERN & COMPANY, INC.

**285 BEAVER HALL HILL, MONTREAL**

**Offices: New York, Pittsburgh, Seattle. Plants: Linden, N.J.**
**Buyers and Sellers of New and Used Machinery**

## Ideal Offerings of Used Machines

**LATHES**

3—28″ x 12′ Bove & Emmes, 3 step cone, D.B.G., Q.C.G.
3—26″ x 12′ C.M.C., 3 step cone, D.B.G., Q.C.G.
2—26″ x 10′ C.M.C., 3 step cone, D.B.G., Q.C.G.
6—24″ x 12′ Bove & Emmes, 3 step cone, D.B.G., Q.C.G.
1—24″ x 12′ Rahn Larmon, 3 step cone, S.B.G., Q.C.G.
3—24″ x 10′ Bove & Emmes, 3 step cone, D.B.G., Q.C.G.
1—22″ x 10′ Devenport, 3 step cone, D.B.G., Q.C.G.
1—18″ x 8′ Greaves Klausman, 3 step cone, D.B.G., Q.C.G.
1—18″ x 8′ Walcott, 3 step cone, D.B.G., Q.C.G.
1—14″ x 6′ American, 3 step cone, S.B.G., Q.C.G.

**ADDRESSOGRAPH**

1—Type A. Rubber System, complete, motor driven.

Our complete list includes other lathes, screw machines, turret lathes, horizontal boring mills, upright and radial drills, presses, pumps, boilers, etc. Write for particulars.

A complete line of Elliot Woodworking Machines, Belleville and Wagner Motors.

**Western representative for Geo. F. Foss Machinery & Supply Co., Ltd. Montreal, Que.**

## R. S. HOLLY

**Room 37, 33 Richmond Street West**
**Toronto, Ont.**

**Telephone: Main 4728**


## Would You Like to make some Extra Money?

Of course you would. Well then, why not do so? Canadian Machinery is always on the lookout for well-worth-while ideas, and are willing to pay a good price for them.

We are often asked, "What sort of ideas do you want?" Briefly, what we are desirous of obtaining is this, "Any idea that has proved of value in the machine shop, drafting room, or tool room." Think of how you got over some difficulty, a ticklish piece to hold in the lathe, or perhaps how you increased production on some particular piece. Any idea that saves time or money in the machine industry will appeal to us. Never mind the style. Write it as best you know how. We will put the finishing touches to both the wording and the sketch. Start in **NOW** and send us something of such a nature.

***Address it to***

**The Editor, Canadian Machinery**

**143 University Ave., Toronto, Can.**

# Of Interest to Every Canadian

*Number One of a Series of Advertisements*

Efficient service is the keynote of membership of

## *Canadian Machinery*

—IN—

## Canadian National Newspapers and Periodicals Association

—a highly constructive service—absolutely dependable and devoid of prejudice and personal bias. It means much to you!

The policies and principles back of this important service enable you to secure practical and impartial information of great value in business and in the home: and they assure a ready fund of literature of exceptionally high standard at all times.

To read the Association's Standards of Practice listed herewith is to understand what this Association means to you.

### Standards of Practice

**Canadian National Newspapers and Periodicals Association**

THE Members of this Association shall dedicate their best efforts to the cause of business, and public service, and to this end shall pledge themselves:

1. To consider first the interests of the Subscriber.
2. To work for truth and honesty in all departments.
3. To eliminate, in so far as possible, their personal opinions from their news columns, but be leaders in thought in their editorial columns, and make their criticisms constructive.
4. To refuse to publish puffs, free reading notices, or paid write-ups, to keep their reading columns independent of advertising considerations, and to measure all news by the standard "Is it real news?"
5. To decline any advertisement which has a tendency to mislead, or which does not conform to business integrity.
6. To solicit subscriptions and advertising solely upon the merits of the publication.
7. To supply advertisers with full information regarding character and extent of circulation, including detailed circulation statements, subject to proper authentic verification.
8. To co-operate with all organizations and individuals engaged in creative advertising work.
9. To avoid unfair competition.
10. To determine what is the highest and largest function in the field which they serve, and then to strive, in every legitimate way, to promote that function.

This is Number One of a series of advertisements regarding an Association that typifies thorough-going Canadian stability. Read the forthcoming advertisements in the Magazines, and Agricultural, Business, Religious and Educational newspapers, and Technical newspapers.

## Canadian National Newspapers and Periodicals Association

**Office - 70 Lombard Street - Toronto, Ontario**

# Money Saving Information

"The most useful information contained in any paper I get"—so a Western banker writes in to-day's mail, renewing his subscription for FINANCIAL POST.

"Very often," his letter goes on to say, "I am called on to suggest investments for small amounts, sometimes as low as a few hundreds, and I find your Investors' Inquiry Service a reliable partner to consult. If every investor knew there was such a service at his call it would surely lessen the losses of many of these people."

The Investors' Inquiry Service fills just that need. Unless you are perfectly sure of your investments, write us before you buy.

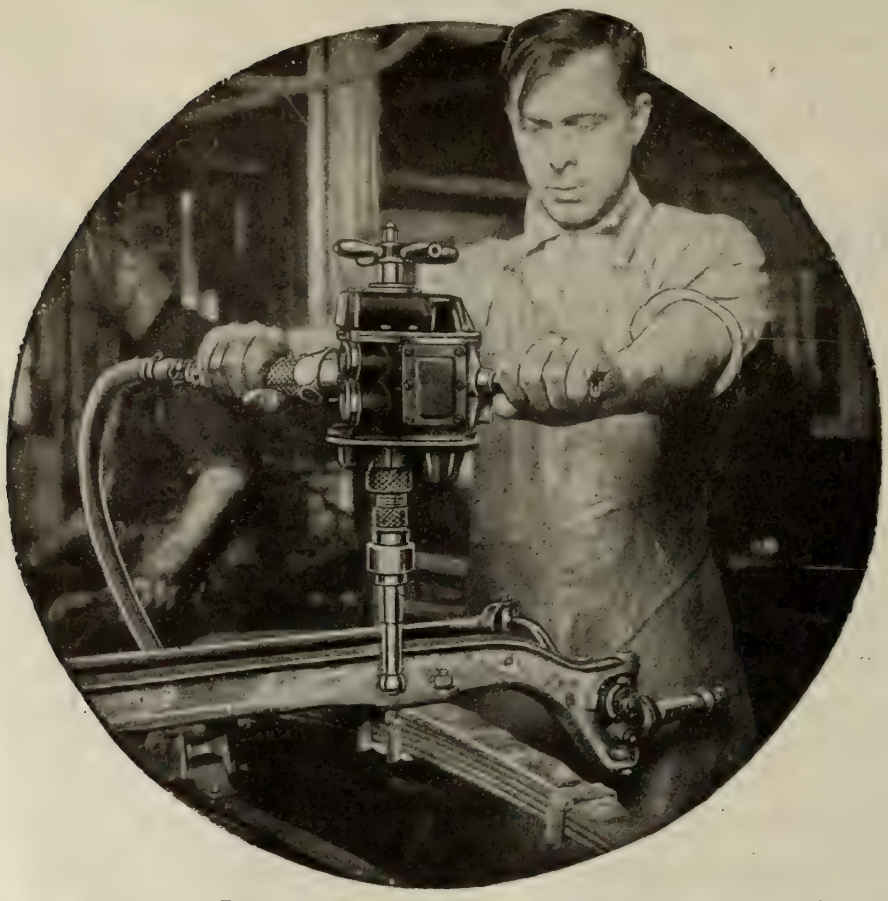
It costs FINANCIAL POST subscribers nothing to be sure before placing hard-earned savings in stocks that may never have a chance of paying dividends.

Trained service men will give you the benefit of keen analysis based on the facts behind the securities you are considering. This is one of many features enjoyed by our readers.

## THE FINANCIAL POST

**143 UNIVERSITY AVE.**
**TORONTO, CAN.**

*Send me for one year (52 issues) The Financial Post.*
*I attached $5.00. Commence at once.*



# *Piece workers prefer Little Giants*

BECAUSE "they can push them harder and earn more."

Piece workers demand the speediest drill manufactured; the foreman of the assembly shop requires both maximum output and quality work.

Good reasons why Little Giant Air Drills are now standard in hundreds of shops and plants.

Another reason—the toggles of Little Giants are equipped with quickly *renewable* bearings. No need to scrap an entire toggle because of a minor worn part.

Little Giants are ready to stand comparative test in *your* plant and become *your* standard drill. Prompt delivery can be secured from the Company Branches listed below.

*Sales Representatives*

## The Holden Company, Limited

354-356 St. James Street, Montreal, Canada

*Sales and Service Branches:* TORONTO, 342 Adelaide Street, West WINNIPEG, 150 Princess Street VANCOUVER, 81 Pender Street

*Canadian Factory:* Canadian Pneumatic Tool Company, Montreal

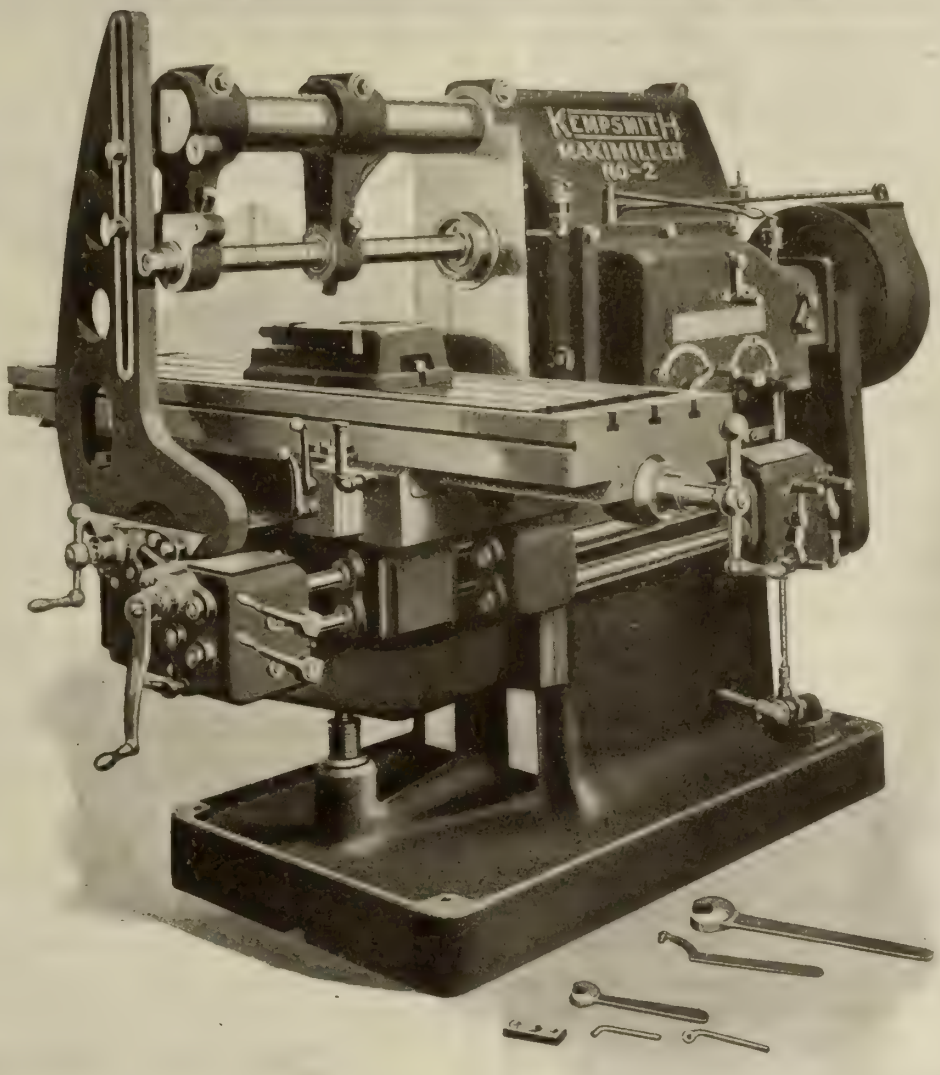
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BOYER PNEUMATIC HAMMERS · · LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS
CHICAGO PNEUMATIC AIR COMPRESSORS · · VACUUM PUMPS · · PNEUMATIC HOISTS,
GIANT OIL AND GAS ENGINES ROCK DRILLS · · COAL DRILLS

# GIANT ENGINES

*Dependable Power at* *Less Cost Per Hour*

# KEMPSMITH




## No. 2 PLAIN MAXIMILLER

Kempsmith Millers are built in three sizes each in the Plain and Universal Cone Types, two sizes of Maximiller Geared Head Types, a Production Type, with a choice of three table ranges, and two sizes of Vertical Geared Head Type. Our Knee Type Millers can be fitted with a complete line of attachments, which greatly increase the range of the milling machine.

**Literature will be gladly sent upon request.**

## THE KEMPSMITH MANUFACTURING CO.

MILWAUKEE, WIS., U.S.A.

FOREIGN DEALERS:—American Trading Co., 25 Broad Street, New York, N.Y. (Japan); Barandiaran & Co., 3-Alameda, San Sebastian, Spain; Bevan & Edwards Pty., Ltd., 117 King Street, Melbourne, Australia; Blair, Reed & Company, Nathan's Bldg., Wellington, N.Z.; Bloxham, Edgar, 12 Rue Du Delta, Paris, France; 245 W. 12th St., New York City; L. S. Devos, Grand Central Palace, New York City; Herbert, Alfred, 54 Dey Street, New York City; Nielsen & Winther, Blegdamsvej 60, Copenhagen, Denmark; 24 Stone Street, New York City; Parke & Lacy Co., 60 Clarence Street, Sidney, N.S.W., Aust.; Selson Engr. Company, 85 Queen Victoria St., London, E. C., England; Corso Vittorio Emmanuele, 11, No. 9, Turin; 5 Piazzo Castella, Milan, Italy; 24 Stone Street, New York City; Pascual Teja, La Capuchinas, No. 65, Mexico, D.F.; Spliethoff, Beeuwkes & Co., Leuvehaven, W.Z. 159, Rotterdam Holland; Turner, Hoare & Co., Ltd., Lansdowne Road, Post Box No. 195, Bombay, India; Charter & Gardiner, 55 Calle Echaque Santa Cruz, P. O. Box 1201, Manila, Philippine Is.; Societe Anonyme Belge Alfred Herbert, Rue De Laeken, 35a & 35b, Brussels, Belgium.

CANADIAN DEALERS:—The Geo. F. Foss Machinery & Supply Co., Limited, 305 St. James St., Montreal, Canada; General Supply Co., 38 Toronto St., Toronto, Canada.

# HINTS TO BUYERS


## STEEL CASTINGS

ELECTRIC Steel Castings of all kinds from 5 pounds to 5,000 pounds.

PROMPT DELIVERY

**Manitoba Steel Foundries, Ltd.**

1204 McArthur Building

Winnipeg - - - Manitoba

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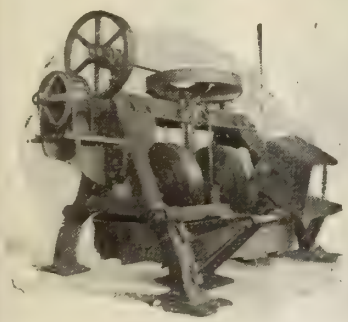


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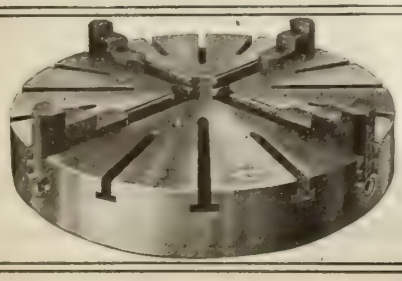
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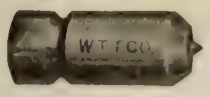
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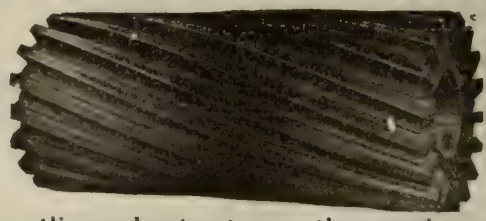
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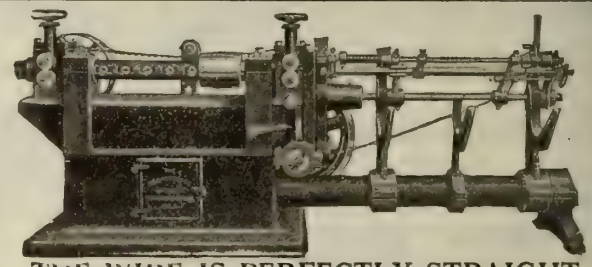
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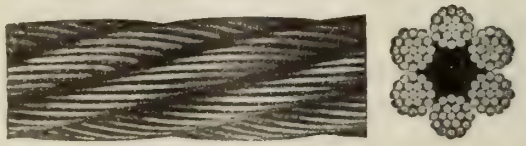
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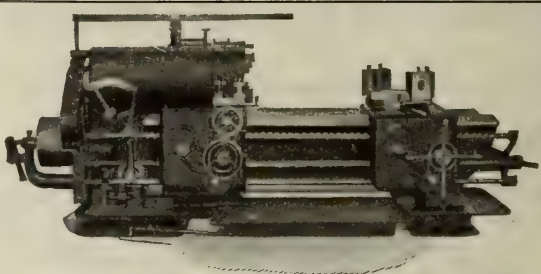
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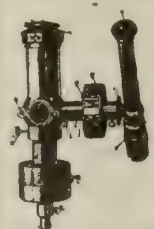
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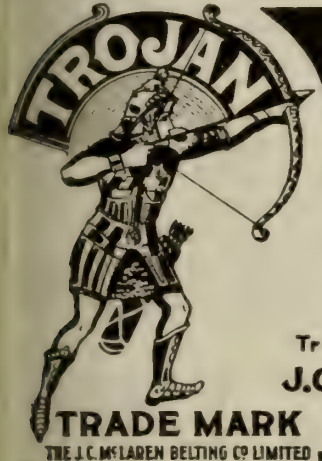
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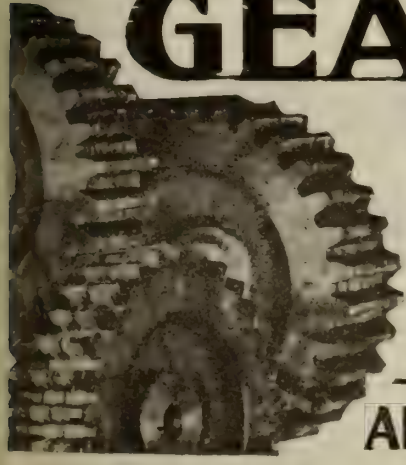
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**Benches, Work**
Aikenhead Hardware Ltd., Toronto, Ont.

**Bending Machines, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bertrams Ltd., Edinburgh, Scotland.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

**Bins, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Blocks**
Ford Chain Block Co., Philadelphia, Pa.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Chain (See Hoists, Hand)**
Aikenhead Hardware Ltd., Toronto, Ont.
Ford Chain Block Co., Philadelphia, Pa.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Die**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Illingsworth Steel Co., John, New York City, N.Y.

**Blocks, Pillow**
Can. Link-Belt Co., Toronto, Ont.

**Blowers**
Can. Blower & Forge Co., Ltd., Kitchener.
General Combustion Co. of Can., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sheffield-Engineering Supplies, Ltd., Montreal, Que.
Sturtevant Co., B. F., Boston, Mass.

**Bolt and Nut Machinery**
Acme Machinery Co., Cleveland, Ohio
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy Co., Toronto, Ont
Greenfield Tap & Die Corp., Galt, Ont.
Landis Machine Co., Inc., Waynesboro, Pa
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Bolt and Nut Machinery, Automatic**
National Acme Co., Cleveland, Ohio.

**Bolts and Nuts**
London Bolt & Hinge Works, London, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio
N. S. Steel Co., Ltd., New Glasgow, N.S
Petrie, Ltd., H. W., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont
Wilkinson & Kompass, Hamilton, Ont

**Bolt Threading Die Heads**
Jones & Lamson Machine Co., Springfield Vermont
Landis Machine Co., Inc., Waynesboro, Pa

**Boosters**
Sturtevant Co., B. F., Boston, Mass

**Boring and Turning Mills, Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy Co., Toronto, Ont
Gisholt Machine Co., Madison, Wis
Herbert Ltd., Alfred, Toronto, Ont.

**Boring, Drilling and Milling Machines, Horizontal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Bertram & Son Co., Ltd., The John, Dundas, Ont
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa.
Universal Boring Machine Co., Hudson, Mass

**Boring, Drilling and Milling Mach., Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Boring Heads**
Aikenhead Hardware Ltd., Toronto, Ont.

**Boring Tools**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Gisholt Machine Co., Madison, Wis.

**Brakes, Magnetic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Brass**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Bricks, Fire**
Elk Firebrick Co. of Can., Ltd., Hamilton, Ont.

**Bridges**
Hamilton Bridge Works Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

**Broaching Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont

**Bronze**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Bronze, Phosphor**
British Smelting & Refining Co, Ltd, Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.

**Bucket Carriers, Pivoted**
Can. Link-Belt Co., Toronto, Ont.

**Buffing or Polishing Machines (See Polishing and Buffing Machines)**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie Ltd, H W, Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.

**Bulldozers**
Bertram & Son Co., Ltd, The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.

**Burners, Oil and Gas**
Can Hauck Burner Co, Port Hope, Ont.
General Combustion Co of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

**Bushings**
Fisher Motor Co., Ltd., Orillia, Ont.
Morrow Screw & Nut Co, Ltd, John, Ingersoll, Ont.

**Calipers**
Brown & Sharpe Mfg. Co, Providence, R I.
Goodell & Pratt Co., Greenfield, Mass
Starrett Co, L. S, Athol, Mass

**Cams**
Canada Foundries & Forgings Co, Welland, Ont

**Can-Making Machinery (See Sheet Metal Working Machinery**
Bliss Co, E W, Brooklyn N Y
Brown, Boggs & Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co, Sherbrooke, Que

**Cars, Ore**
MacKinnon Steel Co, Sherbrooke, Que.

**Castings, Aluminum**
Canada Electric Castings Co., Ltd., Orillia
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Electric Steel & Engineering Co., Welland, Ont
Tallman Brass & Metal Co, Hamilton, Ont.

# BUYERS' DIRECTORY

**Castings, Brass and Bronze**
Algoma Steel Corp., Ltd., Sault Ste Marie, Ont.
Canada Electric Castings Co., Ltd. Orillia
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
International Machinery & Supply Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Copper**
Can. Hanson & Van Winkle Co., Toronto, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Marine**
Can. Steel Foundries, Montreal, Que.

**Castings, Die Molded**
Electric Steel & Engineering Co., Welland, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Ferro-Alloy**
Can. Steel Foundries, Montreal, Que.

**Castings, Iron**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Electric Steel & Engineering Co., Welland, Ont.
Fleck Ltd., Alexander, Ottawa, Ont.
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Hyd. Press**
Can. Steel Foundries, Montreal, Que.

**Castings, Monel Metal**
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

**Castings, Naval Bronze**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Nichrome**
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Nickel**
Can. Hanson & Van Winkle Co., Toronto, Ont.

**Castings, Semi-Steel**
Davidson Mfg. Co., Thos., Montreal, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

**Castings, Steel**
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

**Cements, Iron**
Smooth Mfg. Co., Jersey City, N.J.

**Centering Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Chains (See Sprockets and Chains)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chains, Driving**
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chasers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chemists**
Toronto Testing Laboratory, Toronto, Ont.

**Chucking Machines**
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis
Jones & Lamson Machine Co., Springfield, Vermont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Stemle Turret Machine Co., Madison, Wis
Warner & Swasey Co., Cleveland, Ohio

**Chucks, Drill**
Jacobs Mfg. Co., Hartford, Conn.

**Chucks, Drill and Tap**
Aikenhead Hardware Ltd., Toronto, Ont
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Goodell & Pratt Co., Greenfield, Mass.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Lathe**
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Magnetic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**
Columbia Hdwe. Division, Cleveland, O
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

**Cleaners, Metal, Waste, General**
Oakley Chemical Co., New York, N.Y.

**Clocks, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Clutches, Friction**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**
Can. Link-Belt Co., Toronto, Ont.

**Collars, Shaft or Set**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

**Collets**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compressors, Air**
Curtis Pneumatic Machinery Co., St. Louis, Mo

**Compressors, Air and Gas**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**
Ford-Smith Machine Co., Hamilton, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Copper**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Cored Bronze Bars**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Cotter Pins**
Morrow Screw & Nut Co., Ltd., Jonn, Ingersoll, Ont.

**Counterbores**
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Countershafts**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Couplers, Car and Locomotive**
Can. Steel Foundries, Montreal, Que.

**Couplings, Flexible**
Holden Co., Ltd., Montreal, Que.

**Couplings, Rigid**
Bernard Industrial Co., A., Fortierville, Que.

**Couplings, Shaft**
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

**Cranes, Electric**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Cranes, Hand (See Hoists, Hand)**
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

**Cranes, Locomotive**
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Cranes, Traveling**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Crank Pin Turning Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia, Pa.

**Cutters, Flue**
Holden Co., Ltd., Montreal, Que.

**Cutters, Gear**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**
Armstrong-Whitworth of Canada, Ltd. Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Milling**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que
Cleveland Milling Machine Co., Cleveland.
Elliott & Whitehall Tool Co., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Cutters, Stay Bolt**
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Thread**
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.

**Cutting-Off Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass

**Cutting-Off Machines, Pipe (See Pipe-Cutting and Threading Machines)**
Landis Machine Co., Inc., Waynesboro, Pa
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Cutting-Off Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill
Pilot Steel & Tool Co., Montreal, Que.

**Cutting Oil Filters (See Oil Filtering Systems)**
Bowser, S. F., & Co., Ltd., Toronto, Can
**Cataract Refining Co., Toronto, Ont.**

**Cutting, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

**Cutting, Oxy-Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Dealers, Machinery (See Searchlight Section)**
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Deckle Straps**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Diamonds, Black and Rough**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond, Carbon and Bortz**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Desmond-Stephan Co., Hamilton, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Wheel Trueing Tool Co., Detroit, Mich.

**Diamond Crossings**
Can. Steel Foundries, Montreal, Que.

**Die-Castings**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Dies, Pipe-Threading**
Jones & Lamson Machine Co., Springfield, Vt.

**Die Sinking Machines, Automatic**
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich

**Die Sinkers**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Screw and Thread Cutting**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont
Ford-Smith Machine Co., Hamilton, Ont
Toledo Machine & Tool Co., Toledo, Ohio.

**Dies, Forging**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

# BUYERS' DIRECTORY

**Di Hammer**
...ber & Hillier, St. Catharines, Ont

**Di Self-Opening, Adjustable**
...metric Tool Co., New Haven, Conn.
...bert Ltd., Alfred, Toronto, Ont.
...es & Lamson Machine Co., Spring-...ld, Vt.
...ls Machine Co., Inc., Waynesboro, Pa.
...chey Machine & Tool Co., Detroit, ...ich.
...onal Acme Co., Cleveland, Ohio
...-O-Lite Co. of Can., Toronto, Ont.
...& Whitney Co., of Canada, Ltd., ...ndas, Ont.
...or Tool Co., Waynesboro, Pa.

**Di Threading-Opening**
...me & Co., A. B., Hespeler, Ont.
...s & Lamson Machine Co., Spring-...ld, Vt.
...ls Machine Co., Inc., Waynesboro, Pa.
...e Twist Drill & Machine Co., New ...edford, Mass.
...chey Machine & Tool Co., Detroit, ...ich.
...onal Acme Co., Cleveland, Ohio
...t & Whitney Co., of Canada, Ltd., ...ndas, Ont.
...d Tool & Machine Co., Lachine, Que

**Di Cement**
...hes Supply Co., Toronto, Ont
...sau Abrasives Co., Chicago, Ill

**Drilling Heads**
...worthie, Ltd., John, Birmingham, Eng.
...ons, Fred C., Machinery Co., Chi-...go, Ill.
...d-Smith Machine Co., Hamilton, Ont
...ley Machine Co., Torrington, Conn
...ney & Precker Co., Milwaukee, Wis
...ne, Ltd., H. W., Toronto, Ont

**Dr. Lathe and Milling Machine**
...strong Bros. Tool Co., Chicago, Ill

**Drafting Boards and Tables**
...ng Bros., Ltd., Montreal, Que
...omy Drawing Table & Mfg. Co., ...rian, Mich.
...thes Owens Co., Ltd., Montreal, Que

**Drafting Materials**
...erican Lead Pencil Co., New York ...y, N.Y.
...ng Bros., Ltd., Montreal, Que.
...omy Drawing Table & Mfg. Co., ...rian, Mich.
...thes Owens Co., Ltd., Montreal, Que.

**Dressers, Grinding Wheel**
...borundum Co., Niagara Falls, N.Y.
...e Abrasive Wheel Co., Ltd., Mimico, ...nt.
...d-Smith Machine Co., Hamilton, Ont.
...e Koebel Co., Inc., New York, N.Y.
...on Co of Can., Ltd., Hamilton, Ont.
...er Machy. Co., Grand Rapids, Mich.

**Drill Holders**
...strong Bros. Tool Co., Chicago, Ill.

**Drill Rods**
...strong Whitworth of Canada, Ltd., ...ontreal, Canada.
...rhead Hardware Ltd., Toronto, Ont.
...adian Atlas Crucible Steel Co., Ltd., ...oronto, Ont.

**Drill Speeders**
...ada Machinery Corp., Galt, Ont.

**Drilling Machine Heads**
...y & Wright Mfg. Co., Hartford, Conn.
...er Mfg. Co., Freeport, Ill.
...ed States Machine Tool Co., Cin-...nnati, Ohio.

**Drilling Machines, Automatic**
...ster Drilling Mach. Co., Goshen, Ind.
...nal Automatic Tool Co., Richmond, ...d.

**Drilling Machines, Bench**
... Engineering Co., Tipton, England.
... Blower & Forge Co., Ltd., Kitchener.
...ell & Pratt Co., Greenfield, Mass
...s & Wright Mfg. Co., Hartford, Conn.
...h Speed Hammer Co., Rochester, N.Y.
... Ltd., H. W., Toronto, Ont.
... & Whitney Co., of Canada, Ltd., ...ndas, Ont.
... & Co., John C., Birmingham, Eng.
... Electrical Tool Co., Cincinnati, O.
...sin Electric Co., Racine, Wis.

**Drilling Machines, Electric and Hand**
...rhead Hardware Ltd., Toronto, Ont.
...nnati Electrical Tool Co., Cincinnati, ...io
... Machinery & Supply Co., Geo. F., ...ntreal, Que.
...k-Walker Mchy. Co., Toronto, Ont.
... Speed Hammer Co., Rochester, N.Y.
... Co., Ltd., Montreal, Que
...endent Pneumatic Tool, Chicago, Ill
... & Co., A. B., Hespeler, Ont.
...sin Electric Co., Racine, Wis

**Drilling Machines, Gang**
... & Son Co., Ltd., The John, ...ndas, Ont.
... Machine Co., Bridgeport, Conn.
...k-Walker Mchy. Co., Toronto, Ont.
... Mfg. Co., Freeport, Ill
... & Whitney Co., of Canada, Ltd., ...ndas, Ont.

**Drilling Machines, Heavy Duty**
...g-Whitworth of Canada, Ltd., ...ontreal, Canada
... & Son Co., Ltd., The John, ...ndas, Ont.
... Machinery Corp., Galt, Ont.
...-Walker Mchy. Co., Toronto, Ont
... Drilling Mach. Co., Goshen, Ind.
... Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**
Canada Machinery Corp., Galt, Ont
Gisholt Machine Co., Madison, Wis
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Multiple Spindle**
Beacon Engineering Co., Tipton, England
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill
National Acme Co., Cleveland, Ohio
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

**Drilling Machines, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que
Independent Pneumatic Tool, Chicago, Ill

**Drilling Machines, Portable**
Haskins Co., R. G., Chicago, Ill
Holden Co., Ltd., Montreal, Que
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis

**Drilling Machines, Radial**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Riverson & Son, Jos. T., Chicago, Ill.
Toomey Inc., Frank, Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Drilling Machines, Sensitive**
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
High Speed Hammer Co., Rochester, N.Y.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Turret**
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

**Drilling Machines, Vertical**
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Drills, Center**
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Wilt Twist Drill Co of Canada, Ltd., Walkerville, Ont.

**Drills, High Speed Twist**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co., Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.
Taylor Tool Co., J. A. M., Toronto, Ont
Wilt Twist Drill Co of Canada, Ltd., Walkerville, Ont.

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Drills, Twist and Flat**
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Dust Handling Equipment**
Can. Blower & Forge Co., Ltd., Kitchener
Sturtevant Co., B. F., Boston, Mass

**Electrical Instruments**
Bristol Co., Waterbury, Conn
Northern Electric Co., Montreal, Que

**Electrical Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont
Northern Electric Co., Montreal, Que
U.S. Electrical Tool Co., Cincinnati, O

**Elevating Trucks (See Trucks)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Elevators and Conveyors**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que
Main Belting Co. of Can., Montreal, Que
Mathews Gravity Carrier Co., Port Hope, Ont.

**Emery Cloth**
Wausau Abrasives Co., Chicago, Ill.

**Emery Wheels (See Grinding Wheels)**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Carborundum Co., Niagara Falls, N.Y.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont
International Machinery & Supply Co., Montreal, Que.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Engines, Capstan**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Engineers, Mechanical**
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.

**Expanders, Tube**
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Eyeglasses, Safety (See Goggles, Safety)**
Prest-O-Lite Co. of Can., Toronto, Ont.
Willson Goggles, Inc., Reading, Pa.

**Fans, Electric**
Can Blower & Forge Co., Ltd., Kitchener
Northern Electric Co., Montreal, Que.
Sturtevant Co., B. F., Boston, Mass

**Fans, Exhaust**
Can. Blower & Forge Co., Ltd., Kitchener
Petrie, Ltd., H. W., Toronto, Ont
Sturtevant Co., B. F., Boston, Mass

**Fans, Ventilating**
Can Blower & Forge Co., Ltd., Kitchener
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont
Sturtevant Co., B. F., Boston, Mass.

**Fibre**
Diamond State Fibre Co., Toronto, Ont
Northern Electric Co., Montreal, Que.

**File Handles**
Ingersoll File Co., Ltd., Ingersoll, Ont.

**Files and Rasps**
Atkins & Co., Inc., E. C., Indianapolis, I
Foss Machinery & Supply Co., Geo. F., Montreal, Que
Ingersoll File Co., Ltd., Ingersoll, Ont
International Machinery & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Canada Saw Co., Montreal, Que

**Filing Machines**
Garlock-Walker Mchy. Co., Toronto, Ont
Oliver Machinery Co., Grand Rapids, Mich
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Filler, Iron (See Cements, Iron)**
Smooth Mfg. Co., Jersey City, N.J.

**Fire Extinguishers**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Fittings, Pipe**
Interprovincial Malleable Iron Co., Guelph, Ont.

**Flexible Shafts**
Aikenhead Hardware Ltd., Toronto, Ont
Hastings Co., R. G., Chicago, Ill.

**Flux, Galvanizing**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Fluxes, Welding**
L'Air Liquide Society, Toronto, Ont.

**Forging Machinery**
Acme Machinery Co., Cleveland, Ohio
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.

**Forgings, Drop**
Canada Foundries & Forgings Co., Walkerland, Ont
Dominion Forge & Stamping Co., Ltd., Toronto, Ont

**Forgings, Hammer**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Walkerland, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont
N.S. Steel Co., Ltd., New Glasgow, N.S.
Steel Co of Canada, Ltd., Hamilton, Ont.

**Foundry Equipment**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Foundry Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Frogs, Spring or Rigid**
Can. Steel Foundries, Montreal, Que.

**Fuel Oil Burning System**
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Heat Treating Coal**
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Oil and Gas**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Bellevue Industrial Furnace Co., Detroit.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces and Ovens, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont

**Furnaces, Tempering and Annealing**
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furniture, Machine Shop**
Garlock-Walker Mchy. Co., Toronto, Ont.
Ministry of Munitions, London, Eng
National Engineering Co., Sarnia, Ont

**Gages, Comparator**
Jones & Lamson Machine Co., Springfield, Vt
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont
Perdue, W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass

**Gages, Measuring (See Tool Work)**
Crossman & Co. Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Q.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Gages, Recording**
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.

# BUYERS' DIRECTORY

**Gages, Snap, Thread and Cylindrical**
Ackworthie, Ltd., John, Birmingham, Eng
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Standard**
Armstrong Whitworth Co. of Can., Lt Montreal, Que
Atkins & Co., Inc., E. C., Indianapolis,
Elliott & Whitehall Tool Co., Galt, O.
Johansson Inc., C. E., Windsor, Ont.

**Gages, Thread**
Ackworthie, Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Garnet, Emery and Flint Paper and Cloth**
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Gas, Coal Compressed**
L'Air Liquide Society, Toronto, Ont.

**Gas, Compressed**
Prest-O-Lite Co. of Can., Toronto, Ont.

**Gaskets**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

**Gear Blanks**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear-Cutting Machines**
Bertram & Son Co., Ltd, The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

**Gear Testing Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Gears, Cast**
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

**Gears, Cut**
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hamilton Gear & Machine Co., Toronto, Ontario.
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Gears, Dressed**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Gears, Forged**
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Gears, Herringbone**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

**Gears, Machine Moulded**
Can. Steel Foundries, Montreal, Que.

**Gears, Rawhide (See Gears, Cut)**
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear, Silent Chain**
Gardner & Son, Robt., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Can. Link-Belt Co., Ltd., Toronto, Can.
Hans Renold of Canada, Ltd., Montreal, Quebec.

**Gears, Worm**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.

**Generators, Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Generators, Electric**
Holden Co., Ltd., Montreal, Que
Northern Electric Co., Montreal, Que
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Goggles, Safety**
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

**Grab Buckets**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Grease Cups, Pressed Steel and Brass**
Can. Winkley Co., Ltd., Windsor, Ont.

**Greases, Lubricating**
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

**Grinding Discs**
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Grinding Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Grinding Machines, Abrasive Belt**
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Automatic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Bench**
Aikenhead Hardware Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Goodell & Pratt Co., Greenfield, Mass.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co., Waltham, Mass.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Grinding Machines, Center**
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines Chaser**
Jones & Lamson Machine Co., Springfield, Vt.

**Grinding Machines, Cutter and Reamer**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Cylindrical**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Die**
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

**Grinding Machines, Disc**
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Drill**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Face**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Floor and Tool**
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.
Wilkinson & Kompass, Hamilton, Ont.

**Grinding Machines, Internal**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Manhattan Machine & Tool Works, Grand Rapids, Mich.

**Grinding Machines, Portable**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Carborundum Co., Niagara Falls, N.Y.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Haskins Co., R. G., Chicago, Ill.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wilkinson & Kompass, Hamilton, Ont.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Power Oscillating Tool**
Herbert Ltd., Alfred, Toronto, Ont.

**Grinding Machines, Ring Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Snagging**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Surface**
Garlock-Walker Mchy. Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont

**Grinding Machinery, Tool Post**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wilkinson & Kompass, Hamilton, Ont.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Universal**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Machine Co., Greenfield, Mass.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa
Manhattan Machine & Tool Works, Grand Rapids, Mich.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co., Waltham, Mass.

**Grinding Wheels**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Carborundum Co., Niagara Falls, N.Y.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
International Machinery & Supply Co., Montreal, Que.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Guards, Machinery and Window**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Gun-Barrel Machinery**
Steinle Turret Machine Co., Madison, Wis.

**Hack Saws, Power**
Ackworthie, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Hamilton, Canada.
Garlock-Walker Mchy. Co., Toronto, Ont.
Goodell & Pratt Co., Greenfield, Mass.
Lyman Tube & Supply Co., Montreal, Que.
McKenzie Machinery Co., Guelph, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hammers, Chipping**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hammers, Drop**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

**Hammers, Electric**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Hammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Ryerson & Son, Jos. T., Chicago, Ill.

**Hammers, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bradley & Son, Inc., C. C., Syracuse, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
High Speed Hammer Co., Rochester, N.Y.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.

**Hammers, Riveting**
Cleveland Pneumatic Tool Co., Toro Ont.
Ryerson & Son, Jos. T., Chicago, Ill

**Hangers, Shafting**
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, O
Foss Machinery & Supply Co., Geo. Montreal, Que.
Terry & Co., John C., Birmingham, E
Williams Machinery & Supply Co., A. Montreal, Que.

**Hardening, Case-Hardening and Tempering**
Hamilton Gear & Machine Co., Toro Ont.

**Hardness Testing Apparatus**
Shore Instrument Co., Jamaica, N.Y.

**Hobbing Machines**
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hobs**
Armstrong-Whitworth of Canada, L Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence,
Greenfield Tap & Die Corp., Galt, On
Pratt & Whitney Co., of Canada, L Dundas, Ont.

**Hoists, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbro Que.
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto,
Morris Crane & Hoist Co., Ltd., Niag Falls, Ont.
Northern Crane Works, Walkerville,
Volta Mfg. Co., Welland, Ont.

**Hoists, Hand**
Lyman Tube & Supply Co., Montreal,
Morris Crane & Hoist Co., Ltd., Niag Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Hoists, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbro Que.
Curtis Pneumatic Machinery Co., S Louis, Mo.
Garlock-Walker Mchy. Co., Toronto,
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago,
Morris Crane & Hoist Co., Ltd., Niag Falls, Ont.
Northern Crane Works, Walkerville,

**Holders-On, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbro Que.
Cleveland Pneumatic Tool Co., Toro Ont.
Holden Co., Ltd., Montreal, Que
Independent Pneumatic Tool, Chicago,

**Hose, All Kinds**
Quaker City Rubber Co., Philadelphia,

**Hose, Flexible**
Gutta Percha & Rubber, Toronto, Ont

**Hose, Industrial**
Dunlop Tire & Rubber Goods Co., L Toronto, Ont.
Goodyear Tire & Rubber Co. of C Ltd., Toronto, Ont.

**Hose, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Foamite Firefoam Co., Hamil Ont.

**Hose, Steam, Suction, Water**
Quaker City Rubber Co., Philadelphia,

**Hose, Steel**
International Machinery & Supply Montreal, Que.

**Hydraulic Leather**
Graton & Knight Mfg. Co., Worces Mass.

**Hydraulic Machinery**
Bertram & Son Co., Ltd., The Jo Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbro Que.
Garlock-Walker Mchy. Co., Toronto,
Stewart & Co., Duncan, Glasgow, S

**Hydrogen**
National Electro Products, Ltd., Toro Ont.

**Index Centers**
Dickow, Fred. C., Machinery Co., cago, Ill.

**Igniters, Gas Engine**
Canada Foundries & Forgings Co., W land, Ont.

**Indicators, Speed and Test**
Aikenhead Hardware Ltd., Toronto, O
Atkins & Co., Inc., E. C., Indianapoli
Brown & Sharpe Mfg. Co., Providence,

**Insultion**
Diamond State Fibre Co. of Can., L Toronto, Ont.

**Jacks, Hydraulic**
International Machinery & Supply Montreal, Que.
Norton, A. O., Boston, Mass.

**Jacks, Planer**
Armstrong Bros. Tool Co., Chicago,
Starrett Co., L. S., Athol, Mass.
Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que.
Crescent Machine Co., Ltd., Montreal.

**Jigs and Fixtures (See Tool Wo**

# BUYERS' DIRECTORY

**Seating Machines**
Machine Co., Bridgeport, Conn.
& Whitehall Tool Co., Galt, Ont.
Walker Mchy. Co., Toronto, Ont.
Mfg Co., Muskegon, Mich.
Ltd., H. W., Toronto, Ont.
& Whitney Co., of Canada, Ltd., Dundas, Ont.
Inc., Frank, Philadelphia, Pa.

**Machine**
Drawn Steel Co., Hamilton, Ont.
Walker Mchy. Co., Toronto, Ont.
Mfg Co., Muskegon, Mich.

**Machine**
& Co., Inc., E. C., Indianapolis, I.
Machinery Corp., Galt, Ont.
Mchy. Co., Grand Rapids, Mich.
Canada Saw Co., Montreal, Que.

**Mandrel Holders**
& Whitney Co., of Canada, Ltd., Dundas, Ont.

**Marking Leather**
Belt Lacer Co., Grand Rapids, Mich.
Belting Co. of Can., Montreal, Que.

**Motors, Electric**
Eng'r'ng Co., Ltd., Toronto, Ont.
Electric Co., Montreal, Que.

**Machine Attachments**
Machinery Corp., Galt, Ont.
Machine Co., Torrington, Conn.
Machine Co., St. Louis, Mo.
Ltd., H. W., Toronto, Ont.

**Machine Pans, Portable**
Machinery Corp., Galt, Ont.

**Machine Tools**
Bros. Tool Co., Chicago, Ill.
Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Machine Co., Madison, Wis.
Machine Co., Torrington, Conn.

**Machines, Automatic and Semi-Automatic**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Machine Co., Madison, Wis.
Ltd., Alfred, Toronto, Ont.
& Lamson Machine Co., Springfield, Vt.
Co., Ltd., R., Galt, Ont.
Acme Co., Cleveland, Ohio.
Turret Machine Co., Madison, Wis.

**Machines, Bench**
& Co., Chas. P., Montreal, Q.
& Whitney Co., of Canada, Ltd., Dundas, Ont.

**Machines, Boring**
& Son Co., Ltd., The John, Dundas, Ont.
Machinery Corp., Galt, Ont.
Turret Machine Co., Madison, Wis.

**Machines, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)**
Machine Tool Co., Cincinnati, Ohio.
& Son Co., Ltd., The John, Dundas, Ont.
Machinery Corp., Galt, Ont.
Machine Co., Madison, Wis.
& Lamson Machine Co., Springfield, Vermont.
Co., Ltd., R., Galt, Ont.
Machinery Co., Guelph, Ont.
& Son Jos. T., Chicago, Ill.
Turret Machine Co., Madison, Wis.
& Swasey Co., Cleveland, Ohio.

**Machines, Engine**
& Co., Chas. P., Montreal, Q.
& Son Co., Ltd., The John, Dundas, Ont.
Machinery Corp., Galt, Ont.
Machinery & Supply Co., Geo. F., Montreal, Que.
Walker Mchy. Co., Toronto, Ont.
Bros., Inc., Chicago, Ill.
Ltd., Alfred, Toronto, Ont.
Machine Co., Torrington, Conn.
R. S., Toronto, Ont.
Machine Co., St. Louis, Mo.
Co., Ltd., R., Galt, Ont.
Ministry of Munitions, London, Eng.
Machinery Co., Grand Rapids, Mich.
Ltd., H. W., Toronto, Ont.
Lathe & Drill Co., Rockford, Ill.
Machine & Tool Co., Toronto, Ont.
& Son, Jos. T., Chicago, Ill.
Machine Tool Co., Sidney, Ohio
Co. of Can., Ltd., Chas. A., Windsor, Ont.
Lathe Co., Jackson, Mich.
Machinery & Supply Co., A. R., Montreal, Que.

**Machines, Extension and Gap**
& Son Co., Ltd., The John, Dundas, Ont.
Machinery Corp., Galt, Ont.
Machine Co., Madison, Wis.
Co., Ltd., R., Galt, Ont.
Machinery Co., Grand Rapids, Mich.

**Machines, Heavy Duty Projectile Boring**
& Son Co., Ltd., The John, Dundas, Ont.
Wire Machy. Co., Ltd., Montreal
Machine Tool Co., Sidney, Ohio
Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio

**Lathes, Polishing (See Polishing and Buffing Machines)**
Ford-Smith Machine Co., Hamilton, Ont

**Lathes, Relieving**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Lathe, Universal Hand**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Lathes, Screw-Cutting**
Jones & Lamson Machine Co., Springfield, Vt.

**Lathe, Speed and Hand**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Lathes, Spinning**
Terry & Co., John C., Birmingham, Eng.

**Lathes, Threading**
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

**Lathes, Vertical Turret**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

**Lathes, Wood Turning**
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Lead Pipe**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Lighting Fixtures**
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

**Linoleum Mill Machinery**
Bertrams Ltd., Edinburgh, Scotland

**Liquid Air Plants**
L'Air Liquide Society, Toronto, Ont.

**Lockers, Clothes**
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

**Lubricants**
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Lubricating Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Machinists' Small Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Goodell & Pratt Co., Greenfield, Mass.
Ker & Goodwin Machine Co., Brantford, Ont.
Ministry of Munitions, London, Eng.
National Machine Tool Co., Racine, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Ryerson & Son, Jos. T., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Mandrels, Expanding**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Mandrels, Solid**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Measuring Machines**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Metals, Alloy**
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Ministry of Munitions, London, Eng.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Tallman Brass & Metal, Ltd., Hamilton, Ontario.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Metalite Cloth**
Ritchey Supply Co., Toronto, Ont.

**Micrometer Calipers**
Alkenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Milling Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Milling Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Milling Machines, Automatic**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Bench**
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Hand**
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

**Milling Machines, Horizontal and Planer Type**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal Q.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Milling Machines, Plain**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
Toomey Inc., Frank, Philadelphia, Pa.

**Milling Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Milling Machines, Universal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Cincinnati Milling Machine Co., Cincinnati, Ohio
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Toomey Inc., Frank, Philadelphia, Pa.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Milling Machines, Vertical**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

**Monel Metal**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Motors, Electric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Moulded Rubber Goods**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Nails and Staples**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Nickel, Bars, Sheets, Wire, Etc.**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Nickel Plating Outfits**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Nickel Silver**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Nitrogen**
L'Air Liquide Society, Toronto, Ont.

**Nut Tappers (See Bolt and Nut Machinery)**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

**Nuts, Finished and Semi-finished**
Galt Machine Screw Co., Galt, Ont.

**Nuts, S.A.E., Plain and Castellated**
Galt Machine Screw Co., Galt, Ont.

**Oil Filtering and Storage Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oil Storage Engineers**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oils**
Canadian Oil Companies, Ltd., Toronto, Ont.
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Hole Covers**
Can. Winkley Co., Ltd., Windsor, Ont.

**Oils, Soluble**
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Stones**
Carborundum Co., Niagara Falls, N.Y.

**Oxygen**
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

**Oxy-Acetylene Apparatus**
L'Air Liquide Society, Toronto, Ont.

**Packing, Hydraulic**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, L..., Halifax, N.S.
Gutta Percha & Rubber, Toronto, Ont.
International Machinery & Supply Co., Montreal, Que.

**Packing, Rod and Steam**
Quaker City Rubber Co., Philadelphia, Pa.

**Packing, Steam**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.
Gutta Percha & Rubber, Toronto, Ont.
International Machinery & Supply Co., Montreal, Que.

**Paper Mill Conveyors**
Bertrams Ltd., Edinburgh, Scotland.

**Patents**
Fetherstonhaugh & Co., Ottawa, Ont.
Marion & Marion, Montreal, Que.

**Pans, Wet and Dry**
Frost Mfg. Co., Chicago, Ill.

**Pattern-Shop Machinery (See Woodworking Machinery)**
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Patterns, Wood and Metal**
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Wraggis Pattern Works, Galt, Ont.

**Penstocks, Steel**
MacKinnon Steel Co., Sherbrooke, Que.

# BUYERS' DIRECTORY

**Phosphor Tin**
British Smelting & Refining Co. Ltd., Montreal, Que.

**Photographic Duplicating Machines**
Commercial Camera Co., Providence, R.I.

**Pig Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Bending Machines**
American Pipe Bending Machine Co., Boston, Mass.
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

**Pipe Couplings**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Cutting and Threading Machines**
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**
Landis Machine Co., Inc., Waynesboro, Pa.

**Pipe Fitters' Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa.

**Piston-Ring Machines**
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Planers, Parallels**
L. & P. Mfg. Co., Niagara Falls, Ont.

**Planing Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Toomey Inc., Frank, Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

**Planing Machines, Rotary**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Pneumatic Tools**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
International Machinery & Supply Co., Montreal, Que.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Pressed Steel Parts**
Ackworthie, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Presses, Drop and Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Toledo Machine & Tool Co., Toledo, Ohio

**Presses, Foot and Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

**Presses, Forcing**
Atlas Press Co., Kalamazoo, Mich.
Niagara Machine & Tool Works, Buffalo, N.Y.
Stewart & Co., Duncan, Glasgow, Scot.

**Presses, Hydraulic**
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Niagara Machine & Tool Works, Buffalo, N.Y.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

**Presses, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Protractors**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Propellers**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Pulleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal and Fibre**
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Pulp and Paper Mill Equipment**
MacKinnon Steel Co., Sherbrooke, Que.

**Pumps, Automobile Tire**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Pumps, Barrel and Boiler-feed**
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coalant**
Trahern Pump Co., Rockford, Ill.

**Pumps, Geared and Hand**
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

**Pumps, Lubricant and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener
Jardine & Co., A. B., Hespeler, Ont.

**Punches, Power**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rverson & Son, Jos. T., Chicago, Ill.
Toledo Machine & Tool Co., Toledo, Ohio

**Punching Machines, Horizontal**
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Racks, Cut**
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**
Holden Co., Ltd., Montreal, Que

**Reamer Holders**
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

**Reamers, Expanding**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Reamers, Solid**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co., Montreal, Que.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Reamers, Taper**
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Taylor Tool Co., J. A. M., Toronto, Ont
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

**Recorders, Temperature**
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Recorders, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Rheostats**
Northern Electric Co., Montreal, Que.

**Resistance Materials**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Respirators**
Willson Goggles, Inc., Reading, Pa.

**Rivets**
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Rivet Heaters**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.
Ryerson & Son, Jos. T., Chicago, Ill.

**Riveting Machines**
Bilton Machine Co., Bridgeport, Conn.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**
Stewart & Co., Duncan, Glasgow, Scot.

**Rolls (Rubber Covered)**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rudder Frames, Steel**
Can. Steel Foundries, Montreal, Que.

**Rubber Goods, Mechanical**
Quaker City Rubber Co., Philadelphia, Pa.

**Rules, Steel**
Chesterman & Co., Ltd., J., Sheffield, Eng.

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Rust Preventatives**
Oakley Chemical Co., New York, N.Y.

**Sand Paper**
Wausau Abrasives Co., Chicago, Ill.

**Sand Equipment**
Can. Link-Belt Co., Toronto, Ont.

**Sand Mills**
Frost Mfg. Co., Chicago, Ill

**Sanding Machinery**
Oliver Machy. Co., Grand Rapids, Mich

**Sand Rammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Saw Frames and Blades, Hack**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Sawing Machines, Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Ryerson & Son, Jos. T., Chicago, Ill.

**Sawing Machines, Power Hack**
Ackworthie, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Saw Sharpening Machines**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saw Tables, Universal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
McKenzie Machinery Co., Guelph, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Hot and Cold**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Saws, High Speed Steel**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Metal Band**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saws, Metal, Power**
Clemson Bros., Inc., Hamilton, Ont.

**Saws, Metal Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

**Saws, Milling**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Saws, Screw Slotting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Swing Cut-off**
Oliver Machinery Co., Grand Rapids, Mich.

**Scales**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal, Q.

**Screens**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Screw Driving Machine**
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Screw Extractors**
Cleveland Twist Drill Co., Cleveland, O.

# BUYERS' DIRECTORY

**Screw Machine Work**
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio
Tallman Brass & Metal Co., Hamilton, Ont

**Screw Machinery, Wood and Lag**
Cook Co., Asa S., Hartford, Conn.

**Screw Machines**
Brown & Sharpe Mfg Co., Providence, R I.

**Screw Machines, Automatic**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

**Screw Machines, Plain or Hand**
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont
Warner & Swasey Co., Cleveland, Ohio

**Screw Plates**
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

**Screws, Cap and Set**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Screws, Machine**
Barnes Co., Wallace, Bristol, Conn.
Steel Co. of Canada, Ltd., Hamilton, Ont

**Screws, Safety Set**
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Second-Hand Machinery**
**( See Searchlight Section)**
Petrie, Ltd., H. W., Toronto, Ont

**Separators, Moisture and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Separators, Oil and Waste**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Shafting**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Shapes, Cold-Drawn Special Steel**
Union Drawn Steel Co., Hamilton, Ont.

**Shaping Machines**
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
McKenzie Machinery Co., Guelph, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Toomey Inc., Frank, Philadelphia, Pa.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Shapers, Wood**
Oliver Machinery Co., Grand Rapids, Mich.

**Shears, Hand**
Can. Blower & Forge Co., Ltd., Kitchener.

**Shears, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y.
Stewart & Co., Duncan, Glasgow, Scot
Toledo Machine & Tool Co., Toledo, Ohio
Williams Machinery Co., A. R., Toronto, Ont.

**Shearing Machines, Angle, Iron Bar and Gate**
Bertrams Ltd., Edinburgh, Scotland

**Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio.

**Sheets, Nickel, Resist, Alloy**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Sheets, Nickel, Monel and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Side Frames, Locomotive**
Can. Steel Foundries, Montreal, Que

**Slotting Attachments**
Ford-Smith Machine Co., Ltd., Hamilton, Ont
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio

**Slotting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont
Canada Machinery Corp., Galt, Ont
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont

**Solders**
British Smelting & Refining Co., Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Canada

**Snap Flasks**
Oliver Machy. Co., Grand Rapids, Mich

**Special Machinery and Tools**
Brown Engineering Corp., Ltd., Toronto
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q
Ford Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Spectacles, Industrial**
Willson Goggles, Inc., Reading, Pa

**Springs**
Barnes Co., Wallace, Bristol, Conn
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont

**Sprockets and Chains**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Squares**
Brown & Sharpe Mfg Co., Providence, R I.

**Stamping, Metal**
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn
Diamond Saw & Stamping Works, Buffalo, N.Y.
Elliott & Whitehall Tool Co., Galt, Ont
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Stamps, Steel**
Diamond Saw & Stamping Works, Buffalo, N.Y.

**Stairways, Wrought Iron**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Steam Specialties**
Crane Ltd., Montreal, Que.

**Steel Plate**
Dom. Foundries & Steel, Hamilton, Ont.

**Steels, Tool**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa

**Steel Blooms and Billets**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steel, Cold-Rolled Strip**
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q

**Steel Castings**
Dom. Foundries & Steel, Hamilton, Ont

**Steel Forgings**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Steel, Shafting and Free Cutting Screw**
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

**Steel, Sheet**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q
Illingsworth Steel Co., John, New York City, N.Y.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

**Steel, Tanks**
Can. John Wood Mfg. Co., Toronto, Ont

**Steel, Stainless**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont
Vanadium Alloys Steel, Latrobe, Pa.

**Steel Wire Rods**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steels, Alloy, Open Hearth and Electric**
United Alloy Steel Corp., Canton, Ohio

**Steels, Alloy and Carbon**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng
Barnes Co., Wallace, Bristol, Conn
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver Harris Co., Walkerville, Ont
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont
Firth & Sons, Ltd., Thos., Montreal, Q
Illingsworth Steel Co., John, New York City, N.Y.
Pilot Steel & Tool Co., Montreal, Que
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont
United Alloy Steel Corp., Canton, Ohio
Vanadium Alloys Steel, Latrobe, Pa
Vulcan Crucible Steel Co., Aliquippa, Pa

**Steels, High-Speed**
Armstrong Bros. Tool Co., Chicago, Ill
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que
Atkins & Co., Ltd., Wm., Sheffield, Eng
Baines & David, Ltd., Toronto, Ont
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont
Drury Ltd., H. A., Montreal, Que
Firth & Sons, Ltd., Thos., Montreal, Q
Illingsworth Steel Co., John, New York City, N.Y.
Pilot Steel & Tool Co., Montreal, Que
Rice Lewis & Son, Ltd., Toronto, Ont
Steel Co. of Can., Ltd., Hamilton, Ont
Vanadium Alloys Steel, Latrobe, Pa
Vulcan Crucible Steel Co., Aliquippa, Pa

**Steel, Magnet**
Can. Atlas Crucible Steel Co., Toronto, Ont
Vanadium Alloys Steel, Latrobe, Pa

**Steel, Structural**
MacKinnon Steel Co., Sherbrooke, Que

**Steel Tubing, Close Joint and Welded**
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

**Stern Frames, Cast Steel**
Can. Steel Foundries, Montreal, Que

**Stools, Shop**
Ministry of Munitions, London, Eng

**Straightening Machinery**
Bertrams Ltd., Edinburgh, Scotland
Ryerson & Son, Jos. T., Chicago, Ill

**Studs**
Galt Machine Screw Co., Galt, Ont

**Surface Plates**
Bilton Machine Co., Bridgeport, Conn

**Swaging Machines**
Atkins & Co., Inc., E. C., Indianapolis, I

**Switches, Railway**
Can. Steel Foundries, Montreal, Que.

**Switches and Switchboards**
Northern Electric Co., Montreal, Que.

**Tablets, Bronze, Memorial**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Tachometers**
Aikenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

**Tanks, Steel**
MacKinnon Steel Co., Sherbrooke, Que
Can. John Wood Mfg. Co., Ltd., Toronto, Ont.

**Tanks and Pumps, Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

**Taper Cutting Dies**
Jones & Lamson Machine Co., Springfield, Vt.

**Tap Holders**
Greenfield Tap & Die Corp., Galt, Ont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taper Pins**
Galt Machine Screw Co., Galt, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Tapes, Measuring**
Chesterman & Co., Ltd., J., Sheffield, Eng
Starrett Co., L. S., Athol, Mass

**Tapping Machines and Attachments**
Ackworthie, Ltd., John, Birmingham, Eng
Archibald & Co., Chas. P., Montreal, Q
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont
Jardine & Co., A. B., Hespeler, Ont
National Acme Co., Cleveland, Ohio
Petrie, Ltd., H. W., Toronto, Ont
Starrett Co., L. S., Athol, Mass

**Taps and Dies**
Ackworthie, Ltd., John, Birmingham, Eng
Butterfield & Co., Inc., Rock Island, Que
Geometric Tool Co., New Haven, Conn
Greenfield Tap & Die Corp., Galt, Ont
International Machinery & Supply Co., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Taylor Tool Co., J. A. M., Toronto, Ont

**Taps, Collapsing**
Geometric Tool Co., New Haven, Conn
Jardine & Co., A. B., Hespeler, Ont.
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio
Victor Tool Co., Waynesboro, Pa.

**Teeth, Dredge Bucket**
Kennedy & Sons, Wm., Owen Sound, Ont

**Testing Metals and Materials**
Toronto Testing Laboratory, Toronto, Ont.

**Thermometers**
Bristol Co., Waterbury, Conn

**Thread-Cutting Tools**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont
Jones & Lamson Machine Co., Springfield, Vermont
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont
Victor Tool Co., Waynesboro, Pa

**Thread Cutting Machines**
Jones & Lamson Machine Co., Springfield Vermont
Landis Machine Co., Inc., Waynesboro, Pa

**Threading Machines**
Acme Machinery Co., Cleveland, Ohio
Geometric Tool Co., New Haven, Conn
Greenfield Tap & Die Corp., Galt, Ont
Jones & Lamson Machine Co., Springfield, Vt
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont

**Thread Lead Testing Machines**
Jones & Lamson Machine Co., Springfield, Vt
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont

**Thread-Rolling Machines**
Bliss Co., E. W., Brooklyn, N.Y.

**Tongs**
Hepburn Ltd., John T., Toronto, Ont

**Tool Cases**
Rice Lewis & Son, Ltd., Toronto, Ont.

**Tool Holders**
Armstrong Bros. Tool Co., Chicago, Ill
Bilton Machine Co., Bridgeport, Conn
Gisholt Machine Co., Madison, Wis
Williams & Co., J. H., Brooklyn, N.Y

**Tool Markers, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Tool Posts, Lathe**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y

**Tool Steels for all Purposes**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Tools, Small (See Machinists' Small Tools)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Bertrams Ltd., Edinburgh, Scotland
Burgess & Marchand, Montreal, Que.
Chesterman & Co., Ltd., J., Sheffield, Eng
Elliott & Whitehall Tool Co., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.
Ministry of Munitions, London, Eng
National Machine Tool Co., Racine, Wis.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strellinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont
Williams Machinery & Supply Co., A. R., Montreal, Que

**Tool Work**
Brown Engineering Corp., Ltd., Toronto.
Crescent Machine Co., Ltd., Montreal, Q
Ford-Smith Machine Co., Hamilton, Ont

**Torches, Blow**
Can. Hayek Burner Co., Port Hope, Ont.
International Machinery & Supply Co., Montreal, Que.
National Electro Products, Ltd., Toronto, Ont
Perdue, W. B., San Francisco, Calif
Prest-O-Lite Co. of Can., Toronto, Ont
Rice Lewis & Son, Ltd., Toronto, Ont

**Trackwork, Railway**
Can. Steel Foundries, Montreal, Que

**Trackwork, Manganese Steel**
Can. Steel Foundries, Montreal, Que

**Transformers**
Northern Electric Co., Montreal, Que

**Transmission Machinery**
Bernard Industrial Co., A., Fortierville, Que
Can. Link-Belt Co., Toronto, Ont
Garlock-Walker Mchy. Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Toronto, Ont.
Renold (Hans) of Canada, Ltd., Montreal, Que.

# BUYERS' DIRECTORY

**Transportation Systems (See Trucks)**
Matthews Gravity Carrier Co., Port Hope, Ont.

**Treated Bits**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Trolleys and Tramways**
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Trucks**
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cowan Truck Co. (R. B. Smiley), Toronto, Ont.
Diamond State Fibre Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Maple Leaf Mfg. Co., Montreal, Que.
Ministry of Munitions, London, Eng.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Trucks, Industrial Motor**
Maple Leaf Mfg. Co., Montreal, Que.
Ministry of Munitions, London, Eng.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Tube, Products**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Electric Welded or Oxy-Acetylene Welded**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Flexible**
Dunlop Tire & Rubber Goods Co., Ltd Toronto, Ont.
Goodyear Tire & Rubber Co of Can., Ltd., Toronto, Ont.

**Tubing, Seamless Steel**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Seamless Steel, Brass and Copper and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
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**Turbines, Water**
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Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
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Hendey Machine Co., Torrington, Conn
Hoosier Drilling Mach. Co., Goshen, Ind.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.

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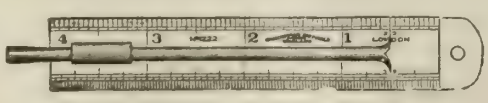
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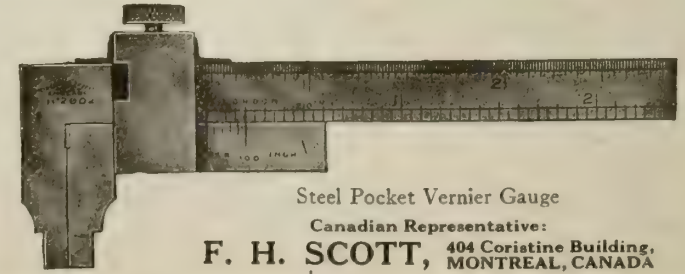


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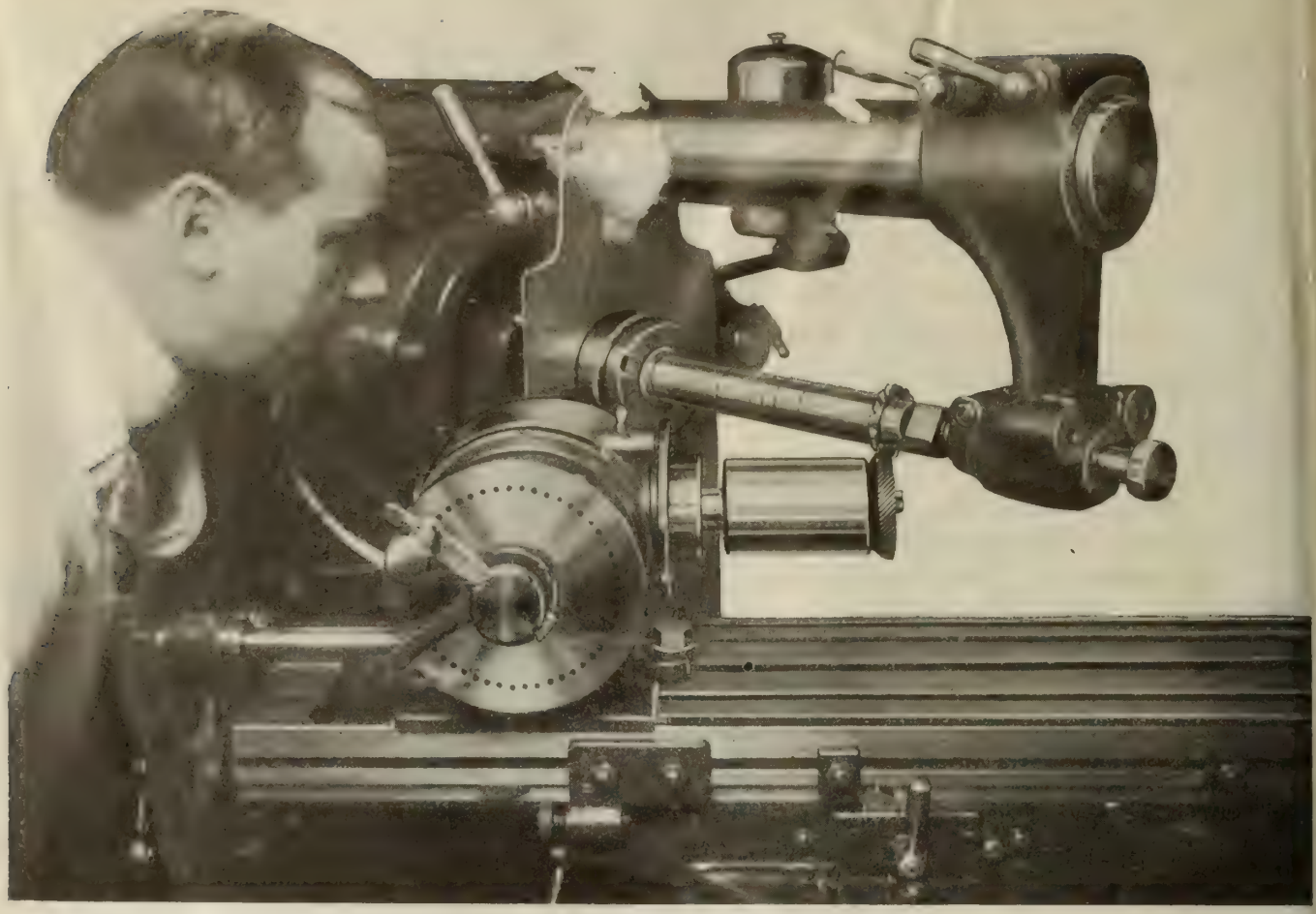
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THE Hendey reputation is a big thing to consider when buying machine tools.

Take for example the Hendey Universal Milling Machine in the plant of the American Stay Company. As you see, it is cutting spiral gear teeth on a shuttle. The company expresses entire satisfaction with the service they are securing.

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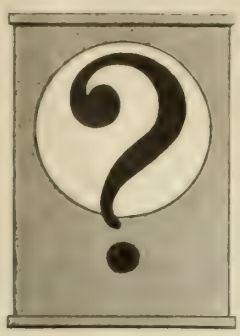
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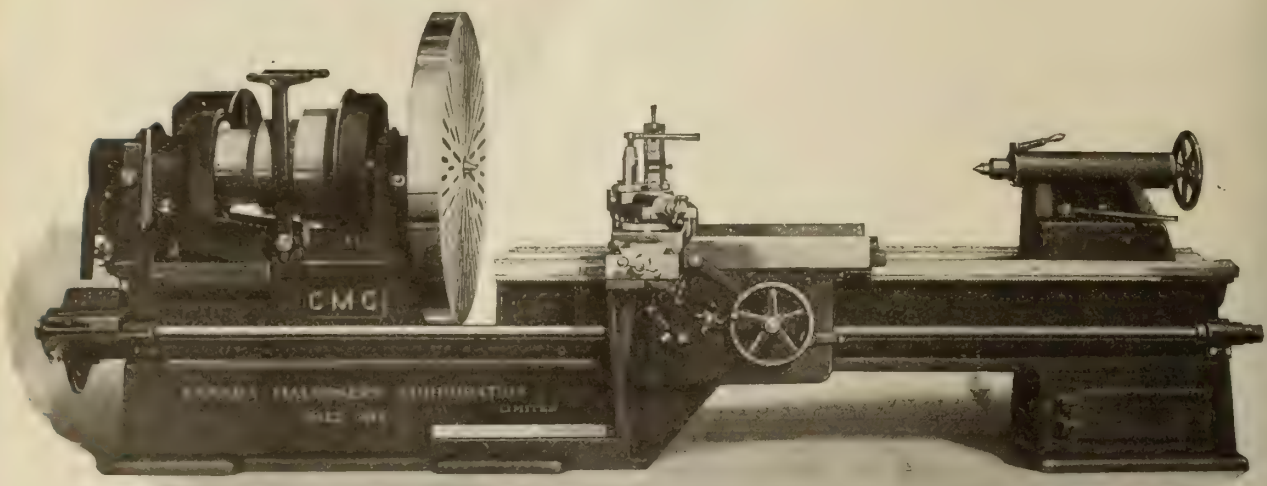
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LIMITED

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# CANADIAN MACHINERY AND MANUFACTURING NEWS

Vol. XXV., No. 7 Published by the MacLean Publishing Company, Limited, Toronto February 17, 1921 $4.00 a Year Subscription Price


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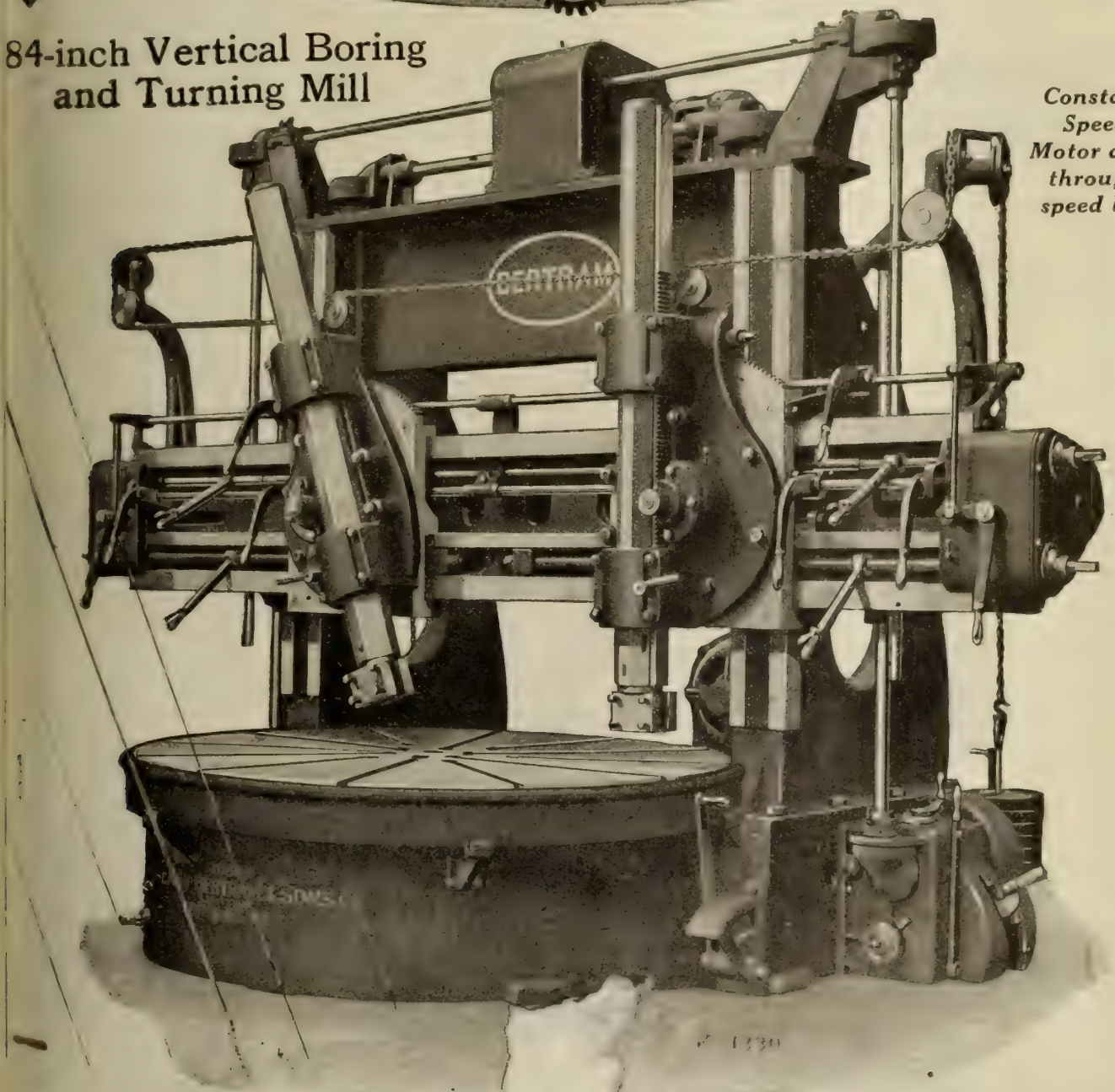


# The BERTRAM Page

## MACHINE TOOLS

84-inch Vertical Boring and Turning Mill

*Constant Speed Motor drive through speed box*



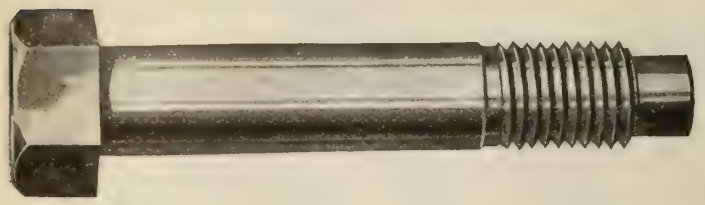
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**Speed of output and accuracy are sometimes strange bedfellows.**

**With accuracy constantly in the foreground Gridley Automatic Turret Lathes are constructed to be pushed in the long or heavy cut and to stand up under continuous running.**

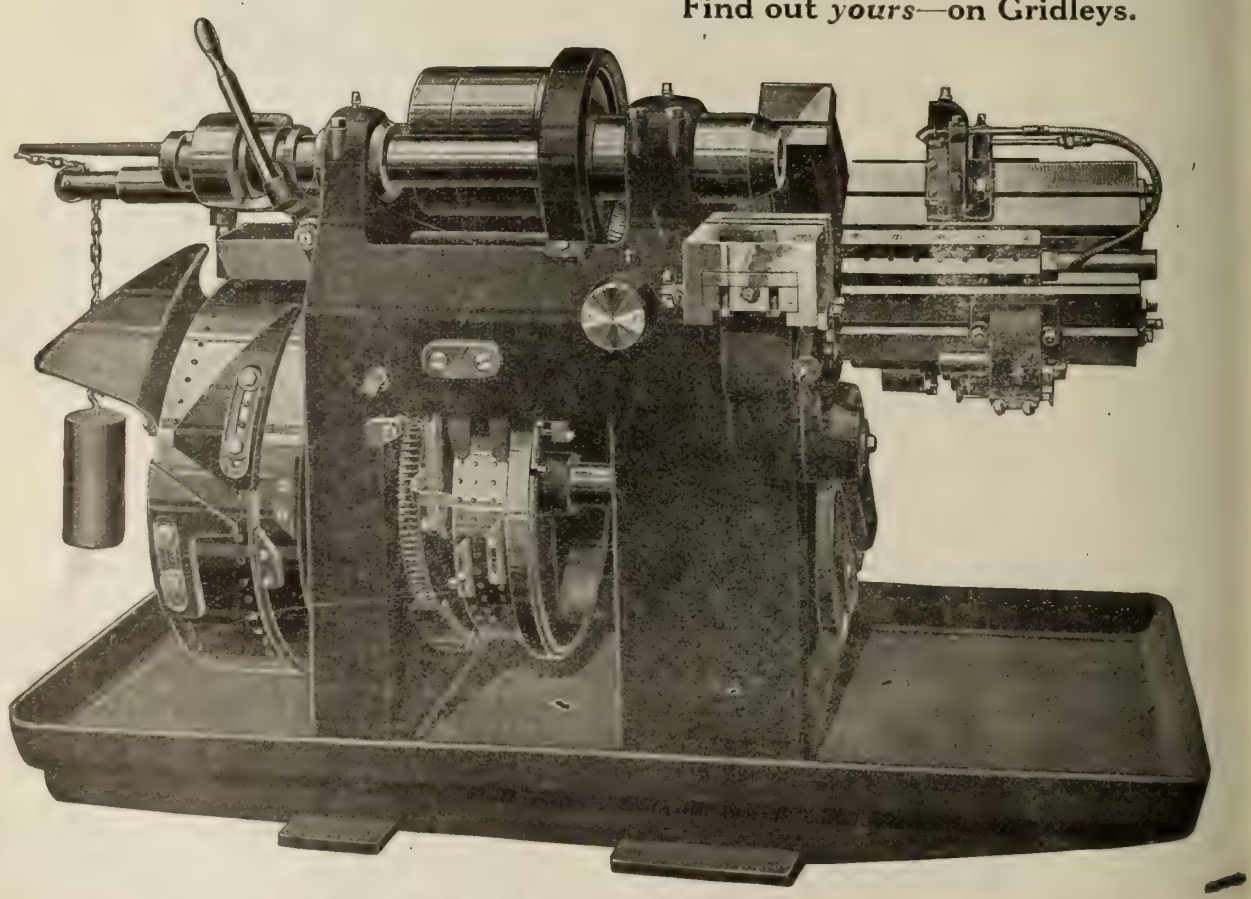
**After all, turret lathe efficiency is low per piece cost, and low costs mean simply getting the maximum output per hour and accuracy as good as you want it.**

**Find out *yours*—on Gridleys.**

$2\frac{1}{4}$"

$3\frac{1}{4}$"

$4\frac{1}{4}$"



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# How to Save Money on Hack Saw Blades

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The place to save money on hack saw blades is not on the purchasing agent's desk, but in the shop.

Cost per blade has but little or nothing to do with hack saw economy. The blade that will really save money for you may cost a little more per blade, but a great deal less per cut. Figure cost by service rendered and you will realize why so many purchasing agents have changed their specifications from "Star Blades or equal" to "Star Blades—no substitute."

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We now sell our own product, for we believe no other organization is in such a good position to give selling service on Star Saws as our own factory that has made them for 37 years.

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**MIDDLETOWN, N.Y.**

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# STAR HACK SAW BLADES

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**CHROME-NICKEL**

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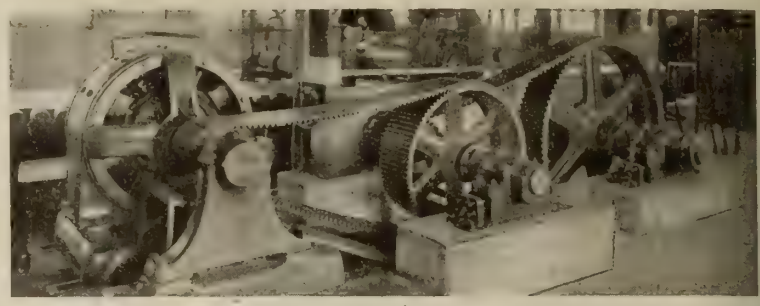
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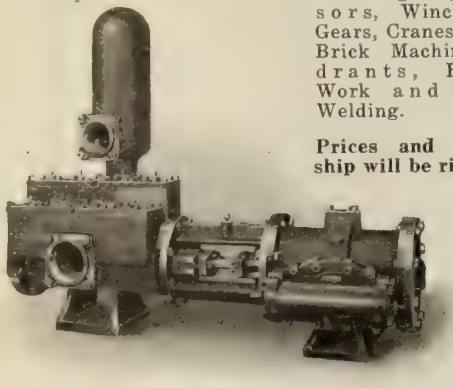
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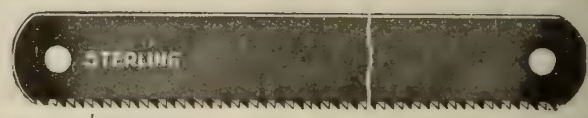
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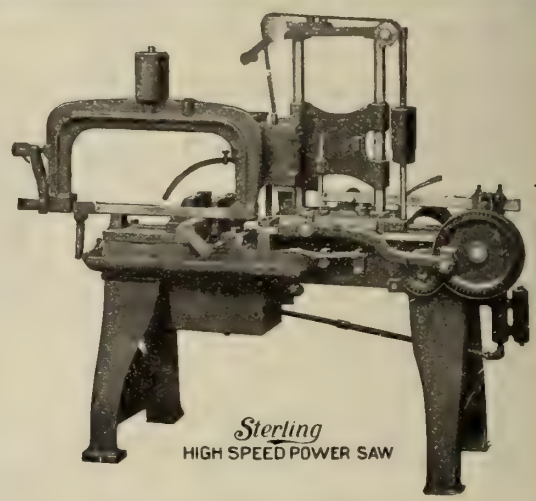
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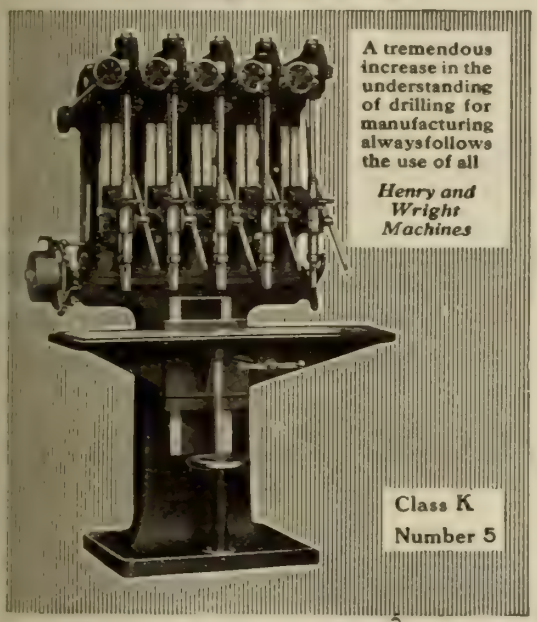
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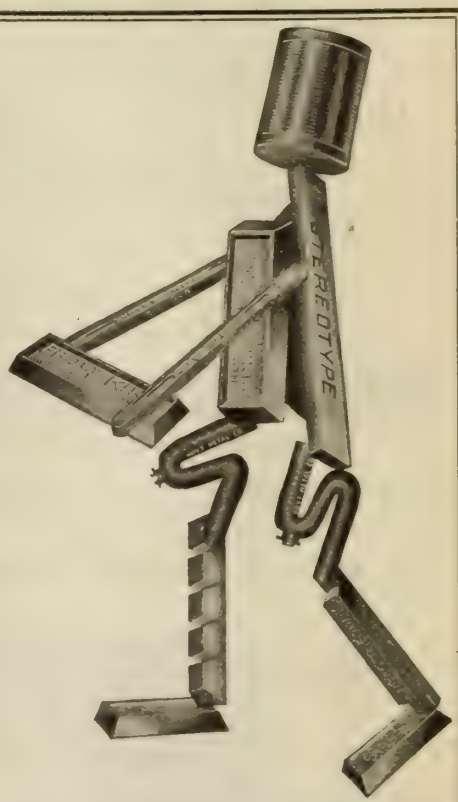

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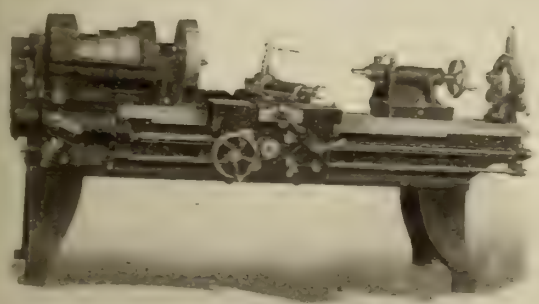
will withstand heavy pressure without increasing its temperature.

For general machinery bearings it is without a peer.

If you are from Missouri try a sample lot and be convinced.




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The surplus strength and rigidity of the Sidney makes it the ideal lathe for the "Big Job."

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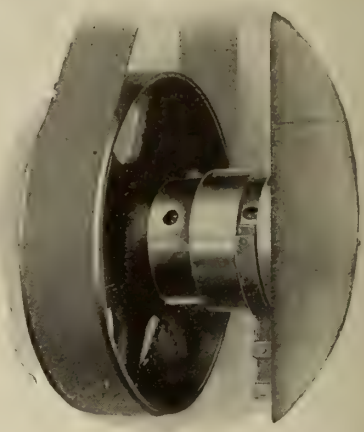
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## Put Johnson Clutches on Your Machines

The tight and loose pulley is passing from favor. With all its disadvantages, it long survived because a reliable friction clutch was not in evidence.

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Of course you know of Dumore Grinders—their precision, their long life and their reputation for dependability. Every part of Dumore Grinders except, of course, the spindles, handles, etc., are die-cast.

This is but another example of the extent to which die-castings can be used.

Do you require machine parts in large numbers? If so, you can save considerable expense by having them die-cast.

The making of a quantity of duplicate parts by the die-casting process is both efficient and economical.

Get your die-casting from Fisher — the largest maker of die-castings in Canada. Fisher die-castings are clean and accurate; they require no machining; they come to you all ready to assemble.

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**Any Thickness** **Any Lengths**

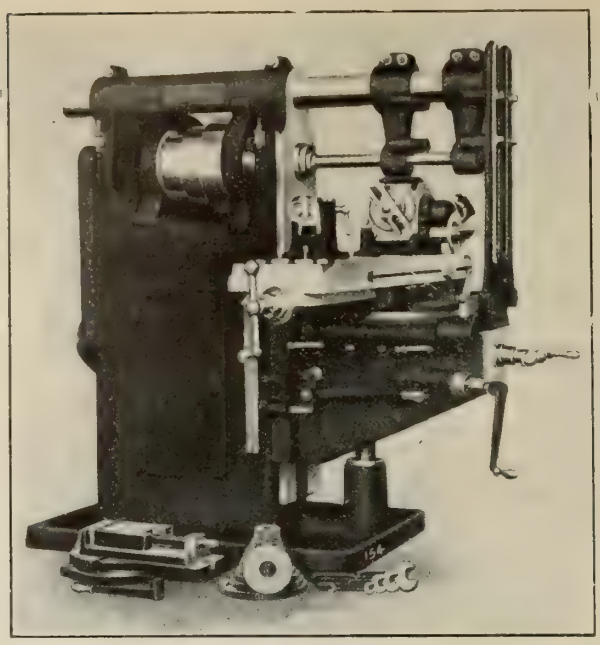
*Send Us Your Enquiries.*

## Dominion Foundries & Steel, Limited
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# Ford-Smith Milling Machines

When the leading machine shops throughout Canada adopt Ford-Smith Millers, there must be a reason. Their choice is governed by these features found in all Ford-Smith Millers *Power* and *Neverfailing Accuracy*.



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The strong, accurate, well-balanced construction of every Ford-Smith Miller is a positive guarantee of quality production. Made in two types—plain and Universal, and built in sizes for almost every class of milling.

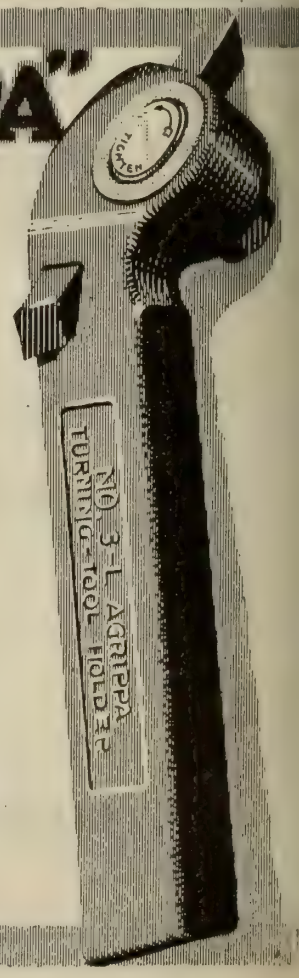
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A wide range of sizes in standard patterns for all regular machining operations: Turning, Boring, Planing, Threading, Knurling, Cutting-off and Side Work.

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# BROWN-BOGGS

B B

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The designs of the various "B-B" tools are the result of many years' exhaustive experiment and manufacture.

Only the highest quality materials are used in their construction.

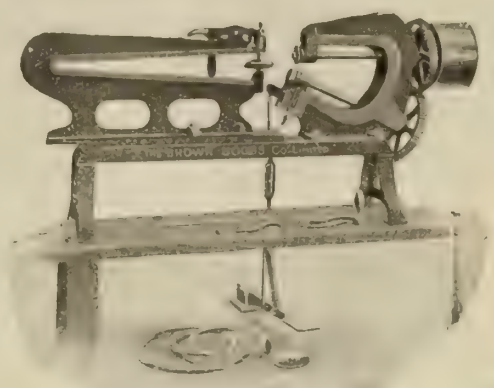
Every workman is thoroughly competent.

Our plant is modern and fully equipped.

Before every improvement is adopted it must **prove** its worth.

Each tool, before it leaves the factory, is rigidly tested to insure a high safety factor.

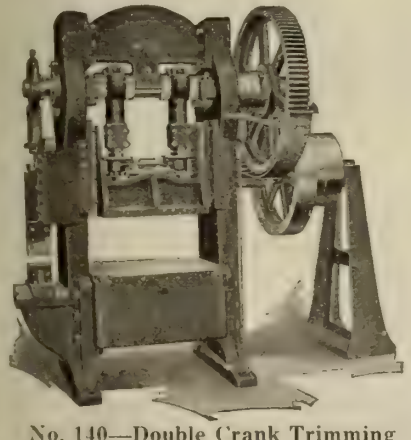
Every "B-B" product is fully guaranteed.



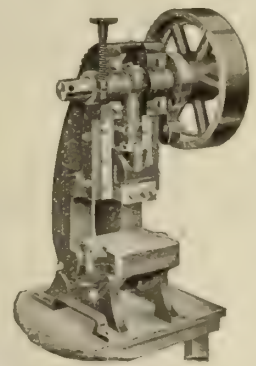
No. 36—Ring and Circular Shear

The "B-B" line comprises tinsmiths' tools and sheet metal working machines of all kinds; canners' and evaporators' machinery, shears of every description, power presses for punching, forming, embossing, blanking.

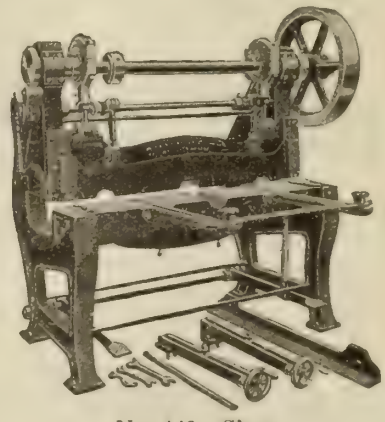
**We shall be glad to send you a catalog containing a full description of the tools in which you are interested.**



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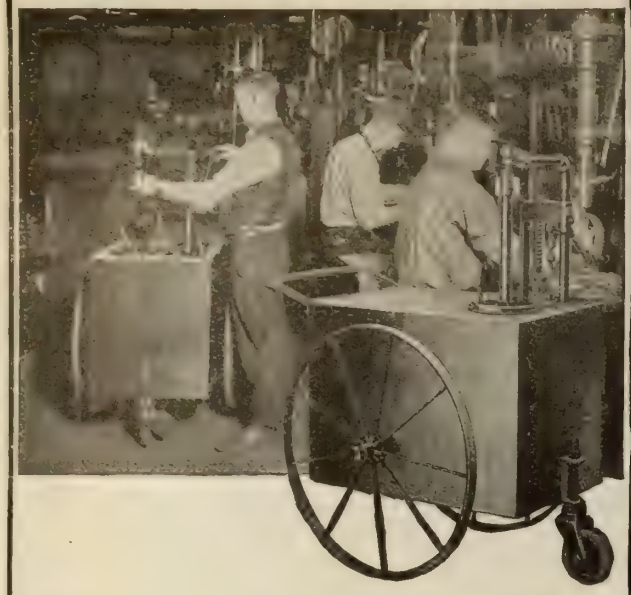
No. 10—Bench Press



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# THE BROWN-BOGGS CO. LIMITED

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# Take the Oils To The Machines

In a Bowser Portable Outfit and save Mechanics' time. Keep machines working and increase production.

Minutes spent by men in the oil room are wasted—lost. Your men don't want to lose those minutes. The old oil storage simply forces them to do it.

BOWSER ESTABLISHED 1885

## Oil Storage Systems

prevents these losses, bring a day's supply of oil to the machines—no loss of time or oil. Workmen enjoy the convenience and safety of Bowser equipment—employers appreciate the actual money saving effected.

OUR LITERATURE EXPLAINS WHY
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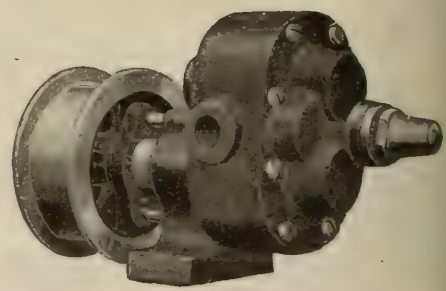
— in the development of the Pneumatic tool industry of the world are represented in "Keller-Master"

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TRAHERN



# for Machine Tool use

TRAHERN Coolant Pumps will deliver heavy, forceful streams of water, oil or compound with sufficient force to reach deepest cuts. Less sharpening of tools and fewer spoiled pieces will result.

TRAHERN Coolant Pumps may be installed on any machine and will pump any liquid not containing grit. They will supply 16½ gal. per minute at low speed, reverse automatically, operate against 100 lb. pressure. When properly installed they will not lose their prime.

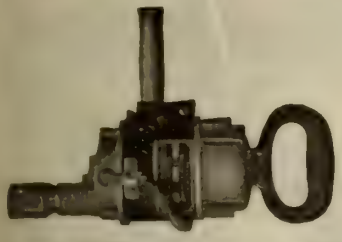
*Ask us for Bulletin No. 44*

**TRAHERN PUMP DIVISION**
*Geo. D. Roper Corporation*
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# U. S. Electric Drills and Grinders

**Save Time, Labor and Money**



They can be attached to any lamp socket.

For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

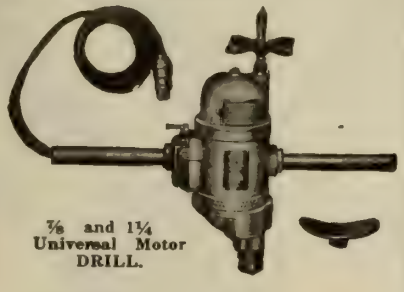
**3 SIZES**

3-16 in., W.G.T., 6 lbs.
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All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



⅜ and 1¼ Universal Motor DRILL.

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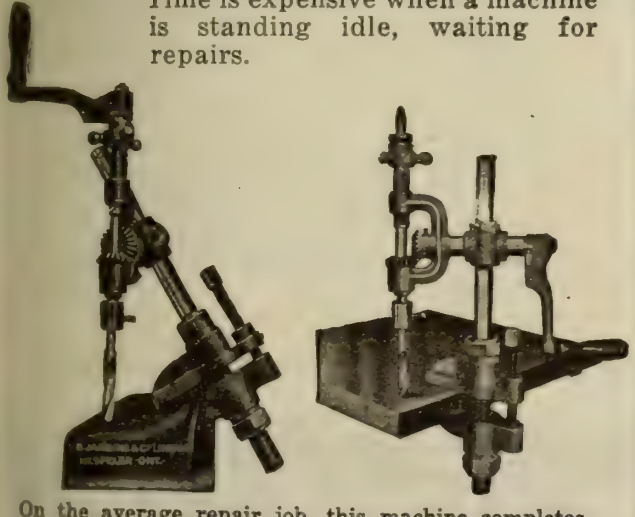
**THE UNITED STATES ELECTRICAL TOOL CO.**

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# Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.

Sold by all Machinery and Supply Houses.

**A. B. JARDINE & CO., Limited**

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# Only Sharp Files Do Good Work

It is impossible for a file that is the least bit dull to do its job properly.

Throw your files away as soon as they show signs of dullness, and buy new ones.

If you want to be sure of getting maximum service before wear is apparent, specify one of the following brands, the standard in files:

**Kearney & Foot**
**Great Western**
**American**
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**Globe**

# Files

*Made in Canada by*

**Nicholson File Company**

**Port Hope - Ontario**


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# IMCO TOOLS



## Strength!

Strength to withstand the continual "crowding" which is the usual lot of cutting tools is an outstanding characteristic of all "Imco" drills, reamers and milling cutters.

This feature is of even greater significance when you consider how unique is a tool which combines **both** toughness and cutting power.

**Catalog of "Imco" 3 and 4-lip drills, reamers and milling cutters upon request.**

*Eastern Representatives:* WATT MACHINERY & EQUIPMENT CO., 344 St. James St., Montreal, Que.

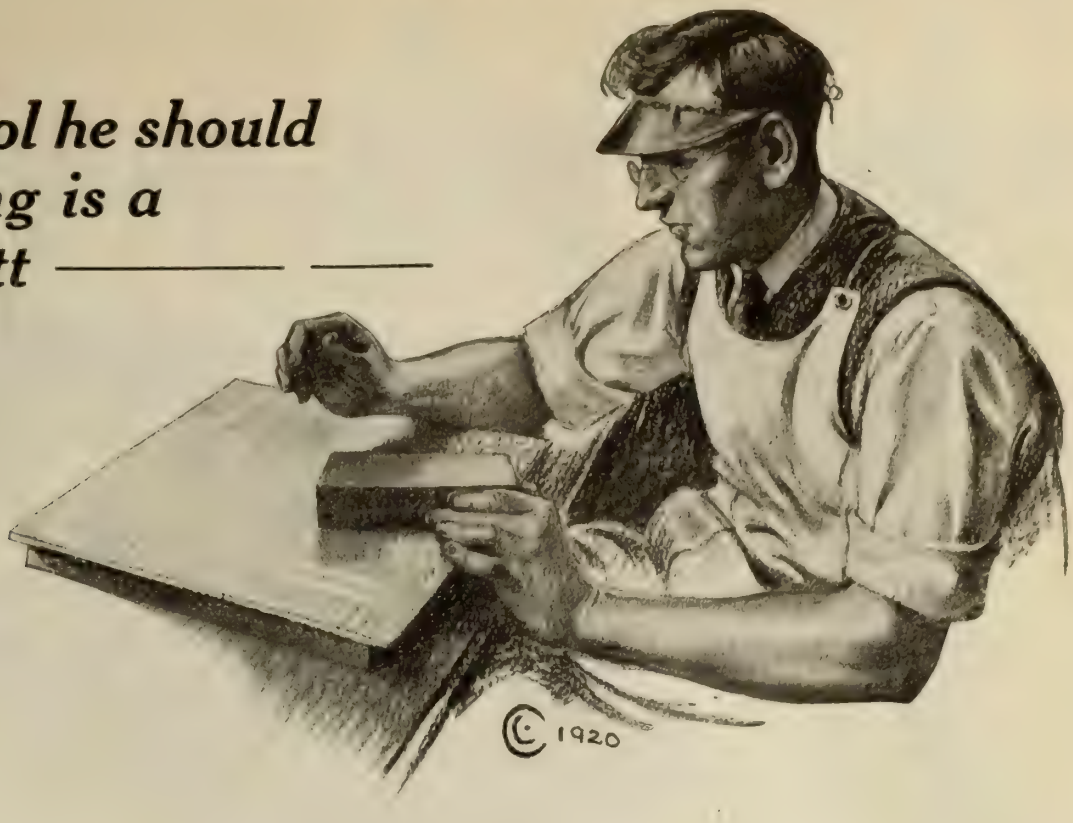
## Ingersoll Machine & Tool Co., Ltd.

Ingersoll, Ontario.

Toronto Office — 80 Bay St. Phone Adelaide 7227.

Chas. A. Strelinger Co. Ltd. Windsor, Ont.

***The tool he should be using is a Starrett ———— ——***




# Have You This Tool in Your Kit?

There are four hermaphrodite calipers of Starrett make. One of these—the tool to be used here—is designed especially for laying out work such as marking lines parallel with the edge of a block, finding temporary centers, etc. Another, designed for less sensitive adjustment, is used where the requirements are not so rigid. Two of them have lock joints, permitting work over flanges, etc.



The caliper this machinist is using may be found in the new Starrett Catalog No. 22 . See if you have it in your kit.

**THE L. S. STARRETT COMPANY**

*The World's Greatest Toolmakers*
*Manufacturers of Hack Saws Unexcelled*

ATHOL, MASS.

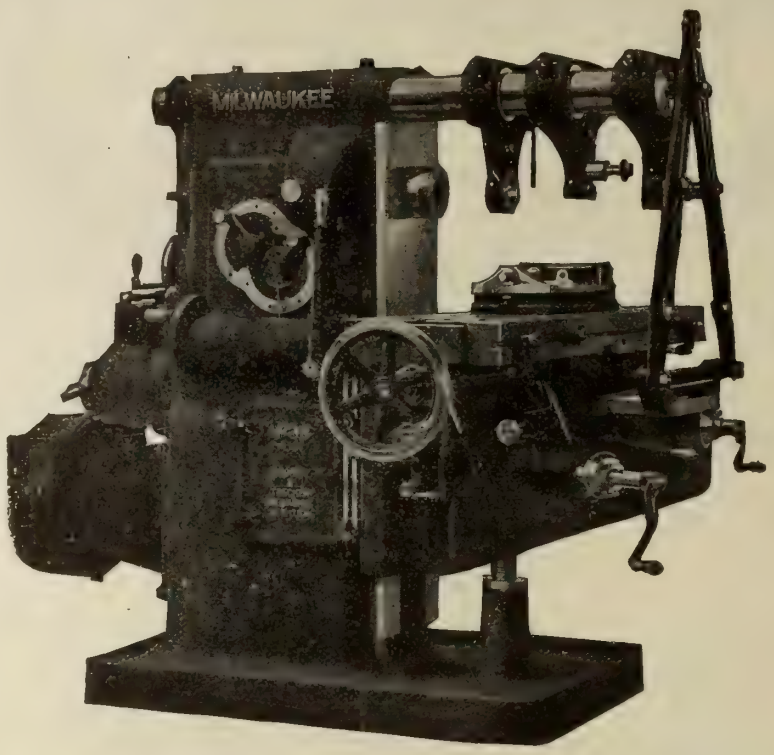
STARRETT TOOLS — STARRETT HACK SAWS CUT QUICKER LAST LONGER

# Use Starrett Tools

42 180

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# MILWAUKEE MILLING MACHINES

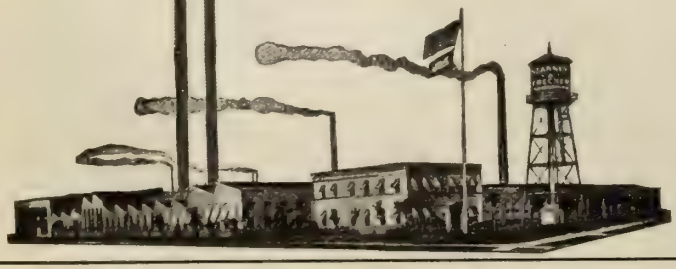



## *Every Feature An Aid To Milling Economy*

TO MEET the varied demands of different classes of work with speed and accuracy, we have incorporated many notable features in Milwaukee Milling Machines which qualify them to accomplish successfully the most exacting requirements. They are designed and constructed to economically perform all classes of milling—light or heavy.

Milwaukee Horizontal Milling Machines possess the double overarm—solid top, box section knee—automatic flooded lubrication system, one and one half gallons of oil per minute flowing over all gears and bearings in the column, feed box and pulley bracket—cutter lubricant pump which functions only when the spindle revolves—flanged spindle with hardened steel collar for driving arbors—constant speed drive, reverse being self-contained.

All these features contribute to "Milwaukee" efficiency and profitable production. Let us send our catalogue.



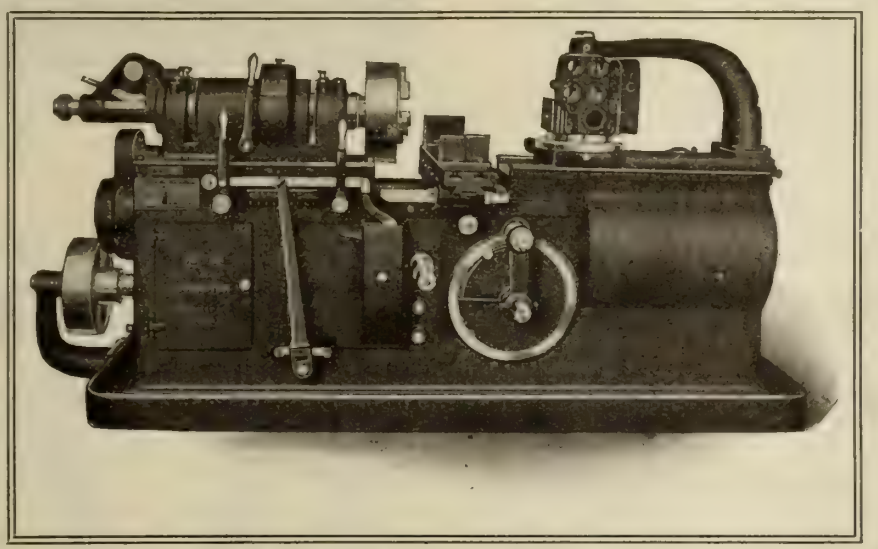
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CORPORATION
MILWAUKEE, WIS., U.S.A.

*Canadian Representatives:*
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F. F. Barber Machy. Co., Toronto.
A. R. Williams Machy. Co., Vancouver and Winnipeg.

# AUTOMATICS

When times are dull you want to get full value from your labor; you cannot afford to do otherwise and stay in the game. When times are busy you have hard work getting help.

A serious problem from either angle. The solution —Potter & Johnston Manufacturing Automatics for all duplicate parts from castings, forgings, cut-off stock, up to 40 inches diameter and up to 15 inches long.



Potter & Johnston Automatics need but little labor to attend to, one operator being sufficient to take care of a battery of machines. When the time of every operator is known in advance—you can figure with certainty on production.

*Write for detailed particulars of P. & J. Automatics.*

**Find out what they will do for you.**

*Canadian Offices:* POTTER & JOHNSTON MACHINE CO.

## ROELOFSON MACHINE & TOOL CO., LIMITED

*Head Office and Show Rooms:*

*11 Wellington Street East,* TORONTO, CANADA

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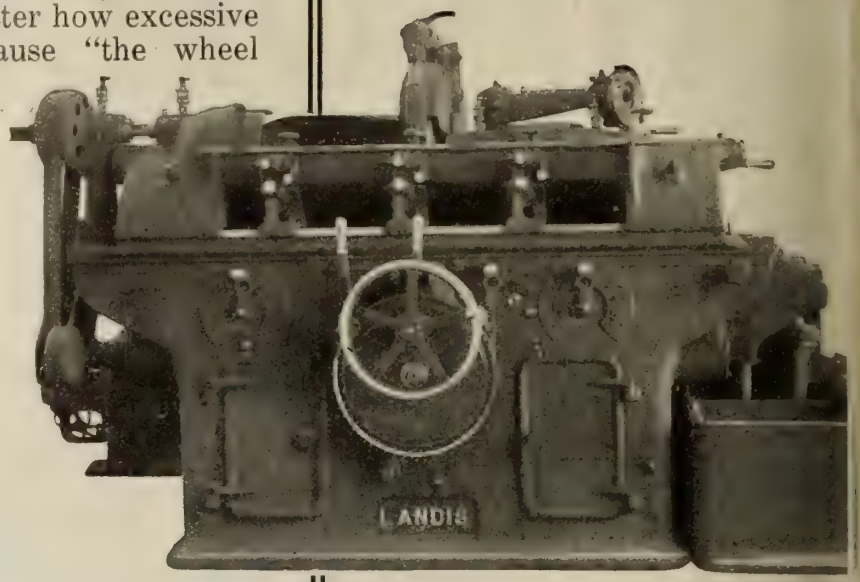
# Constant Accuracy

## Plain Grinding Machine

There can be no variation of the degree of accuracy of the Landis. No matter how excessive the tool-load may be, because "the wheel travels"—and the work remains stationary, its accuracy remains constant.

A study of the Landis is necessary to appreciate its many advantages—its compact, rigid, chatter-eliminating construction and the built-in, labor-saving features for which it is noted.

The Landis catalog goes into details. May we send you a copy?




**LANDIS TOOL CO., Waynesboro, Pa.**

50 Church Street, New York City

# STEEL *for*

## Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

**We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.**

**Steel Ingots *by the* HARMET Liquid Process**



**Nova Scotia Steel and Coal Co., Limited**

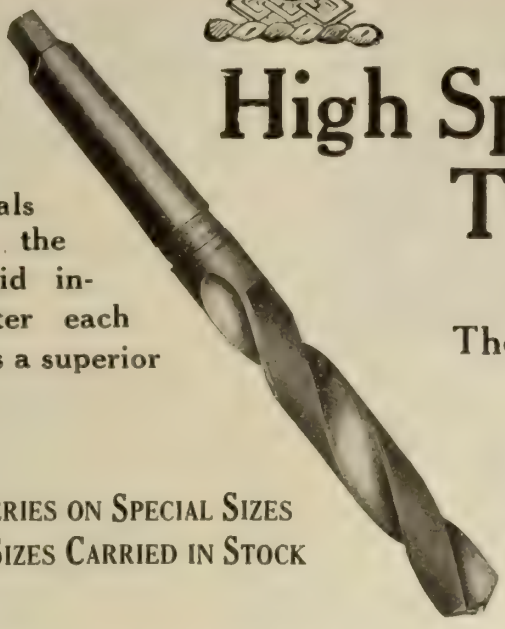
*Head Offices:*
New Glasgow, N.S.

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Western Room 14 Windsor Hotel
MONTREAL

TRADE MARK

"A.W." Drills
MILLED OR TWISTED

From the raw materials entering the steel to the finished drill a rigid inspection is given after each operation, which assures a superior product.



# High Speed Twist Drills

The Drills for Maximum Production

PROMPT DELIVERIES ON SPECIAL SIZES
ALL STANDARD SIZES CARRIED IN STOCK

## ARMSTRONG WHITWORTH OF CANADA, LIMITED

Head Office:—
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126 WELLINGTON ST. W., TORONTO

Works:—
Longueuil, Que.
McARTHUR BLDG., WINNIPEG

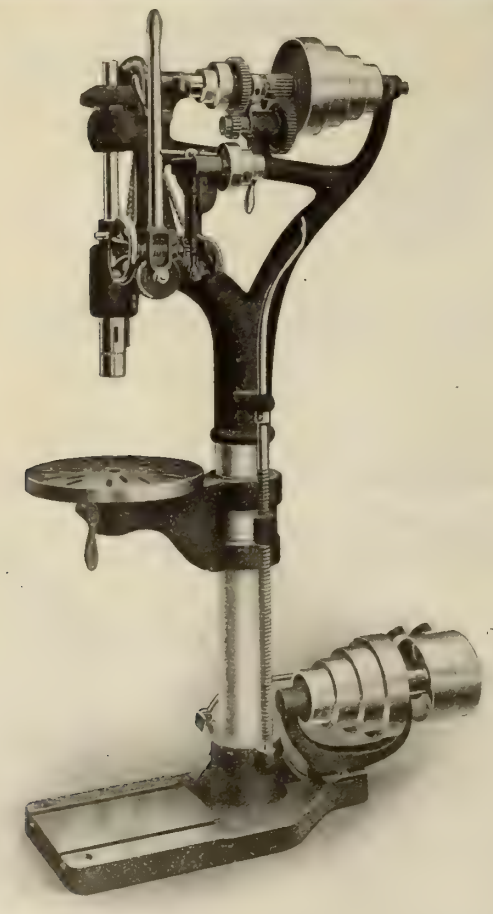
W. ATKINS & CO LD Sheffield ENG

*The*
HIGH SPEED STEELS
*For superior cutting power:*
"Double Waco" and "Waco Superior"
Carbon Tool Steels
*For all Purposes.*
"Turtle Brand," unequalled for reliability.
MINERS' DRILL STEELS
Solid and Hollow.
All Sections.




Representative
MARSHALL SON & BUNNEY
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# DENBIGH DRILLING MACHINES



## BUILT IN FOURTEEN SIZES

By the aid of a very efficient plant and organization, we manufacture these machines in large numbers by mass production.

*Prices and Deliveries are Right*

**John M. Terry & Co.**

85 Newington Causeway, London, S.E. 1.

CABLES—ATHENIAN, SEDIST, LONDON

# MacKINNON STEEL CO., LTD.

*Engineers, Manufacturers and Erectors of Steel Structures*

Industrial Bridges, Buildings, Towers, Smoke Flues and Stacks, Chutes, Coal Bins, Ore Bins, Tanks, Cranes, Engine Houses, Grain Elevators, Derricks.

Structural Steel and Steel Plate Work, and a combination of the two lines.

*Prompt Deliveries Assured*

**MacKINNON STEEL CO., LIMITED**

Sherbrooke, Quebec

Montreal Office: 404 New Birks Building

# CANADIAN ATLAS CRUCIBLE STEEL Co. LIMITED

Made in Canada

## L-XX HIGH-SPEED
## ATLAS TOOL STEELS
## ATLAS ALLOY STEELS

**Hot Rolled, Forged Blocks and Discs**
**Cold Drawn Steel and Drill Rod**

GENERAL SALES OFFICE:

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# STEEL CASTINGS

*QUICK DELIVERIES*

**High Carbon Steel**
**Manganese Steel**
**Chrome Steel**
**Mild Steel**

*QUALITY GUARANTEED*

**Sizes—½ lb. to 5,000 lbs. each**

**THE WILLIAM KENNEDY & SONS,**
*LIMITED*
OWEN SOUND, ONTARIO
ESTABLISHED 1860

# STEEL CASTINGS

We shall be glad to supply, in addition to our General Catalogue, literature on
Steel Castings — Lithographed Ware
Galvanizing — Enamelled Signs
Wire Goods
Stoves

Made by the Acid Electric process up to fifteen tons. Castings made by this process are free from blow holes, easy to machine, and superior in every way to ordinary Steel Castings.

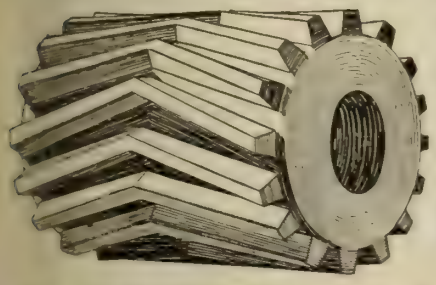
Castings supplied for shipbuilding, cars, locomotives, all classes of machinery, etc.

*The Thos. Davidson Mfg. Co. Limited*

**Head Office: Montreal.**

**Branches: Toronto and Winnipeg**

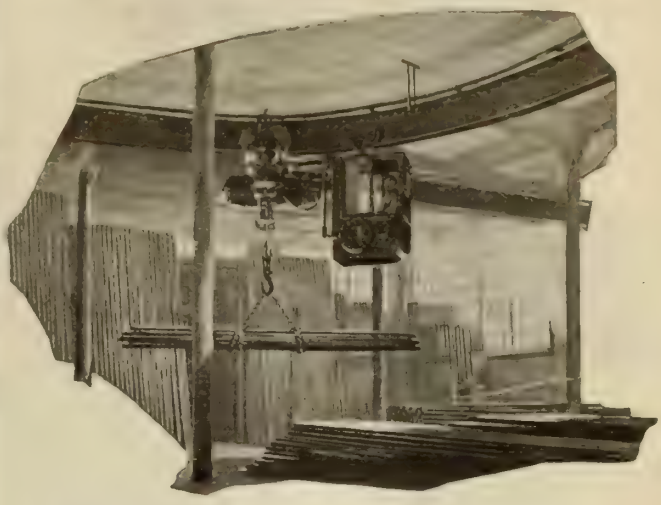
**Steel Foundry Division: Lachine Canal, Turcot.**



DAVIDSON STEEL CASTINGS MADE IN CANADA THE SEAL OF DURABILITY

# DAVIDSON

# SHEPARD
ELECTRIC CRANES & HOISTS



## Overhead, out of the way —

a "Shepard" tracks along on a Monorail—if necessary, picking a load at one extreme of the plant, carrying and putting it down at the other. One man, the operator in the traveling cage, controls every operation.

A Shepard Monorail system takes up no floor space; it is out of the way, and utilizes space that could not be used otherwise.

A Shepard Electric Hoist is economical to operate, and is easily maintained. Dirt, dust, fumes, and dampness can in no way "touch" electrical and mechanical operative mechanisms which are contained within tight metal housings.

Shepard engineers will gladly talk with you regarding a more economical means of transferring and rehandling for your business. Their services do not obligate you.

"Shepard" makes Electric Hoists ½ to 30 tons; Electric Traveling Cranes 1 to 50 tons; Electric Winches; and Cargo Handling Equipment for Docks and Ships.

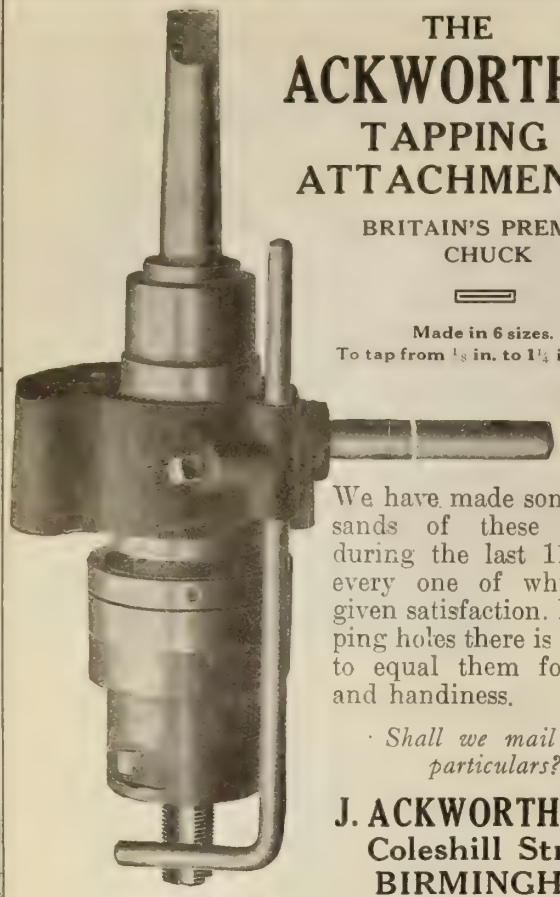
**Shepard Electric Crane & Hoist Co.**
426 Schuyler Ave., Montour Falls, N.Y.

New York — Chicago — Philadelphia — Pittsburgh
Boston — Baltimore — San Francisco — Cleveland
Detroit — Melbourne — Montreal — London

*Member Electric Hoist Manufacturers' Assn.*

*Canadian Representatives:* RUDEL-BELNAP, Montreal


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THE
# ACKWORTHIE
## TAPPING ATTACHMENT.

BRITAIN'S PREMIER CHUCK

Made in 6 sizes.
To tap from ⅛ in. to 1¼ in. Whit.

We have made some thousands of these Chucks during the last 11 years, every one of which has given satisfaction. For tapping holes there is nothing to equal them for speed and handiness.

*Shall we mail you particulars?*

**J. ACKWORTHIE, Ltd.**
**Coleshill Street,**
**BIRMINGHAM**

# LA SALLE
## Has an Advantage Over Other Grinders

There is some outstanding feature of all La Salle Grinding Machines that lends it exceptional productive ability.
The American Drill Grinder is especially adaptable for grinding twist, flat and three-lipped drills, because it has automatic lip rest and caliper jaw device, which assures proper clearance on all sizes of drills automatically. Send for descriptive matter covering our entire line of grinding machinery.

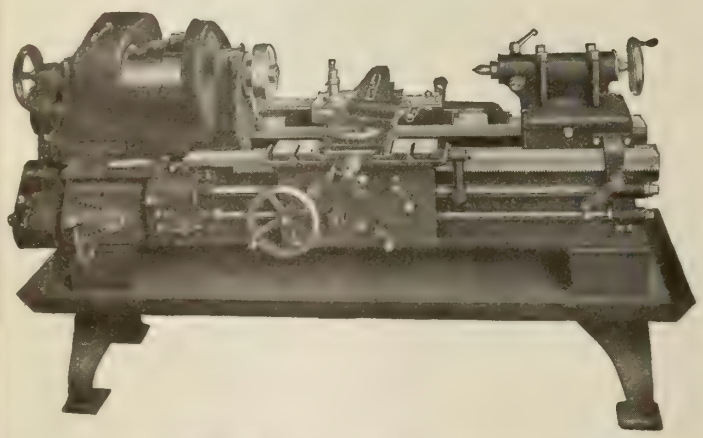


American Drill Grinder
For Wet or Dry Drill Grinding ⅛" to 2¼". Also ⅛" to 3½" dia.

**LA SALLE TOOL CO.**
**La Salle, Illinois, U.S.A.**

Represented in Canada by
**A. R. Williams Machinery Co., Ltd.**
**64-66 Front Street W., Toronto**
Halifax St. John, N.B. Montreal Winnipeg Vancouver

# "LEHMANN LATHES"
## Will Put the Same Degree of Efficiency Into *Your* Shops as They Have in Many Others



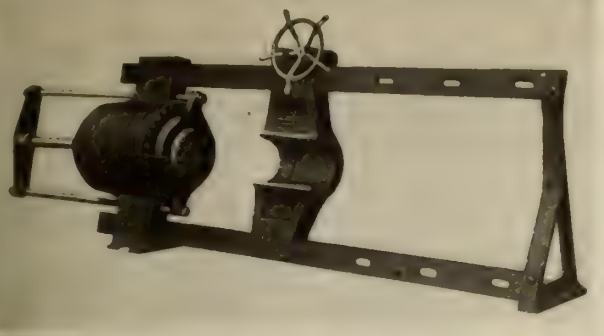
TWO SIZES—16", Swing 18¼" and 18", Swing 20¼"

Because they are constructed "right" of the best material, workmanship and design, and therefore are adaptable to all conditions, whether it be work requiring accuracy to the highest standards or for the heavy duty where power, strength and rigidity are required.

Convince yourself of these facts! Let us send you complete specifications of this superior lathe and the names of some of the larger concerns who are using "LEHMANN LATHES" for better results.

***We know you are interested, so don't put off writing us. Do it to-day. Now!***

**LEHMANN MACHINE COMPANY,** 3566 CHOUTEAU AVE. ST. LOUIS, U.S.A.



# PERRIN
## 400-Ton Hydraulic Wheel Press

This Made-in-Canada Press is built to operate direct from Accumulator at 1500 pounds per square inch pressure.

*Perrin for Reliability*

**WILLIAM R. PERRIN, LIMITED**
TORONTO

# WHY EXPERIMENT ?
## WE DID IT FOR YOU YEARS AGO



**IMPERIAL GENUINE**




For Heavy Engines and Extraordinary Hard Work

**HARRIS HEAVY PRESSURE**

THE COPPER COATED CAKE

For Donkey Engines, Saw Carriages, Small Motors, Transmission Line Shafting and all steady heavy pressure duty.



**Matchless**

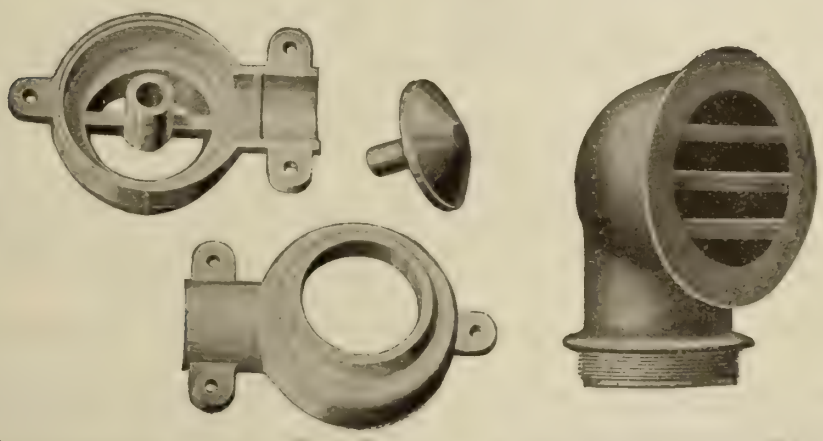
Suitable For Slow-Moving Bearings

Write For Prices

**THE CANADA METAL CO., LIMITED**
TORONTO HAMILTON MONTREAL
WINNIPEG VANCOUVER

# DIE-CASTINGS

DOEHLER PROCESS



MADE IN CANADA

Note the smooth appearance of the Die-Castings in the illustration. No burrs—no rough spots. Cored holes are perfectly round and centred. Require practically no machining

SEND BLUE PRINTS TO US FOR ESTIMATES



*Manufactured by*

**Tallman Brass & Metal Limited**
**HAMILTON, ONT.**



THE SIGNIFICANCE TO *YOU* OF THE MEMBERSHIP OF

# CANADIAN MACHINERY

IN THE ASSOCIATED BUSINESS PAPERS, INC.

**YOU depend upon Canadian Machinery for an unbiased and accurate report of all news affecting your business interests.**

**Probably, too, you give heed to its editorial counsel in many matters of considerable consequence. You have a right, therefore, to know about the policies and principles back of the important service rendered by Canadian Machinery.**

**The membership of this publication in The Associated Business Papers, Inc., means that it has achieved an exceptionally high publishing standard, and has subscribed unreservedly to these—**

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**The publisher of a business paper should dedicate his best efforts to the cause of Business and Social Service, and to this end should pledge himself—**

1. To consider, first, the interests of the subscriber.
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10. To determine what is the highest and largest function of the field which he serves, and then to strive in every legitimate way to promote that function.

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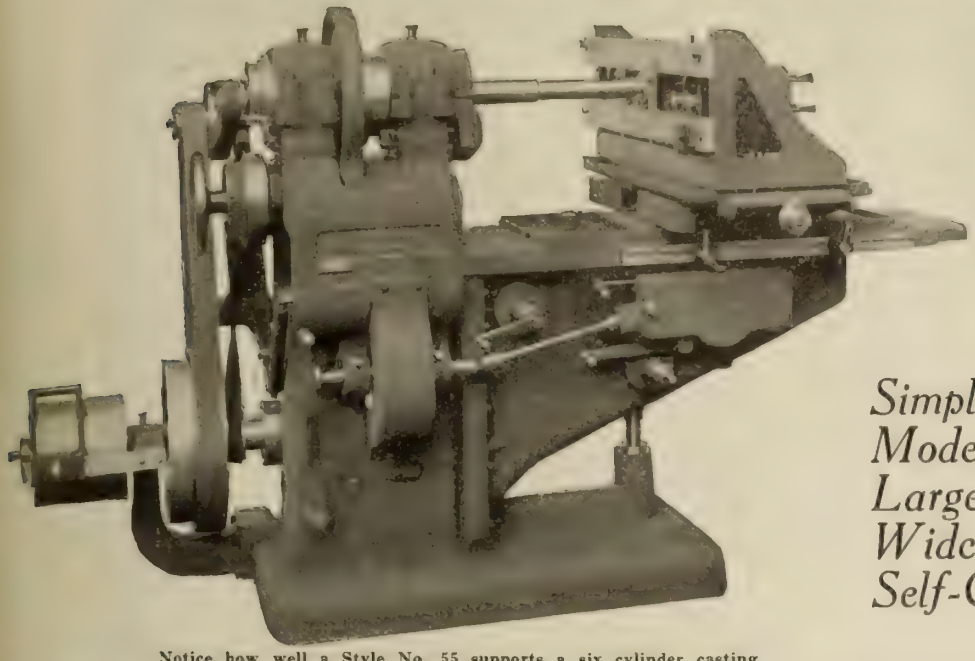
## THE ASSOCIATED BUSINESS PAPERS, INC.

*The International Association of Trade, Technical and Class Publications*

220 WEST 42nd STREET NEW YORK CITY

HEALD

# Have You Ever Considered The Cylinder Regrinding Business?



**Heald Style No. 55**

*Simple*
*Moderate Price*
*Large Capacity*
*Wide Range*
*Self-Contained*

Notice how well a Style No. 55 supports a six cylinder casting.

If you have ever contemplated going into the regrinding business you have undoubtedly considered a Heald Machine. Possibly you felt it was a little more than you could carry financially, but listen to this—

Our latest style No. 55 has all the advantages of the old machine for regrinding purposes, but we are able to sell it at a reduced price.

How did we do it?

Not by reducing the Heald quality. No, indeed. That is against the Heald policy, but we have eliminated the feed boxes and expensive units so necessary in a manufacturing machine and substituted a driving unit which furnishes power for the speeds and feeds, also making it self-contained.

Then again we have made it wider, to better support large castings, and also increased the capacity by a greater distance between the tables and the grinding circle.

**There are a number of things we would like to tell you in addition to the price and capacity if you will give us your name and address.**

## The Heald Machine Co.

**51 New Bond St.**

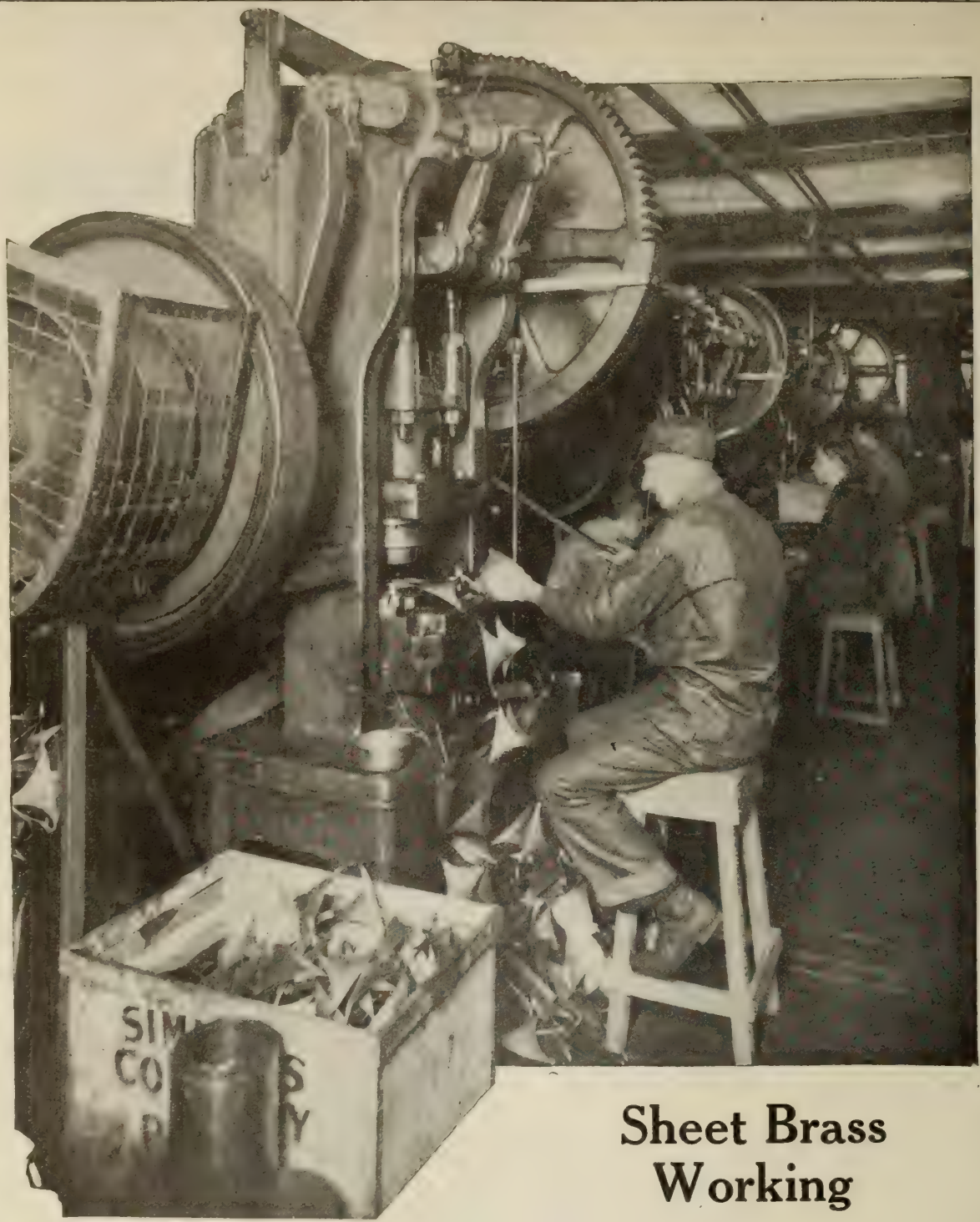
**WORCESTER, MASS., U.S.A.**

BRANCH OFFICES:—New York, 839 Singer Bldg.; Philadelphia, 1302 Stephen Girard Bldg.; Chicago, 26 South Jefferson St.; Detroit, 401 Marquette Bldg.; Cincinnati, 311 Provident Bank Bldg.; Cleveland, 721 Engineers' Bldg.; Buffalo, 331 Jewett Ave. WESTERN AGENTS: Eccles & Smith Co., Los Angeles, San Francisco, Seattle and Portland; Salt Lake Hardware Co., Utah and Idaho; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.



One machine handles all sizes and shapes of cylinders.

*If interested tear out this page and place with letters to be answered.*



# Sheet Brass Working

This "BLISS" No. 1½ Toggle Drawing Press is one of the many "BLISS" Presses used by the Simmons Company to achieve fine results in making brass beds. It is shown here blanking and drawing bedpost necks from .035" strip brass 9" wide. The shells are 5¾" diameter x 2¼" deep.

BLISS 1857

## E. W. Bliss Company

*Main Offices:* BROOKLYN, N.Y., U.S.A.

*American Factories:* BROOKLYN, N.Y.; HASTINGS, MICH.; CLEVELAND, O.; SALEM, O.

BLISS 1921

SALES OFFICES

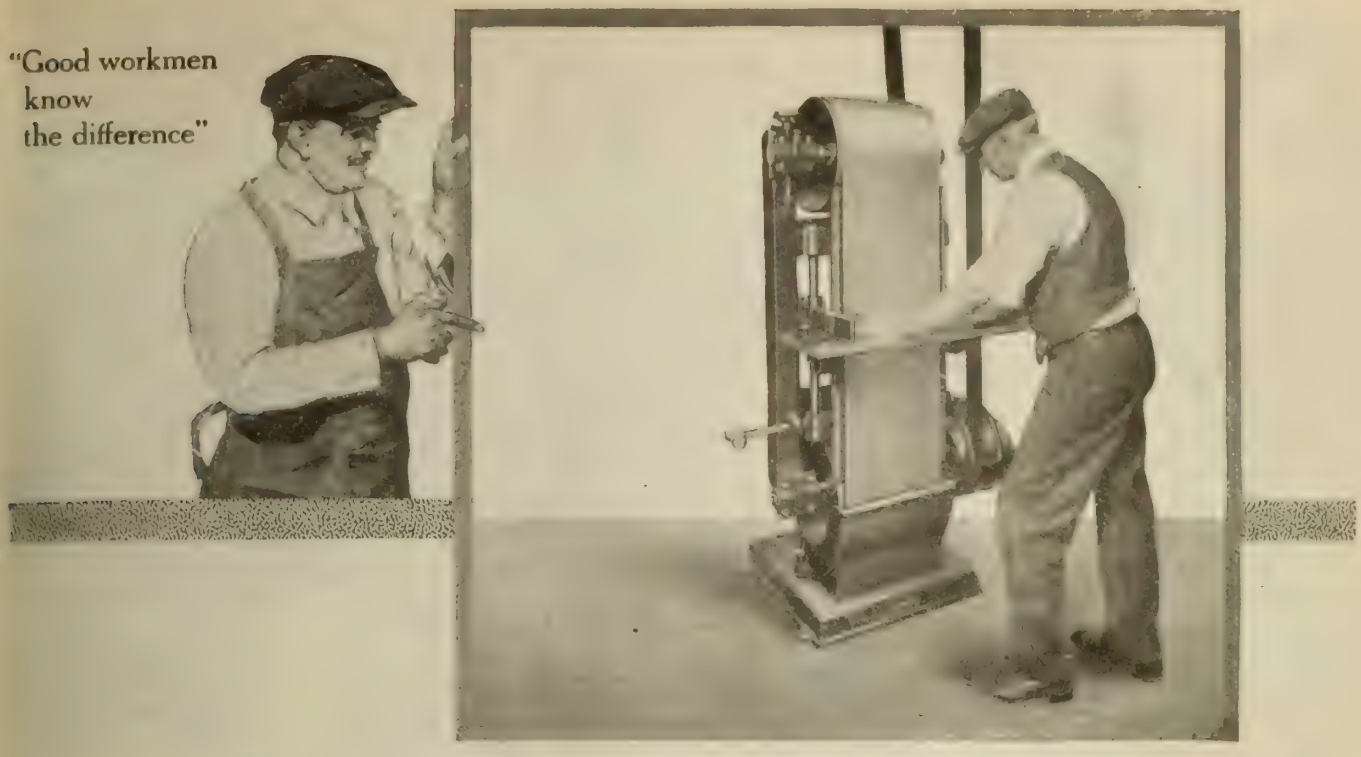
CHICAGO, People's Gas Bldg. DETROIT, Dime Bank Bldg. CLEVELAND, Union Bank Bldg.
CINCINNATI, Union Trust Bldg. BUFFALO, Marine Bank Bldg. ST. LOUIS, Boatmen's Bank Bldg. PITTSBURGH, Keenan Bldg.

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115

"Good workmen know the difference"



# *Not bolted to the floor—why?*

*(Ask Gordon Scott, He Knows)*

This was in August, 1919.

Gordon Scott, Manager of the Peerless Surfacing Machine Company of Troy, New York (manufacturers of Peerless Surfacing Machines), laid down the report of the tests. "It's as if we had built a fine safety razor but couldn't get good blades for it," he said.

These tests showed that Peerless Surfacing Machines were O. K., true-running, production boosters —that the defective work complained of was due to the abrasive belts used.

"Ordinary belts won't do," ran the report. "Their belt joints are thicker than the rest of the belt and give a marked 'hop' or 'jump' on each revolution. This causes marred, scratched work."

And a little further down Scott read, "One belt stands out—Speed-grits Uniflow belt. Recently developed by Manning Abrasive Company. Has an absolutely flat joint. No 'jump' or 'hop' no matter how many R. P. M. Gives perfect finish."

Now notice the picture above. A Peerless Surfacing Machine running at top speed while simply set on the floor (*not* bolted). Its "jumpless" Speed-grits Uniflow belt is grinding a block of carbon steel.

On steel, alloy, iron, wood, or hard rubber—smooth-running Speed-grits Uniflow belts give speed in production *plus* perfect finish.

Today you can order Speed-grits Uniflow belts by mail—one or a dozen. Just send a piece of a wornout belt of the type now being used.

(Many abrasive-belt users tell us that taking the "jump" out of the belt joint is the biggest thing accomplished in the abrasive industry since the discovery of artificial abrasives.)

Why not find out? Order your trial Uniflow belts today.

*"Good Workmen Know the Difference."*

Send for "The Difference Book"—Address

**RITCHEY SUPPLY COMPANY**

154 Pearl Street (CANADIAN DISTRIBUTORS) Toronto, Canada

Or Send to Manning Abrasive Co., Troy, N.Y., U.S.A.

Manning Speed-grits

Look for this trade-mark on the back of every belt, sheet or disc.

# Manning Speed-grits

Reg. U.S. Pat. Off.

**Don't say sandpaper—say Speed-grits**

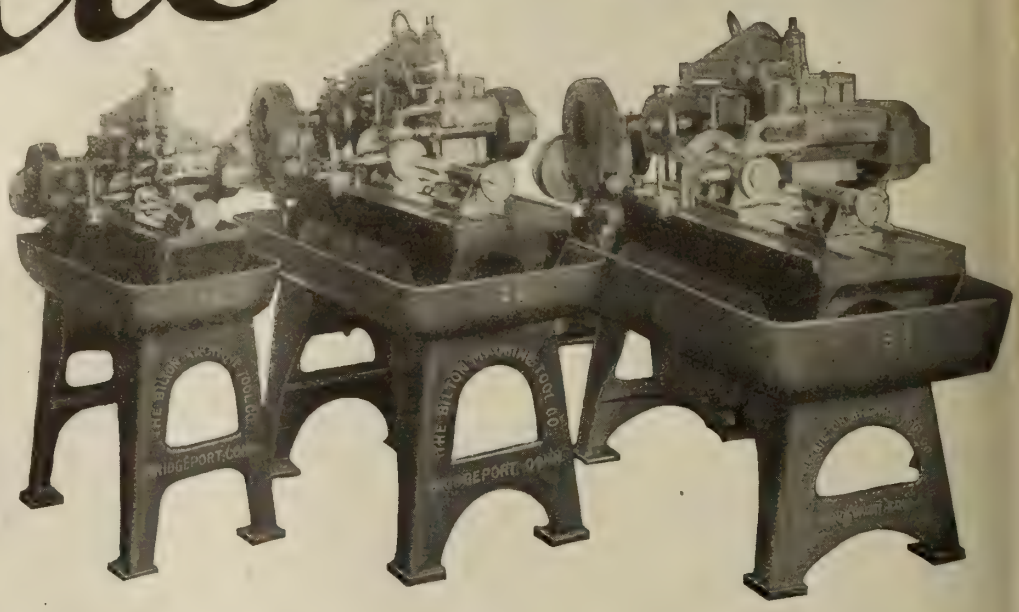
**Speed-grits**

comes in the following varieties:

METALITE CLOTH
HANDY ROLLS
GRINDING DISCS
DURITE CLOTH
DURITE PAPER
DURITE COMBINATION
DURUNDUM PAPER
DURUNDUM CLOTH
GARNET PAPER
GARNET CLOTH
GARNET COMBINATION
FLINT PAPER
EMERY CLOTH
EMERY PAPER

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# Bilton GEAR MILLERS



## Fully Automatic

Their adaptability is almost unlimited on small work—such as cutting spur, bevel, miter, angle gears, saws, ratchets, sprockets, cutters, knurls, taps, cylinders, form cutting, manufacturing, milling, etc.

A big time saver, as indexing takes place during return stroke of cutter — which is removing metal 90% of the time.

*Write us for Catalog* **30-6**

***Over 500 leading manufacturers now use the Bilton for high production on accurate work***

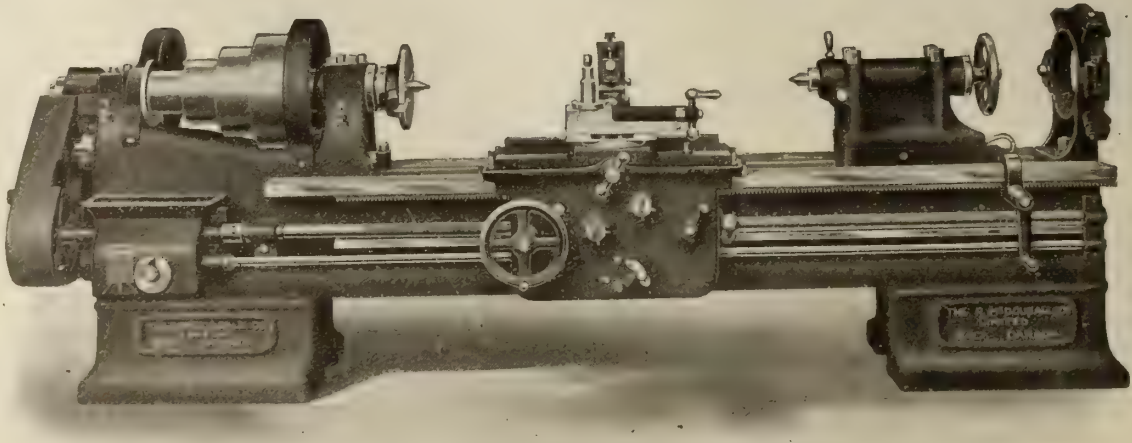
**Bilton Machine Tool Co.** Housatonic Avenue **Bridgeport, Conn., U.S.A.**

**Foreign Agents: Alfred Herbert, Ltd. Chas. Churchill & Co., Ltd.**

# EXPERT Workmanship

IS MUCH IN EVIDENCE IN THE CONSTRUCTION OF

# McDOUGALL Engine Lathes



No pains are spared in the construction of this machine to make its accuracy and finish consistent with its perfect design.

McDougall Engine Lathes possess all the features which ensure economical production, dependable accuracy, and ease of operation.

Shall we send you our literature describing this lathe in detail?

**THE R. McDOUGALL COMPANY, LIMITED, GALT, ONTARIO**

**The Canadian Fairbanks-Morse Co., Limited, Sales Agents**

B·S
TRADE MARK

Specify B&S Cutters

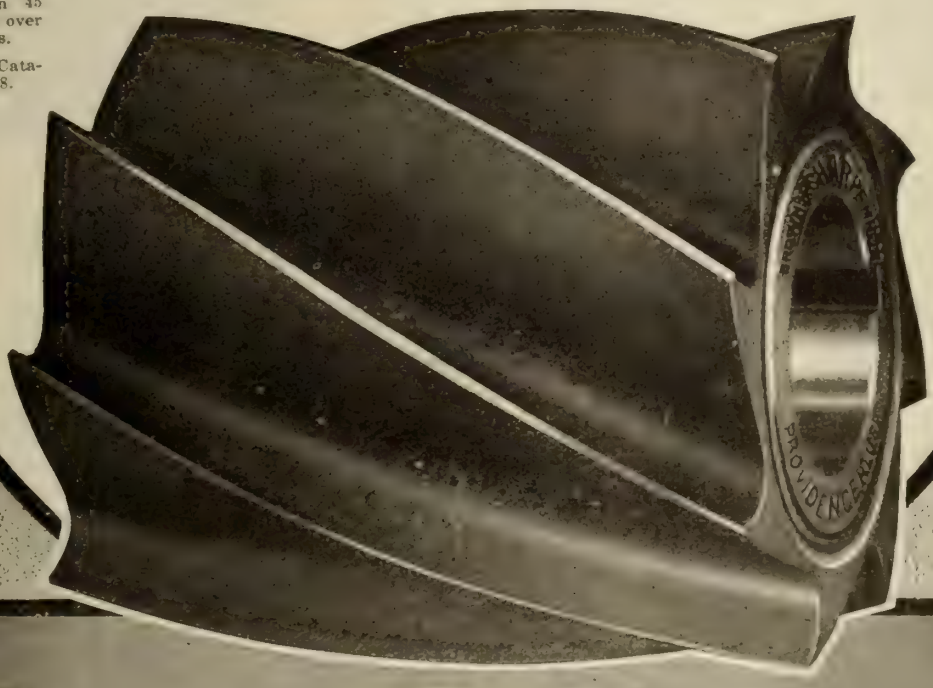
"For Increased Production and Lowered Operating Costs"

They stand the drive of the busy shop, thereby enabling you to utilize the full power of your machines.

**Brown & Sharpe Mfg. Co.**
**Providence, R.I. U.S.A.**

Brown & Sharpe Standard Cutters are regularly made in 45 styles and over 3,000 sizes.

Send for Catalog No. 28.




BROWN & SHARPE
CUTTERS

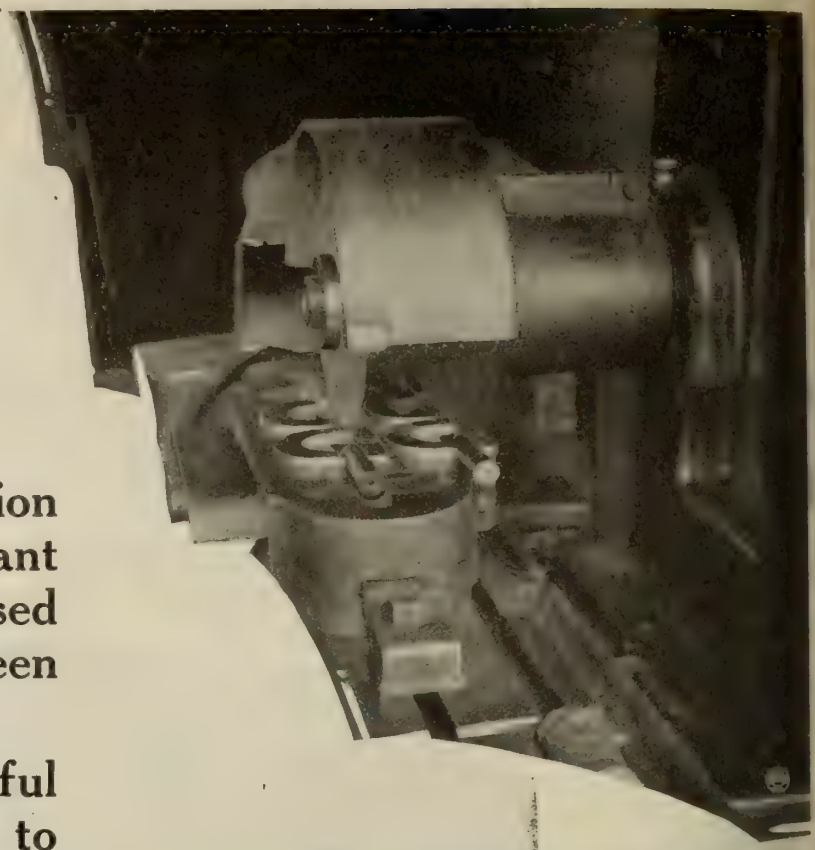

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Refinements in grinding methods enable the manufacturers of small tools to achieve a desirable accuracy of the product.

The growth of precision grinding in this important work and the increased scope of grinding has been truly remarkable.

No one making a careful investigation can fail to note the many precision grinding successes made possible by

# ALUNDUM
## GRINDING WHEELS



*Sides of micrometer frames are finished ground on surface grinders equipped with Norton Aluminum Wheels 7 in. diameter by 1/4 in. face.*

**NORTON COMPANY OF CANADA**
LIMITED
HAMILTON, ONTARIO

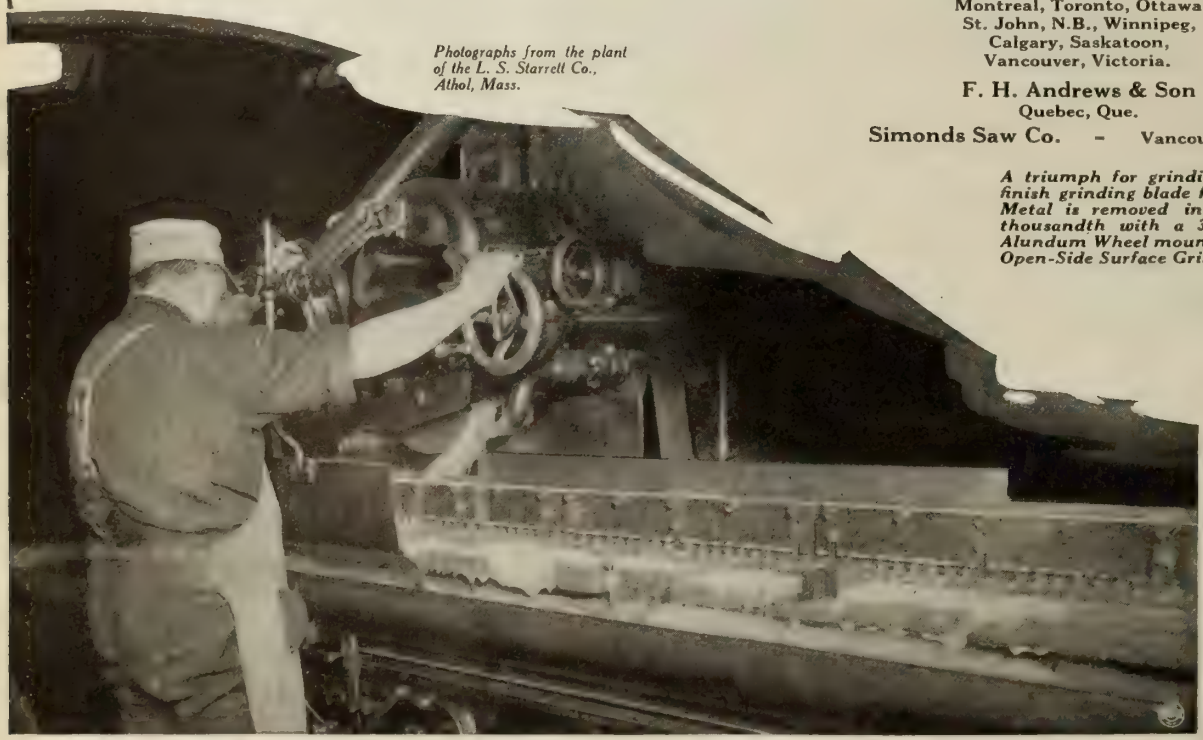
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Simonds Saw Co. - Vancouver, B.C.

*Photographs from the plant of the L. S. Starrett Co., Athol, Mass.*



*A triumph for grinding equipment—finish grinding blade for 48 in. square. Metal is removed in fractions of a thousandth with a 38-30 H. Norton Alundum Wheel mounted on a Norton Open-Side Surface Grinder.*

R60

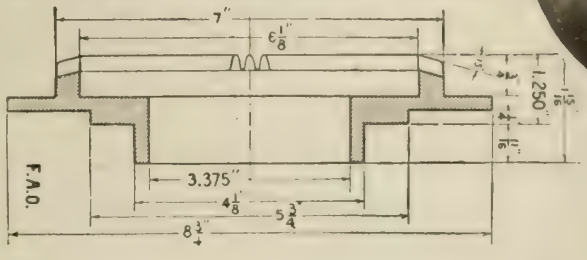
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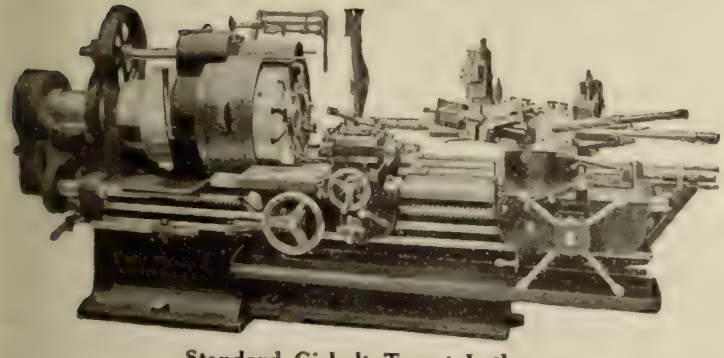
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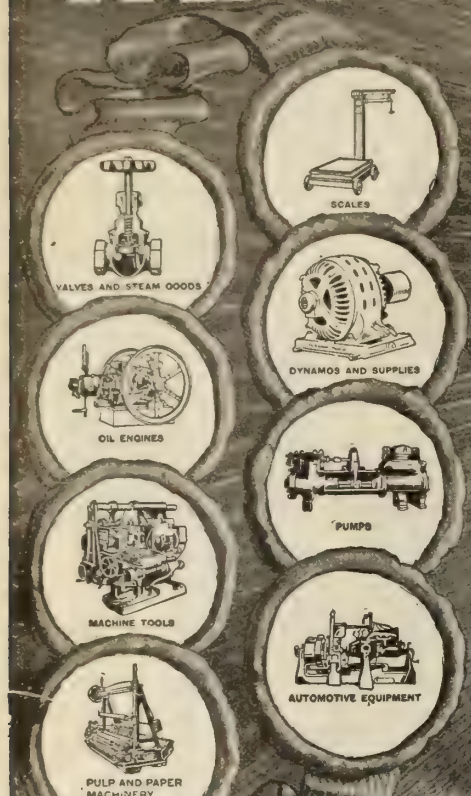
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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

VOL. XXV. No. 7 February 17, 1921

# *Tooling the Modern Turret Lathe*

## Proper Methods of Chucking—Holding Work by Special Jaws—Angle Plate Fixture—Cradle Fixture, and Varied Indexing Fixtures.

*By A. H. Lloyd, B.Sc., M.B.E.*

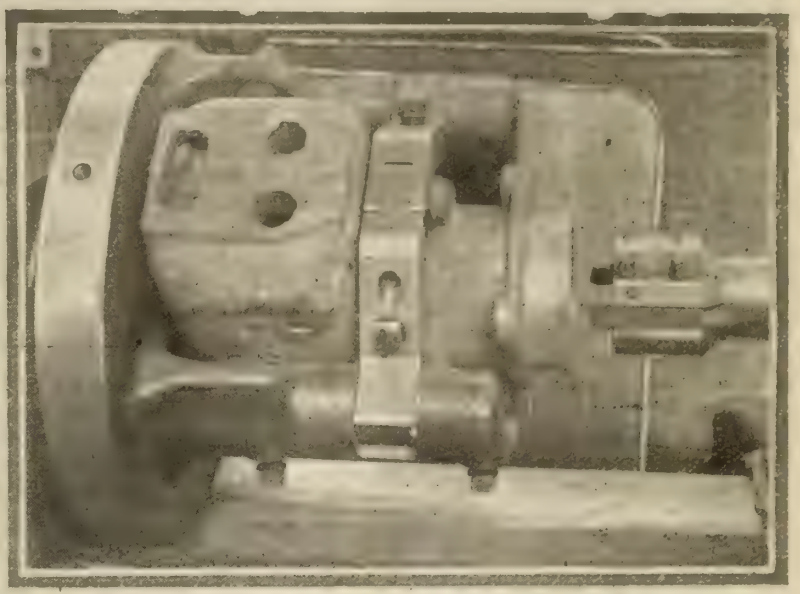


FIG. 7.—CRADLE FIXTURE FOR HOLDING CYLINDER CASTINGS.

MUCH of the prejudice which existed against capstan lathes and turret lathes in their early days was probably due to a fear that when the lathes were installed the results would fall short of expectations, due to lack of proper tool equipment. To be dependent on the machine tool maker for special tools for each and every job which came along was not altogether a desirable position, yet many firms hesitated to take the obvious course of starting tool designing and tool making departments of their own. The war swept away all this prejudice by force of circumstances. Enormous numbers of turret lathes came into being, and many users were compelled to tool up the machines themselves owing to the inability of the makers to meet the demand for special tools. This was a good thing, for in doing so they gained confidence in their ability to get the best out of costly and valuable machines, with the result that turret lathe tool design is now accepted as a scientific subject of great importance and is given considerable attention in the technical press.

Realizing some of the difficulties of turret lathe users when production was of such importance, the firm with which I am connected published in 1916 a book called "How to Lay-out Turret Lathe Tools," in which an attempt was made to enunciate certain broad principles of

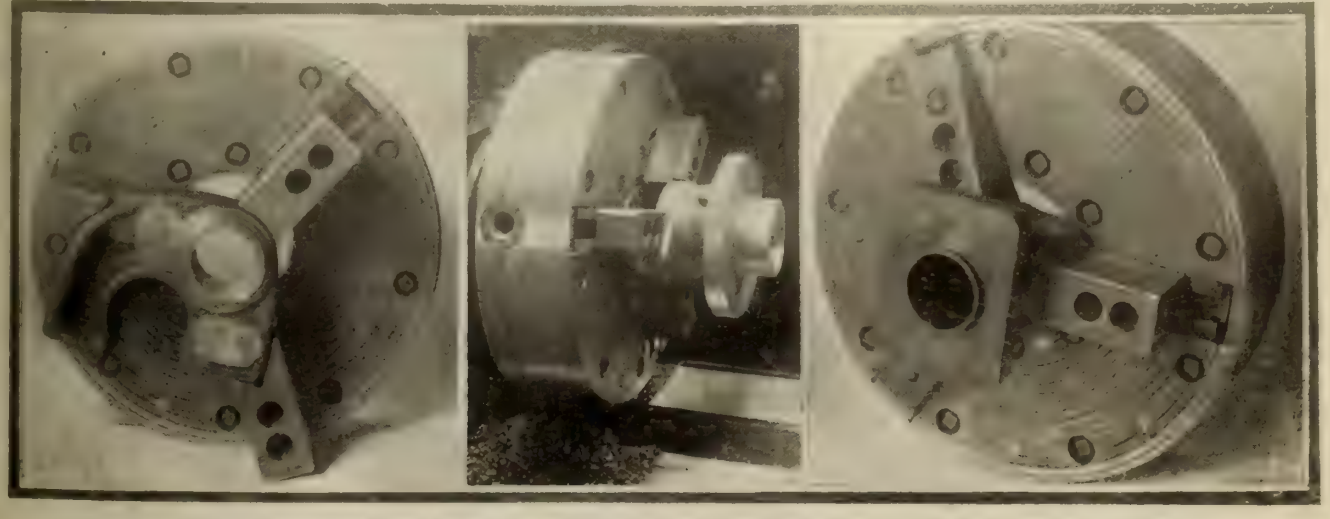


FIG. 1.—EXTREME LEFT VIEW. SPECIAL JAWS FOR ROLLER STEADY BOXTOOL FRONT PLATE.
FIG. 2.—CENTER VIEW. SPECIAL JAWS FOR OVAL FLANGE.
FIG. 3.—RIGHT HAND VIEW. SPECIAL JAWS FOR BORING BAR HOLDER.

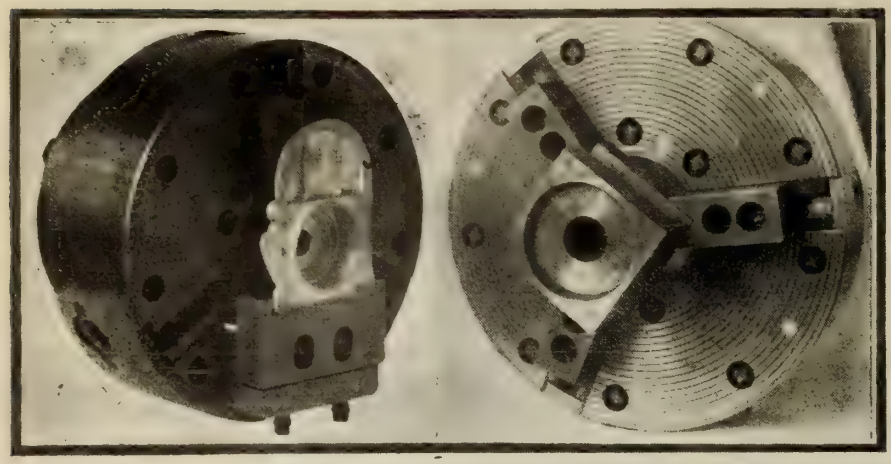


FIG. 4.—LEFT HAND VIEW. ONE JAW METHOD OF HOLDING MAGNETO END PLATE.
FIG. 6.—RIGHT HAND VIEW. SPECIAL SOFT JAWS FOR HOLDING SQUARE TURRET BLOCKS

turret lathe tool design and practice which, if adhered to, would enable anyone with a fair shop experience to undertake this work with a reasonable assurance of success. In this article I propose to approach the subject by giving a number of examples of modern turret lathe lay-outs, from the description of which we shall, I hope, be able to extract some information of interest and value. In doing so I shall exclude consideration of hexagon turret lathes for producing articles from the bar, as this type of lathe is always equipped with a very complete outfit of tools which enables it to handle all ordinary work within its capacity without the use of special tools.

### Two Viewpoints

Every turret lathe job has to be considered from two points of view, namely, chucking and tooling. The chucking often gets insufficient consideration, and one sees an otherwise good lay-out of tools spoiled by inefficient chucking. First let us consider some examples of chucking in the "Coventry" concentric chuck, which possesses great gripping power, and adaptability to irregular objects by the use of special jaws.

At Fig. 1 is shown a set of special jaws for holding a drop forging, which is the front plate of a roller steady box-tool. The machining operations consist of drilling, boring, facing, and the interest lies entirely in the method of chucking. One jaw grips the boss whilst the second, which is of vee block form, engages the corner and positions this correctly, whilst the third jaw grips behind the boss on the top side of the stamping. This piece would have been a very awkward one to handle in the ordinary way, but with the special jaws correctly fixed in position, chucking is as simple as in the case of an ordinary circular object. In order to facilitate putting special jaws in the correct position on the jaw slides, it is good practice, after they have been once set up and adjusted to a sample stamping, to mark lines on the sides of the jaws, which register the position in relation to one of the rings on the face of the chuck.

In dealing with pieces of work like stuffing boxes, glands, and similar articles, one is often faced with the necessity of requiring the chuck jaws to grip on an oval flange. This has usually been looked upon as legitimate work for a two-jaw concentric chuck or a four-jaw independent chuck. Those who have had experience of two-jaw chucks, however, know that they are usually short of gripping power, which of course makes it difficult to get the best out of the tooling. On the other hand, four-jaw chucks, whilst having plenty of gripping power, are, to my mind, not so quick and sure to operate as the concentric chuck. By designing special jaws, oval flanges can be held in the manner shown in the next slide. One jaw grips across the minor axis of the oval, whilst the two remaining jaws are bevelled off symmetrically and form a centralizing vee.

In equipping Herbert combination turret lathes and capstan lathes we manufacture large numbers of boring bar holders, which are made from iron castings. These are bored and faced on auto lathes, and at one time the castings were chucked in cradle fixtures. Subsequently the question of gripping them in the concentric chuck was considered, with the result that the set of jaws shown at Fig. 3 was designed.

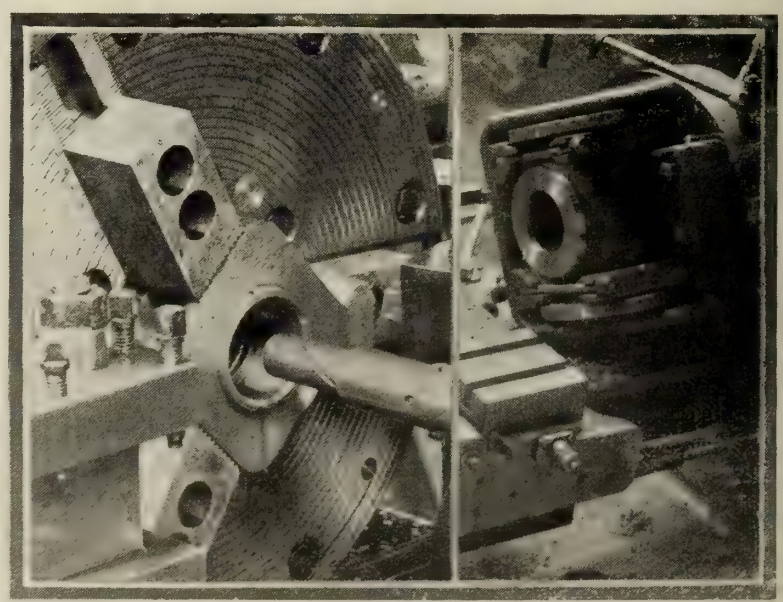
Two of the jaws are made from standard bar jaws tapered to suit the casting, the third jaw is made from a standard soft jaw blank, in which a traverse vee is machined for locating and gripping on the pad bolt boss. It is not difficult to imagine that this method is much quicker that the fixture method of holding, and in addition has the advantage that it ensures concentricity of the hole with the outside of the casting, since the arrangement is self-centering despite slight variations in the castings.

### The One Jaw Method

A special method of chucking which is often very helpful to tool designers is known as the "one-jaw" method, an

*This article, which is the first of a series, is written by an authority on this class of work As he so aptly remarks in the present portion "The chucking often gets insufficient consideration, and one sees an otherwise good layout of tools spoiled."*

*The various fixtures shown can equally be applied to other similar shaped parts, so that readers would do well to more than lightly consider the examples depicted. We believe this series will be filed away by many readers for future reference, and each will be complete in itself. The next portion will appear March 24th, and will go into tool layouts of various kinds.*



LEFT HAND VIEW, FIG. 5, SHOWING SPECIAL JAWS FOR HOLDING SQUARE PIPE FLANGE
RIGHT HAND VIEW, FIG. 8, SHOWING SPECIAL FIXTURE FOR HOLDING GLOBE VALVES

example of which is shown at Fig. 4. The work is an aluminum die casting, the end shield of a motor-cycle magneto. This piece cannot be satisfactorily gripped with three jaws on the boss, as it is of a peculiar shape, and moreover, gripping at such a point would be liable to distort the finished hole. In the method of chucking shown, the gripping is done by a single jaw against an adjustable locating block bolted to the face of the chuck, the two other jaws being removed. The locating block is made in two parts, the upper portion being adjustable inwards by two set screws which facilitate setting up true. When adjusted to the casting the locating block is clamped up by means of two collar screws.

Holding square objects in the "Coventry" chuck is as easy as holding oval flanges, as will be seen at Fig 5. The article in the chuck is a steel pipe flange which has to be bored, faced and tapped. One standard jaw grips on a corner, whilst the two remaining jaws are bevelled off to a suitable angle. In this case the jaws are gripping on an unmachined surface, but the same method is applicable to finished work.

Fig. 6 illustrates how we use it in our own practice for boring and facing the square turrets of our lathes. In producing these parts the steel bars are milled in lengths, afterwards being cut up and milled on the remaining sides, the lathe operation being the last. It is therefore very important that the lathe work should be concentric with the previous machining, and the method of chucking adopted gives the required degree of accuracy.

### The Use of Fixtures

The preceding examples may be regarded as typical of work which can be held in a concentric chuck, and we may now consider the question of fixtures. You will appreciate that this is a subject of which we can only touch the fringe, and we will merely consider what are the desirable features to be aimed at in fixture design. They should, of course, be designed with as little overhang as possible, so as to make the work rigid under heavy cuts; they should be accurately balanced to avoid vibration at high speeds; they should be as light as is consistent with ample strength; the means of clamping should be rapid and secure.

Broadly, fixtures can be divided into two types, namely, those in which the work is located from an unmachined surface, and those in which it is located from a surface machined at a previous operation. An instance of work located from an unmachined surface is shown at Fig. 7. The fixture shown was designed for holding water-cooled cylinders of a "Lister" engine during the boring operation, which is done on one of our No. 9 combination turret lathes. At first sight it might appear that this piece could be held in a concentric chuck by designing special jaws, but in this particular instance the fixture is better practice.



FIG. 10.—INDEXING FIXTURE FOR AERO-ENGINE CRANKCASES

Gripping with jaws would, in all probability, crack the water jacket, and, in addition, the work would overhang so far from the chuck that it would not be possible to turn the skirt at the same time as boring. The casting is located in the fixture on four adjustable set screws which form a vee, and is clamped against this by two more set screws carried in a strap bridging across the fixture. The strap is made in two parts which are hinged about pins in the sides of the fixture. The hinges are jointed together in the centre where they overlap, by a hardened pin which is a push fit through the two parts of the strap. When removing the casting from the fixture, the two clamping screws are slacked off and the central pin withdrawn, thus allowing the two portions of the strap to be swung clear of the work. This method of clamping is rapid, as the strap, being made in two hinged parts, is easier to manipulate than the conventional single piece strap.

Fig. 8 depicts a special fixture for holding globe valves on a No. 9 combination turret lathe during the machining operation on the centre hole and flange. The casting is drawn down on to two vee blocks shaped to suit the shoulders of the valve casting by means of straps clamped by swivel bolts. One nut only is required to clamp each strap, as the bolts at the rear are hinged to the straps. When chucking or unchucking, the straps are swung clear of the work and retained in position by two plungers carried in the balance weight. The locating blocks and clamps are removable, so that the same fixture can be made to accommodate various sizes of valve.

At Fig. 9 is shown an angle plate fixture for holding a carburetor body. In this case the location is obtained from the float chamber which has been

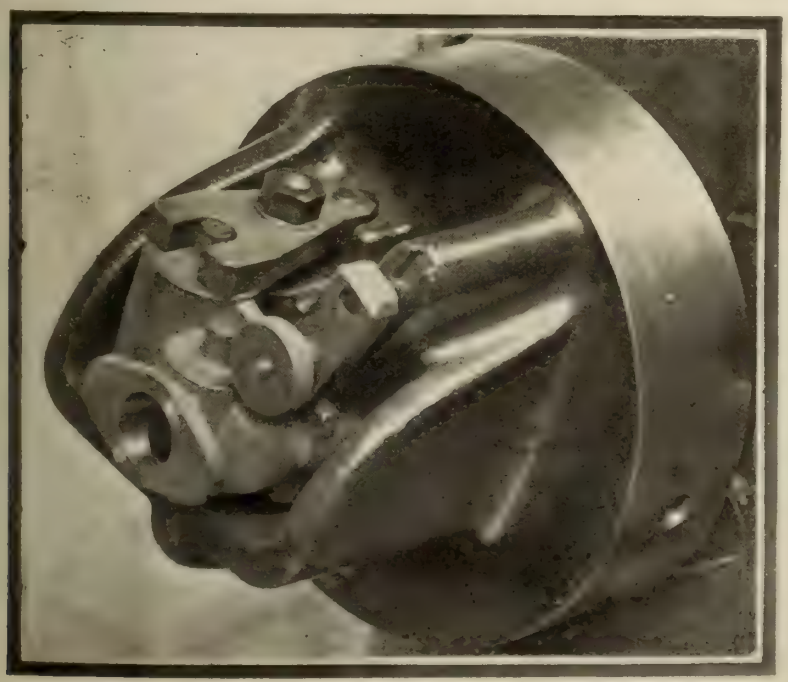


FIG. 9.—ANGLE PLATE FIXTURE FOR CARBURETOR BODIES.

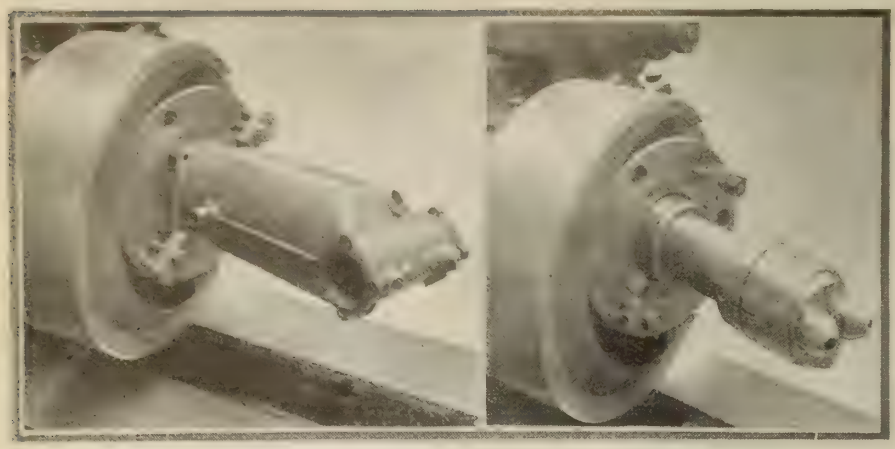


FIG. 11A—LEFT HAND VIEW. SKEWED INDEXING FIXTURE FOR AERO-ENGINE CYLINDERS
FIG. 11B.—RIGHT HAND VIEW SHOWING THE CYLINDER REMOVED.

machined at a previous operation. The casting is clamped down on to a short spigot, locating in the float chamber bore, the clamp having a slot in it, so that when the nut is released sufficiently to allow the casting to be raised from the spigot, it can be taken straight out. The other clamp is operated by a knurled nut, and serves to swing the casting around to an adjustable locating point at the rear. A partial turn of the nut is sufficient to allow the clamp to be slid out of the way and allow the casting to be removed from the fixture.

### Indexing Fixtures

We cannot leave the question of fixtures without discussing indexing fixtures. A very good example is depicted at Fig. 10. This shows an operation on the crankcase of the "Le Rhone" rotary engines. In this engine the cylinders are radially disposed round the crankcase, and are secured in position by screwing them down into their seating. The operations consist of boring, bossing, facing and screwing, and in connection with the latter operation it is necessary for the thread to start from the same point on all holes, so that the cylinders screw down into alignment with the valve tappet mechanism. The work was done on a No. 9 combination turret lathe, and the indexing fixture was designed by Messrs. W. H. Allen of Bedford. In the fixture is a central pillar bored out and fitted with a steady bush which serves to pilot the boring bars used at this operation. The screwing is done with a Coventry collapsing tap which is started by connecting it to the chasing saddle. This fixture provided a boldly conceived method of doing an unusual job in a rapid manner.

The peculiar indexing fixture shown at Fig. 11 was designed to hold the cylinders of the Rolls-Royce "Eagle" engine whilst boring the valve holes in the head. The work is located by an expanding peg and is also clamped down on a faceplate. In the flange of the cylinder there are two accurately spaced dowel holes of unequal diameter which locate the cylinder on the crankcase. The smaller of these two holes is utilized to locate the cylinder in the first position on the fixture by means of a dowel on the faceplate. When the first hole has been bored, the clamps are swivelled out of position (as shown in the view of the fixture with the cylinder removed), the expanding peg is released, and the cylinder rotated by hand through approximately 180 deg. The actual location for the second hole is done by pushing a hardened plug through the finished valve hole, thus lining it up with a locating hole at the front of the fixture. When in the second position, the dowel is in the large hole, so that it does not influence the location.

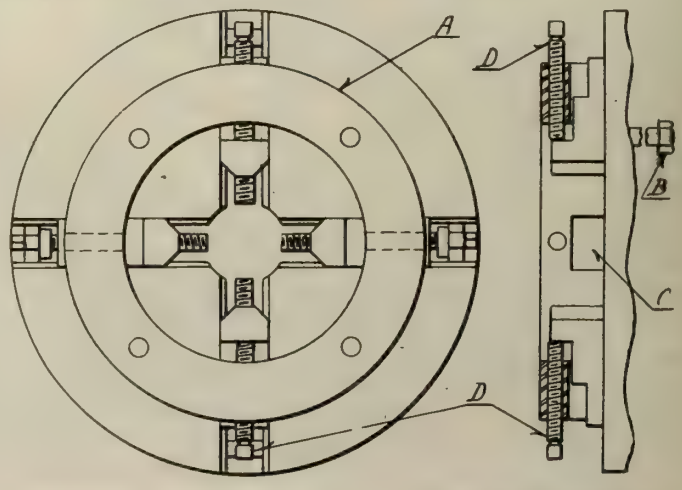
### HEAT TREATMENT OF STEEL

According to Scientific Paper No. 395 of the U.S. Bureau of Standards, the experimental results obtained by the Bureau regarding the relation of high temperature treatment of high-speed steel to secondary hardening and red hardness appear to warrant the following conclusions: (1) Secondary hardening necessitates prior partial austenitization produced by the high-temperature treatment; (2) the variations with heat treatment in physical properties and microstructure of high-speed steel are analogous to those of hypereutectoid carbon steel with the exception of the microstructure of hardened but untempered steel; (3) red hardness is largely a function of the composition of the matrix, and is only comparatively slightly affected by the amount of dissolved carbide. Three reasons are given for the established advantages derived from the use of the high-temperature heat treatment—namely, increased red hardness, increased initial hardness, and reduced brittleness.

# *Increasing Grip on the Work*

Chuck jaws after long service become worn owing to the frequent gripping of work on the extreme end. When working on heavy jobs the grip seldom takes place along the entire jaw, the result being loss of rigidity and tool troubles. To remedy this on a particular job some time ago we had recourse to the idea here shown.

A ring A of suitable size was faced on one side and slotted at four points for jaw clearance C, and secured to the chuck face by four bolts B. Immediately over each jaw a screw D was located so that the "slack" could be taken up and the necessary pressure applied to give a parallel and firm grip.




*Canadian Machinery*

# One Method of Producing Steel Barrels

## Importance of Steel Used in Manufacture—Press Operators—Two Styles of Reinforcement, Rolled on Body, and Separate Hoop—The Detection of Leaks—System of Galvanizing.

By J. H. MOORE

THE relatively short life of wooden barrels, together with the steadily increasing cost of wood suitable for barrel making, has, within the last few years, greatly increased the popularity of the steel barrel. Experience has proven that steel barrels are unusually well suited for many classes of service, and although various concerns may turn out a similar product in an entirely different manner, the sequence of operations are of rather standard style. We make this explanation so that it may be quite clear that we are not telling "How to make steel barrels," so much as we are narrating the method employed by the W. D. Beath, Ltd., Toronto, Canada. This concern has been producing steel barrels of different sizes for some considerable period, and have embodied the very best practice obtainable through such experience.

### The Steel Used

Hot rolled steel is, as a general rule, used for making steel barrels, and three pieces of steel are required to complete a barrel. When we say three pieces, we do not infer that there are only three pieces to a barrel, but what we mean is this, that there are three main pieces, namely, the body, and the two heads, sometimes called the top and bottom. As a rule the body material is made from 13-gauge stock, and the heads from 12-gauge material.

The raw material arrives at the plant in sheets of such size that those used for body making only require a slight amount of trimming under a squaring shear. The sheets from which the heads are drawn are usually made in a size that allows the blanking and drawing of three heads. This style of sheet is easy to handle, and economical. The chemical composition of barrel steel is perhaps the most important factor in successful barrel making. Poor steel means endless trouble, in the shape of faulty seams, cracks and so on. For this reason the concern we speak of are very particular regarding the stock they use.

### Making a Barrel

Let us suppose we are going to watch the making of a barrel, right from the raw stock to the finished product, the barrel being of the galvanized variety. We shall commence with the body, digressing when necessary to the making of the heads.



THIS VIEW SHOWS A TYPICAL EXAMPLE OF BARREL, TOGETHER WITH A SEPARATE TOP AND BOTTOM

The raw material for the body comes from the stock room in sheets, as already described, that require only a slight trimming on the squaring shear. After squaring they go through what is termed the first rolls, and there they are rolled, after which they are seamed by a welding torch as shown in the photograph. A complete line of these torches and welding stands are installed and the line presents a very busy appearance indeed. After the seams are welded, the partially completed barrel takes various steps, depending on its nature.

For example, two types of barrels are made, the reinforced type of barrel, with a steel hoop placed near the top and bottom, and the type which has merely a reinforcement rolled in the body stock itself. The former type is, of course, the stronger, but for some purposes the latter is just as good, and is less expensive.

Should the barrel be of the reinforced steel hoop type, here is what happens. The rolling hoops, as they are called, which are made from flat stock, are rolled, then welded. They are next placed over the body of barrel in correct position, and go into an expanding machine which presses out the stock, gripping the reinforced hoop securely. Later, a band header raises a bead on the body, partially around the reinforced hoop, this making everything secure. On barrels that have no reinforced rolling hoops, the form of reinforcement is rolled on the body itself by means of a siutably formed pair of rolls.

Leaving the bodies for a short time, let us discover how the heads are made. As stated before, three heads are cut from one sheet, and these are cut out on a circular cutting machine. They are next embossed and lettered on a huge Toledo press, and a word of detail regarding this set of dies would not be amiss.

It is no doubt already well known that in turning out barrels such as this, it is necessary that every barrel have a number. The name of the firm for whom



LEFT HAND VIEW SHOWS A PORTION OF GALVANIZING ROOM. RIGHT HAND VIEW DEPICTS THE MAKING OF A BARREL HEAD ON THE PRESS.

the barrels are being made is also usually embossed on the head, and it is for this purpose that the die about to be explained is made.

The idea for the design of these marking dies was really obtained from the way in which a typesetter assembles type for printing. These dies have, however, an advantage over ordinary type insomuch that they can be used over and over again in various combinations and produce any desired marking on the work. It will be apparent from the photograph shown just what style of marking is accomplished. The dies consist of steel blocks, each of which carries a number or letter of the desired size. These die sections are made in pairs, one letter, or figure, being in relief, while the other is cut into the face of the die block. One stroke of the press, of course, completes the impression on the head, which appears in relief.

The heads are next placed on another similar Toledo press, and a flange of about 1½-inch depth all around is drawn, this being for the bottom only. The top heads are of slightly different construction, and have a raised portion on the same, also two holes are punched on this piece. The photograph accompanying the text illustrates clearly the construction of both heads. The nipples are now welded to the top heads on special stands.

### Assembling Barrels

The heads are next inserted into the body, a special reinforcing ring is placed at the same portion, after which they are rolled into place on a vertical seam rolling machine. Following this seam rolling operation, the edges around both the top and bottom are welded. This operation is also shown by photograph.

This practically completes the barrel with exception of testing, and this operation is performed in the following manner: Every barrel is tested to 15 or 20 pounds pressure, and compressed air is used. To detect leaks, if any, soapy water is used, and, of course, should



BUSY AT WORK WELDING THE SEAM AT TOP OF A BARREL.

there be a leak it soon bubbles up. Having been tested, and taking it for granted that the barrel has to be galvanized, it is passed on to a cleaning machine, which takes out all dirt from inside of barrel. From here it passes into the galvanizing room, and enters the pickling baths, where it stays from 20 minutes to half an hour at approximately 150 degrees temperature. It next goes to a drying oven and is dried.

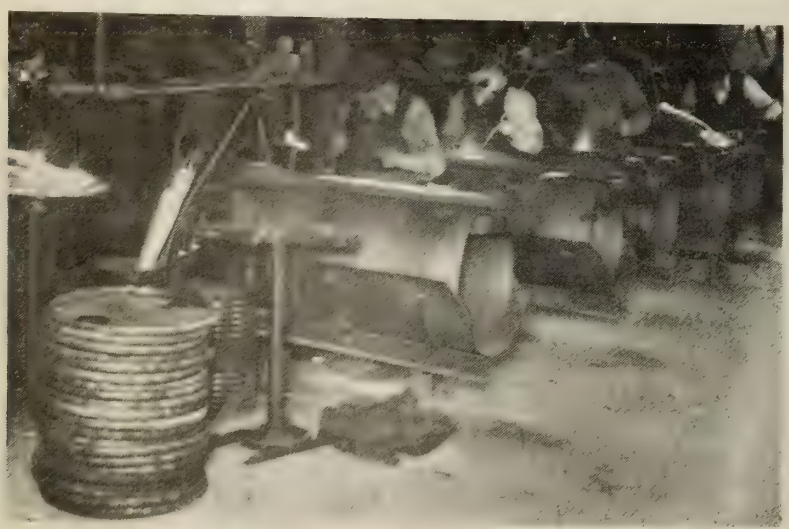
The barrel is now ready for galvanizing, and briefly speaking here is how this concern dip their barrels. They have an ingenious carriage idea arranged over their tank, and we have illustrated this by photograph. Placing the barrel on the carriage shown, the operator pushes the same up the incline, over the tank on to hook shown, then dips.

The tank containing the galvanizing solution has a coke fire all around it, and it is very important that the galvanizing metal be kept at the proper temperature. After galvanizing, the barrels are unloaded from the tank by reverse of process already explained. To take any pieces of scale, or hardened spelter, from the inside of barrels, a suction arrangement is used, very similar to an ordinary suction sweeper. This removes all dust or scale in very short order.

### Other Operations

Should the barrels be of the painted type, no galvanizing is necessary, and they are dipped in a tank of asphaltum paint, then dried. This concern use a Davis 300-pound capacity acetylene generator, which produces 300 feet of gas hourly. The method of linking up their oxygen cylinders is also worthy of note. The cylinders are linked up in series of 10, and two groups are arranged. All the welding torches are fed from these groups, and as soon as the one group is exhausted the other series is switched over and a new line of cylinders installed to replace the empty ones. In this way there is no delay at any time.

For other classes of work they have a Lincoln electric welder, and the writer viewed a fine example of electrically welded galvanizing tank made by this concern themselves. A notable feature in the making of these barrels is the fact that once the stock is on the move it goes right through with no back motions. By this we mean that the operations are so arranged as to keep the work moving towards the final operation, without any return routine. The heads of barrels go down one side of the plant for a certain distance, while the bodies go down the other side for a like distance. At a certain point they meet and from there the barrel follows the operations already spoken of. Some 500 barrels are completed every nine-hour day.



A PARTIAL VIEW OF THE BODY SEAM WELDING DEPARTMENT.

## CHIMNEY TEMPERATURES

An instrument has been produced for ascertaining the temperature of a chimney at various depths. The apparatus consists of three tubes extending to various depths, and enclosed in a long, pointed steel case. These tubes end in bulbs, and are filled with alcohol. At the upper end of the instrument are three dial temperature indicators, each connected to a tube. The scales on the dials range from 32 deg. to about 200 deg. Fah., and are colored black up to 120 deg., but upwards from that temperature the color is red, indicating excessive heats. If several of these devices are forced into a coal pile at varying depths and in different localities, accurate information can be gathered for the whole of the pile. It is stated that instruments employed at intervals of 50 ft. have proved very effective.

# Various Clamping Units of the Slip-on Type

*By F. Scriber*

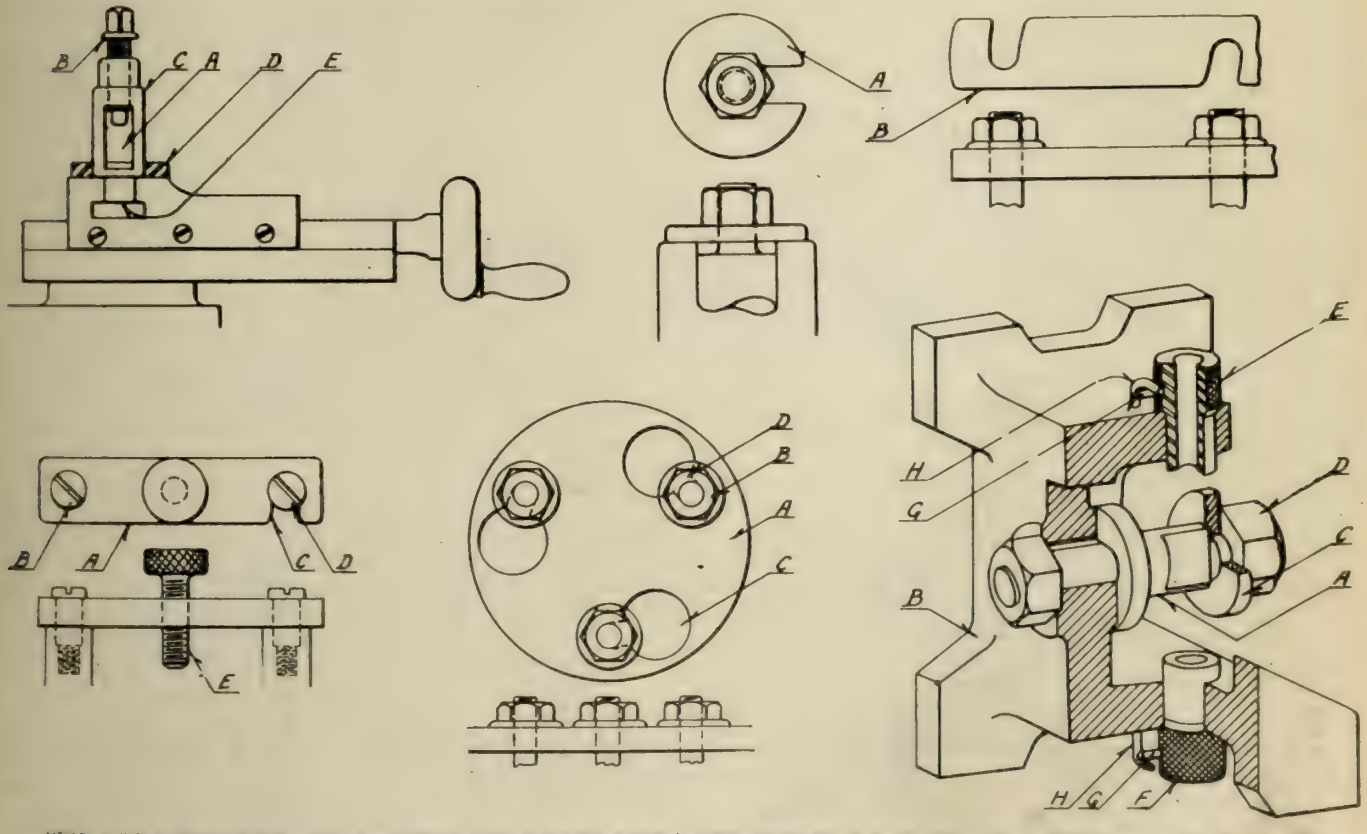
IN DESIGNING nearly all classes of jig work it is considered advantageous to have the clamping parts arranged for quick removal of the work. Methods of accomplishing this vary considerably and it is the object of this article to describe a number of different types of slotted collars and slotted clamps. Referring to Fig. 1, the illustration at the left shows a clamp which has the hole cut out so as to form a slot. In making this collar it is the usual practice to have the nut which clamps the collar of such a diameter that the work will pass over the nut without removing the same, therefore it is necessary to loosen the nut slightly, when the clamp can be removed by turning the same about its axis, so that work placed under it may be readily removed. This arrangement is often made with both slots cut from the one side.

Fig. 2 shows a round plate A clamped by three nuts B; holes C, suitable to clear these nuts, are drilled in this plate with slots connecting the main bolt holes. Turning this plate about its axis so the holes will line up with the nuts permits removal of the plate, while turning it so that the nuts are over the slots, as illustrated, places the plate in the clamping position. Circular plates of this type are often made with quite a number of holes and bolts, while they are also made in rectangular and other shapes.

A modification of the design shown in Fig. 1 is illustrated in Fig. 3; this consists of a hinged clamp A, which pivots about a screw B, and when in a clamping position the slot C passes over the head of the screw D. The work placed between these screws is then clamped by the knurled screw E. Various modifications of this design will readily suggest themselves in tool design work.

Fig. 4 is an example of the slip collar principle shown in Fig. 1, as used in a drill jig. In using this tool, work which has a hole in it is slipped over the stud A, this stud being clamped into the jig B, the stud being keyed in place to prevent it from turning. When the work is located on the stud the slip collar C is put in place in the manner described in Fig. 1, and the nut D tightened to securely hold the work in place. Two slip bushings, E and F, guide the drills used for drilling the work and these slip bushings are prevented from turning by pins G and hooked pins H.

Collar design that is in general use on lathes is shown in Fig. 5. This design can frequently be used to advantage for holding work in jigs, and it is with this object in view that it is here shown. In using this arrangement the object is to place a cutting tool in the opening A, when by tightening the screw B, the post C is pulled up causing the tool to be wedged against the collar D, the other surface which takes the clamping strain being the upper side of the tee-slot E, and as previously mentioned, this adaptation in varied forms can often be employed to solve tool, jig and fixture problems, one modification of this being to have the post itself carried on a hinged pin so it will align itself when clamped.




FIGS. 1 TO 5 INCLUSIVE. FIG. 1.—UPPER RIGHT HAND VIEW. TWO CLAMPING METHODS FOR QUICK REMOVAL OF WORK
FIG. 2.—LOWER CENTER, SHOWING SLOTTED DISC FOR REMOVAL OF BOLTS.
FIG. 3.—LOWER LEFT HAND VIEW SHOWING SWIVEL COVER, OR SLOTTED PLATE CLAMPING DEVICE
FIG. 4.—LOWER RIGHT HAND VIEW. JIG SHOWING SLOTTED COLLAR CONSTRUCTION.
FIG. 5. UPPER LEFT HAND VIEW TOOL CLAMPING COLLAR USED ON LATHES.

# Making a Bent Ring Cleat on the Bulldozer

## Coiling the Stock—Cutting the Coils Into Rings—Inside Diameter Important, Otherwise Subsequent Die Operations Will be Poor—Light Drop Hammer Used, also Bulldozer.

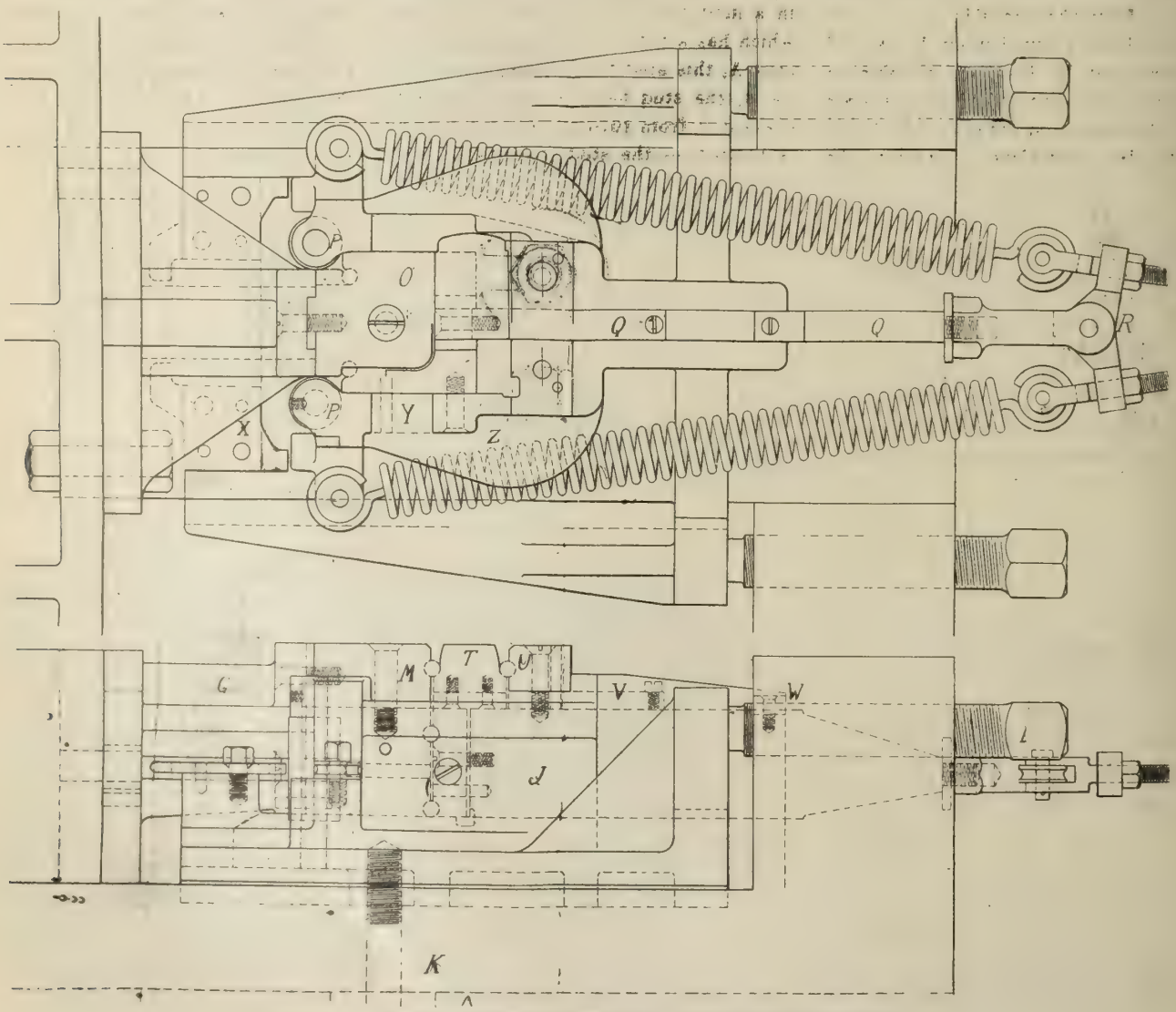
By G. LAIDLER

THE accompanying article and illustrations describe an interesting method of making bent ring cleats. The piece to be made is a welded ring of 7/16 inch diameter soft steel, the final shape and dimensions being those shown in Fig. 1. The straight rods are received in commercial lengths and the first operation is the winding of the rods around a suitable arbor in the form of a spring, which are afterwards cut into rings with the ends overlapping. The coiling of the rod, shown in Fig. 2, is accomplished in a simple winding machine, which consists of a belt-driven head and a cylindrical mandrel, the diameter being slightly less than that desired for the inside of the rings. The end of the rod is driven by a pin in the flange of the head, and the stock is drawn over a grooved roller as the machine revolves. The work produced is in the form of a helical spring.

Cutting the coils into rings is performed as shown in Fig. 3, a press being utilized for this purpose. The top shear has its cutting edge inclined at a slight angle to the plane of the coil. The body of the spring is held in the hand of the operator with its axis horizontal, against the face of the block A, fixed to the bottom bolster of the press. This cutting block is shaped to support the coil on the inner circumference, and to suit the free face due to the pitch of the helix. The sheared end of the coil is held against a vertical shoulder on the block, while the descending upper shear blade severs the coil at a point a few degrees beyond the complete circle and at a bevel, thus forming the overlap that afterwards is used to make the weld.

It is essential that the inside diameter of the coils be produced to accurate dimensions to insure successful work in the subsequent die operations. Each coil, therefore, is gauged after cutting, by placing on a circular block which is shaped to the inclination of the overlapping end. The operator discards all rings not conforming to the limited tolerance.

The rings are then heated in a furnace conveniently located to a light rope drop hammer fitted with suitable welding dies. The dies are made to envelop about two-thirds of the circle, the remaining third providing a hold for the operator's tongs. The lower die has a tapered central portion D, which stands




A DETAIL VIEW OF THE FINAL BENDING OPERATIONS.

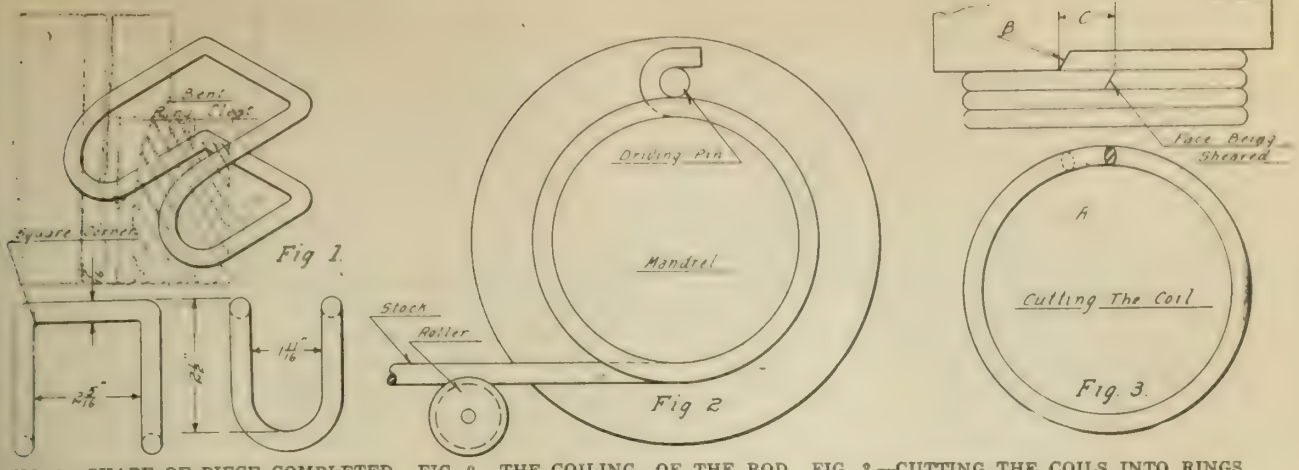



FIG. 1.—SHAPE OF PIECE COMPLETED. FIG. 2.—THE COILING OF THE ROD. FIG. 3.—CUTTING THE COILS INTO RINGS.

well above the diameter of the round stock of the ring, so that the ring may readily drop into place against the quarter circle radius at its base. The upper die E is correspondingly recessed, and where the weld F occurs the dies are shaped so as to spread the extra metal over a greater part of the circle than that occupied by the initial lap. The welded ring is now about 4¾ inches inside diameter.

### Final Operations

The final operations of bending and flattening the ring are performed in a bulldozer fitted with the special two-purpose dies here described. The long horizontal stroke of the bulldozer is particularly adapted to this class of work. The forming dies consist of a moving diehead G, which is bolted to the ram of the machine, and a stationary die-holder and component parts which are clamped across the bed and bear against the end thrust screws L. The moving dies are in two parts: the upper block M designed to press the circular ring into an elongated shape as the first operation. The lower block N forms this elongated ring into the final shape A as the second operation.

The stationary die-holder has a recess O fitted with inserts grooved to envelop the outer faces of the finished piece. At each side of the entrance are guide rollers P, to give an easy bending movement to the yielding piece. In the center of this die-holder a slot is provided for the slide bar Q, the movement of which is controlled by two heavy adjustable tension springs acting on the compensating bridge R, fixed to the end of the bar. The front of the bar carries a clamping die S, which is normally pressed out ahead of the rollers, but which forms part of the forming die when pressed back. On the top of the bar slides is the centering block T, around which the ring is flattened against the stationary piece U, grooved to suit, and forming a tangent to the semi-circular ends of the flattened ring. This block has a stem V that works in a groove under the rear piece U, and the block takes part of the forward movement of the slide bar by contact of the stem with the projecting lip W. The front part of the stationary die has lugs to which the stripped plates are attached. The stripped fingers run in side grooves of the lower moving die. The rear part of one of the strippers is shaped to serve as a gauge for the flattened ring when inserted for the final operation. The bodies of both die-holders and moving die-head are made of cast iron, and parts coming in contact with the red hot ring are made of high speed steel.

Fig. 6 shows a sketch of the sequence of operations for the forming of the ring. With the moving die-head withdrawn the slide bar Q and clamping die S project ahead of the stationary die, and the centering block is in its forward position. The heated circular ring is placed over this centering block, the clutch tripped and the upper moving die M flattens the ring around the centering as it moves toward the rear block U. When the ram recedes the flattened ring is removed by tongs on its projecting end. The ring is now turned into the

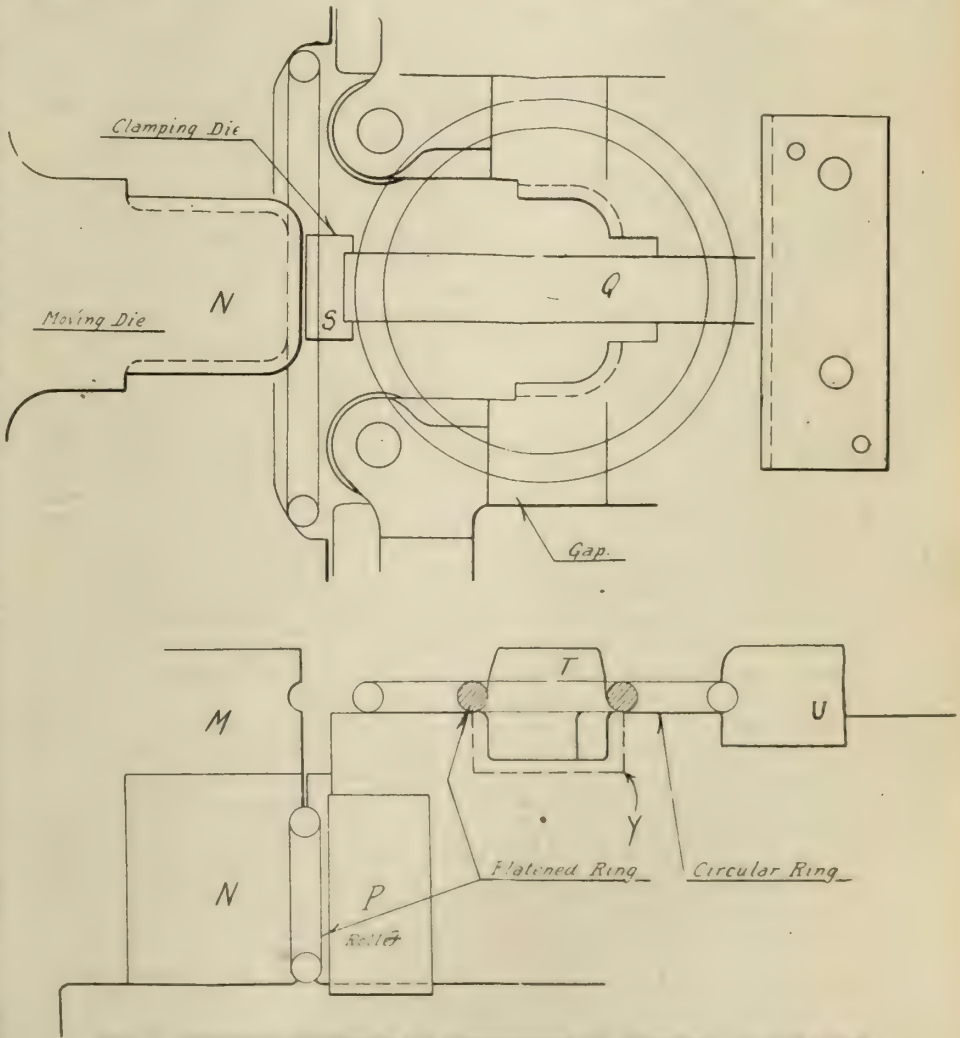
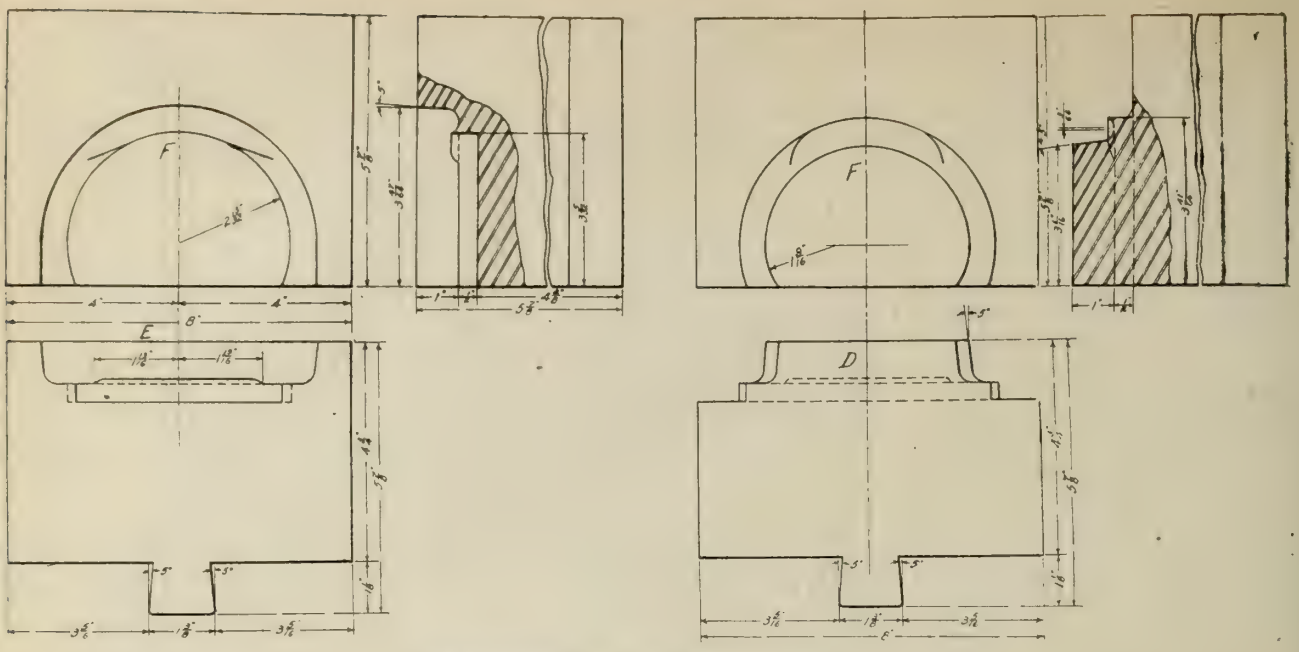



FIG. 6.—SHOWING SEQUENCE OF OPERATIONS IN FORMING OF THE RING.




THE WELDING DIES USED ON THE RING.

vertical plane and set in front of the rollers, the far side against the gauging face of the stripper. The clutch is again released and the lower moving die N advances, gripping the center of the ring against the clamping die S, while the ring is bent around the rollers P and forced into the dies O. As the ram retires, the clamping die, under the tension of the controlling springs, keeps the bent ring on the moving die until the fingers of the stripper retard the piece and permit it to fall clear on to the sloping flange of the stationary die. The centering block on top is meanwhile advanced to its forward position ready for the following ring to be flattened.

Two rings may be passing through the machine at the same time, but as it is advisable to place the weld so that it will come on the straight portion of the finished work, it is probably more advantageous to make one operation per stroke, as the machine can then be run continuously.

## WHY DID IT BREAK?

MANY a steel treater and tool designer has asked himself this question after the failure of some particular part which was being hardened. Sometimes he discovers the trouble, but generally it remains an unsolved mystery.

At a joint meeting of the American society for steel treating, Toronto chapter, and the American society of mechanical engineers, Ontario section, held in Toronto February 11, this subject of breakage was ably discussed by Howard J. Stagg, assistant manager of the Halcomb Steel Company, Syracuse, N.Y. His talk was illustrated by lantern slides, and splendid examples of failure, due to various causes, were shown on the screen.

Particular stress was laid on the point of inefficient design, and the mechanical engineers came in for a good natured call down. "Engineers in general," commented Mr. Stagg, "are well aware that sharp cornered keyways, sharp angles and sudden change of section are all to be avoided as far as possible, yet they will persist in calling for them on their drawings."

To prove that keyways are a real source of danger, several slides were shown which clearly illustrated that the failure of parts containing sharp cornered keyways always occurred, and started from the sharp corners. The illustrations covered varied styles of work and proved that the point raised was absolutely correct. In every example the remedy was the same, namely, to place a small radius at the bottom of the keyway. The speaker claimed that some concerns were finding it a good plan to make their keyways semi-circular in shape, rather than with the regular straight edge.

Further slides brought out the danger of damaging a piece of steel while grinding. "Even the slightest indent, hole, nick or notch in a piece of steel that has to be hardened is dangerous," said Mr. Stagg. He went on to prove this statement by showing examples of parts that had cracked owing to all of the above mentioned causes. The grinding examples were particularly interesting, and the slides clearly proved that a wheel should be carefully selected to prevent this trouble arising. Not only must the wheel be selected as to grain, etc., but the surface, or face, of the wheel should be kept true and clean. Dirt causes friction, friction causes scratches, and providing the dirt is hard enough, and large enough, the nick becomes almost a small groove. It was surprising to note the amount of damage that could occur from these small cracks.

### Never Hurry

The danger of hurrying hardening operations was also covered. "Never hurry a job," commented Mr. Stagg. "Heat slowly, uniformly and thoroughly, to the minimum temperature required for tempering. Quench and draw the temper immediately after hardening." This statement was repeated time after time during the evening, and as the speaker frankly remarked, "Let that thought sink in, and the evening has been well spent." Various slides were shown that proved conclusively this danger of hurry.

In order to emphasize the importance of slow and even heating, a chart was shown that depicted the fact that up to a certain critical point steel expanded. After this point the steel contracted for a short time, then expanded once more. There is no need to go further into this at the present time except to say that the speaker gave these figures to prove his contention for the necessity and advisability of drawing the temper immediately after hardening.

If a volume in its original state is, say, one inch, the volume after quenching is 1.00077 inches. When drawn immediately after hardening, the volume returns to .99999 almost to infinity, or, in other words, returns practically to its original state, this, of course, relieving internal stresses.

The various slides throughout the talk were of such real merit and value to the designer and mechanic alike that we made arrangements to secure photographs of the best of these, together with detailed data on each example. This will be published in a later issue and should prove of decided interest to our readers.

Officials of the Canadian Government Merchant Marine recently announced a general reduction in cargo rates on goods and materials leaving Canadian ports for Great Britain. The new rate will be 40 cents a cubic foot, or 75 cents per hundred pounds. This is a reduction of about 20 per cent. over the rates formerly in force.

# Long Line, Group, and Individual Drive

## The Question of Transmission is a Many Sided One. The Three Methods Are Discussed, Actual Figures Being Given to Illustrate and Verify the Statements Made

By R. F. JONES, Research Director for Leather Belting Exchange *

THE question of the most economical and efficient method of transmitting power from the prime mover to the machine tool is still one which has many reasonable arguments for each system of transmission. The industrial engineer has to study the question from its many sides and decide which is the best for his plant, according to the individual problems which he has to solve.

The three systems in use at the present time are:

1. The long line shaft, which drives the individual tools, and, which in turn is driven by the prime mover.

2. The electric system of driving each tool by an individual electric motor.

3. The electric system of driving certain groups of tools by an electric motor through a short line shaft.

The long line shaft running from one end of a factory to the other is the time honored method of distributing power throughout the plant. This system is still in use for many processes of manufacture, and probably will continue to be used for a good many years to come in certain kinds of plants where it is especially well adapted to the work. But for machine shop and machine tool driving the long line shaft is practically obsolete. The line shaft has to be too long to permit good alignment of the bearings, so that the friction loss is apt to be large. However, it has the advantage of low initial cost, and in these days of excessively high prices this is a serious consideration.

For the purposes of the ordinary machine shop or factory the choice of drive now lies between the individual motor system or the group system of driving. In either case electrical power is practically always used. Often an engineer can employ both to advantage, the group system being used for the bulk of the smaller machine tools, and the individual motors being used on the few larger machines, such as those requiring above ten horse-power. The engineer in making his decisison will be governed largely by such considerations as first cost, maintenance, depreciation, provision for extension, efficiency of the system, sectional operation, flexibility as to location of tools, and positive application of power.

Individual electric driving of each machine tool came into practice some years ago and gained much headway, but in recent years the trend has been more to the group drive, with the individual drive for the larger tools. The initial cost of the individual drive is much greater because of the high cost of manufacturing small units and because of the large total power required.

The following remarks are from a well known encyclopedia and state the general trend of opinion on this subject:

"The individual motor drive with a separate motor attached to each machine makes an installation expensive, and although this form of drive is the most flexible it is frequently giving way to the group drive for light machine shop work.

"The horse-power of the motor required for group driving is much less than the sum of the horse-power required for each individual tool. The reason for this is that some of the machines are idle, and others consume only a small amount of power at the same time, when the remaining machines absorb the maximum amount. Actual experience has shown that for group driving in an ordinary machine shop, a motor of ¼ or 1-5 of the total H.-P. of the motors required for the individual machines is sufficient."

### THE THREE SYSTEMS

The systems discussed are as follows:

The long line shaft, which drives the individual tools, the shaft being driven from a prime mover; the electric individual motor drive; the method of driving certain groups of tools by an electric motor through a short line shaft.

It is easy to see that the initial investment is materially reduced by using the group system, because the added shafting and belt required is not nearly as expensive as the large number of small motors. Experience has also proved that maintenance and depreciation costs are also less with the group system.

### Advantages Claimed

The principal advantage claimed by advocates of the individual electric drive is that it gives a closer speed adjustment of the tool to the work, so that the workman can be running his machine at its maximum output a greater proportion of the time. Most of the smaller individually driven machines are driven with belts by small constant speed induction motors. In this case no advantage in speed regulation of the machine tool is gained because we still have to use gears with a fixed number of speed changes, the same as we would if the machine were driven from a countershaft with cone pulleys.

With the direct current motor driving through gears we can obtain some speed regulation between the steps of the gears by changing the field strength of the motor. However, closer speed regulation than we get with the modern lathe, where eight speeds is common, and where sixteen can easily be obtained with a two speed countershaft, is a very doubtful advantage, because of the many other variables such as the shape, sharpness, and composition of the cutting tool, which affect the rate of production.

In order to eliminate the cone pulley or the gears, builders of electrical machinery have designed motors for use with machine tools, whose speed range is as great as six to one. These motors are intended to drive the machine direct, and accomplish speed changing by field and armature control. In machine tool work such as lathes and boring mills, the rate of cutting the metal is about the same for any one metal regardless of the size of the piece. If the piece is large the rotary speed will be low, but the motor will have to supply just as much power at this low speed as it does at the highest speeds. Since the power delivered by an electric motor increases with the speed, it is apparent that for a motor to deliver full power at its slowest speed it will be capable of delivering unnecessary power at its highest speeds.

Mr. Alexander Gray, Professor of Electrical Engineering at Cornell University, in his book entitled, "Principles and Practice of Electrical Engineering," gives examples to show the increase in cost as the speed range is increased. He states that a ten horse-power, 220 volt, 1,200 R.P.M. motor will cost 66% more if it is built to give ten horse-power at speeds ranging from 600 to 1,200 or a speed ratio of two to one, and 160% more if the same power is desired at speeds from 300 to 1,200 or a speed ratio of four to one. A four to one ratio is a small range of speed for ordinary machine tools, and yet it increases the cost of the individual motors two and six-tenths times when this system of speed control is used. It is evident that this extra initial cost will not be justified in the average shop.

The multiple voltage systems, which are designed to give the speed changes, by using several different terminal voltages also require oversize motors, so that the increased investment required

*A paper read before the National Association of Leather Belting Manufacturers.

by such a system is also not justified in the average shop.

### The Group Drive

On the other hand the group drive requires only one motor for each group which runs at a constant speed so that either direct or alternating current can be used. This motor drives a short line shaft, which in the modern installations is hung with ball bearing hangers. Line shafts of this type waste very little power, and are a great contrast to the old type which ran the entire length of the shop, and sometimes used up thirty or forty per cent. of the power of the prime mover. As the large motor is five to ten per cent. more efficient than the small individual motor and is also running much closer to its most efficient load, it will save enough power to more than make up for the small loss in the line shaft. Several tools of the same kind are usually grouped together, and space can be left for the addition of new machines. If the engineer wants to put in an additional tool here and there he can easily add to the group. If it is necessary to install several new machines they can be put together and a new group started. In this way expansion is readily accomplished.

The individual drive has a slight advantage if only one machine is to be operated. This is usually provided for by having a few of the individually driven tools in the shop to be used when the groups are not running. With such an arrangement we combine the advantages of the individually motored machine with the economy of the group system.

Advocates of the individual electric drive claim that it has an advantage when arranging the machines to fit in with the continuity of the manufacturing process. A good engineer when originally laying out a plant by the group system will have little trouble in placing his machines so that they accomplish this end. The overhead shafting and the vertical belts are often considered as a disadvantage because they interfere with the light. This may be true in old fashioned and poorly designed shops, but with the modern high ceilings and large windows such as we find today it is rather absurd to say that a reasonable amount of belting and shafting will seriously interfere with the light.

### The Belt as a Medium

The group system also has the advantage of having the power transmitted through belting. A belt is a very valuable medium to have between the source of power and the machine, because it often acts as a safety device by slipping off when the machine becomes heavily overloaded. The belt also cushions the machine tool by stretching and slipping when the power is suddenly applied. At first many individually driven machine tools were direct driven by gearing to the motor. This gave an advantage of positive power at all times, but it was soon found that without the belt, serious damage was apt to be inflicted on the tool or the motor when subjected to heavy overloads. Nowadays a short belt is often used instead of the gears, but since the motor is usually high speed and the motor pulley small, the belt has to be kept very tight. Journal friction and wear on the belt are increased thereby with a corresponding increase of maintenance costs.

Too often the salesman of the individual drive will compare the modern efficient methods of the electric transmission with older mechanical installations in which the line shaft losses rose to a high figure. To be strictly comparable the equipment should be modern in both cases. These unfair comparisons have led many people to believe that an individual motor for each machine gives the most efficient and economical transmission. The modern well informed engineer knows that the group drive system combined with a few of the larger machines, individually driven, will cost less and show greater economy of production than the shop equipped throughout with individually driven machine tools.

Frederick Taylor, widely known industrial engineer and famous for his work on shop management, published the following statement in the Journal of the American Society of Mechanical Engineers in 1909:

"The belt is one of the oldest and most commonplace of the elements used in shop practice, so that engineers designing new establishments or remodeling old ones, who wish to be up to date, naturally incline toward the use of the electric drive rather than the belt. There is no doubt, however, that this has led to the use of the electric drive in many instances where the belt would be far more economical and satisfactory in almost every way.

"In the average machine shop, for instance, the writer is prepared to say that for more than half of the machines the belt drive can still be used with greater economy and with more satisfactory results than the electric drive; only on the assumption, however, that the belting is systematically cared for.

"It has been shown by an accurate record kept through a long term of years that in the average machine shop the average cost per belt per year is $2.25. This includes the original cost of the belt plus all the labor and materials used in maintaining, repairing, and cleaning it throughout its life. No similar statistics for the maintenance and renewal of the motor drive seem to be available, but I think that no one will contend that the latter can in any way approach this economy.

"In large machines economy lies on the side of motor drive in many instances, but with almost all small machines the belt drive should still be used."

Mr. Taylor was regarded as an authority on shop management and he has done some of our best work along this line. He was the first man to make a scientific investigation of manufacturing problems, and his belting records are regarded as the best and most extensive information obtainable on the economic use of belting. His endorsement of the belt drive should carry great weight with the manufacturer who is planning a new shop.

In view of these facts it is apparent that the group drive offers practically all of the advantages of the individual drive, besides having the big advantages of much lower first cost, slower depreciation, and lower maintenance charges.

### POINTS BROUGHT OUT

That the horse power of the motor required for group driving is much less than the sum of the horse power required for each individual tool.

That the overhead shafting is not such a disadvantage as it is claimed to be, especially in modern shops where the lighting conditions are more favorable.

That belts to be efficient should be properly cared for.

That the cost per belt in the average machine shop is $2.25 per year. This includes original cost, plus labor and material used for maintenance, repair, etc.

That in large machines economy lies on the side of the motor drive, but on small machines the belt drive should still be used.

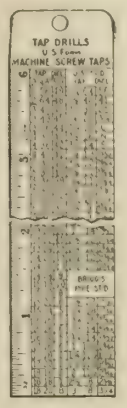
### WOOD TURNING TOOL

A handy tool for turning wood on slow-running lathes is described and illustrated in British Machine Tool Engineering. It takes the form of a thin conical cup of steel, with its base uppermost. The cup is fixed to a holder and is used in the slide rest. It is said to give a good clean finish, even to soft wood, when the work is running at speeds usual in metal turning. To give the finest finish the tool should be set to such a height as to give very small clearance. For the final finish of wood rollers, either solid or lagged, a good method is to use a metal hand plane set to a very fine cut and held at an angle of about 45 deg. The plane should be made to slide cornerwise along the roller with only a small part of the middle of the plane iron in action. Carefully manipulated, this will give a finish equal to that which a carpenter gets planing boards on the flat.

The output of peat in Sweden is stated to be rapidly increasing. During the present year considerably over 400,00 tons have already been dug, corresponding to over 200,000 tons of coal.

# Have You Tried This Contest Yet? If not--- Do so Now

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.




The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

## What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

G. A. Todd, Penetanguishene, Ont., is the winner for the January 27th issue. He was the only reader with all answers correct. Quite a few were out on query No. 12, which read "A suggestion worth considering." On page 79 of that issue were these words: "If what you want is not here, write us and we will tell you where to get it." This was, to our mind, a suggestion worth considering. How about it? We appreciate the interest taken by readers in this contest, and will in every possible way make it interesting.

**CONTEST FOR FEBRUARY 17TH ISSUE**

**Contestants are required to write us, stating to which advertisements we refer in this number.**

1—Something that claims to make more—yet with less?
2—Something specially adapted to hard usage.
3—A pertinent question.
4—Something that requires no patterns.
5—How to save three important things.
6—Something that although not new is guaranteed.
7—How to solve your metal cutting problems.
8—Something that can be depended upon under all conditions.
9—An important request.
10—Something that actually has steel fingers.
11—A product of smooth appearance.
12—How you might cut 25 per cent. of your cost in castings.

**These are Correct Answers for List from January 27th Issue:**

1—The Consolidated Iron & Steel Mfg. Co.
2—Canadian Machinery.
3—Cleveland Pneumatic Tool Co.
4—Armstrong Bros. Tool Co.
5—J. C. McLaren Belting Co.
6—Canadian Asbestos Co.
7—John Hepburn, Ltd.
8—Canadian Driver-Harris Co., Ltd.
9—Gisholt Machine Co.
10—Landis Tool Co.
11—Armstrong-Whitworth of Canada, Ltd.
12—Canadian Machinery Buyers' Directory.

## Closing Date for This Contest is March 10th.

# John Gets a Lecture on "How to Run a Lathe"

## The Operation of a General Purpose Lathe—Text Book Lore and Actual Conditions in the Shop Sometimes Differ—Supporting the Work—Points to Watch—Using Plug and Ring Gauges.

By J. DAVIES

ONE of John's ambitions in life was to operate a lathe so that when the foreman told him they were getting pretty well caught up on planer work and asked him to operate a lathe he readily agreed to do so. When he got home to his father that evening he said, "I am going to try to run a lathe tomorrow and I want you to give me a free lecture on lathe work."

That evening John and his father got together for a talk. "Don't you think that the lathe is the most important machine in the shop?" John commenced.

"I couldn't say any machine was the most important," remarked his father, "but without accurate lathe work no modern machine shop can exist. It is capable of a larger variety of operations than any other machine in the shop, and it requires considerable care and skill to become a good lathe hand. It has been found that many operations can be more economically performed on a lathe which is specially adapted for some specific purpose, so that we have a number of lathes that are really special types in their own line, such as axle lathes, wheel lathes, turret lathes, etc. We will take for our talk the operation of a tool room, engine, or general purpose lathe, as any man that can operate a lathe on general work will have no difficulty in operating a special machine, the main principles being the same.

"Consider first the turning of a plain round bar, and deal with conditions as we find them; there is a world of difference between actual conditions as you find them in some shops, and what you read about in text books. This bar might have been cast in the foundry, cut off with the shop saw, or as it often happens, the saw was busy with another job, so the blacksmith just nicked it round with a chisel, and broke it off, leaving a nasty ragged end. The first thing to do is to face, or cut off the bar to the proper length. If the bar has a ragged end, don't waste time finding center with compass or jenny-legs. Put the bar in the chuck, passing the bar through the hollow spindle of the lathe, and leave just enough sticking out of the chuck to face or cut off.

### Supporting the Work

"If the lathe spindle should be hollow you will need to support one end with a steady head. If there is sufficient length to cut off, use a cutting-off or parting tool, but if there is not more length to cut off than the width of the cutting-off tool, use a side tool. Don't use a cutting-off tool any longer than is necessary, the length should slightly exceed half the diameter of the bar to be cut, the width from 3-16 in. to ¼ in. After facing the end the most convenient tool for centering is a combined drill and countersink to fit the tailstock, which is then fed into the bar with the tailstock spindle. A very useful tool is a centering tool. It is made of standard size tool steel hammered out like a flat drill, used in the lathe tool post like any other drill. It is indispensable for truing up the centre of an old shaft. The centering drill or tool should be at an angle of 60 deg., to suit the angle of the lathe centres.

"It is important to have round, smooth centers at the correct angles, as it is impossible to do good lathe work with bad centers. If the center is not made with a combination drill and countersink, a small hole should be drilled into the bar to ensure that the center will not ride on the point when the center hole wears a little."

"How about the centering machine we have in the shop, why not use it?"

"Use it by all means when you can, but you will often find the conditions just as I have described them. The first operation is to cut to length, then center; don't have your centers in a small projecting piece that will be cut off after the job is done, but rather leave your centers in the finished job, then it will be very convenient if it is necessary to put the piece back in the lathe at any time.

### Ready For Turning

"After centering we are ready to begin turning. Put a lathe dog on one end and lubricate the center hole at the other end. The tailstock must be set to the proper position for holding the work between the centers; don't wind out the tailstock spindle any further than is necessary, and have the pressure on the spindle such that the work can be turned by hand, but not loose enough to have any end play, or fall down by the weight of the dog. Be sure that the tail of the dog is quite free in the slots of the faceplate of driving plate. A common mistake for beginners is to have the tail of the dog held up in such a manner as to hold the work away from the live center, thus causing the work to run untrue. Some prefer to drive a round bar with a dog with a straight tail, driven by a pin bolted in one of the slots or holes of the face plate. This gives a direct drive and avoids all possibilities of twisting or ramming of the tail in the slot.

"The next thing is to see that the bar is running true. It may be true at the ends, but bent in the middle more than the amount of stock to be turned off. If there is no special straightening machine, and it is seldom there is, it can be straightened between the centers of the lathe either by the use of a jim-crow or with a bar or lever, unless the job is a heavy one, when it might be necessary to take it to the blacksmith shop. Straightening a shaft cold in the lathe stretches the metal and sets up a kind of internal strain in the metal, so that it will very seldom remain true after being cleaned up with one cut; never try to finish a job with one cut that has been straightened in the lathe. If there is an old lathe that can be used for straightening, so much the better, as straightening between the centers is bad for the lathe and should be avoided if possible.

"In using the jim-crow, revolve the work round in the lathe and hold a piece of chalk against it to find the high spots. Put the high spot or bent part at the top, right under the screw of the jim crow, and tighten up the screw until you judge you have taken out the bend. Test the bar by revolving it round again, and repeat the operation until you have the work true enough to turn up. The work can also be straightened by putting a bar or lever under the work in such a way that when the bar or lever is pushed down the work is sprung up, only in this case the marked or bent part must be down. After a few trials it will be found to run nearly true. If the bar is too stiff to be straightened by simply springing it with a bar, give it a few sharp blows with a hand hammer on the top of the shaft while holding it up with the bar. The hammering should be light or the bar will be found to be bent the opposite way.

### Watch the Centers

"If the job has been straightened between the centers, examine the lathe centers before starting a cut, putting the lathe on top speed to see if the live center is true. If the live center is slightly out of truth, although a piece of work turned out on it might be straight and true, or a number of different sizes were turned, they might all be true with each other, they would not be true with the center hole in the shaft. If, however, the dog was loosed off and clamped again in a fresh place, or the piece was turned end for end, it would

not run true, so that it is very necessary to have a true live center, especially when work passed from one lathe to another before being finished.

"The dead center should always be hardened. The live center may, or may not, be hardened, according to circumstances. If a live center is turned, hardened, and then put back into its place the chances are that it will not run true, owing to unequal expansion and contraction in the operation of hardening and tempering. To use hardened live centers they ought to be ground in their place by a special grinding attachment for that purpose. On the other hand, while a soft lathe center can easily be turned up and tried it can easily be bent or bruised and made untrue. If you are working in a shop that has grinding attachments for the lathe, by all means harden the live center, but if not, better leave them soft, or have the temper drawn just enough to turn.

"Even though the center is ground perfectly true, it will be found that after removing it and putting it back it may not run true. This is due to the fact that the center hole in the spindle is not always absolutely true; therefore, when turning the center always make an identification mark on it, and on the lathe spindle to enable you to put them back in the same place.

### Centers Must Be in Line

"In order to turn a parallel bar between the lathe centers it is necessary for the lathe centers to be in line with each other and with the line of movement of the tool rest. To test this, use a bar about 2 ft. long with a small portion at each end turned to the same size or slightly less in the middle for clearance; set the tool to just touch one end of the bar, then run the carriage along to the other end, move the tailstock whichever way it needs to go until the tool exactly touchhes either end of the bar. If the end of the tailstock is not already marked, make a reference mark with a fine chisel, so that it can be put back to the same place if you need to move it at any time.

"If you have no test bar, or no time or opportunity to make one, try out the centers by using the job in hand. Turn a small portion at each end to the same size, then, instead of undercutting the middle for clearance, set the tool to touch the turned portion at the live center end, take the job out of the centers, or if it is a light job turn back the tailstock center enough to allow you to run the carriage to the other end against the centers and test as before. If the job is too heavy to conveniently take out of the lathe, note the graduations on the cross feed screw or make a reference mark on same and see that the tool just touches each end of the turned portion when the reference mark on cross feed screw is the same. Another result of the centers not being in line can be seen by facing the end of the work between the centers, when, by placing a straight edge across the end it would be found that the end would be concave or convex, according to which way the tailstock needed to be moved, as the centers have to be exactly at right angles to the cross slide to produce a flat surface.

"Volumes have been written about the theory of cutting tools, but to specify the exact size and shape of all the different lathe tools is too big a job for me. The shape of the tool depends entirely upon the nature of the job and the kind of metal to be cut. Generally speaking, the softer the metal to be cut the sharper the tool, while with hard metal there is less clearance. Cast iron can be cut with a broader nosed tool than wrought iron or steel, because the chips break off more readily and thus relieve the tool, allowing a broader nose and rougher feed.

### The Height of the Tool

"It is important to have the tool at the right height, so in order to insure this make a mark on the tailstock spindle exactly the height of the lathe center, put a parting or cutting-off tool in the tool post and adjust it to the exact height of the lathe centers. Now slightly press it against the tailstock spindle and run the carriage along, making a permanent mark on the tailstock spindle about 2 inches long. This will be found very convenient, especially when setting the tool for taper work.

"Set the tool a little above the center; by using the reference mark on the tailstock spindle you will know exactly the height of the tool in relation to the lathe centers. The larger the diameter of the work the higher you can set the tool above the lathe centers with advantage. Avoid setting the tool below the center, because if there is any lost motion in the screw or slackness in the slide, the tendency is to pull the tool into the work, when, without warning, the job will climb over the top of the tool and jump out of the centers. Fasten the tool in the tool post as close to the cutting edge as possible and keep it quite clear of the work while doing so.

"Making the first cut is entirely a matter of judgment. Try the calipers on it as soon as you can, but be careful not to take too much off at the first trial, as there are no lathe putting-on tools. After adjusting the cut to the right size start the feed and let it run half way up the bar, then remove the work, run the tool back to the starting point, replace the work in the reverse position, and let the same cut run over the part that has not been turned. The work will now be the same size at both ends and the cut will meet in the center. If the live center should not run perfectly true it will be least noticeable where the cuts meet in the middle of the bar.

"If it is necessary to take a number of cuts, and a very accurate job is wanted, it is best to reverse the work at every cut so that the centers will wear even. Before clamping the dog to a finished surface, place a piece of sheet brass about the size of a postage stamp under the setscrew to save marking the surface.

### The Finishing Cut

"Always grind the tool before taking the finishing cut. Finishing tools, as a rule, will stand a little more rake on top than roughing tools. Take the finishing cuts with a fine feed and at as high a speed as the tool will stand up to, considering the diameter and length of the job being done.

"A good lathe hand can, with care, detect a difference of .001 inch with an ordinary pair of spring calipers. They should be held lightly between the thumb and fingers of the right hand, while the thumb and forefinger of the left hand hold one of the caliper points stationary on the piece to be calipered. Gently swing the other point across the work and move it in and out until you find the place where the point has the least travel. This is the smallest diameter that can be found, and is at right angles to the axis of the shaft. When this point is determined let the calipers pass over with a very slight pressure; some prefer to let the calipers pass over without touching, noting very carefully the amount of side play or travel of the calipers at the smallest part and then have the same conditions exactly on the plug or piece that they are measuring from. This is probably the most accurate way, but it requires some experience as it dpeends more upon judgment than sense of touch.

"If the shaft has to be turned to fit a ring gauge it must of necessity be a few thousandths less than the ring gauge, depending upon the diameter, as a ring gauge of 3 in. diam., for instance, will not pass over a 3 in. plug, although sometimes plug and ring gauges are made to pass over each other, especially homemade ones.

"When using the plug and ring gauges remember that the kind of fit that the ring and plug gauge make with each other is exactly reversed in the work. If the plug and ring gauge will not go together the work made to them must. If the ring and plug will pass over each other the work may not, as it would depend on whether the work was a closer fit than the plug and ring gauges are to each other. These conditions apply when the hole in the work is made to fit the plug, and the shaft turned to fit the ring, so that if the plug and ring gauges were being made for parts that were wanted to be a forced or driving fit it would be necessary to make the gauges so many thousandths slack.

"But look, it's 11.30 p.m.—Off to bed, or else you'll be so sleepy in the morning you'll fall on top of the lathe and ruin all the benefit of my talk."



# DEVELOPMENTS IN SHOP EQUIPMENT



## WEB THINNING MACHINE

The Herbert Hunt & Sons, Ltd., Old Trafford, Manchester, England, have built the machine shown at Figs. 1 and 2 to meet the requirements for an accurate and reliable twist drill point—sharpening and web-thinning machine. The principle upon which the construction is based, is to revolve the drill continuously in one direction and to impart automatically to the drill when so rotated, the necessary motions to give the correct clearance to the lips, also to feed the drill forward a predetermined amount once during each complete revolution, the mechanism for giving the correct form repeating its movement to both lips. The machine will grind any quantity of drills automatically to one length. This is a feature that will be appreciated where multiple spindle drilling machines are being used.

The machine is built in two types, one a full power model, in which all motions are operated by power and only requires the operator to reload the drills; the other is a hand machine, which embodies the same motions, but having only the grinding wheel driven by power. In the former type of machine a point-thinning arrangement is fitted for thinning down the web of the drill at the cutting point. On the latter type this arrangement is only fitted upon request, although all provision has been made for the same.

The machines are entirely self-contained, being driven by fast and loose pulleys embodied in the wheel head, therefore no countershaft is required. A centrifugal pump, together with necessary piping provides ample lubrication to the grinding wheel. This lubricant is returned to the supply tank after use.

As previously stated the various motions necessary to grind the correct clearance to the cutting lips are produced automatically. In the case of the fully automatic machine these motions are driven from the grinding head spindle, and in the case of the hand machine they are produced by the operator revolving a hand wheel which replaces the crank handle seen to the left. No special settings are required for the various range of drills. The drill is chucked in the work spindle S, which is formed at the end into an ordinary socket. A quarter turn of the knurled nut seen on the spindle secures the drill in position. During this action the sleeve bush A is locked against rotation by the latch as seen, so that the correct relationship between the drill and the cam motion may be ensured. The hand wheel is now tightened which locks the spindle and as the automatic motion is engaged, the latch automatically comes out of engagement and grinding proceeds. The drill is given a swivelling and a reciprocating motion which causes the work spindle as it rotates to advance and retire from the grinding wheel.

In the case of the swivelling motion, the action is produced by worm and worm wheel and bevel gearing, driven from the main spindle, which gives motion to a vertical shaft mounted on the swivel slide B. To the end of this vertical shaft is fitted a crank disc, and by a connecting rod L is coupled to a stationary part of the machine M. This motion causes the swivel to pivot round the vertical axis of the drill support bush. The reciprocating motion is produced by means of a face cam E which makes contact with a fixed roller. The cam is mounted at one end of a horizontal shaft D which is rotated by bevel gears from the vertical shaft. At the other end of the camshaft is fitted a yoke C which couples up with the sleeve A. Thus as the camshaft rotates, the work spindle, through the medium of the coupling yoke, is moved backwards and forwards. By means of the spur gears F N a 2-to-1 ratio is obtained, which causes the work spindle to rotate once for every two rovolutions of the camshaft, thereby repeating the reciprocating motion for each of the drill lips.

A cross slide is fitted which automatically moves the work to and fro across the grinding wheel face. The slide can be adjusted into various positions by means of a small hand wheel. The motion is taken advantage of to effect an automatic feed which is of the simple ratchet type, and adjustable from 0.001 to 0.015-inch advancement to one revolution of the drill. It is arranged so that it will automatically trip as desired.

The point-thinning arrangement is made to carry the drill at the correct angle to the grinding wheel. It is provided with a stop which supports the end of the drill, and a finger to engage with the cutting lip of the drill. The motion is given by a lever operating the slide and passes the drill beneath the grinding wheel.

Three grinding wheels are supplied, each mounted on its own bush. Vertical adjustment is provided to compensate for wear of the wheel and the size of the drill being thinned.

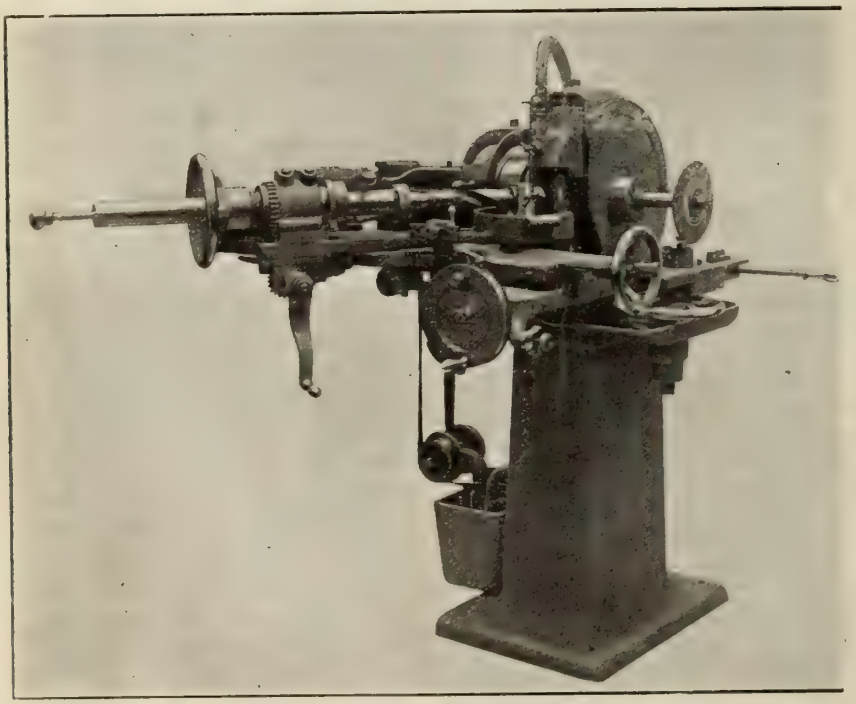


FIG. 1.—A GENERAL VIEW OF THE WEB THINNING MACHINE.

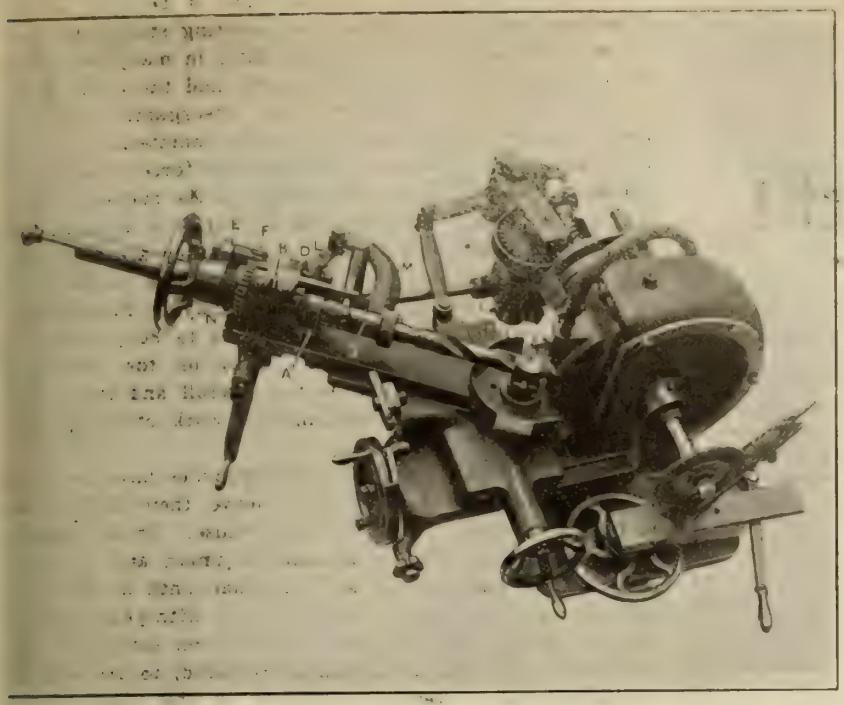


FIG. 2.—A PLAN VIEW OF THE WEB THINNING MACHINE.

# NEW THINGS IN MACHINE TOOLS

### NEW STYLE VICTOR DIE HEAD

The Victor Tool Company have redesigned their "D" head, adding certain improvements and classifying it as "style E." The tools are adjustable for variation of thread fit. The shanks are hollow for long work. Provision is made for extension of the dies through the cap when cutting close to shoulders. Internal or external tripping may be provided. The head is made entirely of steel. At present the head is made in two sizes, the range being from ⅛ to ½ inch and from ¼ to ¾ inch.

### STAGGERED-TOOTH KEYWAY BROACH

A specially designed keyway broach has been brought out by the Velco Manufacturing Company, of Greenfield, Mass. The broach is made from a solid bar, the staggering being obtained by milling the teeth from either side and in such a way that the cutting edges of the teeth overlap, thus making a clean cut. The teeth are deeply cut and made with a large radius, giving extra strength and chip clearance. The cutting faces slant in opposite directions, which gives a shearing cut and equalize the side thrust on the bar. The broaches are made in all standard sizes.

### LAMINATED SHIMS

The Laminated Shim Company, of New York, has recently placed on the market a specially constructed shim that is made up of thin layers of metal, so that shims of any desired thickness may be obtained by simply "peeling off" the number required for the necessary thickness. It is termed the "Fit All" owing to its adaptability to fit any style of automotive bearing with little or no trimming, the shape being decided on after a thorough study of about one thousand different bearings. The shims are made up in different thicknesses and can be supplied with two different sizes of holes.

### "MICRO" BOX TOOL FOR TURRETS

The Cruban Machine and Steel Corporation, of New York, have placed on the market an interesting design of box tool for use on screw machines and automatics. Adjustment for the tool bit is provided for by means of a micrometer attachment, graduation reading in thousandths of an inch lineal adjustment. The "V" guides are controlled by spring pressure and may be locked in position when adjusted to the diameter of the work. If desired a bushing plate, which will carry bushings of any desired size, may be used instead of the V guides. Special arrangement of the tool bit prevents the same from slipping.

### HORIZONTAL BORING MACHINE

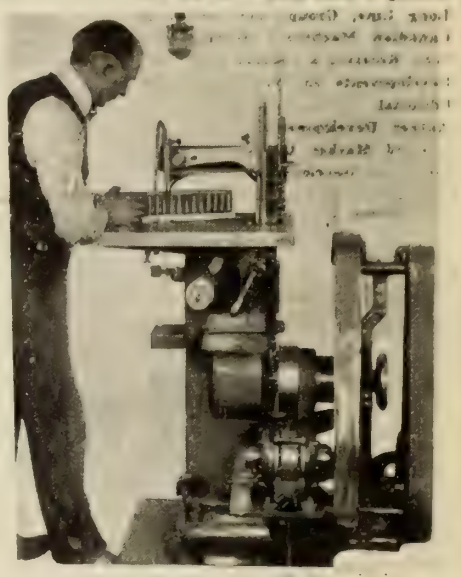
A new addition to the lines of the Giddings and Lewis Machine Tool Company is a horizontal machine known as No. 25, with the following principal dimensions: The diameter of the main spindle is 2½ inches, the front end provided with a No. 4 Morse taper, the spindle having a travel of 13½ inches. Extreme distance between table and work centre, 20 inches. Table has a surface of 18 by 48 inches, with a traverse travel of 33 inches and a longitudinal travel of 30 inches. Eight spindle speeds are provided for, with a range from 12½ to 337½ r.p.m. There are nine feeds in either direction. Power required, 3 horsepower.

### DIE FILING MACHINE

W. D. Rearwin, Grand Rapids, Mich., has placed on the market a No. 6 die filing machine. This machine is larger than the regular No. 5 size, and is said to prove itself useful for many other purposes beside die filing.

The machine is provided with a 20-inch x 24-inch table that is 30 inches high. The slide is a forging and has a capacity to take files of random lengths up to 14 inches. The space back of the file is 9 inches and 8 inches from top of table to under side of file arm. The slide has a stroke of 7 inches and recedes from work on the up stroke. Extra arms are provided for sawing, and special filing of closed bottom dies, also for patterns where filing against a shoulder is necessary.

This machine can be furnished with motor, countershaft, or can be driven direct from the line shaft.



GENERAL VIEW OF THE FILING MACHINE

### HYDRAULIC PRESS

A very useful hydraulic press for general jobbing work has been developed and placed on the market by the Charles F. Elmes Engineering Works, of Chicago, Ill. The machine is particularly adapted to forcing, bending, straightening and broaching work, having a capacity up to 50 tons. Suitable attachments may be used for a large variety of operations. By using the lower portion of the press alone, the cylinder makes a serviceable 50-ton jack. The machine is lightly constructed and may be readily moved to any location and placed in any position desired. The press weighs about 500 pounds.

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## More Metric Propaganda

CANADIAN MACHINERY has received from the World Metric Standardization Council a letter stating that the Metric Standards Bill has been introduced in the Senate of United States, and goes on to state:

> "Favorable editorial comment by your publication would aid powerfully in securing for the United States the advantages of this logical system. It is believed that the enclosed items will be of interest to your readers.
>
> "May we count on your co-operation?"

Well, that's a fair question and calls for a fair answer, and that answer is no—not for a minute.

As a matter of fact this whole metric system is a piece of propaganda. It is not wanted by the mechanical world. We have gone along famously on good old feet and inches. We have measured ourselves up against the kitchen door year after year—we bought a piece of land—we built a house—we got a suit of clothes—we made a machine tool—we made small tools and we put up factories. We drew plans and made blue prints—we laid out concessions and side lines—we built bridges, some of the largest in the world.

And say, all these were based on inches and feet and the only thing that worries some of us now is that we have to measure our business with a foot stick when we'd like to be using a yard measure.

There are bigger problems to be solved and more worthy matters to which any publication can lend its assistance.

The agitation carried on by the World Metric Standardization Council will have a fair sized job trying to explain why it should not be tagged as an ordinary nuisance.

## The Public Pays

THE action of the United States Railroad Labor Board, in rejecting the appeal of the Association of Railway Executives for abrogation of national working agreements, is a feature of industrial economics that must be paid for by the public at large.

In times like the present, when the requirements of a railroad are appreciably lessened, and it becomes advisable, if not imperative, to reduce the operating staffs, the feature of seniority, while highly commendable in many ways, nevertheless places upon the management and the executives, responsibilities and obligations that disorganize, completely, any plans for efficient production and maintenance of ordinary operations. When a reduction of force is decided on, the department heads have no choice in the matter, as to who will be retained. The question of wages is not considered. A certain number of men must go and they are deleted from the bottom of the seniority list, irrespective of their qualifications. Several 100 per cent. men may be included in the "lay off," while others of, perhaps 70 to 80 per cent., are retained. This means greater outlay on the part of the management, both as regards the payroll and the increased supervision required in checking the work of the inefficient "seniors."

During the past year railroad companies have been forced to let highly skilled apprentices leave their service owing to the enforcement of the seniority clause. On the expiration of apprenticeship the boy becomes a junior, and as a result, he cannot be employed as a journeyman until all those "senior" to him have been re-engaged. A fifth-year apprentice may be nearly 100 per cent proficient on locomotive work, but must give way, if a man is required, to one who may have had only a year's experience on this class of work. In cases such as these the company suffers heavily, as the education and training given to the boy is, in a measure, gone for naught, at least so far as direct returns to the company are concerned.

The public ask the "why" of increased freight and passenger rates. Well—the railroads, like any other business, cannot continue to play a losing game—therefore, the public pays.

## Striking Both Ways

TO what extent can a buyers' strike be successful in beating down prices? And if a producers' strike goes along hand-in-hand with a buyers' strike, which is going to win out in the long run?

Production right now is under consumption in nearly every line. There are very good reasons for this, which need not be gone into here. But available supplies are being worn down in nearly every line and are coming to the point of exhaustion. Demand is likely—almost certain to increase, because now it is at the minimum and any movement will be on the upward trend. When this starts what is going to happen?

One of the best market reviewers on the continent sums the situation up something like this:

> "When a railroad falls behind in keeping up the physical condition of its property, there sets in a cumulative deficiency of maintenance, which can only be made up by devoting for a time much more than the normal amount to this purpose. Correspondingly, there is no doubt a cumulative deficiency of production in many lines. Meantime, there is always a minimum amount of consumption going on. Probably, inventories are not as large to-day as they were three months ago. When the public finally makes up its mind that prices have reached bottom, it may be found that, as in the case of the stock market, most of the cheap merchandise had already been disposed of."

The buyer will have to size up the situation to meet the requirements of his own case and he should be in a position to analyze his own field. There is a very real situation in the opinion given above and purchasing agents and others should watch carefully to see that it does not work out and catch them rushing into a rising market, when all the time they had been waiting for it to come still lower.

# *Some Plants Have Not Lost an Hour Yet*

IT is quite wrong to suppose that factories in general are closed down in Canada. They are not. Neither is it right to imagine that they are all running short time in an effort to give as much work as possible to the staff.

From letters received by Canadian Machinery it is certain there are plants that have not yet lost an hour—some of them are working twenty-four hours a day.

There is no intent on the part of this paper to make it appear that everything is lovely, but there is a desire to allow information to come to the surface that will tend to show some of our blue-ruin shouters that industry in the Dominion is a long way from being headed for the bow-wows and that there are men who believe the bottom of the hill has been reached and that we are already starting on the way up again.

There is nothing more dangerous than insane optimism and nothing worse than unfounded pessimism. Between the two there must be the real situation—the one the people want to know about and ought to know about.

If you know of anything that looks to you like a hopeful sign either in your own business or in businesses with which you come in contact, let us hear about it. Give us the chance to pass it along. The circulation of business facts will make good reading now.

### Believes Orders Must Come Soon

A. T. Enlow, of the Dominion Sheet Metal Corporation, Hamilton, although not prepared to offer many things to boost the general situation, says: "There is a slight increase in the number of small orders being received and if this indicates anything we presume it means that the buyers are getting down to the boards and need the stock, but naturally are not buying very heavily until they feel sure that present prices are right. We never had all good conditions simultaneously, such as first-class quality, A1 service, lowest price and plenty of business, but the buyer must keep in mind that all the three other items cut little figure if he does not have good service and the wise man is the one who gets in at the right time."

### Finished Many Boilers

The Robb Engineering Works, Limited, Amherst, N.S., have been busy filling orders and right now are working on four Robert Manning type vertical boilers of 365 horsepower each for the Nashwaak Pulp & Paper Co., St. John, N.B. One of the Montreal schools had a good-sized order with them as well as the Montreal Harbor Commission. The Montreal Suspender & Umbrella Co. have also been purchasers of equipment from the Robb Co., while boilers have been shipped for installation in a number of new buildings that have been going up in Montreal and district.

### Here's a Busy Plant

The president of one well-known Ontario plant pays his respects to papers in general for publishing "absolute fiction, mechanically produced from the brains of well-educated editors, whom it would appear are paid by the word, to fill up white space." But after that preliminary canter this manufacturer gets down to business and makes it perfectly plain that things have been good with his plant. So far they have been able to keep their shop going and have not lost a minute and in one department that is working now with a view to building up an export business, they are going it twenty-four hours a day. He adds: "We notice a great improvement in inquiries. Particularly in the wholesale hardware trade stocks have been very low and as we guaranteed prices for a while that has stimulated buying."

Nor does this manufacture drop back on the old statement that collections are poor. Here is his view: "Collections are as good as usual, i.e., they are far better than they were before the war.. People seem to have cultivated the idea of paying cash and we have nothing to complain of in this direction."

### Not Impressed by Retailers

"We have not created any change in employment conditions," he continues, "so that there has been no complaint from the employees. We do not know just when wages will have to be brought down. Speaking generally, we do not think it is time to bring down wages on a flat scale, for the reason the workmen to-day is not benefiting by any supposed reduction in the cost of farm produce or in the cost of eats, for while the farmer and the manufacturer and the wholesaler have reduced their prices, the retail merchants have not decided to cut to the consumer yet. At least if they have it is not visible and many of the retail merchants, especially in wearing apparel, have become fakirs." The writer of this opinion then goes on to give the grounds for this statement, claiming that two Toronto stores had deliberately misrepresented the goods they were trying to sell.

This manufacturer holds strongly to the view that the price of material in the retail stores is a very real problem for the manufacturer at the present moment, for he cannot very well adjust wages until a reduction has definitely been made in the cost of living and passed on to the consumer.

### Better Conditions Ahead

A. M. Kerr, secretary-treasurer of the Preston Woodworking Machinery Corporation, states that their plant up to now has been working full time without any reduction in wages. Orders are being pretty well overtaken now and it is the intention of the company to make a small cut in wages shortly. Of conditions as their travelers find them, Mr. Kerr says:

"We have very little business on hand now, but our travelers seem to be successful in scaring up a few orders every week and they report conditions as being quite hopeful. It seems that there is business going, but it seems necessary to go after it with every possible atom of energy to successfully land an order. Our business is almost entirely derived from furniture factories, automobile factories and kindred lines. Furniture men report business as improving and they seem quite bright just now. Conditions in the automobile industry are looking better, too, and we confidently expect to be able to sell a goodly part of the output of our plant. We propose running along full force as long as possible, stocking up any surplus machines.

"We are getting better production per man in our plant than we did a year or so ago and this to our minds is the solution of the whole difficulty in our country to-day—more production per man, enabling us to lower prices and thus secure business which would then be offered."

### Just Sawing Wood

J. W. Shepperson, secretary-treasurer of Ham Brothers, Brantford, never could see blue ruin. Nor has he seen any reason to cross the floor in the present situation. "Would just add," he states, "that from some of the gloomy countenances one looks upon these days you would think this was actually the first period of depression the world had ever seen. Many a time in the past we have pulled through a far more depressing time than the present and we are of the opinion that if we just keep a stiff upper lip and keep on sawing wood it will not be long before we have the stick sawed through and no one will be very much the worse of the effort."



# MARKET DEVELOPMENTS



## Some Reductions Announced This Week

### Prices on Several Lines Have Moved Down From Ten to Twenty Per Cent.—Iron and Steel Prices Are Not Regarded as Being Very Firm and May be Marked Down

WHILE it is not possible to say that an era of lower prices has definitely set in on the iron, steel and machine tool market, it cannot be denied that the movement is in that direction. Especially is this so in machines turned out by the newer makers as some of the old-established companies are still working on orders and are in no mood to consider reductions. Many of the makers have planned their course very carefully and have avoided making up a large stock to urge lower prices on their sales force. Reductions during the week have been made in motors, gear cutting machines, internal grinding machines, etc., and these range from ten to twenty per cent.

Dealers are taking a more determined stand regarding cancellations and it is not an easy matter to get a cancellation accepted now. One firm cancelled the day the machine came, but the dealer fought it out in the courts and made acceptance necessary.

Some houses are reporting a much better week in inquiries than for some time past. None of these had been in the market before and they were from a widely distributed area.

Steel merchants are not taking in much material just now, still working on the theory that their best move for the present is to get their stocks down as low as possible. There is a fair amount of business going, but it is still in small quantities and for only immediate needs.

There is nothing better in the scrap metal markets. Dealers will hardly take on anything in iron and steel and only limited quantities of copper. Copper is looked upon as likely to improve before the other lines. Prices quoted are still very low and are not guaranteed.

Pittsburgh reports indicate that buyers generally anticipate some movement in steel there and predict that it will be downward in price. There are plenty of rumors of prices sagging several dollars a ton, but this has not become general enough yet to establish a new market at a figure below the price of the United States Steel Corporation.

## MONTREAL BUYING IS STILL DONE ON SMALLER SCALE THAN USUAL

Special to Canadian Machinery

MONTREAL, Feb. 17.—Despite the readiness on the part of buyers to take advantage of any discounts offered —which evidently shows a supply of available money for purchasing purposes —the acquisition of equipment is confined almost entirely to urgent requirements, and it is seldom reported that manufacturers are taking care of far future needs. The general tendency still appears to be that of deferring buying at present prices or while trading is in a state of depression. On every hand one sees and hears the note of optimism but seldom sees the instrument on which it is played. Some dealers are reporting slightly increased business, but only after strenuous efforts on the part of the salesmen. As one representative said: "Many seem to be willing but are evidently afraid."

**Further Revisions Possible**

Despite the recent announcements of different steel men that quotations were at rock bottom, there are indications that point to further revisions in existing prices, and that these will be downward goes without saying. Speaking of the week's activity, one dealer remarked: "We are not taking any steps to revise our prices, although this may become necessary in the next few weeks. Our business just now is not heavy but the movement is satisfactory. There is a possibility that mill prices in the States will be affected shortly, as some of the independents are quoting low in order to get business. Should this influence the big fellows to cut their present prices the result will be a general adjustment on the part of the dealers to meet the conditions of the new market. It may be that action on the part of the large interests would tend to place trading on a firmer basis, but there is this fact, the Steel Corporation has large orders still on the books, so they have no good reason to meet the lower prices."

**Looking For Better Business**

When one local machine tool maker remarked to Canadian Machinery that "business should show steady and increasing acceleration from now on," he only repeated what has been said by many during the past few weeks. This dealer admitted that up to the present no tangible reason could be given for the general optimism displayed other than the general need of all industry. "A great number of manufacturers," said the dealer, "have, during the past few years, practically starved themselves in the way of purchasing needed machinery and equipment. At present the buying is restricted owing to existing conditions of high costs and financial difficulties, a feature that is responsible very largely for the trade depression of the day. When the time comes when these obstacles will have been eliminated or reduced, the business will return in such force that we will have difficulty meeting the demand. This may seem like overdone optimism, but the trend undoubtedly is towards better business."

Asked as to the exchange situation, the dealer stated that the American tool manufacturer has been treating them fairly in the way of absorbing the high exchange, many of them leaving only that over 10 per cent. to be handed on to the buyer. Some of the principals had reduced the list price of the tools and when this had been done, the full exchange had been added. In some cases

ne change made little difference, as the educed list price plus exchange was qual to the former price with the exhange discounted. Movement of heavy ols is quite quiet and supplies and small quipment show little improvement.

### Metal Prices Firm

Metal movement is not heavy but is ill sufficient to retain the interest of the ade. Prices are quite firm and in some stances show a tendency to become onger. This is especially true of copers. Tin is gradually coming back to ormal, the price quotation this week eing 40 cents per pound.

### Old Metal Business Quiet

"We are looking forward to an early evival of activity and while any day nay see a movement to better business, e can only repeat what we have been aying for several weeks back, and that s, that present movement is just about enough to pay the overhead and keep the ffice open. However, we believe the tide s at its lowest and that soon we shall ee a gradual return to normal." This statement by an old material dealer differs little from what has been given for the past few months, and no concrete evidence is available to indicate a change for the better. Some local trading is carried on, chiefly with the grey iron foundry shops. Developments in the steel and iron market may influence the scrap situation to the extent of weaker quotations. The week's prices show no change and are nominal.

## MORE INQUIRIES IN LOCAL MARKET

**Several Changes Made in Prices—Steel Warehouses Getting Rid of Stock**

TORONTO.—Inquiries can hardly be looked upon as the state of trade, but in the machine tool field they are looked upon as indicating a desire on the part of people to buy. During the last week or so there has been an increase in the number of inquiries sent in from the Ontario field, which for some of the houses has been rather backward in showing much improvement. "We think most of the inquirers mean business," was the remark of one of the dealers this morning. "As far as we can learn none of them has been in before in the way of an inquiry. The list is pretty well scattered, and there are no very large orders, but it is a hopeful looking move."

Some of the machine tool dealers are having a little trouble with payments, and a few of them have cases of cancellation where their only way out is to fight. For instance, one dealer had a machine cancelled on him after it had reached the city, and he had notified the firm that he was clearing it and would commence the erection on the following day. In this case the dealer refused to cancel, and the acceptance followed in the usual way.

## POINTS IN WEEK'S MARKETING NOTES

**A number of makers of machine tools of various kinds, also of motors, have announced reductions in their selling prices reaching from 10 to 20 per cent.**

—

**New York reports that the machine tool market is still very dull there, and also adds that a quantity of German made equipment has been disposed of to one of the large industrial concerns.**

—

**The Pittsburgh steel market seems to incline to the belief that the Steel Corporation prices will be revised when it becomes more urgently necessary that they wish to secure new business.**

—

**The local steel merchants have not made any change in their selling prices although when a fair sized order seems liable to be placed there is often a departure from the recognized price.**

—

**Some of the machine tool dealers report that they are receiving many more inquiries than for some time past. These inquiries for the most part are from new sources that have not been in the market before.**

—

**Scrap metal dealers are buying only very small quantities of copper. They are not taking anything in the line of iron or steel. The prices are still away down and then the lower schedule quoted is only nominal.**

—

**A new base price has been announced for wire nails and also for cut nails.**

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The tendency toward lower levels in the machine tool market is becoming more marked. On other pages of this week's issue of Machinery there are references to new prices on tools of several sorts. This paper has been notified by the makers of several lines that they are coming down 15 to 20 per cent. on the first of March.

### Selling in Small Lots

Mostly pick-up trade is what the average dealer in small tools would tell you were he to describe the situation now. There are a few good orders coming into the market. For instance, the National Railways have specifications out for about $5,000 worth of drills, mostly high speed, for the Moncton shops. This is the shop with which the dealers like to do business, as it has a reputation of being about the only one of the Government owned list to place orders promptly and make settlements in the same way. Prices have been fairly firm in the small tool business for some time, and shading of prices is not resorted to—at least if it is it is done in such a way that it does not get a chance to become gossip in the machine tool market.

### In the Steel Market

Dealers do not state that there have been any reductions made in prices yet, but it is a fact that there is a tendency to shade prices. This is always liable to happen when firms are out after business, and that is exactly what is happening now. Bar iron is still quoted at 4.75 base, but all the dealers know that there have been some exceptions to that price. The price is based on present mill prices, but the eagerness to secure any business that comes up blinks at these things now and then.

Boiler tubes are moving out a little better this week, although the season on the whole will be only a fair one for this line.

Some of the yards in this district are working hard to get rid of stocks, and prices are being placed pretty close to the limit in order to get in shape to take advantage of any better price schedules that may be brought out.

In some lines business is coming in better, but mostly in the small goods.

A new base price has been given for wire nails, the figure now standing at $5.10, while cut nails are quoted $5.75, f.o.b. Montreal. Copper rivets and burrs are also selling under a new list, dated February 7, showing quite a reduction.

### The Scrap Metal Market

Business dull, prices only nominal—that tells the story of the scrap metal market this week. Dealers will hardly go to the length of stating they are out of the market entirely, a position they were prepared to take a few weeks ago. The chances are that one would find it fairly difficult to place a tonnage of iron or steel, unless at a runaway price, but it is possible that some of the yards would be inclined to take on small lots of copper. The chances are that the price of that metal will be one of the first to show signs of recovery when the tide turns definitely.

## NEW PRICE STARTS ON FIRST OF MARCH

**Landis Announce New Price That Is Down from 15 to 20 per Cent.**

Canadian Machinery has received the following letter from T. H. King, sales manager of the Landis Tool Company:

"Beginning with March 1, 1921, it is the intention of Landis Tool Company to make a general reduction in prices on all machines with the exception of the crankshaft grinding machine. This reduction will average 15 to 20 per cent. on our entire product with the exception noted."

## SOME PRICES ARE ON THE WAY DOWN

**New York Market Is Quiet, Although a Number of Reductions Are Named**

Special to Canadian Machinery

NEW YORK, Feb. 17.—There have been price reductions during the past week or two on miscellaneous lines of metal working equipment.

The General Electric Company reduced motors about 10 per cent., and most of its competitors have followed suit.

Two makers of shapers reduced prices 15 per cent., following the same action by a Newark maker a few weeks ago.

A manufacturer of power presses in Brooklyn has reduced prices 10 to 15 per cent. and Rochester manufacturers of high-speed riveting hammers have reduced prices 10 per cent.

Other reductions include 15 per cent. by a maker of automatic gear cutting and riveting machines and 10 per cent. on oilstone grinders.

Business is very dull in most machine tool markets, though a slight improvement is noted here and there. The sentiment has improved in the automobile manufacturing section of the country, due to the speeding up of production at some of the plants.

The only large business in prospect which may be placed this week is a list required by the Santa Fe Railway, totalling about $150,000, and a list of tools to be bought by the Ohio Locomotive Crane Company, Bucyrus, Ohio, of a like amount.

A few German punches and shears were bought a week or so ago by the Ohio Locomotive Crane Company.

## PRICES REDUCED ON SEVERAL LINES

**Mills Are Out Looking for Business and Prices Are Starting to Sag**

Special to Canadian Machinery

PITTSBURGH, Feb. 17.—This week has shown the first definite breakaway from the Steel Corporation schedule. Many buyers have refused to regard that schedule as final and they are feeling now that their belief has ground in fact.

The Midvale Steel & Ordnance Co. has instructed its sales offices to find out the prices at which orders can be secured and also has granted authority to take the business. The drive on the part of this company has resulted in definite offers of tonnages of the major products at well below the regular market quotations. Since the instructions were not written it is difficult to obtain actual information as to the prices named, but it has been verified that it named 2.25c., Pittsburgh, on shapes and bars.

Unverified reports have been current of quotations of 2c on bars and it also is rumored that the same price was named against a tonnage of plates in the Chicago district.

Other independent interests have done nothing in the matter of price cuts, but it is patent that in the event any business is uncovered by the company which is active in this respect the others will go along.

So far as can be learned the effort to interest buyers in purchases at practically their own prices has not been successful. This, however, was to be expected, in view of the fact that the first effect of a sudden reduction in prices usually is to make buyers cautious. The Steel Corporation subsidiaries meanwhile are holding to the level of prices which it has observed now for almost two years, and apparently they are content to wait to see what success attends the efforts of independent companies to secure business at lower prices before taking any action either as regards selling prices or wages. It is pretty well established that the cutting of prices by independent companies is to be accompanied by lower wages, and since the rates of Pittsburgh and Youngstown companies have not yet been disturbed it is figured that the acceptance of business at the prices named would involve a cut in wages of as much as 30 per cent. The market is even duller than it has been as a result of the apparent willingness of independents to consider lower prices, and prices are even more indefinite now than they have been at any time since the reaction in business set in last fall.

The recession in the activities of the Steel Corporation subsidiaries has been rather pronounced in the past week. The Carnegie Steel Co. has one less active blast furnace than a week ago, and while it has all of its ingot making capacity on except its Sharon, Pa., works, production is not over 90 per cent. of capacity, and finishing mills are not as fully engaged as they were recently. With new business on a very light scale as compared with completed tonnages, it is probable that before the end of the month total operations now averaging close to 90 per cent. will be below 80 per cent. The company at an early date will shut down its Columbus, Ohio, works, due to the lessened demand for sheet bars from the American Sheet & Tin Plate Co., which as far as sheets are concerned is not nearly so busy as it was recently. The American Steel & Wire Co. has experienced no improvement in business and its plant operations still are declining. The National Tube Co. is the one subsidiary organization which continues to run full.

The increases in independent steel company operations are only partly sustained, for new orders have not been coming forward in volume sufficient to offset those which have been completed.

The pig iron market reflects no increase in interest on the part of melters, although one large company in the week under review bought about 2,000 tons of foundry iron for early delivery.

## Scrap Metal Market

The prices of scrap metal are steadie as the downward trend is halted in som districts. The demand continues ligh

Quotations in the Chicago district ar remaining steady. Scrap for foundr use is in demand as founders seek t average their high-priced pig iron. Rai roads are offering tonnages.

On the Boston market several sales o No. 1 machinery scrap have shown a improvement in price. One Massachu setts foundry bought four cars at $25.5 del. A sale was made of several car of stove plate at $15 del.

The steadiness of the scrap metal a New York is reported to be due more t lack of buying than any improvement i sentiment. There is very little inquir from consumers.

Heavy melting steel has weakened or the Buffalo market and is now quoted at $15 to $15.50, with little selling. There is no sign of a buying movement.

Pittsburgh reports that some railroad scrap is being purchased occasionally. The Pennsylvania railroads offerings in the territory aggregate around 18,000 to 20,000 tons. One iron works is said to be in the market for 1,000 tons of heavy melting steel, but is offering only $12 and dealers and brokers claim to be unable to buy at $15 to $16. Releases on old scrap contracts continue to be difficult to obtain.

The market at Cleveland is absolutely devoid of activity. Consumers are not buying, shipments are not being accepted by mills, and the market is such that exchanges between dealers have practically ceased.

The trend of the St. Louis market is downward, several reductions being made during the week. The new quotation in rerolling rails is now $15.50 to $16. Steel car axles dropped $1.50, now being quoted at $19 to $19.59, and wrought grades, knuckles, couplers, locomotive tires, springs and steel angle bars were reduced 50 cents each. Dealers who recently bought scrap are discouraged. An inquiry was made for 3,000 tons of rerollers from an Indiana interest.

Birmingham reports that trading in the southern scrap iron and steel market is insignificant. Little change is expected within the next 60 days. The larger dealers are adding to their stocks. Quotations are unchanged, though the market is weaker.

It was stated at the annual meeting of the International Railway Fuel Association at Chicago that the life of a boiler fired with coal is about 10 per cent. greater than one fired with oil, while the life of the tubes is about 40 per cent. higher in the coal burners. This statement is the result of experience gained on the Santa Fé system where one-half of the locomotives have been constructed or converted to burn oil.

# How to Get the Employees to Tell "Why"

## Plan Adopted at the Dodge Plant to Learn What the Men Thought of the Firm—Prizes For Telling Why They Stayed and What They Liked and Disliked

By HARRY BOTSFORD, Publicity Manager Dodge Mfg. Co.

PERHAPS the most difficult problem the man in charge of personnel work has to contend with is to get a definite worth-while expression from the employee of just what he thinks of the various forms of welfare work and of the organization that employs him. This was exactly the situation Doctor W. H. Moore, manager of industrial relations for the Dodge Manufacturing Company, of Mishawaka, Indiana, ran up against.

There were six questions which puzzled Doctor Moore and the six questions which puzzled him are questions that might well be asked in every organization, whether or not that organization is of sufficient size to warrant the employment of a highly trained personnel man.

The six questions which perplexed were: What is the Dodge spirit? Why do so many stay so long with Dodge? How can we get the old Dodge spirit into new men? How does an old Dodge man feel about the company? What are the impressions of a new man? And, how can we attract and hold the kind of a man who will stick?

Here were six vitally important questions—a knowledge of the answers would be of manifest advantage not only to the manager of industrial relations but to the entire organization.

At last the idea came to carry out a prize contest in the Dodge News, our weekly internal house organ. Announcement of the contest was very brief and the rules governing were made just as fair as possible. Any employee was eligible; one subject could be selected and the answer was not to contain in excess of 1,000 words. No names were to be signed to any paper but the name, department and clock number of each contestant was to be written on a separate sheet of paper, enclosed in an envelope and attached to the entry. Three prizes were offered: $25, $10 and $5.

The judges of the awards were the manager of industrial relations, the office manager, the superintendent of one of the shop departments, the manager of branch offices, the editor and assistant editor of the Dodge News and the writer. Each of the judges read all of the many papers turned in and selected the three he believed to be the best and wrote out his selection and placed it in a sealed envelope, each making his decision independently of all the other judges. This assured absolute fairness in judging.

When the judges' decisions were compared it was found that the first prize was awarded to a worker in the steel shop who had chosen to give the impressions of a new Dodge man. This man had been a "boomer" and an industrial drifter all of his life but had decided that he liked the organization so well that he was going to stick. To say that the ideas he advanced were valuable to the manager of industrial relations is to put the matter mildly. For an organization to have something in it which will make a solid citizen and a steady worker out of a "boomer" is one thing, but to know what brought about the metamorphosis is several things. For example, we found this man liked our commissary where we sell groceries and clothing to our employees at cost; he enjoyed the benefits of our relief association, he had saved money through our thrift club; he had particularly enjoyed the advantages of our employees' club, our cafeteria and the Dodge News. He was especially grateful for the treatment accorded him by his superiors and of the general spirit of good-fellowship and co-operation between all units of the organization.

The second prize went to one of the office men who told how we could attract the kind of men who will stick. The suggestions advanced were excellent and sensible in every sense. The manager of industrial relations secured many worthwhile ideas from this paper.

The third prize was from a member of the order department who has been with the organization for over twenty years. Naturally, this man selected as his subject why so many stay so long with Dodge. He treated his subject in rhyme but nevertheless it was a sane and sensible text which covered the entire subject.

We are now running in our internal house organ the papers of the winners and of those who secured an honorable mention. These papers are read by the employees each week with great interest.

The contest has been worth-while from every standpoint. We secured the opinions of the workers on some matters which have been bothering us for some time. The opinions, in every case, were more frank and open than they would have been otherwise. The use of the prizes has more than justified the small expenditure required to put the idea across.

What we have accomplished is possible for any other organization to do; we have found out what our workers think of us, our plants, our ideals, and welfare plans. We have secured several valuable hints and ideas which will eventually develop into some changes in our present welfare and personnel work.

We believe the contest idea is well worth the time and money spent. The number of entries were large and answers came from our branches from Seattle, Wash., to New York City, which has proven to us the interest the employees take in our organization.

## Pig Iron Markets

On the Pittsburgh market one company has closed for 2,000 tons of foundry iron for prompt delivery to its Pittsburgh district plants, the iron running in equal quantities from 1.75 to 2.25 silicon and 2.50 to 2.75 valle yfurnace, the former at $28 and the latter at $29.25.

Pig iron has shown further weakness on the Chicago market and southern foundry has dropped to $27.50 base Birmingham. The leading steel interest still has 22 furnaces in blast, but has reduced its steel making to about 80 per cent. capacity and is rolling finished material at 75 per cent. rate. One new blast furnace was blown in today.

The tendency of the New York market is downward. A Bridgeport melter purchased 1,000 tons of foundry and 500 tons of malleable, the price of the foundry iron is understood to have been less than $30 at furnace.

In Pittsburgh district one local house reports a sale of 750 tons No. 2 Pennsylvania foundry iron, to be delivered within three or four months, at a price around $30 furnace. One company is reported to have bought 1,200 tons silicon 1.75 to 2.25 Eastern at about $28 at furnace.

Improvement is shown on the Buffalo market both in inquiries and active orders. One producer reports orders for 5,500 tons being booked, also many inquiries. Car wheel manufacturers are said to be ready to come into the market and considerable business is expected to come from this source. Another sale was made of 800 tons at $30. No sales at less than $30 have been reported.

Severe dullness marks the St. Louis market. A few small sales have been made but no general market established.

A little activity in foundry iron is shown in the Cleveland district, and prices have settled down to $29 and $30 for No. 2 foundry.

An inquiry for 5,000 tons of basic iron has been received from a steel plant in the Cincinnati district and expectations are that part of the order will be placed.

While there have been reports of sales of foundry iron on the Philadelphia market at less than $30 furnace, these have not been confirmed. Only seven Eastern Pennsylvania furnaces are in blast with 26 out.

# SELECTED MARKET QUOTATIONS

**Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.**

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 46 |
| Lake Superior, charcoal, Chicago | 40 50 |
| Standard low phos., Philadelphia | 33 25 |
| Bessemer, Pittsburgh | 33 96 |
| Basic, Valley furnace | 30 00 |
| Toronto price:— | |
| Silicon, 2.25% to 2.75% | 39 25 |

## IRON AND STEEL

| Per lb. to Large Buyers | Cents |
|---|---|
| Iron bars, base, Toronto | $ 4 75 |
| Steel bars, base, Toronto | 4 75 |
| Iron bars, base, Montreal | 4 50 |
| Steel bars, base, Montreal | 4 50 |
| Reinforcing bars, base | 4 75 |
| Steel hoops | 6 00 |
| Tire steel | 5 00 |
| Spring steel | 8 00 |
| Band steel, No. 10 gauge and 3-16 in. base | 5 50 |
| Chequered floor plate 3-16 aud heavier | 7 50 |
| Bessemer rails, heavy, at mill | 2 35 |
| Steel bars, Pittsburgh | 3 00-4 00 |
| Tank plates, Pittsburgh | 3 50 |
| Structural shapes, Pittsburgh | 2 45 |
| Steel hoops, Pittsburgh | 3 05 |
| F.O.B., Toronto Warehouse | |
| Small shapes | 5 00 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 3 48 |
| Structural shapes | 3 58 |
| Plates | 3 78 |
| Small shapes under 3-in. | 3 48 |

## FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

| | C.L. | L.C.L. |
|---|---|---|
| Montreal | 58½ | 73 |
| St. John, N.B. | 84½ | 106½ |
| Halifax | 86 | 108 |
| Toronto | 38 | 54 |
| Guelph | 38 | 54 |
| London | 38 | 54 |
| Windsor | 35 | 50½ |

## METALS

Gross.

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $19 00 | $17 50 |
| Electric copper | 18 50 | 17 50 |
| Castings, copper | 18 00 | 18 00 |
| Tin | 44 00 | 40 00 |
| Spelter | 8 00 | 7 50 |
| Lead | 7 25 | 7 50 |
| Antimony | 8 00 | 8 25 |
| Aluminum | 34 00 | 30 00 |

Prices per 100 lbs.

## PLATES

| | | |
|---|---|---|
| Plates, 3-16 in. | $ 5 50 | $ 5 50 |
| Plates, ¼ up | 5 00 | 5 50 |

## PIPE—WROUGHT

**Standard Buttweld Pipe**

Per 100 Ft.

| | Steel | | Gen. Wrought Iron | |
|---|---|---|---|---|
| | Blk. | Galv. | Blk. | Galv. |
| ⅛ | $ 6 60 | $ 8 50 | $..... | $..... |
| ¼ | 5 31 | 7 41 | 5 91 | 8 01 |
| ⅜ | 5 31 | 7 41 | 5 91 | 8 01 |
| ½ | 7 10 | 8 63 | 7 95 | 9 48 |
| ¾ | 8 80 | 10 87 | 9 95 | 12 02 |
| 1 | 13 01 | 16 07 | 14 71 | 17 77 |
| 1¼ | 17 60 | 21 74 | 19 90 | 24 04 |
| 1½ | 21 04 | 25 99 | 23 79 | 27 84 |
| 2 | 28 31 | 34 97 | 32 01 | 38 67 |
| 2½ | 44 75 | 55 28 | .... | .... |
| 3 | 58 52 | 72 29 | .... | .... |
| 3½ | 74 06 | 90 62 | .... | .... |
| 4 | 87 75 | 107 37 | .... | .... |

**Standard Lapweld Pipe**

Per 100 Ft.

| | Steel | | Gen. Wrought Iron | |
|---|---|---|---|---|
| | Blk. | Galv. | Blk. | Galv. |
| 2 | $32 01 | $ 38 67 | $35 71 | $42 37 |
| 2½ | 48 26 | 58 79 | 54 11 | 64 64 |
| 3 | 63 11 | 76 88 | 70 76 | 84 53 |
| 3½ | 75 90 | 92 46 | 85 10 | 101 66 |
| 4 | 89 93 | 107 55 | 100 83 | 120 45 |
| 4½ | 1 05 | 1 29 | 1 30 | 1 54 |
| 5 | 1 22 | 1 50 | 1 52 | 1 80 |
| 6 | 1 58 | 1 95 | 1 97 | 2 33 |
| 7 | 2 06 | 2 53 | 2 53 | 3 01 |
| 8L | 2 16 | 2 66 | 2 66 | 3 16 |
| 8 | 2 49 | 3 07 | 3 07 | 3 64 |
| 9 | 2 98 | 3 67 | 3 67 | 4 36 |
| 10L | 2 77 | 3 41 | 3 41 | 4 05 |
| 10 | 3 56 | 4 39 | 4 39 | 5 21 |

**Prices—Ontario, Quebec and Maritime Provinces**

## WROUGHT NIPPLES

4-in. and under, 50 per cent.
4½-in. and larger, 40 per cent.
4-in. and under, running thread, 20%.
Standard couplings, 4-in. and under, 20%
Dd., 4½-in. and larger, net.

## OLD MATERIAL

Dealers' Average Buying Prices

Per 100 Pounds.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $10 50 | $ 9 00 |
| Copper, crucible | 13 00 | 11 00 |
| Copper, heavy | 12 00 | 11 00 |
| CCopper wire | 12 00 | 11 00 |
| No. 1 machine composition | 13 00 | 9 75 |
| New brass cuttings | 7 00 | 8 00 |
| Red brass turnings | 8 00 | 8 00 |
| Yellow brass turnings | 7 00 | 6 00 |
| Light brass | 5 00 | 5 00 |
| Medium brass | 6 50 | 6 00 |
| Scrap zinc | 5 00 | 4 00 |
| Heavy lead | 4 50 | 4 00 |
| Tea lead | 2 50 | 2 00 |
| Aluminum | 15 00 | 10 00 |

| | Per Ton | Gross |
|---|---|---|
| Boiler plate | $11 00 | $12 00 |
| Heavy melting steel | 15 00 | 14 00 |
| Axles (wrought iron) | 25 00 | 20 00 |
| Rails (scrap) | 15 00 | 14 00 |
| Malleable scrap | 20 00 | 20 00 |
| No. 1 machine cast iron | 30 00 | 25 00 |
| Pipe, wrought | 8 50 | 8 00 |
| Car wheel | 30 00 | 25 00 |
| Steel axles | 20 00 | 18 00 |
| Mach. shop turnings | 8 00 | 6 00 |
| Stove plate | 23 00 | 20 00 |
| Cast boring | 8 00 | 7 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, 7-16 and up | Net list |
| Carriage bolts, ⅜" and less | 15 |
| Coach and lag screws | —20 |
| Stove bolts | 55 |
| Wrought washers | —25 |
| Elevator bolts | Net |
| Machine bolts, 7-16 and over | —5 |
| Machine bolts, ⅜-in. and less | —30 |
| Blank bolts | Net |
| Bolt ends | —5 |
| Machine screws, fl. and rd. hd., steel | 27 |
| Machine screws, o. and fil. hd., steel | +25 |
| Machine screws, fl. and rd. hd., brass | Net |
| Machine screws, o. and fil. hd., brass | Net |
| Nuts, square, blank | +25 add $2 ( |
| Nuts, square, tapped | add 2 2 |
| Nuts, hex., blank | add 2 2 |
| Nuts, hex., tapped | add 2 7 |
| Copper rivets and burrs, list less. | 27½ |
| Burrs only, list plus | 10 |
| Iron rivets and burrs | 37½ and 5 |
| Boiler rivets, base ¾" and larger | $8 5 |
| Structural rivets, as above | 8 4 |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, bright | 67½ |
| Wood screws, flat, brass | 55 |
| Wood screws, O. & R., brass | 55½ |
| Wood screws, flat, bronze | 50 |
| Wood screws, O. & R., bronze | 47½ |

## MILLED PRODUCTS

(Prices on unbroken packages)

| | Per Cent |
|---|---|
| Set screws | Less 40% |
| Square and hexagon head cap screws | Less 30% |
| Round head cap screws | Plus 10% |
| Fillister head cap screws | Less 10% |
| Flat head cap screws | Net list |
| Button head cap screws | Plus 10% |
| Studs | Less 20% |
| Semi-finished nuts up to and including 1-in. | Less 35% |
| Semi-finished nuts 1⅛ to 1½" | Less 30% |
| Semi-finished nuts 1⅝ to 2 in. | Net list |
| Coupling bolts | Plus 10% |
| Taper pins | Less 40% |
| Planer bolts without fillet | Plus 40% |
| Planer bolts with fillet | Pus 50% |
| Patch bolts | Plus 80% |
| Hollow set screws | Plus 20% |
| Thumb screws | Less 35% |
| Thumb nuts | Less 65% |

## BILLETS

F.O.B. Pittsburgh.

| | Per gross ton |
|---|---|
| Bessemer billets | $43 50 |
| Open-hearth billets | 43 50 |
| O.H. sheet bars | 47 00 |
| Forging billets | 48 50 |
| Wire rods | 57 00 |

## NAILS AND SPIKES

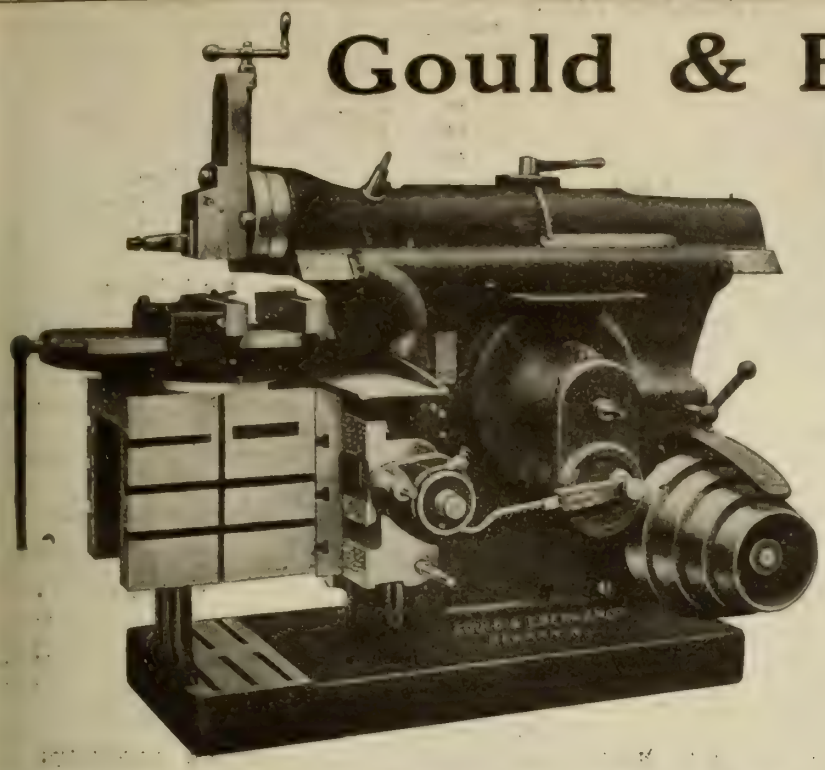
| | |
|---|---|
| Wire nails, base | $5 10 |
| Cut nails, base | 5 75 |
| Miscellaneous wire nails | 50% |

## ROPE AND PACKING

| | |
|---|---|
| Plumbers' oakum, per lb. | 0 10¼ |
| Packing, square braided | 0 38 |
| Packing, No. 1 Italian | 0 44 |
| Packing, No. 2 Italian | 0 36 |
| Pure Manila rope | 0 26 |
| British Manila rope | 0 20 |
| New Zealand hemp | 0 20 |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | Net |



# Gould & Eberhardt

## High-duty SHAPERS

16" - 20" - 24" and 28" sizes

Ask for Catalog and details describing the exclusive features.

*We can give early delivery.*

**The A. R. Williams Machinery Co., Limited**

Halifax, St. John, Montreal
Winnipeg, Vancouver

*If it's Machinery--Write "Williams"*

64 Front St. West
TORONTO


# The Week's Events in Montreal Industry

I. W. Drayton, buyer for the Canadian Fairbanks-Morse Company, in Montreal, has been on a business trip to the States for the past week or more, visiting Chicago and other American cities.

W. S. Worthington & Co., engineers and adjusters, 58 St. Francis Xavier St., Montreal, will remove to more commodious quarters in the old Sun Life Building at 142 Notre Dame St., about the first of March. This company is the sole representative for Canada of the Metals Cutting Company of Canada.

The Montreal General Tool Company, 29 Notre Dame St. East, Montreal, are desirous of getting in touch with firms in the larger centers, for the manufacture of the Victor Radiators for the heating of residences, factories and office buildings. These radiators require only about one-eighth the volume of water as that used in the ordinary radiator, for the same heating capacity.

The Dominion Engineering and Construction Company has been organized for the manufacture of "Delco" machines and "Viking" pumps. A plant has been established in Longueuil across the river from Montreal, and machinery is now being installed. It is expected that the factory will be in operation within a short time. A. G. Kidston & Co., 17 St. John St., have been appointed the Canadian selling agents.

The Grand Trunk Point St. Charles shops in Montreal will be closed during the present week, for the purpose of overhauling the power equipment, general transmission and air compressors. A complete inventory has been taken recently of every machine and piece of equipment, and also the buildings, for the information of the arbitration board now sitting in Montreal, in connection with the handing over of the road to the Dominion Government.

The Engineering & Sales Service Co. of Montreal are now well established in their new premises at 179 Duke St. In addition to their sales service the company are acquiring machinery and equipment for the carrying on of a general jobbing and repairing business. It is expected that the company will be manufacturing Promet here in Montreal in the course of a few weeks. For the past couple of years the Engineering Sales & Service Co. have been the sole Canadian distributers for this metal.

Roy M. Wolvin, president of the Dominion Steel Corporation, has returned from England, where he has been in conference with officials and others interested in the steel merger, but no immediate announcement will be made as to what has been decided regarding the early developments of the British Steel Corporation. Regarding the Dominion Steel Corporation's connection with the proposed merger the president remarked: "Matters have not yet reached a point where any definite statement affecting the affairs of the company can be made."

At the fourth annual meeting of the Montreal Branch of the Canadian Division of the Aerial League of the British Empire, which was held at the Ritz-Carlton Hotel, in Montreal, last week, the name was changed to the Aerial League of Montreal, owing to the disbanding of the parent league. A review of the past year's work, which included the establishment of the Montreal Air Harbor, were given by the Commodore, A. E. Tylee, and other officials of the league. Sir Arthur Currie was elected president for the coming year, and after the election of officers, he gave an interesting address, briefly outlining the objects of the league and the possibilities of the future.

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | $ 0 27½ |
| Solder, guaranteed | 0 29½ |
| Soldering coppers, lb. | 0 62½ |
| White lead, pure, cwt. | 17 00 |
| Red dry lead, 100-lb. kegs, per cwt. | 15 00 |
| Gasoline, per gal., bulk | 0 42 |
| Pure turp., single bbls., gal. | 1 20 |
| Linseed oil, raw, single bbls. | 1 00 |
| Linseed oil, boiled, single bbls. | 1 03 |
| Wood alcohol, per gal. | 2 75 |
| Whiting, plain, per 100 lbs. | 3 00 |

### CARBON DRILLS AND REAMERS

| | |
|---|---|
| S.S. drills, wire size | 40 and 5 |
| Can. carbon cutters, plus | 10 |
| Standard drills, all sizes | 40 and 5 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 and 5 |
| Bit stock | 50 |
| Ratchet drills | 10 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 50 |
| Sleeves | 50 |
| Taper pin reamers | 25 off |
| Drills and countersinks | Net |
| Bridge reamers, carbon | 50 |
| Centre reamers | 5 |
| Chucking reamers | Net |
| Hand reamers | 10 |
| High speed drills, list net to plus | 20 |
| Can. high speed cutters, net to plus | 10 |
| American | plus 40 |

### COLD ROLLED STEEL

[At Warehouse]

| | |
|---|---|
| Rounds and squares | $7.00 base |
| Hexagons and flats | 7.00 base |

### IRON PIPE FITTINGS

| | Black | Galv. |
|---|---|---|
| Class A | 60 | 75 |
| Class B | 26 | 36 |
| Class C | 17 | 26 |

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 7 50 | $ 7 50 |
| Sheets, blue ann., No. 10 | 6 50 | 6 50 |
| Canada plates, dull, 52 sheets | 13 00 | 13 00 |
| Can. plates, all bright | 14 00 | ..... |
| Apollo brand, 10¾ oz., galvanized | .... | ..... |
| Queen's Head, 28 B.W.G. | 13 00 | ..... |
| Fleur-de-Lis, 28 B.W.G. | 12 50 | ..... |
| Gorbal's Best, No. 28 | .... | ..... |
| Colborne Crown, No. 28 | .... | ..... |
| Premier, No. 28, U.S. | 10 00 | 10 00 |
| Premier, 10¾-oz. | 10 50 | 10 40 |
| Zinc sheets | 16 50 | 20 00 |

### PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13; 5-16, $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

### ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13; 5-16 in., $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

### FILES AND RASPS

| | Per Cent. |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 32½ |
| Black Diamond | 27½ |
| J. Barton Smith, Eagle | 50 |
| McClennand, Globe | 50 |
| Delta Files | 20 |
| Disston | 40 |
| Whitman & Barnes | 50 |
| Great Western-American | 50 |
| Kearney & Foot, Arcade | 50 |

### BOILER TUBES

| Size | Seamless | Lapweld |
|---|---|---|
| 1 in. | $27 00 | $..... |
| 1¼ in. | 29 50 | ..... |
| 1½ in. | 31 50 | 29 50 |
| 1¾ in. | 31 50 | 30 00 |
| 2 in. | 35 00 | 30 00 |
| 2¼ in. | 35 00 | 29 00 |
| 2½ in. | 42 00 | 37 00 |
| 3 in. | 50 00 | 48 00 |
| 3¼ in. | ..... | 48 50 |
| 3½ in. | 63 00 | 51 50 |
| 4 in. | 85 00 | 65 50 |

Prices per 100 ft., Montreal and Toronto.

### OILS AND COMPOUNDS

| | |
|---|---|
| Castor oil, per lb. | — |
| Royalite, per gal., bulk | 28 |
| Palacine | 31 |
| Machine oil, per gal. | 58 |
| Black oil, per gal. | 27 |
| Cylinder oil, Capital | 1.01 |
| Petroleum fuel oil, bbls., net | 11.2 |

### BELTING—No. 1 OAK TANNED

| | |
|---|---|
| Extra heavy, single and double | 15% |
| Standard | 15 and 10% |
| Cut leather lacing, No. 1 | 2 00 |
| Leather in side | 2 40 3 00 |

### TAPES

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES

| | |
|---|---|
| Polishing wheels, felt | $4 50 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, Turkish | 8¾ |
| Pumice, ground | 06 |
| Emery glue | 30 |
| Tripoli composition | 9½ |
| Crocus composition | 12 |
| Emery composition | 11 |
| Rouge, silver | 64 |
| Rouge, powder, nickel | 38 |

Prices per lb.

### ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | 8½ |
| Grits, 80 and finer | 6 |

BRASS—Warehouse Price

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 30 |
| Brass sheets, 24 gauge and heavier, base | 38 |
| Brass tubing, seamless | 42 |
| Copper tubing, seamless | 44 |

### WASTE

| | | | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 19 |
| Peerless | 22 | X Empire | 15 |
| Grand | 21½ | Ideal | 18 |
| Superior | 21½ | X Press | 13½ |
| X L C R | 16½ | | |

**Colored**

| | | | |
|---|---|---|---|
| Lion | 13½ | Popular | 10½ |
| Standard | 12 | Keen | 9 |
| No. 1 | 14 | | |

**Wool Packing**

| | | | |
|---|---|---|---|
| Arrow | 35 | Anvil | 22 |
| Axle | 28 | Anchor | 17 |

**Washed Wipers**

| | | | |
|---|---|---|---|
| Select White | 20 | Dark colored | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

### RUBBER BELTING

| | | | |
|---|---|---|---|
| Standard | 10% | Best grades | 15% |

### ANODES

| | |
|---|---|
| Nickel | .55 to .60 |
| Copper | .38 to .40 |
| Tin | .70 to .70 |
| Zinc | .16 to .17 |

Prices per lb.

### COPPER PRODUCTS

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | $35 00 | $37 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 40 00 | 44 00 |
| Copper sheet, tinned, 14 x 60, 14 oz. | 43 00 | 46 00 |
| Copper sheet, planished, 16 oz. base | 47 00 | 50 00 |
| Braziers', in sheets, 6 x 4 base | 39 00 | 42 00 |

### LEAD SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $10 50 | $14 50 |
| Sheets, 3½ lbs. sq. ft. | 10 25 | 14 00 |
| Sheets, 4 to 6 lbs. sq. ft. | 10 00 | 13 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS

| | |
|---|---|
| Acid, boracic | $ .25 |
| Acid, hydrochloric | .03¾ |
| Acid, nitric | .10¼ |
| Acid, sulphuric | .03¾ |
| Ammonia, aqua | .20 |
| Ammonium, carbonate | .23 |
| Ammonium, chloride | .22 |
| Ammonium, hydrosulphuret | .75 |
| Ammonium sulphate | .30 |
| Arsenic, white | .18 |
| Copper, carbonate, annhy. | .35 |
| Copper, sulphate | .10 |
| Cobalt, sulphate | .20 |
| Iron perchloride | .62 |
| Lead acetate | .30 |
| Nickel ammonium sulphate | 16½ |
| Nickel carbonate | .30 |
| Nickel sulphate | .17½ |
| Potassium sulphide (substitute) | .40 |
| Silver Chloride (per oz.) | 1.15 |
| Silver nitrate (per oz.) | 1.10 |
| Sodium bisulphate | .13 |
| Sodium carbonate crystals | .04 |
| Sodium cyanide, 127-130% | .39 |
| Sodium hyposulphite per 100 lb. | 6.50 |
| Sodium phosphate | .15 |
| Tin chloride | .80 |
| Zinc chloride, C.P. | .30 |
| Zinc sulphate | .08 |

Prices per lb. unless otherwise stated

# Make Screw Cutting the Most Satisfactory Operation in Your Shop

Others have done so by equipping with

## Geometric Screw Thread Cutting Tools

Wherever Screw Machines and Turret Lathes annex a Geometric Die Head or Collapsing Tap,

PRODUCTION Goes Up and COSTS Goes Down

## Prove for Yourself

what a Geometric installation will do for you.

Tell us the specifications of your work, and the kind of screw machine used, and we will make you a proposition.

## THE GEOMETRIC TOOL CO.
## NEW HAVEN, CONN.

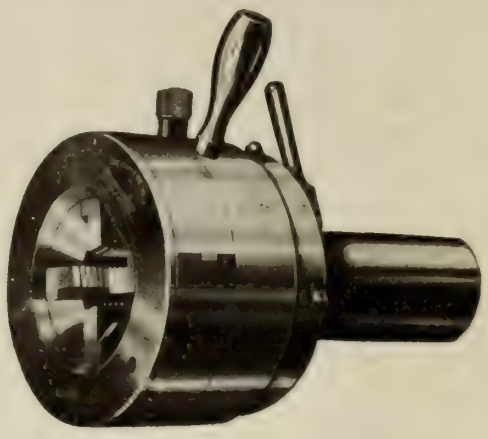
*Canadian Agents:*

**Williams & Wilson, Ltd., Montreal**
**The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B., and Halifax, N.S.**

**Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta**

# FREE TO YOU

## Geometric Die Heads



Instructions for Their Care and Use

HAVE you one of these pamphlets on the Care and Use of Geometric Die Heads?

**YOU WILL WANT THIS BOOKLET SOMETIME**

Are you using Geometric Die Heads?

**YOU WILL WANT IT NOW**

If not using Geometric Die Heads now, you will want it later, when

**YOU DO USE GEOMETRIC DIE HEADS**

It is a small 11-page pamphlet, 6 in. x 4½ in., which tells you how to take care of your Die Heads.

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A post card request will bring the booklet to you, and placed in the hands of the man who uses the Die Heads, it will help

**CUT DOWN EXPENSE**

*If interested tear out this page and place with letters to be answered.*



# INDUSTRIAL NEWS

## NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES



## NEW ADDITION TO CHATHAM PLANT

**Chatham Malleable and Steel Manufacturing Co. Extend Their Premises**

An addition to the plant of the Chatham Malleable and Steel Manufacturing Company, Limited, manufacturers of automotive and hardware specialties and sanitary stable equipment at Chatham, Ontario, is now complete, and the necessary machinery is now being installed. The addition is a one-story, heavy timber frame building, 36 x 100 feet, constructed on a cement foundation, and with a cement floor. Its principal use will be for assembling room and stockroom, but some manufacturing processes will also be carried on in it. The estimated cost is in the neighborhood of $5,000. It will mean a material increase in output as lack of room has hitherto been something of a handicap.

The company report satisfactory conditions in their business. Their plant has been working on full time all winter and orders in hand and prospects seem to warrant the expectation that this will continue for the balance of the season.

## ECHO OF THE WAR DAYS COMES UP

**Hannevig Said To Owe Large Sum To Local Shipbuilding Concern**

According to an announcement from New York, Hannevig & Co., a banking, foreign exchange and shipping concern, which was interested in the Dominion Shipbuilding and Repairs Co., of Toronto, has gone into the hands of a receiver.

The appointment of a receiver followed the action of Osler Wade, assignee of the Dominion Shipbuilding and Repairs Co., in seeking to collect $887,105 which Christopher Hannevig is said to owe the defunct concern.

It was claimed that Hannevig has large assets and liabilities in Norway and a receivership is necessary to prevent the dissipation of the assets of Hannevig & Company.

The receiver issued a statement to the effect that the trouble which Hannevig & Co. found themselves in was due to the delay of the United States Shipping Board in adjusting its obligation with Hannevig & Co. Mr. Hannevig said his creditors would be paid in full as soon as the settlement was made.

## READY TO FIGHT THE CANCELLATION

**What One Toronto Dealer Has to Say in Regard to This Abused Practice**

THE business of cancelling orders after they have been placed and finished by the makers is a hard one to deal with. That, at least, is the conclusion of one Toronto dealer.

Referring to the practice which has become such a common one in many circles in this country he stated that only a short time ago he had a cancellation sent to him and decided that the proper thing would be to fight the matter in the courts and find out if there were anything binding to a firm's signature on the strength of which he had gone ahead and undertaken serious obligations.

"The machine was from five to six thousand, and the order was taken some time ago. Only a short time ago one of the members of the firm was in the office, and I mentioned that the machine was here and we were clearing it. Erection in his plant would be undertaken in a day or so.

"The next thing that happened was the receipt by us of a hurry-up letter of cancellation. Business was not as good now as when the order was placed, but later on the machine would be needed. The idea was that we were to be made part of the getting-out system. There was nothing left for us to do but stand pat, and go to court, with the idea of finding out exactly where we stood. The result was that delivery was made.

"A dealer must protect himself in some way, and it seems to me that such a matter is only one of many that an organization of machine tool dealers could deal with. Why could they not frame up certain standards of practice, which would include decent methods of doing business, and have a uniform attitude toward the cancellation business. It seems to me that we must attempt to work toward the idea that a contract is a contract—that it is a moral obligation, signed, sealed and delivered, and backed up by the firm's name. If we cannot depend on such a document, then what is there we can depend upon?"



T. J. McFADDEN.

T. J. McFadden has joined the Western Ontario sales staff of the Diamond Stake Fibre Co. of Canada, with headquarters in Toronto. Mr. McFadden has had both executive and factory experience with the company before joining the sales force.

## HAS FAITH IN THE ELECTRIC ROADS

**Railway Engineer Quotes Figures That Show Where Savings Would Be Made**

London.—The superior financial and operating advantages, together with the coal problem, will eventually compel the electrification of all Canadian railways, D. M. Morrison, chief engineer of the London & Port Stanley Railway, told the Rotary Club. Mr. Morrison declared that the electric locomotive is capable of working 24 hours a day seven days a week; that an electric railway can haul a third more freight than a steam road on this continent, and that maintenance of way charges are 50 per cent. less when electric locomotives are used. He stated that if all the steam roads in the United States were electrified the saving in coal annually would amount to 122,500,000 tons.

A factory building has been leased by Eckensweil and Harkley, Walkerton, Ont. After being remodelled and equipped it will be used for the manufacture of cement tile.

# ATKINS
## METAL CUTTING SAWS




**Solve your Metal Cutting problems, easily, quickly and economically, by adopting the products made by**

# ATKINS

We make Kwik-Kut Power Hack Saw Machines which use practically the full cutting edge of the Hack Saw Blade at each stroke; Metal Cutting Band Saw Machines for general shop work, cutting all classes of metal up to 12 x 14 inches.

Your requirements for Metal Cutting Circular Saws can be supplied promptly and we solicit a trial of our "AAA" Non-Breakable and Power Hack Saw Blades and Frames.

*"A Better Saw for Every Use"*

## E. C. Atkins & Co.

Established 1857

*"The Sterling Quality Saw People"*

*Factory:* HAMILTON, ONT. *Branch:* VANCOUVER, B.C.

*If interested tear out this page and place with letters to be answered.*

# HIS PREDICTION OF WHAT IS LIKELY TO HAPPEN DURING 1921

WHEN the average man speaks of business conditions to-day he prefers to take a chance on the long future rather than on the immediate present. It is not committing one's self to any particular course to say that ultimately things will be all right, and that conditions are fundamentally sound, or something of that sort.

But Arthur S. Dewing, of the Department of Economics, Harvard University, goes one better than that. He takes the year as it is coming to him, and forecasts the high spots. It was in 1916 that he wrote a post-war prediction for the Yale Review, and what he had to say then came true in so many ways that what he has to say of 1921 carries some weight. Here are his views summarized:

(1) Buying public will continue to demand reduction in prices on commodities above pre-war prices.

(2) Retail merchants will buy sparingly by reason of high interest rates and feeling of uncertainty regarding their customers' attitude.

(3) European countries will not increase their purchases beyond barest necessities and will make strenuous efforts to increase their exports.

(4) The forces that have brought about decline in prices and wages will continue to operate and general course of commodity prices will be toward lower basis.

(5) Certain basic materials like copper, tin, cotton, hides and rubber will not decline much below present values and copper will be the first to feel the effects of better conditions.

(6) Basic commodities like steel, lumber, hogs and cereals will go lower and pig iron will reach its lowest level by midsummer, but fabricated steel products will probably continue to decline throughout the year.

(7) Retail prices of goods produced from these basic commodities may be expected to continue to fall throughout the year. Copper, cotton, and woollen manufactured articles, for example, may very probably sell to the consumer for higher prices by next winter owing to the exhaustion of the stocks of the raw material, but the general reduction in the retail merchant's overhead expenses coupled with the keenest kind of competition among retailers may keep down even these prices.

(8) Interest rates, profits and wages are destined to fall steadily during the year. That wages and profits decline during a period of falling prices is merely the converse of the proposition that they rise during rising prices—and the truth of this is all too clearly before us from the experience of the last few years.

# CAN UNDERSTAND FROM PICTURES

**Canadian Machinery a Welcome Visitor at the Trade Commissioner's Office**

Wendell McL. Clarke, Trade Commissioner to Italy, will be leaving for that country again in a few weeks, having been in the Dominion for the past two months. Mr. Clarke believes there is good business to be done there and intimates that reports of industrial conditions, strikes, etc., were very much exaggerated.

"Canadian Machinery," he remarked, "is of great assistance, and although it is printed in English, the illustrations in the reading matter and in the advertising pages enable the people to see just what many lines look like. Many of the Italian people are surprised that such papers are turned out in Canada. They are of great assistance in furthering Canadian trade in foreign lands."

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A refinery will be built by the Royal East Duke Oil Co., 171 St. James St., Montreal.

# Trade Gossip

**Captain Fatally Injured.** — Captain Kenneth McKenzie, of Tiverton, was fatally injured at his home in Tiverton, nine miles from Kincardine. He went down into his cellar to look at the acetylene plant, which had not been working properly the night before, and it is surmised that he lit a match, for there was a heavy explosion, and part of a match was found on the floor. He was found with his skull crushed in and both arms broken. He died as he was being carried upstairs.

**Make Disc Wheels.**—The National Engineering Company, Limited, of Sarnia, Ontario, who manufacture air compressors, automobile tire pumps and machine tools of various types, intend to add disc wheels to their list of products in the near future. The National Engineering Company are one of Sarnia's newer industries. Their plant has been in operation since April, 1920, and at present from twelve to fifteen men are employed. The company's capitalization is $150,000 and the officers are: J. W. Lawrence, president and general manager; W. A. Swan, vice-president and factory manager; and J. E. B. Phelps, secretary-treasurer.

**The Blashill Wire Machinery Co.,** Montreal, is looking for a local site to establish a plant for making wire fencing. A new type of fence making machine has been designed by A. E. Blashill and the company have been planning the establishing of a plant for two years, but owing to the difficulty of securing raw material the plans were for the time abandoned.

**Must Quit Union.**—Twenty-two electricians, mostly outside linemen, employed by the Winnipeg City Light and Power Department, were suspended and paid off for failure to comply with the order of J. G. Glassco, manager, that they sever their connection with the Electricians' union. The men, it is understood, will be given a day or so to comply with this order, failing which they will be permanently dismissed.

**Sold the Plant.**—Canadian Car and Foundry Company has recently disposed of its Rhodes Curry plant at Amherst, N.S. The plant was not in any degree a vital part of the Car Company's organization and its disposal will enable the Car Company to enter 1921 in a stronger liquid position than otherwise would have been the case. The remaining plants of the company are capable of caring for the unusually large volume of orders now booked.

**Build $30,000,000 Bridge.**—At a meeting of upward of 200 officers of the R. T. Scott Co., Ltd., at the Prince George in Toronto, announcement was made that this Toronto house has secured the financial contract to raise the $30,000,000 required for construction of the Detroit-Windsor bridge, the bond issue being in $30,000,000 seven per cent. preferreds and an equal amount of common bearing eight per cent. Three years is the selling period. Announcement was made of the opening of ten new branches, two of them here.

**Will Pay Dividend.** — Contrary to somewhat generally held expectations, no statement was given out at the conclusion of the meeting of the board of directors of the Dominion Steel Corporation, held in Montreal. It is understood that the chief business considered was composed of details in connection with the amended plan to merge the two steel companies, the Dominion and Scotia, with the possible inclusion of the Halifax Shipyards, Limited, and the Maritime Nail Company, of St. John. The one development of public interest was the announcement that the directors had declared the usual quarterly dividend of 1½ per cent. on Dominion Steel Corporation common stock payable April first to shareholders of record March fifth next. The regular 1¾ per cent. disbursement on the preferred stock of the Dominion Iron and Steel Company was also declared, payable April first to record March 15th next.

Aikenhead's

## Canada's Leading Tool Supply House

When you want tools, think of Aikenhead's. Let us make good our boast that we can supply you with "Anything in Tools" **promptly!**

# The Wahlstrom Drill Chuck

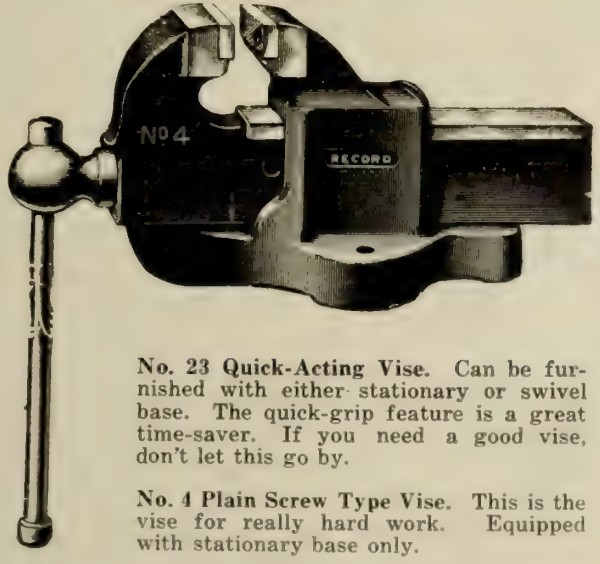
### *Keyless and Colletless. Never Slips*



With a Wahlstrom your operator can drill any number of holes of different diameter one after the other simply by grasping the chuck with on hand and replacing the loosened drill with another—**and two seconds does it.**. It is not even necessary to stop the spindle.

This Wahlstrom Automatic self-centres the tool perfectly and its instant-acting jaws close on the entire shank in a grip that becomes firmer as the resistance to the tool increases. The clutch can't slip and the jaws never mark a tool.

Made in two styles. One holds Nos. 1, 2 or 3 Morse Taper Shank Tools—with or without tang. The other is made in three sizes: 15-64 in. to ½ in.; ⅜ in. to ¾ in., and 17-32 in. to 1 in., thus holding all sizes of straight shank tools from 15-64 in. to 1 in. Booklet upon request.




**No. 23 Quick-Acting Vise.** Can be furnished with either stationary or swivel base. The quick-grip feature is a great time-saver. If you need a good vise, don't let this go by.

**No. 4 Plain Screw Type Vise.** This is the vise for really hard work. Equipped with stationary base only.

# "Record"

## Mechanics' Vises

"Record" Mechanics' Vises are strong, reliable tools which can be depended upon to stand the rough abuse which is the usual lot of a vise. They are made of the best grey iron castings. This is your opportunity to secure a high grade English Vise at a remarkably low price. Ask for fuller description and price list.

## Aikenhead Hardware, Limited

**17 Temperance Street, Toronto, Ont.**

*If interested tear out this page and place with letters to be answered.*

### CLEANING SCRAP METALS FOR CASTING

Scrap metals vary considerably in accordance with the source from which they are obtained, and this way they may be melted and cast direct or have to be made into ingots and re-melted as the case may be; but in all cases where level color is required, as with brass, either very careful sorting or melting in large quantities and casting into ingots becomes necessary, a large natural draught air furnace usually being selected for this class of work.

The scrap from factories, continues Practical Engineer, is usually fairly regular in character, but that collected from miscellaneous sources is generally very uncertain and has to be carefully sorted and graded. With non-ferrous metals and alloys it is an essential that all iron be picked out, and in fact all of these should be massed through a magnetic separator of some kind. Painted metals usually hold oxides of metal in the paint, which are reducible should they get into a bath of molten metal, and even when not reducible the paint base is likely to cause unsound metal unless removed. Zinc-coated iron should never be melted for making castings, and painted iron will at times cause trouble because the paint stock is not always quite destroyed or reduced in the furnace. Having as far as is possible cleaned and sorted the metal before melting, it becomes of some importance to clean it after melting, and here it is desirable to skim crucibles as soon as the metal melts, thus removing not only dirt but nickel and the like with which the scrap may have been plated. To remove the oxides which may have become entangled with the molten metals, with aluminum and its alloys a flux of zinc chloride, with cupreous alloys a flux of salammoniac, and with iron either fluorspar, soda ash or ferro-aluminum should be used in quantities as may be needed, unless some proprietary flux is preferred, and some of these things are very good indeed if used as the makers advise. Scrap does not answer for castings which have to stand tests, but for a large amount of work it is useful on account of its low price as compared with new metals.

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**Business Better.**—Reports received by the directors of Ontario Steel Products Limited at a recent meeting showed that business was looking up. More orders were coming in, and business appeared to be looking brighter in every way. The plants at Chatham and Gananoque are said to be running at considerably more than half capacity, and there does not seem to be any reason to expect any change in the dividend policy.

**Russian Business.** — An undertaking for the repair of virtually all of Russia's locomotives, extending over a number of years, has been signed between the London firm of Armstrong, Whitworth and Company and the Russian Trade Delegation. Reports to this effect had been current for several days and the company has confirmed them. It announces that the contract is subject to the signing by Great Britain of the trade agreement with Russia.

N. L. Somers, assistant works engineer for the past four years with the Algoma Steel Corporation, is incorporating a company, with head office in Toronto, to engage in sales engineering and contracting. Power development and transmission supplies and equipment will be specialized in.

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## OBITUARY

The death occurred at Hamilton on January 27 of Robert McMurtrie, who for many years was a salesman for the Steel Company of Canada.

The death occurred at Toronto General Hospital on February 6, after a short illness, of Mr. James G. Cane, one of the city's leading lumber merchants. Mr. Cane had been in the lumber business in the city for thirty years as head of the firm of J. G. Cane & Company.

The death occurred at Goderich on January 31 of Capt. Alexander Lawson, one of the old-timers of the Great Lakes. He was a master of sailing vessels and has owned several. He was one of the original stockholders in Hutchinson's Flour Mill, now the Western Canada Flour Mills Company. Some years ago he promoted the building of the Masonic Temple on West Street, Goderich.

---

**LOOK WHO'S GOT IT!**




—Des Moines "Register."

**There is a growing suspicion that the newspaper reporters have not been interviewing the right parties!**



# MORROW

## *High Speed Forged Drills*

The long life of Morrow Drills and their keen cutting edge is what makes them popular. It's in the steel, it's in the temper, it's in the knowing how!

*Also manufacturers of Cap Screws, Set Screws, Semi-nuts, and sole distributors of P-H and Imperial Brand Files.*

When ordering drills be sure to specify MORROW'S. There's a difference in your favor.

Please Note Our New MONTREAL ADDRESS

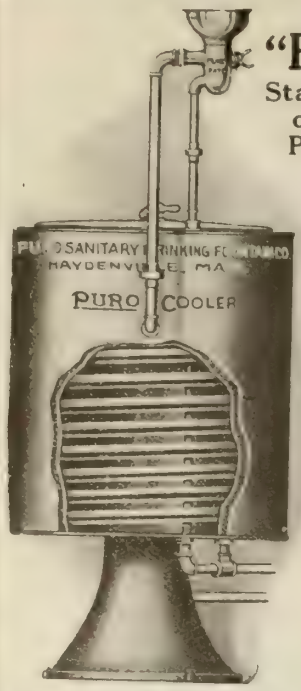
## John Morrow Screw & Nut Co., Limited

Ingersoll, Canada

**John Morrow Screw & Nut Co., Limited**
489 St. Paul Street West, MONTREAL, Quebec
*Telephone:* Main 8418

*If interested tear out this page and place with letters to be answered.*

THE "FLU" Stayed out of this PLANT



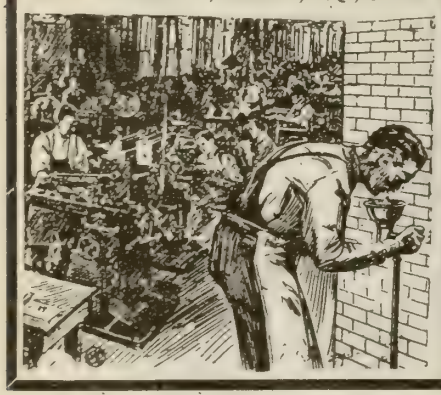

PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)

The only fountain with a bowl that prevents lips touching the bubbler paid its moderate cost over and over in all those well-ordered plants whose precautionary measures successfully barred the Spanish influenza. PURO saves lives, time and water. Write

Puro Sanitary Drinking Fountain Co.

888 F. St. Andre St., Montreal, P.Q., Canada



# E. P. THOMAS REVIEWS WORLD CONDITIONS IN THE STEEL TRADE

E. P. Thomas, president of the United States Steel Products Company, the subsidiary of the United States Steel Corporation dealing with export business, spent a few hours in Toronto, during which a number of men interested in the iron and steel industry had the opportunity of meeting him at a luncheon arranged at the Toronto Club.

Discussing world conditions, Mr. Thomas had the experience of a long trip in Europe to draw from. "Many undertakings will be gone on with now that had been held up for years, fearing the outbreak of the German army and possible German domination. There is the railway in Mesopotamia to Bagdad, and other undertakings. During the years of the war a large amount of steel was withdrawn from commercial and industrial usage, and it is safe to say that now there is a shortage of fifty million tons of steel."

Neither Germany nor France nor Belgium was in a position yet to produce to anything like capacity. It would take France some time to take full advantage of her new iron ore and coal resources. Britain was having difficulty also with labor troubles, and there would be a big export business from the American continent.

The company of which he was head had such faith in the possibilities of the export business that they had gone ahead with the construction of 32 ten to twelve thousand ton ships, at a cost of from fifty to sixty million dollars.

Coming to the operations of the corporation at the plant at Ojibway, Mr. Thomas intimated that construction costs had been the chief obstacle in holding back the completion of this installation. They had already spent four million dollars there, but had hesitated in going ahead faster because the original estimate of twenty millions for the plant had come to look more like fifty millions. They were anxious as soon as possible to get under way in Canada, and to take their place as manufacturers in the Dominion.

For the long future Mr. Thomas had no fears, although for the immediate present he admitted that one man's guess was as good as another's. During his short stay in Canada he claimed he had unearthed even a better brand of optimism than was prevalent in many parts of the United States. Many of the problems following the war had been dealt with, and conditions were favorable to a resumption of normal business.

## TRADE GOSSIP

Several prominent Masons of St. Thomas, Ont., are advocating the erection of a large Masonic temple there.

An addition to their present warehouse is being planned by the Waterloo Manufacturing Company, Saskatoon, Sask.

Joseph S. Johnson died at his home in Galt on February 13. He was an engineer with the G.T.R. for forty-five years.

It was strongly recommended at the annual meeting of the Lambton Farmers' Co-operative Association at Petrolia, Ont., that an elevator be built at that point.

A permit has been issued to the Barrett Company for two tar storage tanks of concrete construction at the southeast corner of Keating and Saulter Streets, Toronto, at a cost of $20,000.

After a few weeks' illness at his home in Owen Sound, the death occurred of James McLauchlan. Mr. McLauchlan, who has been a resident of Owen Sound since 1871, was founder of the business now carried on by the McLauchlan & Sons, Ltd.

It has been stated by W. H. Shaw, head of the Shaw Business College, that he will likely erect a school building on property which he has purchased at 56 Wellesley Street. He is considering the erection of a building three or four stories in height, with all modern improvements.

**New Company.** — Incorporation has been granted to the Canadian Production Tool Company, Walkerville, for the manufacture of production tools, etc. H. E. Walker is president of the new company and H. N. Reynolds secretary-treasurer.

A plant will be erected by the M. N. and R. Fishing Company, in the near future, at or close to Prince Rupert, B.C.

The Ford Motor Company has reopened its plant at Highland Park, and is producing at 25 per cent. of capacity. The plant will operate on a three-day-a-week schedule at the outset.

The death occurred in Hamilton on January 9 of Miles O'Reilly Duff, who was, until the beginning of his illness a year ago, associated with the Dominion Bridge Works Company, of Toronto and Montreal, and also the Hamilton Bridge Works Company. He was a graduate in science of the University of Toronto, and a member of the Engineers' Institute of Canada.

## PRICES AND WAGES GO HAND IN HAND

**What Some of the Independent Producers Are Doing in Youngstown District**

Youngstown, O.—Independent producers of steel in this district are breaking away from the United States Steel Corporation's prices under the lead of interests east and west. Cuts in quota-

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tions ranging to $7 a ton for galvanized are heard. The range through seems to be from $4 to $5 a ton. Some interests will decline to name prices that will cause a greater loss than suspension of operations.

A substantial cut in wages by independents in those districts that are still adhering to the quotations in effect by the United States Steel Corporation is at hand.

New independent steel prices heard are 2.40c to 2.45c base for plates, 2.25c base for bars, 4.25c base for black sheets and 5.25c to 5.50c for galvanized, as low as 2.15c on bars and 5.40c on galvanized is heard.

## Personals

J. A. Evans has accepted the position as office manager with the Canadian Hart Products, Ltd., Hamilton, Canada. For several years past Mr. Evans has been with the Victor Saw Works at Hamilton.

James McGill, engineer on the Steamer Mallon, of the Matthews Steamship Company, whose home is at 44 Smith Street, Toronto, died at Cornwall on January 31, from injuries receiving by falling into an open hatchway on the vessel.

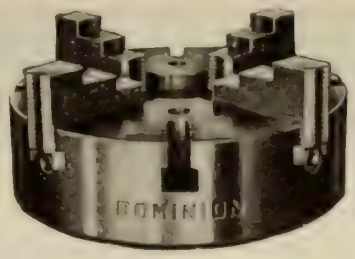
**Ready to Start.**—The plant of the Carbon & Alloy Steel Company at Fraser, Ont., is nearing completion and, it is expected, will be in operation by March 1.

**New Sales Office.**—The city sales office and show room of the Dodge Mfg. Co., Ltd., is being removed to the new Aladdin building, corner Simcoe and King Sts. They will occupy the entire ground floor.

**Getting Canadian Plate.**—What is stated to be the first shipment of steel plates of appreciable width from the Maritime Provinces to the Toronto district has arrived in Toronto. The shipment consisted of three carloads of steel plates, eighty-five inches wide, manufactured by the Dominion Iron & Steel Corporation, of Sydney, Nova Scotia, and transhipped via the Canadian National Railways to the Toronto Iron Works. Hitherto local firms have been obliged to order steel plates of this size from the big mills in the United States, and the fact that Nova Scotia has attained such magnitude as a steel producer is regarded as encouraging by the Canadian trade.

It is expected that excavations will be begun and foundations laid in Queen's Park, Toronto, early next spring for the new Trinity College. The latest estimates place the cost of the first stage of construction at half a million dollars.

The Machinery & Foundries, Limited, Brockville, which was recently incorporated to manufacture hand and power pumps, and gray iron and brass castings, will be in operation early this month.


DOMINION CHUCKS

STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY



The Jaws Are Extra Strong

THEY are drop forgings, made of best quality steel, heat-treated and hardened. The threaded portion of jaws form a half nut for the setting-up screws. Have stood the test of heavy duty work in our own shops where accuracy was the only accepted standard.

DOMINION STEEL PRODUCTS CO.
LIMITED
*Engineers • Manufacturers*
BRANTFORD, CANADA

3

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*Consulting and Designing*
Tools, Jigs, Fixtures and Special Machinery. Let us shoulder your problems.
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DROP FORGE DIES
Send us your blueprints and specifications. Entrust your requirements to experienced workmen and up-to-date equipment. Have your dies made in Canada. First-class workmanship guaranteed.
THE KIMBER & HILLIER MFG. CO.,
Thorold Road, - St. Catharines, Ont.

HIGH CLASS Machine Tools
FOR SHIPYARDS AND CONSTRUCTIONAL WORKS
BERTRAMS LIMITED
SCIENNES EDINBURGH

SALESMEN WANTED
Must be thoroughly familiar with the Foundry and Coal Mining Trade. Box 719 F, Canadian Machinery.

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MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

## AGENCIES WANTED

SOLE AGENCIES WANTED BY WELL-known, reputable and established English engineering firm, represented all over the world, for Contractors' or Municipalities' small Engineering equipment, which must be first-class, competitive in price, and in constant large demand. British made and patented preferred; if Colonial or Foreign, privilege or manufacturing in England required. Big sales assured for the right Equipment. Write giving details to "Engineering," P.O. Box 1934, Montreal. (c8m)

## POSITIONS WANTED

DRAUGHTSMAN (PERTH COUNTY) DESIRES change. Have had general experience of ten years. Am first-class practical shop mechanic, age 30. Married. If you are in need of a young man of ability, who has risen by merit only, let us arrange an interview. Address Box 747, Canadian Machinery. (c6m)

## HELP WANTED

WANTED AS ASSISTANT EDITOR, ON group of technical papers, live-wire mechanical engineer. Qualifications required are: Age, under 45; good education; certain amount of practical experience; ability to express ideas on paper; good mixer and aggressive worker. Splendid opportunity for the right man. State full particulars in first letter, mentioning present salary. Box 152, Canadian Machinery.

### FOR SALE

Enclosed liquid fuel combustion apparatus capable of generating intense heat in pipes and confined passages for heating parts of internal combustion engines and for other uses; spark ignited; blower operated. Patented April 3, 1917. Can be inspected at and for sale by H. W. Petrie, Limited, Toronto.

## What can we do for YOU?

Through these columns thousands of dollars of equipment are disposed of each year. If you are not using Canadian Machinery now, let us tell you what others have done—are doing.

**CANADIAN MACHINERY**
*Classified Advertising Section*
**143 University Ave., Toronto**

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TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (ctfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

### PATTERNS

**Wragge's Pattern Works, 10 George St. South, Galt, Ont.**, Phone 1105 W. Equipped for best service in wood or metal patterns to any specification. Most reasonable prices. Expert workmanship. "Nothing ragged but the name." (cxxvi3m)

### Modern Marine Machinery

Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

### MACHINE WORK WANTED

We are equipped to handle all kinds of general or special machine work. All operations in our plant are done under the most careful supervision and we can satisfy you as to price. Always available for consultation.

**PERFECT MACHINE COMPANY. GALT**
**Builders of Reliable Machinery.**

### Grey Iron Castings

Light and Medium-Bench and Floor Repetition Castings; Capacity 15 tons per day.
Expert Metal and Wood Pattern Work. Our advice and estimates will save you money.
Semi-finishing operations on Lathe or Grill on Castings supplied if required.
ASK US.
**THE KATIE FOUNDRY, GALT, ONT.**

## REGO WELDING *and* CUTTING APPARATUS

Oxygen, Acetylene, and a complete line of Welding and Cutting Supplies.

**Carter Welding Co.**
**of Toronto, Limited**
**7-11 Sheppard St., Toronto, Ont.**
**Phones: Adelaide 2841 and 1524**
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## MACHINERY WANTED

WANTED—NEW AND RE-MANUFACTURED gas and gasoline engines, boilers, saw-mill machinery, planing mill and sash and door factory machinery. New and manufactured iron and wood-working machinery. Electric motors, dynamos, direct connected steam operated generators, portable electric tools. Builders' hoists, elevators. Box 739F, Canadian Machinery.

IF YOU HAVE IRON-WORKING OR WOOD-working machines for sale, or idle machine shop equipment, call or write Canada's largest dealers in new and used machinery. H. W. Petrie Limited, Toronto, Ont. (cfm)

WANTED — WOODWORKING MACHINERY and mining machinery, machine tools, boilers and steam pumps, alternating or direct current motors. Contractors' equipment. Apply Box 737F, Canadian Machinery.

ONE SINGLE STAND 9 x 18 ROLL IN GOOD condition; one receiving separator, capacity about 1,000 bushels per hour. Crane Bros., 817 Ferry St., Niagara Falls, Ont.

## FOR SALE

2—ROTARY STEAM DRIERS—6' DIAM. x 25' long; complete.
2—ENDLESS DOUBLE LEATHER BELTS, 13" x 50' total length each.
1—8" x 12" DOUBLE DRUM BEATTY HOIST and boiler.
1—6" x 12" DOUBLE DRUM BEATTY HOIST and boiler.
2—AIR COMPRESSORS, 800 FT. CAPACITY; belted.
Box 752F, Canadian Machinery.

### FOR SALE

Perfected rotary engine valve, simple design, free from defects common in rotary valves. Patented Feb. 20, 1917. Can be inspected at and purchased from H. W. Petrie Limited, Toronto.

## MACHINERY FOR SALE

1—24" x 12' Canadian Machinery Lathe
2—22' x 10' Davies Lathes.
1—21" x 10' London Lathe.
6—20" x 8' C.M.C. Lathes.
1—18" x 8' Mueller Lathe.
3—19" x 8' C.M.C. Lathes.
1—18" x 8' London Lathe.
1—16" x 8' C.M.C. Lathe.
1—16" x 6' McDougall Lathe.
1—D-1 H. D. Colburn Drill.
2—No. 24 H. D. Foote-Burt Drills.
1—28" B. G. Barnes Drill.
1—22" B. G. Barnes Drill.
1—D.C. Compound Wound Generator, 110 Valts, 125 Amp.
2—No. 54 Perkins Sprue Cutters.
2—2" x 26" Pratt & Whitney Turrets.
1—10" x 52" Plain Landis Grinder.

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**LATHES**

Alfred Herbert Hexagon Turret Lathes for bar work for 1⅝" and 2¾" dia. bar.
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Springfield 16", 18", 20" cone pulley and geared head Engine Lathes.
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12" Pollard Bench Drills.
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20", 22", 24", 27" Pollard Upright Drills.
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6' Tangye Radial Drill.

**SHAPERS**

16" Milwaukee.

**PLANERS**

24" x 24" x 6' Stirk Planing Machine.
60" x 60" x 16' Stirk Planing Machine.
36" x 36" x 8' Stirk Planing Machine.

**MILLING MACHINES**

No. 3 Herbert Horizontal Cone Pulley, 21" x 7" x 16".
No. 16 Herbert Horizontal Single Pulley, 34" x 13½" x 20".
No. 1 Herbert Vertical Cone Pulley, 30" x 12½" x 20".
No. 16 Herbert Vertical Single Pulley, 34" x 13½" x 21".
No. 8 Herbert Vertical Cone Pulley, 62" x 38" x 28½".

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**GRINDERS**

7 No. 6 Perfects.
1—Stevens Cutter Grinder.
1 Brown & Sharpe Surface Grinder with magnetic chuck.
1 No. 2 Wilmarth & Norman surface grinder.

**LATHES**

3 28" x 12' Boye & Emmes, 3 step cone, D.B.G., Q.C.G.
1 24" x 12' Boye & Emmes, 3 step cone, D.B.G., Q.C.G.
1 24" x 10' Boye & Emmes, 3 step cone, D.B.G., Q.C.G.
1 24" x 12" Rahn Larmon, 3 step cone, S.B.G., S.Q.C.
1 22" x 10' Devenport, 3 step cone, D.B.G., Q.C.G.
1 22" x 10' Reed, 3 step cone, S.B.G., S.Q.C.
1 22" x 10' Milwaukee, 3 step cone, D.B.G., S.Q.C.
1 21" x 10' Sidney, 3 step cone, D.B.G., Q.C.G.
1 21" x 10' LeBlond, 3 step cone, D.B.G., Q.C.G.
1 20" x 8' American, all geared head.
1 20" x 8' American, 3 step cone, D.B.G., Q.C.G.
1 19" x 8' LeBlond, 3 step cone, D.B.G., Q.C.G.
1 18" x 8' Walcott, 3 step cone, D.B.G., Q.C.G.
1- 18" x 8' Greaves Klausman, 3 step cone, D.B.G., Q.C.G.
1 18" x 8' Mueller, 3 step cone, D.B.G., Q.C.G.

**SPECIAL OFFER IN SHAPER**

6—14" Davies Shapers (New), bargain to quick buyers.

The purchasing agent who does not ask for quotations from this office is not aware of how far prices can be cut to meet his requirements.

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**Many machines only very slightly used and all absolutely guaranteed.**
**A few machines from our Toronto stock at exceptionally attractive prices are:**

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1—30" x 12' "Blaisdell" (used).
1—30" x 14' "Niles-Bement-Pond" (used).
1—26" x 14' "Niles-Bement-Pond" (used).
1 24" x 10' "Milwaukee" (new).
1 18" x 8' "Rae" (new).
1—16" x 6' "Reed" (used).
1—12" x 8' "LeBlond" Tool Room (used).
1—8" "Rivett" Cabinet Type, full attachments (used).
1—7" "Cataract" Precision (new).

**GAP LATHES**

1—38" x 54" x 12' Bertram (used).
1—22" x 40" x 16' McDougall (used).
1—21" x 30" x 7' South Bend (used).
1—20" x 38" x 12' C.M.C. (used).

**TURRET LATHES**

No. 4 Millhollands, capacity 1⅝" (used).
Several Oliver & Davis Turrets, various capacities (used).

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1—16" "MacKenzie" B.G. Crank Shaper, (new).
1—16" "Rae" B.G. Crank Shaper (slightly used).
1—24" "McGregor-Gurley" B.G. Crank Shaper (used).

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1—42" x 42" x 20' Putnam, 1 head (used).
1 30" x 30" x 10' Pond, 1 head (used).
1 24" x 24" x 6' Powell, 1 head (new).

**MILLING MACHINES**

1—Briggs High Duty Type "A" 22" Traverse (new).
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1—Whitney Hand Miller, 18" x 6" table (used).

**DRILLS**

2 10" Burke Sensitive (Bench type) (new)
1 15" Barnes (used).
20" "Sibley," "Champions," "Rockwell" and "Silver" (new) and (used).
1 36" C.M.C. Heavy Duty (used).
1—3-spindle 20" Silver Gang Drill (used).
1—4-spindle W. & R. Sensitive (used).

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1 66" Bement-Niles Vertical, 2 heads, 24" under rail (used).
1—Universal No. 2½ Horizontal Table, 42" x 22" (used).
1 Bullard "New Era" Vertical Turret, 36", complete equipment (new).

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1 No. 10 Racine 8" x 8" Cap. (new).
1 No. 7 Watkins 9" Cap., 18" Blade (used).
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1 12" x 12" Bury, Class "L," Belt driven (used).
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1 8 x 10 x 8 Bury, Steam driven (used).
1 3" x 1½" x 3 American Steam Pump Co., motor driven (used).

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1 "High Speed" Hammer, No. 3A (used).
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1—"Grant" Riveting Machine, No. 80A (used).
1 "Grant" Riveting Machine, No. 80B (new).
1 Arbor Press, No. 4 "Greenerd" (new).

**GRINDING MACHINES**

1 Landis No. 4 Universal (used).
1 Landis Plain, self-contained, 36" x 12" (used).
1—Norton Plain, No. 434 (used).
1 Fitchburg Cylindrical 8" x 36" (new).
Several Tool and Cutter Grinders (new) and (used). "Globe," "Stevens," "LeBlond" and "Cincinnati."

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*"A voice roared out, hoarse, profane;--the Mate's voice: 'Thought you'd try it again, did you, you dashed beach-comber. I'll teach you, and when I find the dog that left that rope for you I'll give him a leaf out of the same book. You bloody waster! I'll teach you! I'll—!'"*

This is an extract from Frank Packard's "Pawned," which commences in the February 15th issue of MACLEAN'S MAGAZINE.

At the period in the story that this is written the leading character is a beach-comber in the South Sea Islands.

Three months later, John Bruce is stretched at full length on a luxurious divan in the most sumptuous apartment of the Bayne-Miloy, New York's newest and most pretentious hostelry.

*How had this wonderful metamorphosis been made? It is a mystifying, enthralling, intriguing story, the secret of which you can only get by reading every instalment of Frank Packard's wonderful yarn.*

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Let's make an uncommon effort toward a common end—Good Times.

***A message from the Associated Advertising Clubs of the World.***

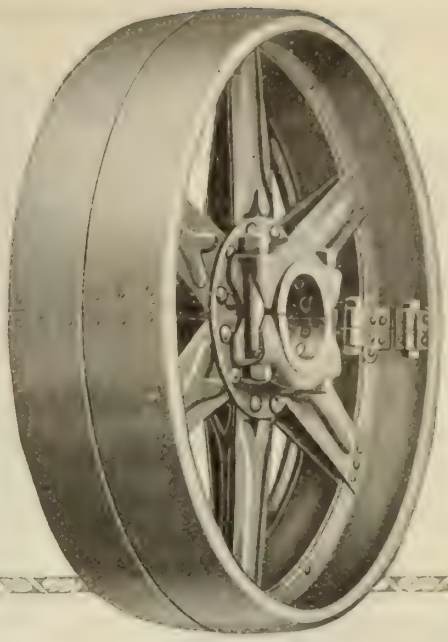



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**The American Pulley Company**
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A wheel with a broad rim transmitting power from or imparting power to machinery—or changing the direction of power by means of a flat belt.

## New Air-Tight Blast Gates

will help you maintain the safety, economy and efficiency so essential in the operation of furnaces and other appliances using low or moderate pressure air.



**THEY ARE SAFE**— because they are ruggedly built of only a few simple parts; the blade stays fixed in any position and by a slight pull of the handle is easily adjusted to give the blast desired.

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**THEY ARE EFFICIENT**—because careful machining makes them AIR-TIGHT; they afford the full area of the blast pipe, in striking contrast to a stop cock; they are quick in operation; they can be placed in any position.

***In short, these New Air-Tight Blast Gates possess all the advantages of stop cocks and valves, and have special features that tend for greater usefulness and economy.***

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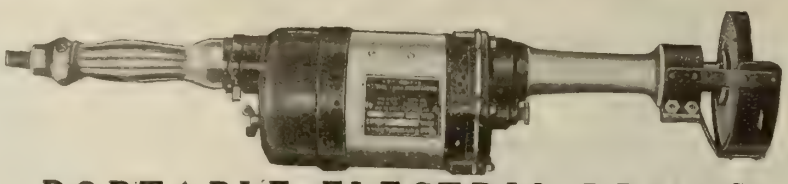
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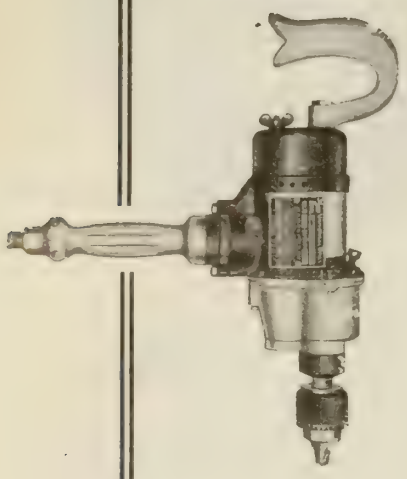

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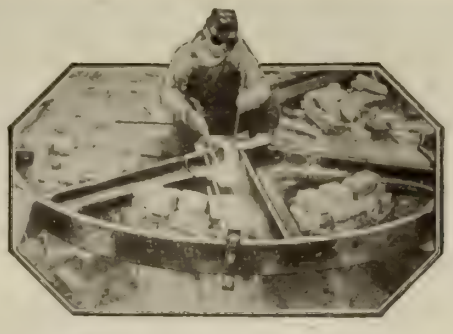
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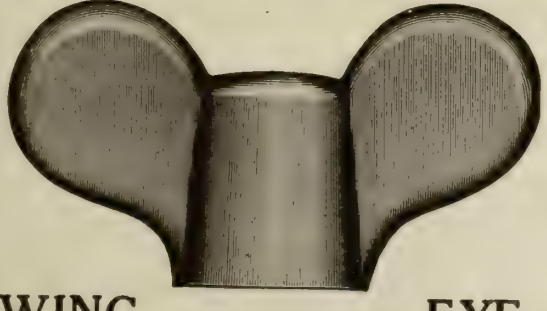
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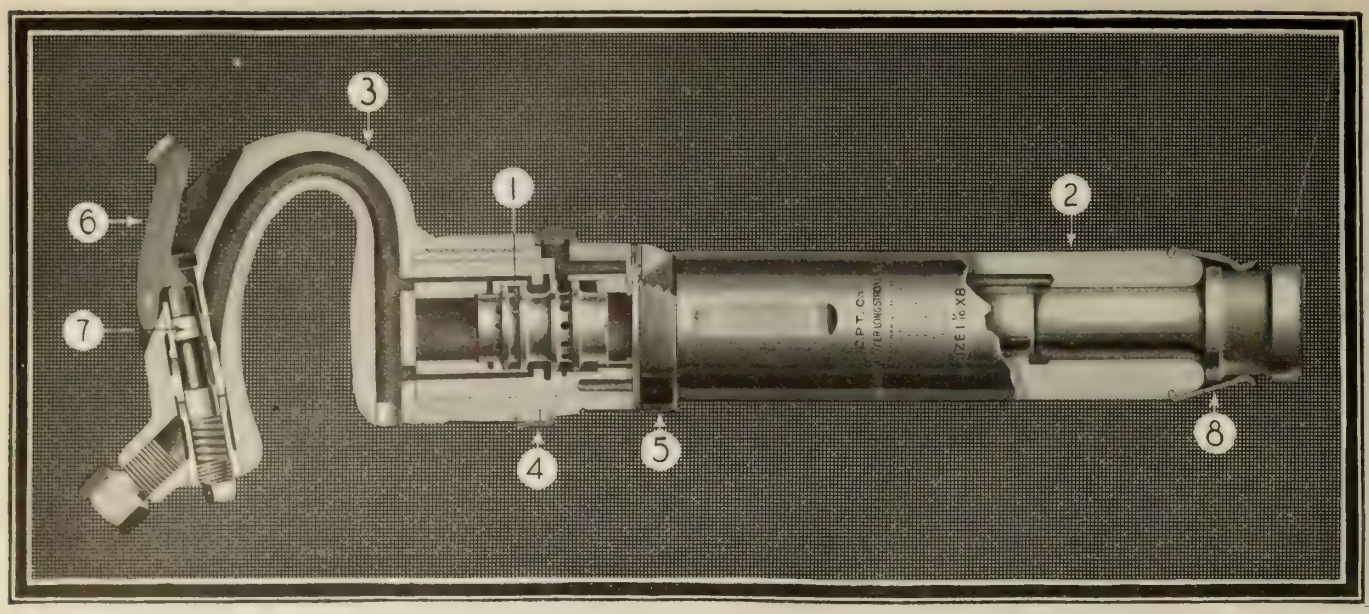
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THE cost per *rivet driven* is the true gauge of riveting hammer efficiency. No riveting hammer built has ever equalled the performance of the Boyer measured on the basis of *work done per hammer.*

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4 Patented locking ring surrounding cylinder. Makes possible the unique method of assembly characteristic of the Boyer—and one reason why the three unit parts of the Boyer can be so rapidly disassembled for cleaning and inspection.

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P104-K

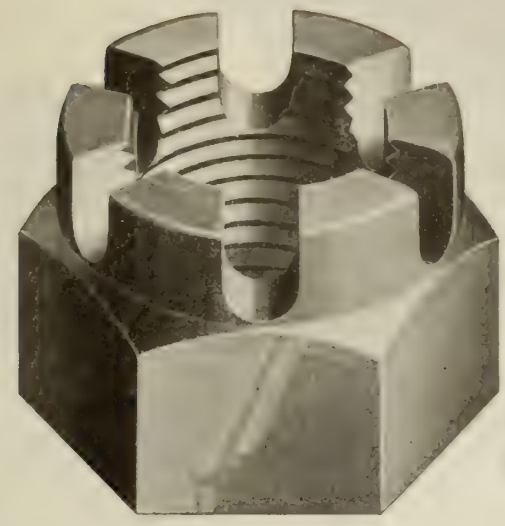
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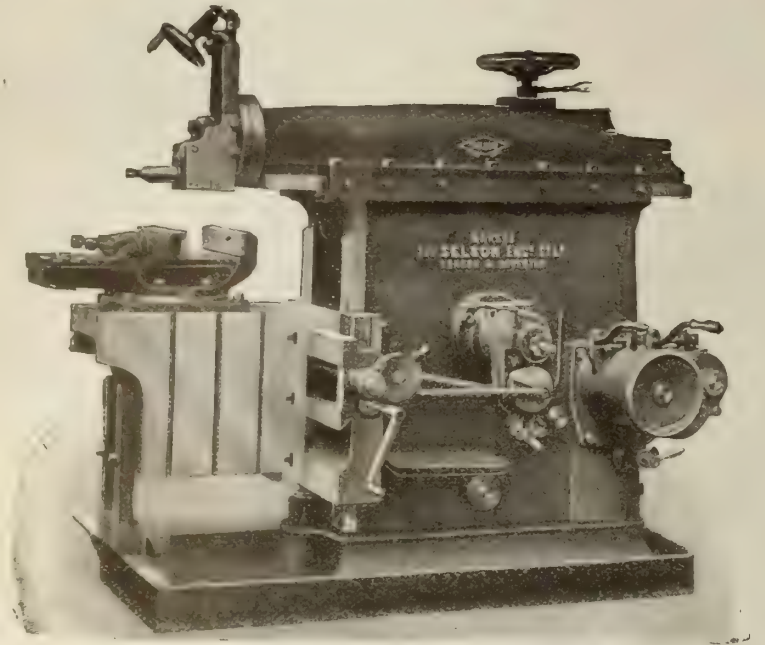
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Sizes
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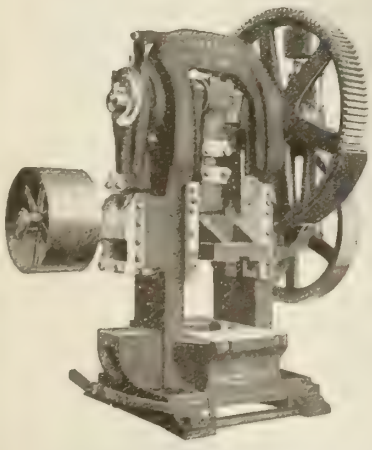
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removes broken taps buried below the surface of the work without trouble or loss of time. It removes any broken tap without injuring the thread. It saves the casting or forging. Pays for itself over and over—often on the very first job.

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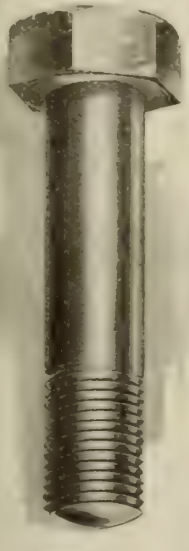
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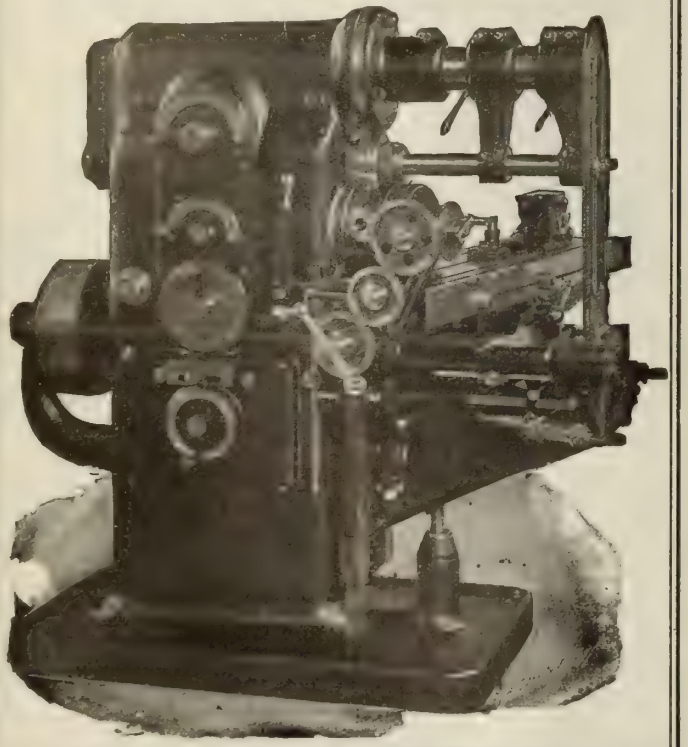
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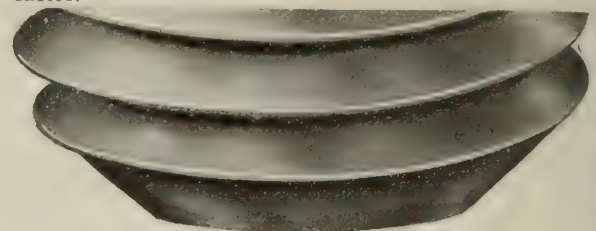


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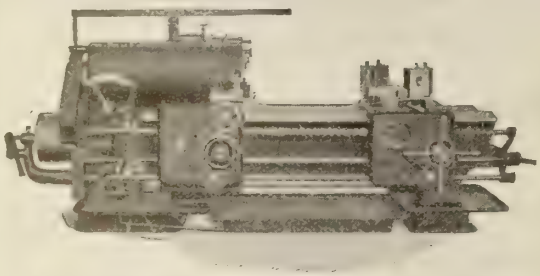
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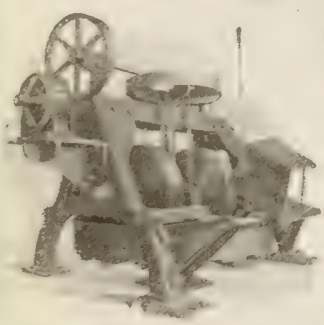
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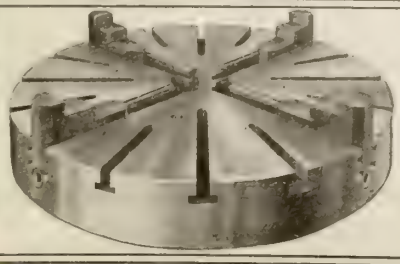
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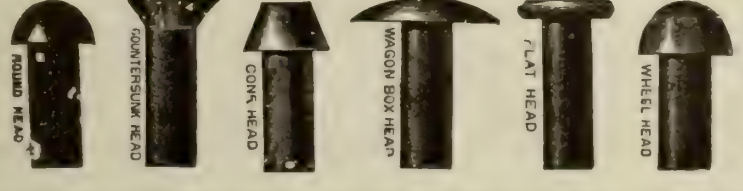
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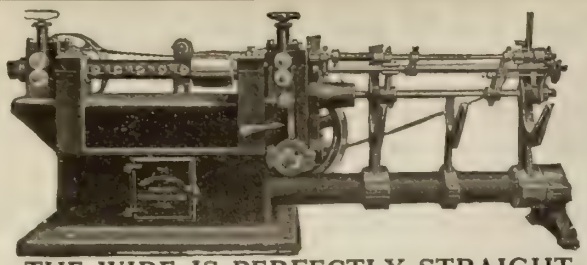


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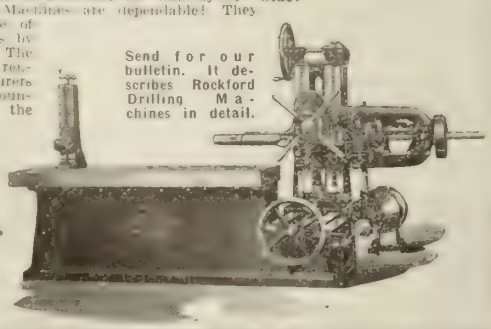
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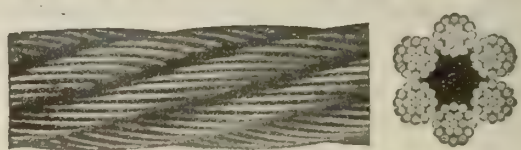
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Can Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Belting, Fabric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Consolidated Rubber Co., Ltd., Montreal, Que
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que
McLaren Belting Co., J. C., Montreal, Que.
Sumner & Co., New York City

**Belting, Leather**
Atkins & Co., Inc., E. C., Indianapolis, I
Can. Fairbanks-Morse Ltd., Montreal, Q.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg Co Worcester, Mass
McLaren Belting Co., J. C., Montreal, Que
Smith Belting Co., Toronto, Ont
Sumner & Co., New York City
Tullis & Son, Ltd., John, Glasgow, Scot

**Belting, Rubber**
Can Consolidated Rubber Co., Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.
Quaker City Rubber Co., Philadelphia, Pa.

**Belts, Abrasive**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.

**Bench Countershaft Standards**
Ford Smith Machine Co., Hamilton, Ont

**Benches, Work**
Aikenhead Hardware Ltd., Toronto, Ont.

**Bending Machines, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bertrams Ltd., Edinburgh, Scotland.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Bins, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Blocks**
Ford Chain Block Co., Philadelphia, Pa.
Wright Mfg Co., Lisbon, Ohio

**Blocks, Chain (See Hoists, Hand)**
Aikenhead Hardware Ltd., Toronto, Ont.
Ford Chain Block Co., Philadelphia, Pa.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Die**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont
Fisher Motor Co., Ltd., Orillia, Ont

**Blocks, Pillow**
Can. Link-Belt Co., Toronto, Ont.

**Blowers**
Can. Blower & Forge Co., Ltd., Kitchener
General Combustion Co. of Can., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que
Sturtevant Co., B. F., Boston, Mass

**Bolt and Nut Machinery**
Acme Machinery Co., Cleveland, Ohio
Bertram & Son Co., Ltd., The John, Dundas, Ont
Garlock-Walker Mchy. Co., Toronto, Ont
Greenfield Tap & Die Corp., Galt, Ont
Landis Machine Co., Inc., Waynesboro, Pa
National Machinery Co., Tiffin, Ohio
Victor Tool Co., Waynesboro, Pa

**Bolt and Nut Machinery, Automatic**
National Acme Co., Cleveland, Ohio

**Bolts and Nuts**
London Bolt & Hinge Works, London, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio
N. S. Steel Co., Ltd., New Glasgow, N.S.
Petrie, Ltd., H. W., Toronto, Ont
Steel Co. of Canada, Ltd., Hamilton, Ont

**Bolt Threading Die Heads**
Jones & Lamson Machine Co., Springfield Vermont.
Landis Machine Co., Inc., Waynesboro, Pa

**Boosters**
Sturtevant Co., B. F., Boston, Mass

**Boring and Turning Mills, Vertical**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada
Bertram & Son Co., Ltd., The John Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont

**Boring, Drilling and Milling Machines, Horizontal**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont
Garlock-Walker Mchy. Co., Toronto, Ont
Gisholt Machine Co., Madison, Wis
Herbert Ltd., Alfred, Toronto, Ont
Landis Tool Co., Waynesboro, Pa

**Boring, Drilling and Milling Mach., Vertical**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont
McDougall Co., Ltd., R., Galt, Ont
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont

**Boring Heads**
Aikenhead Hardware Ltd., Toronto, Ont.

**Boring Tools**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada
Armstrong Bros Tool Co., Chicago, Ill.
Gisholt Machine Co., Madison, Wis

**Brakes, Magnetic (for electric furnaces)**
Volta Mfg Co., Welland, Ont

**Brass**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont

**Bricks, Fire**
Elk Firebrick Co of Can., Ltd., Hamilton, Ont.

**Bridges**
Hamilton Bridge Works Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

**Broaching Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont

**Bronze**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram Walkerville, Ont

**Bronze, Phosphor**
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.

**Bucket Carriers, Pivoted**
Can. Link-Belt Co., Toronto, Ont

**Buffing or Polishing Machines (See Polishing and Buffing Machines)**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford Smith Machine Co., Hamilton, Ont
Petrie, Ltd., H. W., Toronto, Ont
U S Electrical Tool Co., Cincinnati, O

**Bulldozers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont
Garlock-Walker Mchy. Co., Toronto, Ont

**Burners, Oil and Gas**
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City

**Bushings**
Fisher Motor Co., Ltd., Orillia, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Cabinets, Oil**
S. F. Bowser & Co., Inc., Toronto, Ont

**Calipers**
Brown & Sharpe Mfg. Co., Providence, R.I.
Starrett Co., L. S., Athol, Mass

**Cams**
Canada Foundries & Forgings Co., Welland, Ont.

**Can-Making Machinery (See Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

**Cars, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Castings, Aluminum**
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

# BUYERS' DIRECTORY

**Castings, Brass and Bronze**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Canada Electric Castings Co., Ltd., Orillia
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Copper**
Can. Hanson & Van Winkle Co., Toronto, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Marine**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Castings, Die Molded**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Ferro-Alloy**
Can. Steel Foundries, Montreal, Que.

**Castings, Iron**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Hyd. Press**
Can. Steel Foundries, Montreal, Que.

**Castings, Monel Metal**
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

**Castings, Naval Bronze**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Nichrome**
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Nickel**
Can. Hanson & Van Winkle Co., Toronto, Ont.

**Castings, Semi-Steel**
Davidson Mfg. Co., Thos., Montreal, Que.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

**Castings, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

**Cements, Iron**
Smooth Mfg. Co., Jersey City, N.J.

**Centering Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Chains (See Sprockets and Chains)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chains, Driving**
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chasers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chemists**
Toronto Testing Laboratory, Toronto, Ont.

**Chucking Machines**
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Chucks, Drill**
Jacobs Mfg. Co., Hartford, Conn.

**Chucks, Drill and Tap**
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Lathe**
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Magnetic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**
Columbia Hdwe. Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

**Cleaners, Metal, Waste, General**
Oakley Chemical Co., New York, N.Y.

**Clocks, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Clutches, Friction**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**
Can. Link-Belt Co., Toronto, Ont

**Collars, Shaft or Set**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

**Collets**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compressors, Air**
Curtis Pneumatic Machinery Co., St. Louis, Mo.

**Compressors, Air and Gas**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**
Ford-Smith Machine Co., Hamilton, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Copper**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Cored Bronze Bars**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Cotter Pins**
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Counterbores**
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Countershafts**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Couplers, Car and Locomotive**
Can. Steel Foundries, Montreal, Que.

**Couplings, Flexible**
Holden Co., Ltd., Montreal, Que.

**Couplings, Rigid**
Bernard Industrial Co., A., Fortierville, Que.

**Couplings, Shaft**
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

**Cranes, Electric**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Cranes, Hand (See Hoists, Hand)**
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

**Cranes, Locomotive**
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Cranes, Traveling**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Crank Pin Turning Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia, Pa.

**Cutters, Flue**
Holden Co., Ltd., Montreal, Que.

**Cutters, Gear**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Milling**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Milling Machine Co., Cleveland
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.

**Cutters, Stay Bolt**
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Thread**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.

**Cutting-Off Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Cutting-Off Machines, Pipe (See Pipe Cutting and Threading Machines)**
Landis Machine Co., Inc., Waynesboro, Pa.
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Cutting-Off Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Pilot Steel & Tool Co., Montreal, Que.

**Cutting Oil Filters (See Oil Filtering Systems)**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Cataract Refining Co., Toronto, Ont.

**Cutting, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont

**Cutting, Oxy-Hydrogen**
National Electro Products, Ltd., Toronto Ont.

**Dealers, Machinery (See Searchlight Section)**
Ford-Smith Machine Co., Hamilton, Ont
Petrie, Ltd., H. W., Toronto, Ont.

**Deckle Straps**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Diamonds, Black and Rough**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond, Carbon and Bortz**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Desmond-Stephan Co., Hamilton, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Wheel Trueing Tool Co., Detroit, Mich.

**Diamond Crossings**
Can. Steel Foundries, Montreal, Que.

**Die-Castings**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Dies, Pipe-Threading**
Jones & Lamson Machine Co., Springfield, Vt.

**Die Sinking Machines, Automatic**
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

**Die Sinkers**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Screw and Thread Cutting**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

**Dies, Forging**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

# BUYERS' DIRECTORY

**Ha. Hammer**
...mber & Hillier, St Catharines, Ont.

**Ha. Self-Opening, Adjustable**
...ometric Tool Co., New Haven, Conn.
...ert Ltd., Alfred, Toronto, Ont
...es & Lamson Machine Co., Springfield, Vt.
...s Machine Co., Inc., Waynesboro, Pa.
...ley Machine & Tool Co., Detroit, Mich.
...al Acme Co., Cleveland, Ohio.
...e O-Lite Co. of Can., Toronto, Ont.
...t & Whitney Co., of Canada, Ltd., Dundas, Ont.
...er Tool Co., Waynesboro, Pa.

**Ha. Threading-Opening**
...e & Co., A. B., Hespeler, Ont.
...es & Lamson Machine Co., Springfield, Vt.
...s Machine Co., Inc., Waynesboro, Pa.
...e Twist Drill & Machine Co., New Bedford, Mass.
...ley Machine & Tool Co., Detroit, Mich.
...ational Acme Co., Cleveland, Ohio.
...att & Whitney Co., of Canada, Ltd., Dundas, Ont.
...apid Tool & Machine Co., Lachine, Que.

**Ice Cement**
...chey Supply Co., Toronto, Ont.
...Vausau Abrasives Co., Chicago, Ill

**...riding Heads**
...Knowlton, Ltd., John, Birmingham, Eng.
...Low, Fred. C., Machinery Co., Chicago, Ill.
...ord-Smith Machine Co., Hamilton, Ont.
...Jendey Machine Co., Torrington, Conn.
...Warnes & Trecker Co., Milwaukee, Wis
...Petrie, Ltd., H. W., Toronto, Ont

**...ge, Lathe and Milling Machine**
...Armstrong Bros. Tool Co., Chicago, Ill

**...afting Boards and Tables**
...Barnes Bros., Ltd., Montreal, Que.
...Economy Drawing Table & Mfg. Co., Adrian, Mich.
...Hughes Owens Co., Ltd., Montreal, Que.

**...afting Materials**
...American Lead Pencil Co., New York City, N.Y.
...Barnes Bros., Ltd., Montreal, Que.
...Economy Drawing Table & Mfg. Co., Adrian, Mich.
...Hughes Owens Co., Ltd., Montreal, Que.

**...essers, Grinding Wheel**
...Can. Abrasive Wheel Co., Ltd., Mimico, Ont.
...Ford-Smith Machine Co., Hamilton, Ont.
...Lowe-Koebel Co., Inc., New York, N.Y.
...Norton Co. of Can., Ltd., Hamilton, Ont.
...Oliver Machy. Co., Grand Rapids, Mich.

**...rill Holders**
Armstrong Bros. Tool Co., Chicago, Ill.

**...rill Rods**
...Armstrong Whitworth of Canada, Ltd., Montreal, Canada
...Atkenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**...rill Speeders**
Canada Machinery Corp., Galt, Ont.

**...rilling Machine Heads**
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

**...rilling Machines, Automatic**
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

**...rilling Machines, Bench**
Beacon Engineering Co., Tipton, England.
Can Blower & Forge Co., Ltd., Kitchener.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**...rilling Machines, Electric and Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**...rilling Machines, Gang**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**...rilling Machines, Heavy Duty**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**
Canada Machinery Corp., Galt, Ont
Gisholt Machine Co., Madison, Wis
Holly R. S., Toronto, Ont
Rockford Drilling Machine Co., Rockford, Ill
Rockford Lathe & Drill Co., Rockford Ill

**Drilling Machines, Multiple Spindle**
Beacon Engineering Co., Tipton, England
Bertram & Son Co., Ltd., The John, Dundas, Ont
Bilton Machine Co., Bridgeport Conn
Henry & Wright Mfg. Co., Hartford, Conn
Hoefer Mfg. Co., Freeport, Ill
National Acme Co., Cleveland, Ohio
National Automatic Tool Co., Richmond, Ind
Terry & Co., John C., Birmingham, Eng.

**Drilling Machines, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Cleveland Pneumatic Tool Co., Toronto, Ont
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Drilling Machines, Portable**
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago Ill
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis

**Drilling Machines, Radial**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Drilling Machines, Sensitive**
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen Ind
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Turret**
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

**Drilling Machines, Vertical**
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng.
Streiinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Drills, Center**
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drills, High Speed Twist**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass
Pilot Steel & Tool Co., Montreal, Que
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont
Sheffield Engineering Supplies, Ltd., Montreal, Que
Sheffield Twist Drill & Steel Co., Sheffield, Eng

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill
Butterfield & Co., Inc. Rock Island Que
Cleveland Twist Drill Co., Cleveland, O
Morrow Screw & Nut Co., Ltd., John, Ingersoll Ont
Morse Twist Drill & Machine Co., New Bedford, Mass

**Drills, Twist and Flat**
Butterfield & Co., Inc., Rock Island Que
Cleveland Twist Drill Co., Cleveland, O
Can Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que

**Dust Handling Equipment**
Can. Blower & Forge Co., Ltd., Kitchener
Sturtevant Co., B. F., Boston, Mass

**Electrical Instruments**
Bristol Co., Waterbury, Conn
Northern Electric Co., Montreal, Que

**Electrical Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O

**Elevating Trucks (See Trucks)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Elevators and Conveyors**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que
Mathews Gravity Carrier Co., Port Hope, Ont.

**Emery Wheels (See Grinding Wheels)**
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Norton Co. of Can., Ltd., Hamilton, Ont

**Engines, Capstan**
Kennedy & Sons, Wm., Owen Sound, Ont

**Engineers, Mechanical**
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif

**Expanders, Tube**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont
Petrie, Ltd., H. W., Toronto, Ont.

**Eyeglasses, Safety (See Goggles, Safety)**
Prest-O-Lite Co. of Can., Toronto, Ont
Willson Goggles, Inc., Reading, Pa.

**Fans, Electric**
Can. Blower & Forge Co., Ltd., Kitchener
Northern Electric Co., Montreal, Que.
Sturtevant Co., B. F., Boston, Mass

**Fans, Exhaust**
Can Blower & Forge Co., Ltd., Kitchener
Petrie, Ltd., H. W., Toronto, Ont
Sturtevant Co., B. F., Boston, Mass.

**Fans, Ventilating**
Can Blower & Forge Co., Ltd., Kitchener
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont
Sturtevant Co., B. F., Boston, Mass.

**Fibre**
Diamond State Fibre Co., Toronto, Ont
Northern Electric Co., Montreal, Que.

**File Handles**
Ingersoll File Co., Ltd., Ingersoll, Ont.

**Files and Rasps**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Canada Saw Co., Montreal, Que

**Filing Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Filler, Iron (See Cements, Iron)**
Smooth Mfg. Co., Jersey City, N.J.

**Fire Extinguishers**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Fittings, Pipe**
International Malleable Iron Co., Guelph, Ont.

**Flexible Shafts**
Aikenhead Hardware Ltd., Toronto, Ont.

**Flux, Galvanizing**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Fluxes, Welding**
L'Air Liquide Society, Toronto, Ont.

**Forging Machinery**
Acme Machinery Co., Cleveland, Ohio
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.

**Forgings, Drop**
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd., Toronto, Ont.

**Forgings, Hammer**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada
Canada Foundries & Forgings Co., Welland, Ont.
Can Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Foundry Equipment**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Foundry Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Frogs, Spring or Rigid**
Can. Steel Foundries, Montreal, Que.

**Fuel Oil Burning System**
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Electric**
Electric Furnace Construction Co., Philadelphia, Pa
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Heat Treating Coal**
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Oil and Gas**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Bellevue Industrial Furnace Co., Detroit.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces and Ovens, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces, Tempering and Annealing**
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furniture, Machine Shop**
Garlock-Walker Mchy. Co., Toronto, Ont.

**Gages, Comparator**
Jones & Lamson Machine Co., Springfield, Vt.
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont.
Perdue, W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass.

**Gages, Measuring (See Tool Work)**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Q.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Gages, Recording**
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.

# BUYERS' DIRECTORY

**Gages, Snap, Thread and Cylindrical**
Ackworthie, Ltd., John, Birmingham, Eng
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Standard**
Armstrong Whitworth Co of Can., Lt Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis.
Johansson Inc., C. E., Windsor, Ont

**Gages, Thread**
Ackworthie, Ltd., John, Birmingham, Eng
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Garnet, Emery and Flint Paper and Cloth**
Ritchey Supply Co., Toronto, Ont.

**Gas, Coal Compressed**
L'Air Liquide Society, Toronto, Ont

**Gas, Compressed**
Prest-O-Lite Co. of Can., Toronto, Ont

**Gaskets**
Diamond State Fibre Co of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co of Can., Ltd., Toronto, Ont.
Hollies Co., Ltd., Montreal, Que.
Smooth Mfg Co., Jersey City, N.J

**Gear Blanks**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear-Cutting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Fellows Gear Shaper Co., Springfield, Vt
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn

**Gear Testing Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Gears, Cast**
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

**Gears, Cut**
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co., Toronto, Ont
Dominion Bridge Co., Ltd., Lachine, Que
Dom. Steel Products Co., Brantford, Ont
Ford-Smith Machine Co., Hamilton, Ont
Gardner & Son, Robt., Montreal, Que
Hamilton Gear & Machine Co., Toronto, Ontario
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont
Jones & Glassco, Montreal, Que
Lyman Tube & Supply Co., Montreal, Que
McDougall Co. Ltd., R., Galt, Ont
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Gears, Dressed**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Gears, Forged**
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Gears, Herringbone**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

**Gears, Machine Moulded**
Can. Steel Foundries, Montreal, Que

**Gears, Rawhide (See Gears, Cut)**
Hamilton Gear & Machine Co., Toronto Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear, Silent Chain**
Gardner & Son, Robt., Montreal, Que
Morse Chain Co., Ithaca, N.Y.
Can. Link-Belt Co., Ltd., Toronto, Can
Hans Renold of Canada, Ltd., Montreal Quebec.

**Gears, Worm**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto Ontario.

**Generators, Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Generators, Electric**
Holden Co., Ltd., Montreal, Que
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Goggles, Safety**
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

**Grab Buckets**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Grease Cups, Pressed Steel and Brass**
Can. Winkley Co., Ltd., Windsor, Ont.

**Greases, Lubricating**
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

**Grinding Discs**
Ritchey Supply Co., Toronto, Ont

**Grinding Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Grinding Machines, Abrasive Belt**
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Automatic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Bench**
Aikenhead Hardware Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F., Montreal, Que
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.,
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.
Terry & Co., John C., Birmingham, Eng
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont
Wilkinson & Kompass Hamilton, Ont
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Grinding Machines, Center**
U.S. Electrical Tool Co., Cincinnati, O
Wisconsin Electric Co., Racine, Wis

**Grinding Machines Chaser**
Jones & Lamson Machine Co., Springfield, Vt

**Grinding Machines, Cutter and Reamer**
Cincinnati Milling Machine Co., Cincinnati, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Cylindrical**
Garlock-Walker Mchy. Co., Toronto, Ont
Greenfield Machine Co., Greenfield, Mass
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Die**
Jones & Lamson Machine Co., Springfield, Vermont
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio
National Machinery Co., Tiffin, Ont.

**Grinding Machines, Disc**
Beacon Engineering Co., Tipton, England
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Drill**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Face**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Floor and Tool**
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Grinding Machines, Internal**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Portable**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Power Oscillating Tool**
Herbert Ltd., Alfred, Toronto, Ont.

**Grinding Machines, Ring Wheel**
Ford-Smith Machine Co., Hamilton, Ont

**Grinding Machines, Snagging**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Surface**
Garlock-Walker Mchy. Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machinery, Tool Post**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Universal**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Gisholt Machine Co., Madison, Wis.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont

**Grinding Wheels**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Guards, Machinery and Window**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Gun-Barrel Machinery**
Steinle Turret Machine Co., Madison, Wis.

**Hack Saws, Power**
Ackworthie, Ltd., John, Birmingham, Eng
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Hamilton, Canada
Garlock-Walker Mchy. Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hammers, Chipping**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hammers, Drop**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

**Hammers, Electric**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Hammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Hammers, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hammers, Riveting**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hangers, Shafting**
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Terry & Co., John C., Birmingham, Eng.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hardening, Case-Hardening and Tempering**
Hamilton Gear & Machine Co., Toronto, Ont.

**Hardness Testing Apparatus**
Shore Instrument Co., Jamaica, N.Y.

**Hobbing Machines**
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hobs**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Hoists, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Volta Mfg. Co., Welland, Ont.

**Hoists, Hand**
Lyman Tube & Supply Co., Montreal, Que
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Hoists, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Holders-On, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Hose, Industrial**
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co of Can., Ltd., Toronto, Ont.

**Hose, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Foamite Firefoam Co., Hamilton, Ont.

**Hydraulic Leather**
Graton & Knight Mfg. Co., Worcester, Mass.

**Hydraulic Machinery**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Stewart & Co., Duncan, Glasgow, Scot.

**Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Index Centers**
Dickow, Fred. C., Machinery Co., Chicago, Ill.

**Igniters, Gas Engine**
Canada Foundries & Forgings Co., Welland, Ont.

**Indicators, Speed and Test**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.

**Insulation**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Jacks, Hydraulic**
Norton, A. O., Boston, Mass.

**Jacks, Planer**
Armstrong Bros. Tool Co., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

**Jigs and Fixtures (See Tool Work)**
Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que.
Crescent Machine Co., Ltd., Montreal, Q.

# BUYERS' DIRECTORY

Fisher Motor Co., Ltd., Orillia, Ont
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Keyseating Machines**
Bilton Machine Co., Bridgeport, Conn
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg Co., Muskegon, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Keys, Machine**
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg Co., Muskegon, Mich.

**Knives, Machine**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Oliver Machy Co., Grand Rapids, Mich
Simonds Canada Saw Co., Montreal, Que.

**Knurl Holders**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lacing Leather**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

**Lamps, Electric**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**Lathe Attachments**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.

**Lathe Pans, Portable**
Canada Machinery Corp., Galt, Ont.

**Lathe Tools**
Armstrong Bros Tool Co., Chicago, Ill.
Can Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

**Lathes, Automatic and Semi-Automatic**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Bench**
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lathes, Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)**
Acme Machine Tool Co., Cincinnati, Ohio
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
McDougall Co., Ltd., R., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio

**Lathes, Engine**
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Sidney Machine Tool Co., Sidney, Ohio.
Sterlinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Extension and Gap**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Lathes, Heavy Duty Projectile Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blaskill Wire Machy. Co., Ltd., Montreal
Sidney Machine Tool Co., Sidney, Ohio.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio
Blount Co., J. G., Everett, Mass
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio

**Lathes, Polishing (See Polishing and Buffing Machines)**
Ford-Smith Machine Co., Hamilton, Ont

**Lathes, Relieving**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Lathe, Universal Hand**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Lathes, Screw-Cutting**
Jones & Lamson Machine Co., Springfield, Vt.

**Lathe, Speed and Hand**
Garlock-Walker Mchy. Co., Toronto, Ont
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy Co., Grand Rapids, Mich

**Lathes, Spinning**
Terry & Co., John C., Birmingham, Eng.

**Lathes, Threading**
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn
Lehmann Machine Co., St. Louis, Mo

**Lathes, Vertical Turret**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

**Lathes, Wood Turning**
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Oliver Machinery Co., Grand Rapids, Mich
Petrie, Ltd., H. W., Toronto, Ont.

**Lead Pipe**
Steel Co. of Canada, Ltd., Hamilton, Ont

**Lighting Fixtures**
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

**Linoleum Mill Machinery**
Bertrams Ltd., Edinburgh, Scotland

**Liquid Air Plants**
L'Air Liquide Society, Toronto, Ont

**Lockers, Clothes**
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont

**Lubricants**
Cataract Refining Co., Toronto, Ont
Oakley Chemical Co., New York, N.Y.

**Lubricating Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Machinists' Small Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Bertrams Ltd., Edinburgh, Scotland
Brown & Sharpe Mfg. Co., Providence, R.I.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont
Pilot Steel & Tool Co., Montreal, Que
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass
Sterlinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Manganese Steel**
Can. Steel Foundries, Montreal, Que

**Mandrels, Expanding**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Mandrels, Solid**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Measuring Machines**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Metals, Alloy**
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can Steel Foundries, Montreal, Que
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Tallman Brass & Metal, Ltd., Hamilton, Ontario
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Metalite Cloth**
Ritchey Supply Co., Toronto, Ont.

**Micrometer Calipers**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Milling Attachments**
Ackworthie, Ltd., John, Birmingham, Eng
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis
Petrie, Ltd., H. W., Toronto, Ont.

**Milling Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Milling Machines, Automatic**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng

**Milling Machines, Bench**
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng

**Milling Machines, Hand**
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford Ill.
Terry & Co., John C., Birmingham, Eng
United States Machine Tool Co., Cincinnati, Ohio.

**Milling Machines, Horizontal and Planer Type**
Bertram & Son Co., Ltd., The John, Dundas, Ont
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Milling Machine Co., Cleveland
Ford-Smith Machine Co., Hamilton, Ont
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Milling Machines, Plain**
Bilton Machine Co., Bridgeport, Conn
Cincinnati Milling Machine Co., Cincinnati, Ohio
Cleveland Milling Machine Co., Cleveland
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F., Montreal, Que
Garlock-Walker Mchy. Co., Toronto, Ont
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee Wis.
Petrie, Ltd., H. W., Toronto, Ont
Rockford Milling Machine Co., Rockford, Ill
Terry & Co., John C., Birmingham, Eng

**Milling Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Milling Machines, Universal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Cincinnati Milling Machine Co., Cincinnati, Ohio
Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Mchy. Co., Toronto, Ont
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Milling Machines, Vertical**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg Co., Milwaukee, Wis
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

**Monel Metal**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Motors, Electric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis

**Moulded Rubber Goods**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Nails and Staples**
Steel Co. of Canada, Ltd., Hamilton, Ont

**Nickel, Bars, Sheets, Wire, Etc.**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Nickel Plating Outfits**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Nickel Silver**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Nitrogen**
L'Air Liquide Society, Toronto, Ont.

**Nut Tappers (See Bolt and Nut Machinery)**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

**Nuts, Finished and Semi-finished**
Galt Machine Screw Co., Galt, Ont.

**Nuts, S.A.E., Plain and Castellated**
Galt Machine Screw Co., Galt, Ont.

**Oil Filtering and Storage Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oil Storage Engineers**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oils**
Canadian Oil Companies, Ltd., Toronto, Ont.
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Hole Covers**
Can. Winkley Co., Ltd., Windsor, Ont.

**Oils, Soluble**
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oxygen**
Carter Welding Co., Toronto, Ont
Dominion Oxygen Co., Toronto, Ont
L'Air Liquide Society, Toronto, Ont

**Oxy-Acetylene Apparatus**
L'Air Liquide Society, Toronto, Ont.

**Packing, Hydraulic**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg Co., Worcester, Mass.
Guilford & Sons, Ltd., Halifax, N.S.

**Packing, Steam**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg Co., Worcester, Mass.
Guilford & Sons, Ltd., Halifax, N.S.

**Paper Mill Conveyors**
Bertrams Ltd., Edinburgh, Scotland

**Patents**
Fetherstonhaugh & Co., Ottawa, Ont
Marion & Marion, Montreal, Que.

**Pans, Wet and Dry**
Frost Mfg. Co., Chicago, Ill

**Pattern-Shop Machinery (See Woodworking Machinery)**
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Patterns, Wood and Metal**
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Wraggs Pattern Works, Galt, Ont.

**Penstocks, Steel**
MacKinnon Steel Co., Sherbrooke, Que.

# BUYERS' DIRECTORY

**Phosphor Tin**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Photographic Duplicating Machines**
Commercial Camera Co., Providence, R.I.

**Pig Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Bending Machines**
American Pipe Bending Machine Co., Boston, Mass.
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

**Pipe Couplings**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Cutting and Threading Machines**
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**
Landis Machine Co., Inc., Waynesboro, Pa.

**Pipe Fitters' Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa.

**Piston-Ring Machines**
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Planers, Parallels**
L. & P. Mfg. Co., Niagara Falls, Ont.

**Planing Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn, Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Planing Machines, Rotary**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Pneumatic Tools**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Pressed Steel Parts**
Ackworthie, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Presses, Drop and Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Foot and Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

**Presses, Forcing**
Atlas Press Co., Kalamazoo, Mich.
Stewart & Co., Duncan, Glasgow, Scot.

**Presses, Hydraulic**
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

**Presses, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Protractors**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Propellers**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Pulleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal and Fibre**
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Pulp and Paper Mill Equipment**
MacKinnon Steel Co., Sherbrooke, Que.

**Pumps, Automobile Tire**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Pumps, Barrel and Boiler-feed**
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coalant**
Trahern Pump Co., Rockford, Ill.

**Pumps, Geared and Hand**
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

**Pumps, Lubricant and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener
Jardine & Co., A. B., Hespeler, Ont.

**Punches, Power**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

**Punching Machines, Horizontal**
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Racks, Cut**
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**
Holden Co., Ltd., Montreal, Que.

**Reamer Holders**
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

**Reamers, Expanding**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Reamers, Solid**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Reamers, Taper**
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Recorders, Temperature**
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Recorders, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Rheostats**
Northern Electric Co., Montreal, Que.

**Resistance Materials**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Respirators**
Willson Goggles, Inc., Reading, Pa.

**Rivets**
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Rivet Heaters**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.

**Riveting Machines**
Bilton Machine Co., Bridgeport, Conn.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**
Stewart & Co., Duncan, Glasgow, Scot.

**Rolls (Rubber Covered)**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rudder Frames, Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Rubber Goods, Mechanical**
Quaker City Rubber Co., Philadelphia, Pa.

**Rules, Steel**
Chesterman & Co., Ltd., J., Sheffield, Eng.

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Rust Preventatives**
Oakley Chemical Co., New York, N.Y.

**Sand Equipment**
Can. Link-Belt Co., Toronto, Ont.

**Sand Mills**
Frost Mfg. Co., Chicago, Ill.

**Sanding Machinery**
Oliver Machy. Co., Grand Rapids, Mich.

**Sand Rammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Saw Frames and Blades, Hack**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Sawing Machines, Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Sawing Machines, Power Hack**
Ackworthie, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Saw Sharpening Machines**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saw Tables, Universal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Hot and Cold**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Saws, High Speed Steel**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Metal Band**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saws, Metal, Power**
Clemson Bros., Inc., Hamilton, Ont.

**Saws, Metal Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

**Saws, Milling**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Saws, Screw Slotting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Swing Cut-off**
Oliver Machinery Co., Grand Rapids, Mich.

**Scales**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal, Q.

**Screens**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Screw Driving Machine**
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Screw Extractors**
Cleveland Twist Drill Co., Cleveland, O.

# BUYERS' DIRECTORY

**Screw Machine Work**
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio
Tallman Brass & Metal Co., Hamilton, Ont.

**Screw Machinery, Wood and Lag**
Cook Co., Asa S., Hartford, Conn.

**Screw Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Screw Machines, Automatic**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

**Screw Machines, Plain or Hand**
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio.

**Screw Plates**
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

**Screws, Cap and Set**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Screws, Machine**
Barnes Co., Wallace, Bristol, Conn.
Steel Co of Canada, Ltd., Hamilton, Ont.

**Screws, Safety Set**
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Second-Hand Machinery**
(See Searchlight Section)
Petrie, Ltd., H. W., Toronto, Ont.

**Separators, Moisture and Oil**
Bowser, S. F. & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Separators, Oil and Waste**
Bowser, S. F. & Co., Ltd., Toronto, Can.

**Shafting**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Shapes, Cold-Drawn Special Steel**
Union Drawn Steel Co., Hamilton, Ont.

**Shaping Machines**
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Walcott Lathe Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Shapers, Wood**
Oliver Machinery Co., Grand Rapids, Mich.

**Shears, Hand**
Can. Blower & Forge Co., Ltd., Kitchener.

**Shears, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y.
Stewart & Co., Duncan, Glasgow, Scot.
Toledo Machine & Tool Co., Toledo, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.

**Shearing Machines, Angle, Iron Bar and Gate**
Bertrams Ltd., Edinburgh, Scotland.

**Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio.

**Sheets, Nickel, Resist, Alloy**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Sheets, Nickel, Monel and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Side Frames, Locomotive**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Slotting Attachments**
Ford-Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

**Slotting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

**Solders**
British Smelting & Refining Co., Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Canada.

**Snap Flasks**
Oliver Machy. Co., Grand Rapids, Mich.

**Special Machinery and Tools**
Brown Engineering Corp., Ltd., Toronto.
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Spectacles, Industrial**
Willson Goggles, Inc., Reading, Pa.

**Springs**
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

**Sprockets and Chains**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Squares**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Stamping, Metal**
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Stamps, Steel**
Diamond Saw & Stamping Works, Buffalo, N.Y.

**Stairways, Wrought Iron**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Steam Specialties**
Crane Ltd., Montreal, Que.

**Steel Plate**
Dom. Foundries & Steel, Hamilton, Ont.

**Steels, Tool**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel Blooms and Billets**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steel, Cold-Rolled Strip**
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.

**Steel Castings**
Dom. Foundries & Steel, Hamilton, Ont.

**Steel Forgings**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Steel, Shafting and Free Cutting Screw**
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

**Steel, Sheet**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

**Steel, Tanks**
Can. John Wood Mfg. Co., Toronto, Ont.

**Steel, Stainless**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel Wire Rods**
Steel Co of Canada, Ltd., Hamilton, Ont.

**Steels, Alloy, Open Hearth and Electric**
United Alloy Steel Corp., Canton, Ohio.

**Steels, Alloy and Carbon**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co of Can., Ltd., Hamilton, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steels, High-Speed**
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel, Magnet**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel, Structural**
MacKinnon Steel Co., Sherbrooke, Que.

**Steel Tubing, Close Joint and Welded**
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

**Stern Frames, Cast Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Straightening Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Studs**
Galt Machine Screw Co., Galt, Ont.

**Surface Plates**
Bilton Machine Co., Bridgeport, Conn.

**Swaging Machines**
Atkins & Co., Inc., E. C., Indianapolis, I.

**Switches, Railway**
Can. Steel Foundries, Montreal, Que.

**Switches and Switchboards**
Northern Electric Co., Montreal, Que.

**Tablets, Bronze, Memorial**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Tachometers**
Aikenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

**Tanks, Steel**
MacKinnon Steel Co., Sherbrooke, Que.

**Tanks and Pumps, Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

**Taper Cutting Dies**
Jones & Lamson Machine Co., Springfield, Vt.

**Tap Holders**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taper Pins**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Tapes, Measuring**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass.

**Tapping Machines and Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Taps and Dies**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
International Machinery & Supply Co., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taps, Collapsing**
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio
Victor Tool Co., Waynesboro, Pa.

**Teeth, Dredge Bucket**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Testing Metals and Materials**
Toronto Testing Laboratory, Toronto, Ont.

**Thermometers**
Bristol Co., Waterbury, Conn.

**Thread-Cutting Tools**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Thread Cutting Machines**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa.

**Threading Machines**
Acme Machinery Co., Cleveland, Ohio.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Thread Lead Testing Machines**
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Thread-Rolling Machines**
Bliss Co., E. W., Brooklyn, N.Y.

**Tongs**
Hepburn Ltd., John T., Toronto, Ont.

**Tool Cases**
Rice Lewis & Son, Ltd., Toronto, Ont.

**Tool Holders**
Armstrong Bros. Tool Co., Chicago, Ill.
Bilton Machine Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Markers, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Tool Posts, Lathe**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Steels for all Purposes**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Tools, Small (See Machinists' Small Tools)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Bertrams Ltd., Edinburgh, Scotland.
Burgess & Marchand, Montreal, Que.
Chesterman & Co., Ltd., J., Sheffield, Eng.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.
National Machine Tool Co., Racine, Wis.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Tool Work**
Brown Engineering Corp., Ltd., Toronto.
Crescent Machine Co., Ltd., Montreal, Q.
Ford Smith Machine Co., Hamilton, Ont.

**Torches, Blow**
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Trackwork, Railway**
Can. Steel Foundries, Montreal, Que.

**Trackwork, Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Transformers**
Northern Electric Co., Montreal, Que.

**Transmission Machinery**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Toronto, Ont.
Renold (Hans) of Canada, Ltd., Montreal, Que.

# BUYERS' DIRECTORY

**Transportation Systems (See Trucks)**
Mathews Gravity Carrier Co., Port Hope, Ont

**Treated Bits**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Trolleys and Tramways**
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Trucks**
Can. Fairbanks-Morse Ltd., Montreal, Q.
Diamond State Fibre Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Maple Leaf Mfg. Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Trucks, Industrial Motor**
Maple Leaf Mfg. Co., Montreal, Que.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Tube, Products**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Electric Welded or Oxy-Acetylene Welded**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Flexible**
Dunlop Tire & Rubber Goods Co., Ltd Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Tubing, Seamless Steel**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Seamless Steel, Brass and Copper and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Steel Products Co., Brantford, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

**Tubing, Welded**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Tubing, Welded Steel**
Tube Co. of Canada, Toronto, Ont.

**Turbines, Water**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Turret Heads**
Ackworthne, Ltd., John, Birmingham, Eng.
Bertram & Son Co., Ltd., The John, Dundas, Ont

**Turret Machines (See Lathes, Horizontal Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Cook Co., Asa S., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Turrets, Tool Post**
Gisholt Machine Co., Madison, Wis.

**Unions, Pipe**
Crane Ltd., Montreal, Que.

**Universal Joints**
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Valves**
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Crane Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Vises, Drilling Machine**
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.

**Vises, Metal Workers'**
Aikenhead Hardware, Ltd., Toronto, Ont.
Columbia Hdwe. Division, Cleveland, O.

**Vises, Milling Machine**
Brown & Sharpe Mfg. Co., Providence, R.I.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.

**Vises, Pipe**
Columbia Hdwe. Division, Cleveland, O.
Greenfield Tap & Die Corp., Galt, Ont.

**Vises, Planer and Shaper**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Superior Machine Co., London, Ont.

**Vises, Wood Workers'**
Columbia Hdwe. Division, Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Oliver Machy. Co., Grand Rapids, Mich
Victor Tool Co., Waynesboro, Pa.

Parmenter & Bulloch Co., Gananoque, Ont.

**Voltmeters**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Wagon Loaders**
Can. Link-Belt Co., Toronto, Ont.

**Washers**
Barnes Co., Wallace, Bristol, Conn.
Diamond State Fibre Co., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Washers, Rubber**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Welding Apparatus, Oxy-Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Welding, Electric**
All-Weld Company, Toronto, Ont.
Carter Welding Co., Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.

**Welding Filler Rods**
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

**Welding Machines, Oxy-Acetylene**
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

**Welding, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Prest-O-Lite Co. of Can., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

**Welding Rod, Tobin, Manganese Bronze and Aluminum**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Welding Supplies**
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Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Canada, Ltd., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

**Wheels, Cast, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Wheels, Industrial**
American Pulley Co., Philadelphia, Pa.
Hull Iron & Steel Foundries, Hull, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.

**Winches, Electric**
Volta Mfg. Co., Welland, Ont.

**Winches, Headgate**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Winches, Stoplog**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Wire**
Barnes Co., Wallace, Bristol, Conn.
Canada Metal Co., Ltd., Toronto, Ont.
Dennis Wire & Iron Works, London, Ont
Greening Wire Co., B., Hamilton, Ont.
Northern Electric Co., Montreal, Que.

**Wire Cloth**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Wire Rope**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Wire Straightening and Cutting Machinery**
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Brown, Boggs & Co., Ltd., Hamilton, Ont
Schuster Co., F. B., New Haven, Conn

**Wire, Welding**
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Wires, Special**
Dennis Wire & Iron Works, London, Ont.
Greening Wire Co., B., Hamilton, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Woodworking Machinery**
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Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Wrenches, Drop Forged**
Armstrong Bros. Tool Co., Chicago, Ill
Canada Foundries & Forgings Co., Welland, Ont.

**Wrenches, Machinists'**
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Canada Foundries & Forgings Co., Welland, Ont.

**Wrenches, Pipe**
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Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.

**Wrenches, Tap**
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Galt, Ont

**Wrought Iron Pipe**
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## Over seven pages printed here each week for your convenience

Consult this Buyers' Directory when you want the names of reliable makers of machine tools, parts, steel, in fact any equipment you may need.


THE

TRADE K—T MARK

FOUNDRY

GALT, ONT.

# Do Your Castings Cost Too Much?

A rearrangement of your patterns might cut their cost 25 per cent.; a different method of molding them might double your production at no increase in molding cost. We can advise you and we have expert metal and wood patternmakers who are able to make any changes that may commend themselves to you.

## If you need some new Patterns

send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.

We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us. Ask us.

***We have for our and your requirements, a large stock of assorted White Iron Stars, suitable for light agricultural to medium weight machinery castings, while they last, at 8 cents per lb. F. O. B. Galt.***




Made in Canada Grinding Wheels

## Times Have Changed!

In order to obtain grinding wheels of consistent quality, many manufacturers purchased imported wheels. But times have changed! It is no longer necessary to turn away from home-made goods.

Dominion Grinding Wheels are made in Canada of **abrasives from our own furnaces.** We have found that this is the only way to be **sure** the quality runs uniform to grade and grain.

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**DOMINION ABRASIVE WHEEL CO., LIMITED**
**MIMICO - ONTARIO**

# Reliable Quality


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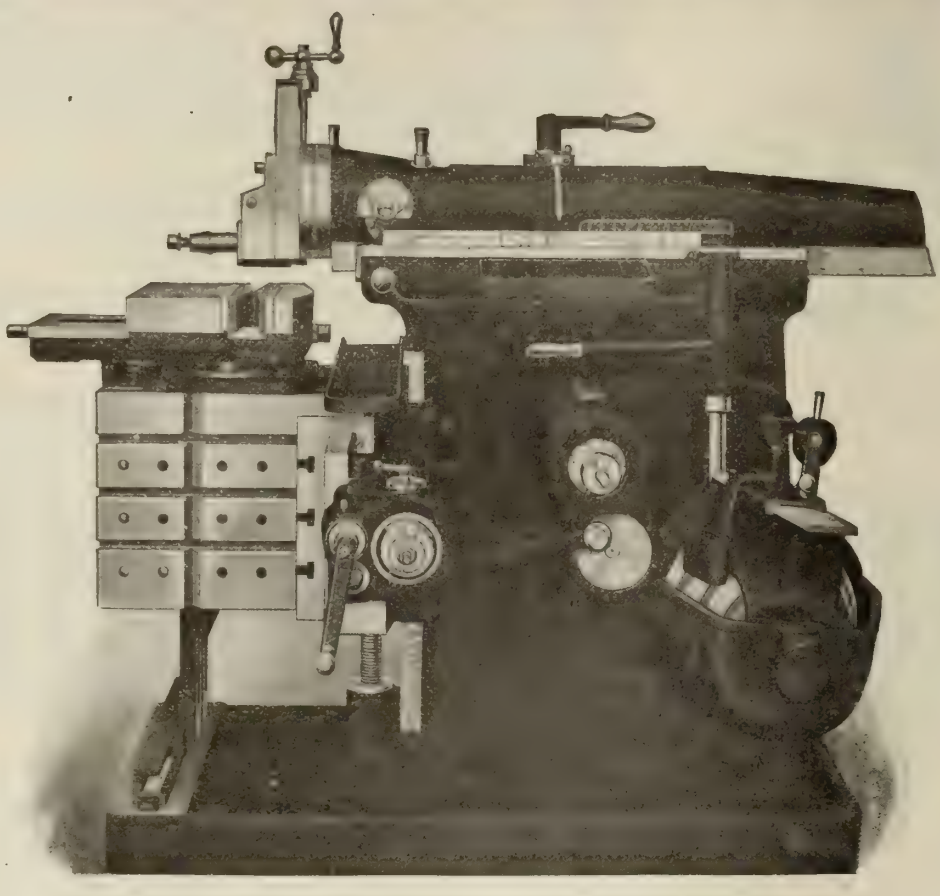
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# HENDEY



Some machines are just like those chaps who suffer from temperament—they have to be humored and only work right when conditions are just so.

Is there any better way to avoid such machines than by taking into careful consideration the reputations for dependable service of the various machines on the market?

Take, for example, this 20-inch Hendey Crank Shaper. Undoubtedly you know some shops which are using at least one of these machines. Ask them their opinion as to its reliability.

**Your search for a thoroughly dependable shaper is ended when you investigate the Hendey.**

## The Hendey Machine Company

**Torrington, Conn., U.S.A.**

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# Cab Tire Cable

## The Cable De Luxe for Industrial Purposes



This advertisement illustrates:

**A length of Northern Electric Cab Tire Cable**
**One Northern Electric No. 511 Marine Plug and Receptacle**
**One Northern Electric No. 407 Cargo Cluster**

This portable combination is specially adapted for use in shipping departments of industrial plants and in loading and unloading operations on board ships, in railway yards and in general construction work.

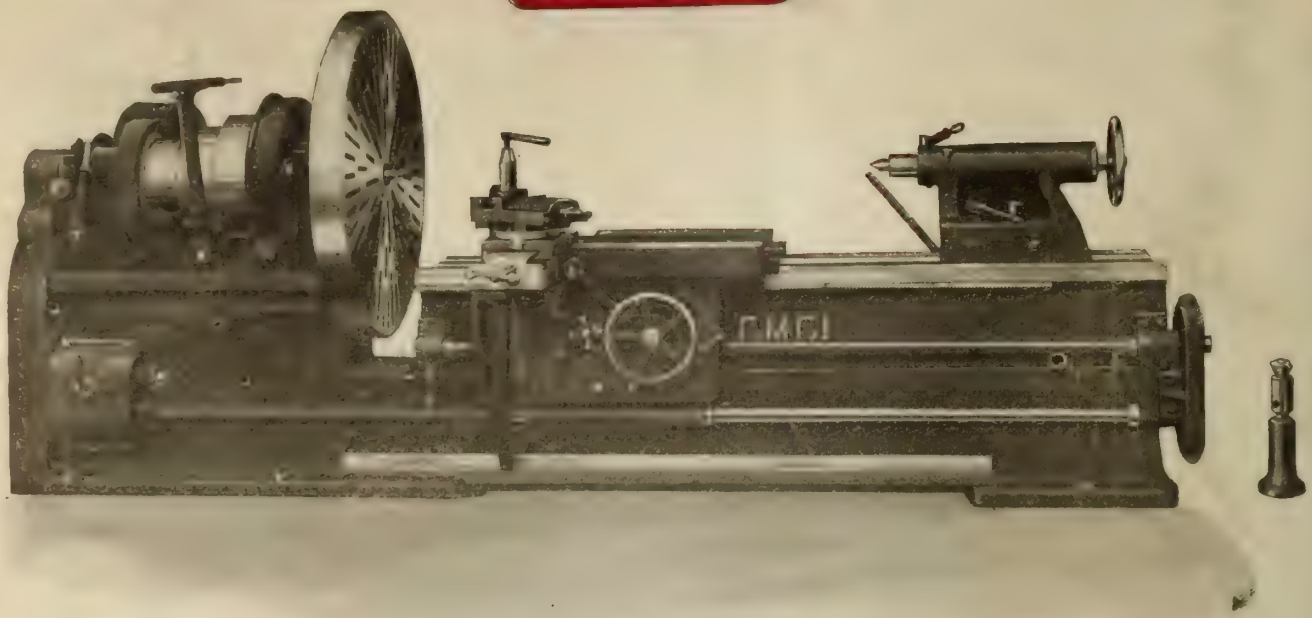
Cab Tire Cable is exceptionally flexible and durable and is ideal for use in localities where dampness or gas fumes abound and where other types of cable would be subject to mechanical injury.

Our nearest house will be glad to give your inquiries immediate attention.

**Northern Electric Company**
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C.M.C.



26" x 48" Extension Bed Engine Lathe

# Canadian Built Machine Tools
## of
# The Highest Grade

Who got the $20,000,000 exchange premium on the Canadian Dollar last year for payment on imported goods?

Buy Canadian-made tools and help make the Canadian Dollar worth one hundred cents everywhere.

We build Machine Tools of the highest grade only, which are quite the equal of imported machines.

Besides, users of C.M.C. machines get the advantage of the service a home manufacturer can give.

**CANADA MACHINERY CORPORATION**
LIMITED

GALT ∴ ONTARIO

# CANADIAN MACHINERY AND MANUFACTURING NEWS

Vol. XXV., No. 8 | Published by the MacLean Publishing Company, Limited, Toronto | February 24, 1921 | $4.00 a Year Subscription Price


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BERTRAM

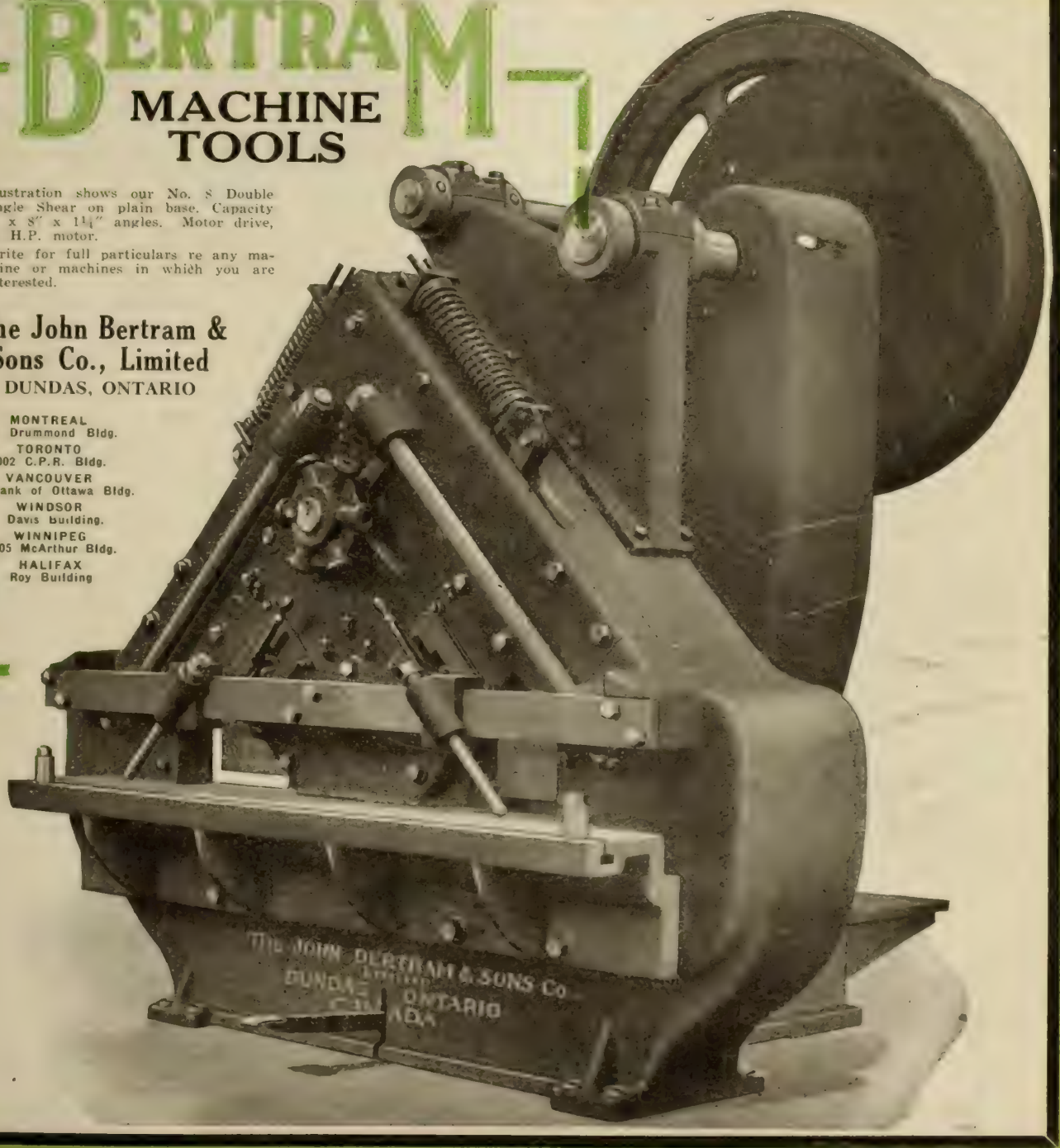
MACHINE TOOLS

Illustration shows our No. 8 Double Angle Shear on plain base. Capacity 8″ x 8″ x 1¼″ angles. Motor drive, 15 H.P. motor.

Write for full particulars re any machine or machines in which you are interested.

The John Bertram & Sons Co., Limited
DUNDAS, ONTARIO

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## All the Fine Qualities That Good Work Demands

Pratt & Whitney Small Tools enjoy an enviable reputation for excellence that has been well earned in the high production shops of the country. Where stamina as well as exceptional accuracy and precision are required P & W Tools have more than held their own. Our line is complete. It includes taps, dies, milling cutters, reamers, punches, drills, etc., both of standard and special design and in sizes to suit every requirement.

Prompt service is assured at our nearest store, where P & W Small Tools are carried in stock for immediate delivery.

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B.C. Equipment Co.

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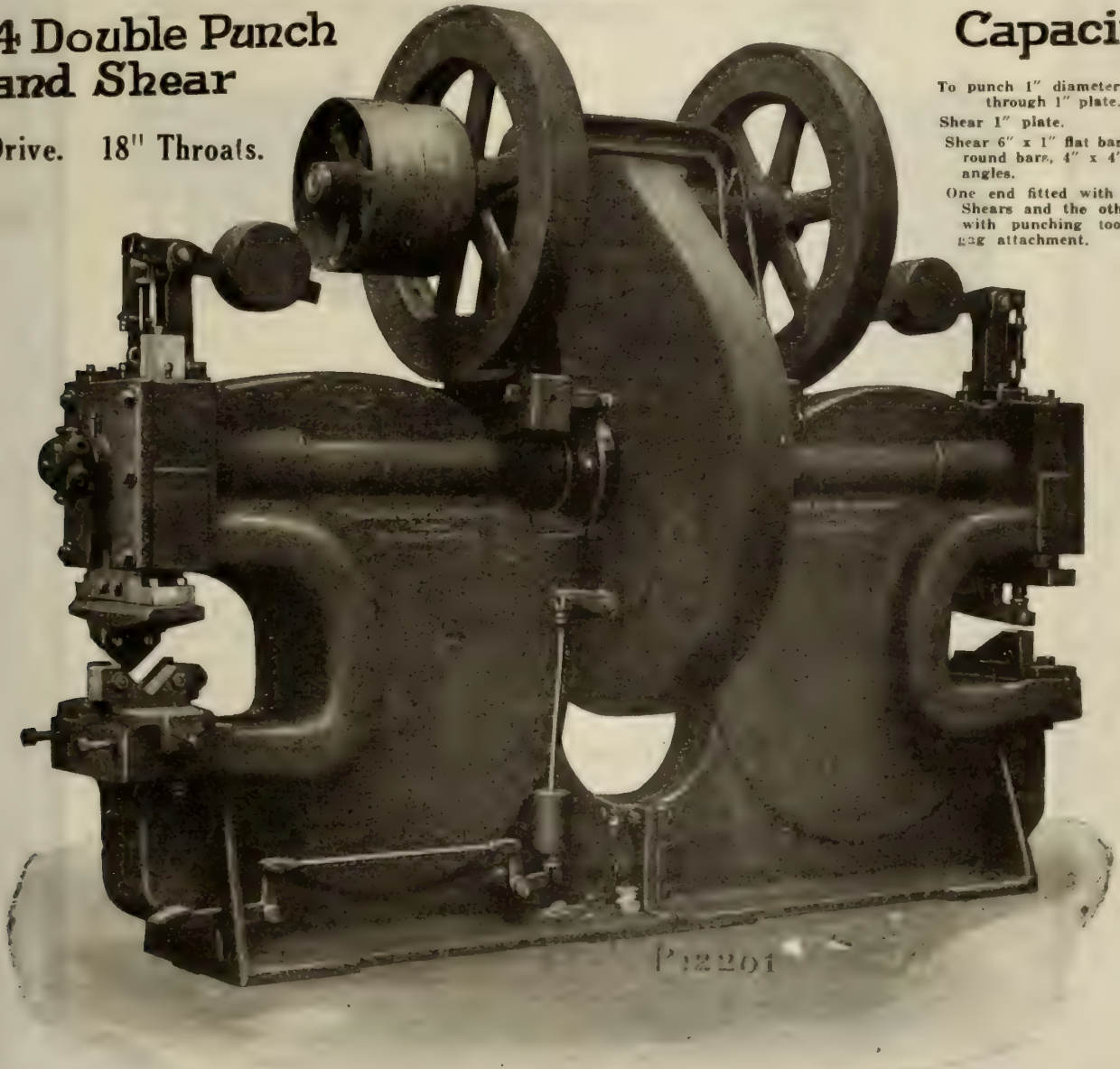


# The BERTRAM Page

## MACHINE TOOLS

## No. 4 Double Punch and Shear

Belt Drive. 18" Throats.




## Capacity

To punch 1" diameter holes through 1" plate.

Shear 1" plate.

Shear 6" x 1" flat bars, 1¾" round bars, 4" x 4" x ⅜" angles.

One end fitted with Angle-Shears and the other end with punching tools and gag attachment.

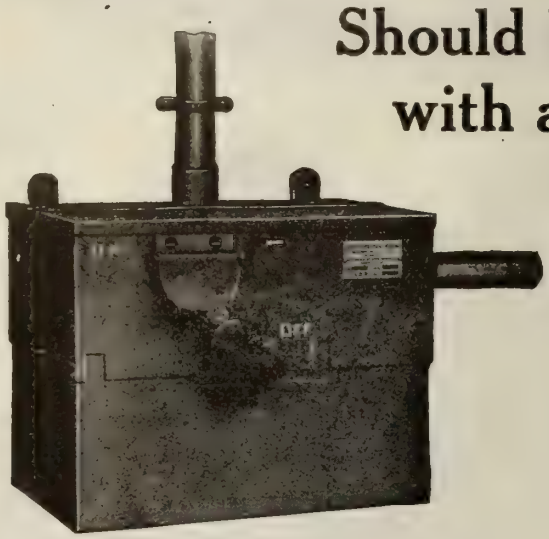
# The John Bertram & Sons Co., Limited

DUNDAS. ONTARIO. CANADA.

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CONDIT Type N-2 Oil Switch has a maximum capacity of 60 amperes and 600 volts and is ideal for protecting small lighting and power circuits. It is single throw and made either two, three or four pole, non-automatic or automatic with under-voltage release and overload protective fuses.
Made with knock-outs for Conduit Connections.

CONDIT Type 1 Oil Starters are of oil switch construction and are equipped with enclosed fuses for overload and short circuit protection. Special design allows fuses of approximately full load running current to be used, *which will not blow during starting period.* Equipped with low voltage release. Handle cannot be left in starting position.

*Our nearest House can supply you*

**Northern Electric Company**
LIMITED

MONTREAL HALIFAX QUEBEC OTTAWA TORONTO
HAMILTON LONDON WINDSOR WINNIPEG REGINA
EDMONTON CALGARY VANCOUVER

CONDIT: *the Synonym of Safety in Electrical Protective Equipment*

# MILWAUKEE MILLING MACHINES

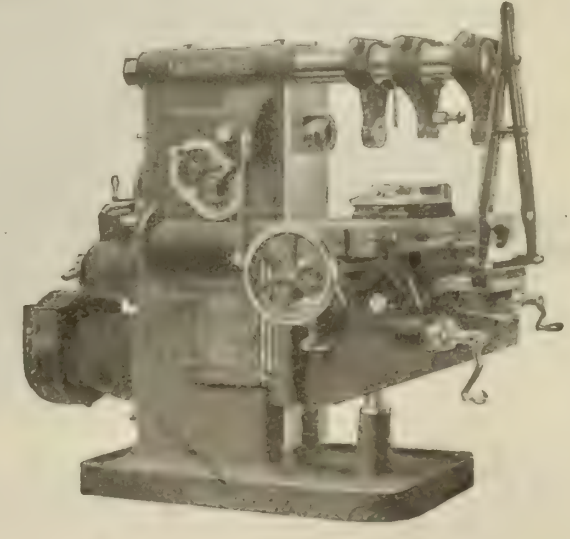
## *Economy—The Demand Of The Day*

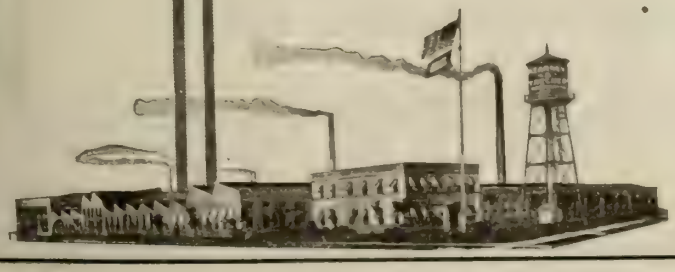
DISCRETION in the selection of machine tools means economy and profit. Equip your plant with machines that are built *right* to insure permanent satisfaction.

Milwaukee Milling Machines embody only the best obtainable materials and workmanship. Designed and constructed to afford maximum rigidity, accuracy, ease of operation, and to produce all classes of milling — profitably and economically.

Such features as the double overarm, flanged spindle, automatic flooded lubrication system and box section, solid top knee are largely responsible for the efficiency of Milwaukee Milling Machines.

An opportunity to assist you with your milling problems will be appreciated. Write for our catalogue.

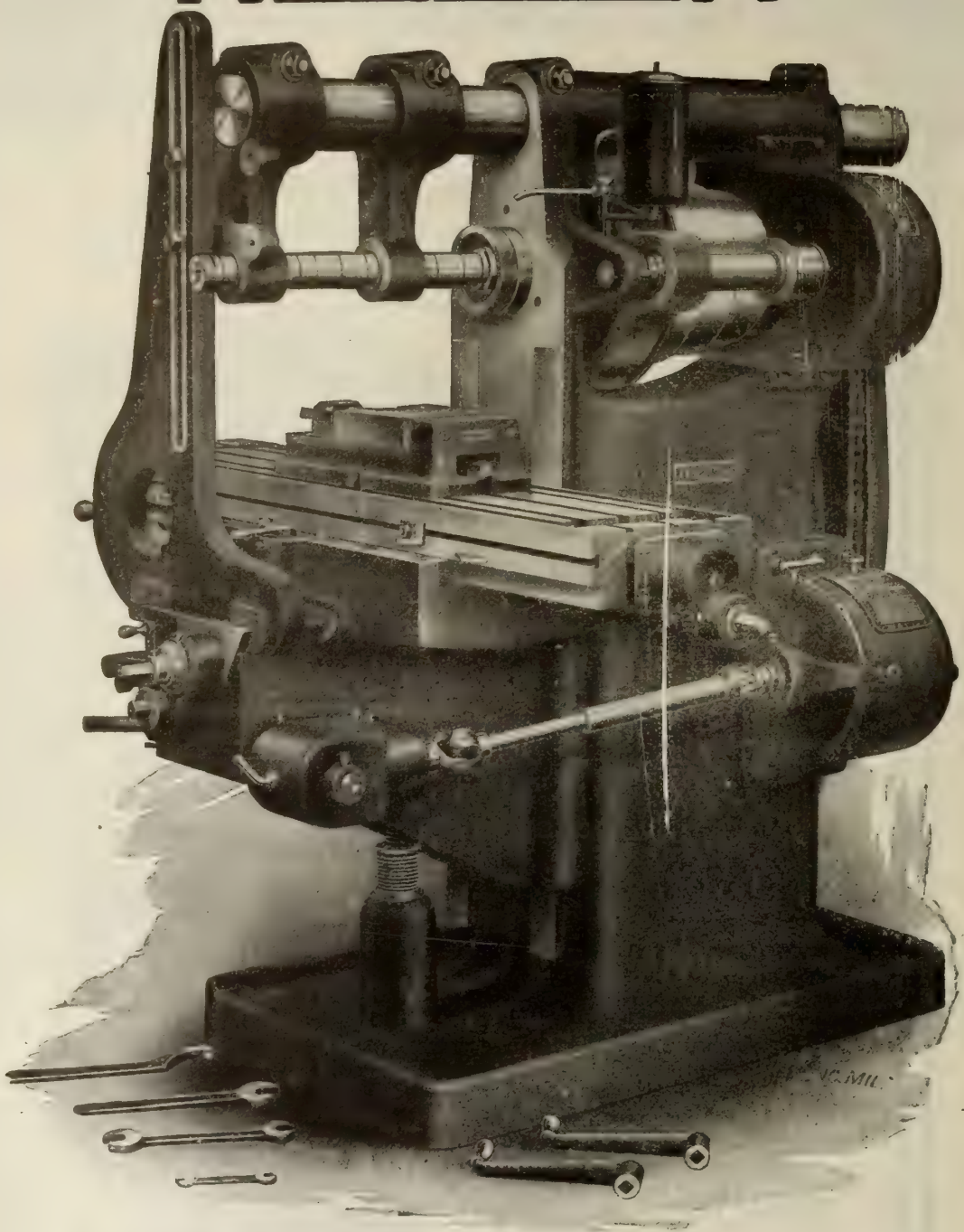




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CORPORATION
MILWAUKEE, WIS., U.S.A.

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F. F. BARBER MCHY. CO., Toronto.
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# KEMPSMITH



## KEMPSMITH No. 3 Plain Milling Machine

**Double Back Geared**

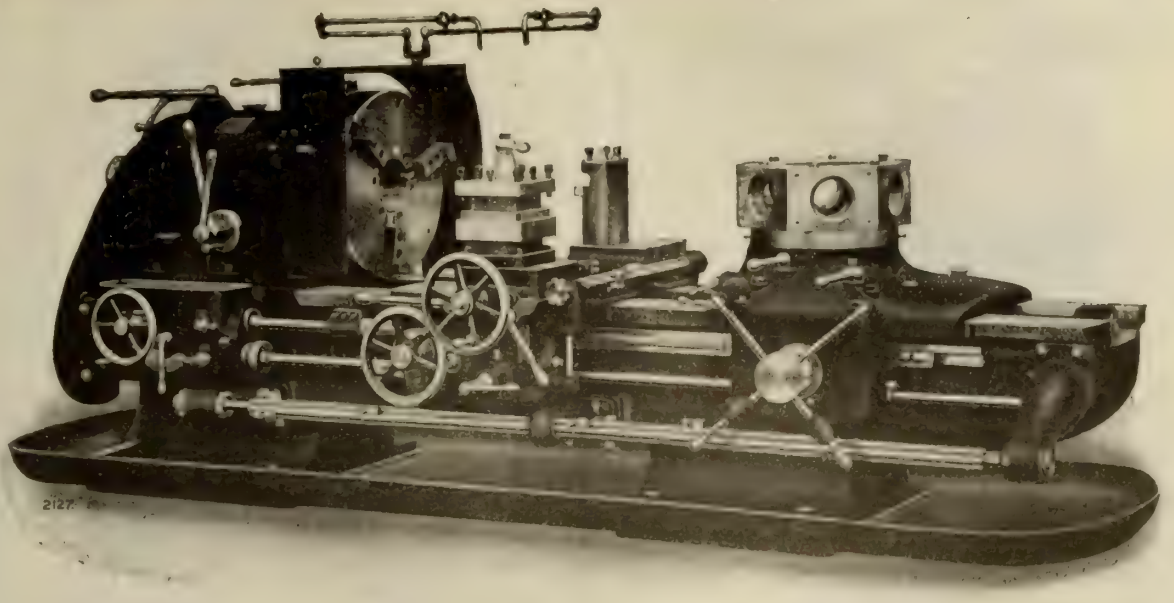
A heavy, powerful tool with double back gears and wide driving belt running on a three-step cone of large diameter. Our catalogue "B" describes and illustrates many notable features of the Kempsmith Miller. Write for a copy to-day.

## THE KEMPSMITH MANUFACTURING CO.

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Since 1889 we have specialized in Turret Lathes and their equipment. We build these machines in two types, the one intended for producing articles direct from bars, the other for machining detached pieces, either castings, forgings or stampings.

On receipt of samples or drawings of the work to be done, we offer the most suitable machine equipped with the necessary tools and fixtures, giving times in which we guarantee to produce each piece.

We have supplied Turret Lathes for machining all kinds of engineering details, and can furnish reliable advice on the most economical methods of production from design to finished article.

## MACHINES IN STOCK

**COMBINATION TURRET LATHES**

No. 3 size, 8 in. centres, spindle flange to face of turret, max. 51 in.
No. 9 size, 10 in. centres, spindle flange to face of turret, max. 48 in.
No. 17 size, 11 in. centres, spindle flange to face of turret, max. 80 in.

**HEXAGON TURRET LATHES**

No. 1 size, capacity 1⅝ in. x 27 in.
No. 13 size, capacity 2¾ in. x 36 in.
No. 4 size, capacity 3½ in. x 42 in.

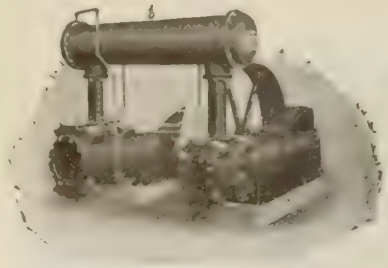
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Turret Lathes, Engine Lathes, Horizontal Boring Machines, Boring Mills, Planing Machines, Slotting Machines, Shaping Machines, Profiling Machines, Grinding Machines, Sawing Machines, Precision Machines, Chucks, Die Heads, Tool Room Equipment, Foundry Equipment, Drills, Milling Cutters and Small Tools.

*If interested tear out this page and place with letters to be answered.*

# Class PLB-2 Compressors



**Bulletin K-301-A**

Successfully combined in these machines are all of the advantages of duplex construction and two-stage compression, without sacrifice of simplicity, compactness or strength.

They are easy to install, because, while practically a solid unit when assembled, they readily break up into sections convenient to handle and place on foundations, even in very close quarters.

Upkeep costs are low, due to their automatic flood lubrication system, enclosed dustproof construction, and the ready accessibility of all parts.

Equipped with a short belt drive attachment, they permit the use of standard motors, and are comparable only to the more expensive direct connected types in efficiency and output for floor space occupied.

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# Reduce Your Costs

Imported Grinding Wheels come high these days. Why use them? You can get equal quality wheels by specifying "Dominion" in all your orders. Dominion Wheels are now made from abrasive from our own furnaces. The quality is thus assured—they run uniform to grade and grain. Try Dominion Wheels and you will get in the habit of buying at home.

Try Dominion Wheels on a Quality basis.

**DOMINION ABRASIVE WHEEL CO., LTD.**

Mimico, Ontario

# Would You Like to make some Extra Money?

Of course you would. Well then, why not do so? Canadian Machinery is always on the lookout for well-worth-while ideas, and are willing to pay a good price for them.

We are often asked, "What sort of ideas do you want?" Briefly, what we are desirous of obtaining is this, "Any idea that has proved of value in the machine shop, drafting room, or tool room." Think of how you got over some difficulty, a ticklish piece to hold in the lathe, or perhaps how you increased production on some particular piece. Any idea that saves time or money in the machine industry will appeal to us. Never mind the style. Write it as best you know how. We will put the finishing touches to both the wording and the sketch. Start in **NOW** and send us something of such a nature.

*Address it to*

**The Editor, Canadian Machinery**

143 University Ave., Toronto, Can.

*If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.*




*Manufacturers:*

**The Sheffield Twist Drill & Steel Co., Ltd.**

**Works: Summerfield Street, Sheffield.**

To **PROMOTE TRADE** within the **EMPIRE, CANADIAN MANUFACTURERS** will find that **"DORMER BRAND DRILLS"** meet all requirements. **QUALITY DRILLS** for quick drilling—USE **"DORMER."**

**Sheffield Engineering Supplies, Limited,**
**230, Craig Street West,**
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***High Twist*** DORMER BRAND ***Speed Drills***

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A well established machinery supply house in Nova Scotia, covering the entire province, which has been handling American machinery, would like to hear from Canadian manufacturers of the following lines:—

**Woodworking Machinery**
**Ironworking Machinery**
**Contractors' Machinery**
**(Hoists, Mixers, etc.)**
**Pumps**
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MACHINERY
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HALIFAX

Diamond-F

# DIAMOND FIBRE

## Do YOU know exactly what Diamond Fibre is?

ANY proposition that will help to **increase** the product and **decrease** the production costs is worthy of investigation by those interested in manufacturing processes. And this is where Diamond Fibre is of interest to you.

Diamond Fibre is a superior grade of vulcanized Fibre (not wood pulp Fibre), tougher than horn, almost as hard as iron, yet lighter than aluminum and impervious to oil and grease. It contains no dirt, grit, metal, or other foreign substances and can be machined into any form without undue injury to the most delicate edge tools. This is why Diamond Fibre is, for many purposes, superior to the much more costly materials such as steel, brass, iron, etc.

It is a money saving advantage for you to specify Diamond Fibre gears, pulleys, receptacles, trucks, and the numerous different special shapes used in every industry.

Possibly it has not occurred to you that it would be of advantage to you to know more about the possibilities of Diamond Fibre in connection with your own business. The question of raw material is a mighty important one and the use of raw material most suitable to your particular need may mean very much increased efficiency at a lower cost.

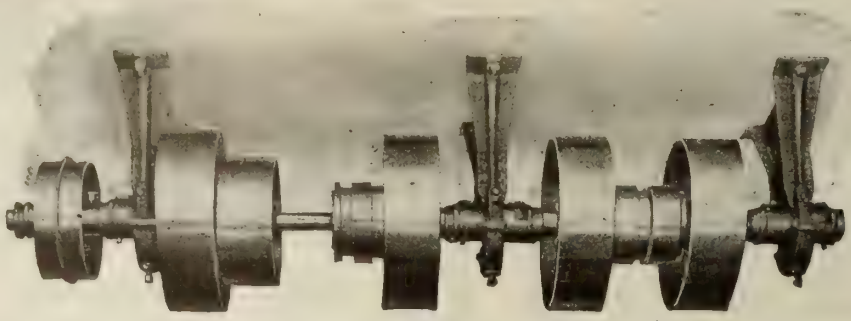
Let us know about any production problem that is worrying you—any leakage in your production profits that you cannot trace and we will cheerfully give you our opinion on it. If we think Diamond Fibre will be of assistance to you we will say so. If we think not we will also say so frankly and you will have obtained the information at no cost to yourself.

Send for our book "Diamond Fibre and Its Uses." It will explain to you just what Diamond Fibre is and the different uses to which it may be put.

**Diamond State Fibre Company of Canada, Limited**

**Wrigley Building, Carlaw Avenue, - Toronto, Canada**

# THE JOHNSON FRICTION CLUTCH



## Put Johnson Clutches on Your Countershafts

Here's a countershaft equipped with three Johnson Clutches—two of the single type and one of the double—providing two speeds, a reverse and a light auxiliary drive. An exceptionally neat and compact construction is obtained, light in weight and smooth-running.

Wherever really high-grade equipment is desired, Johnson Clutches are the selection. For general transmission purposes there is no clutch more reliable, and none so adaptable to all conditions. Johnson Clutches in special types have also been incorporated successfully in machinery of all kinds. Their exceptional fitness for this line of work is described in our booklet, "Clutches as Applied to Machine Building."

**Write for our Yellow Catalog.**

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**CANADIAN FAIRBANKS-MORSE CO., LIMITED, Montreal, Toronto and Winnipeg**

**THE CARLYLE JOHNSON MACHINE CO.** MANCHESTER CONN.

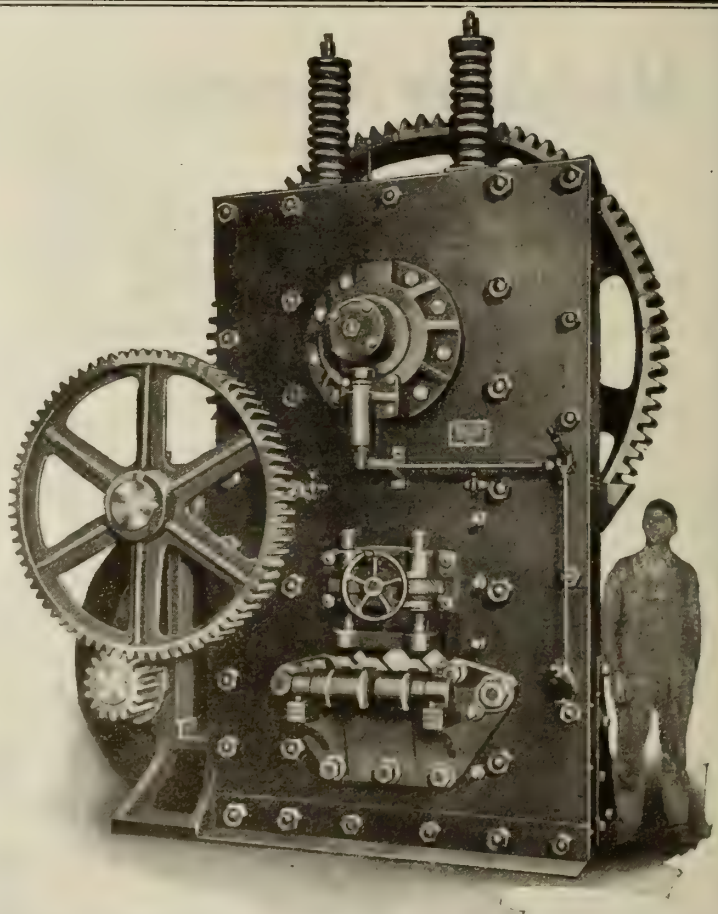
# Buffalo "Armor Plate"

## Punches and Shears

These machines have frames made of tough, unbreakable rolled steel plates—bolted and doweled together to form one solid integral whole that will withstand continuous maximum capacity service.

Yet, capacity for capacity, "Armor Plate" machines are lighter and occupy less floor space than any cast-iron or steel machine.

**Our catalogs tell why. Write Dept. 16 for a copy.**



**Canadian Blower & Forge Co., Ltd.**
KITCHENER, ONT.

# CANADIAN STEEL FOUNDRIES LIMITED

## AMONG OUR PRODUCTS

**O. H. STEEL**
- Bolsters
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- Crosses
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- Guard Rail Clamps
- Complete Intersections

This list is merely an indication

General Offices:
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## WE CAN SUPPLY

# STEEL PLATE

—IN—

**Universal Edge** - up to 40 in. wide
**Sheared Edge** - up to 60 in. wide

**Any Thickness** **Any Lengths**

*Send Us Your Enquiries.*

## Dominion Foundries & Steel, Limited
**HAMILTON, ONTARIO**

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# OXYGEN AND HYDROGEN
## (ELECTROLYTIC)



National Electro Products Limited is the largest manufacturer of Electrolytic (pure) Oxygen and Hydrogen in Canada.

WE PRODUCE GASES EXCLUSIVELY BY ELECTROLYTIC DECOMPOSITION OF WATER

We are, therefore, in a position to furnish Oxygen and Hydrogen far superior to like gases made by any other process.

After Exhaustive Tests We Have Decided to Handle the Well-Known

The Torch for Welders OXYGEN PUROX HYDROGEN Who Want the Best!

## WELDING AND CUTTING TORCHES

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# IMPERIAL CARBIDE




For Welding Cutting and Lighting

HIGHEST GAS YIELD IMPERIAL CARBIDE MADE IN CANADA

It insures **effectiveness** and **economy** by **invariably** producing acetylene gas of **unusual purity.**

Manufactured by

## Union Carbide Co. of Canada, Ltd.
WELLAND, ONTARIO

**Large Stocks maintained at convenient distributing centres throughout Canada**

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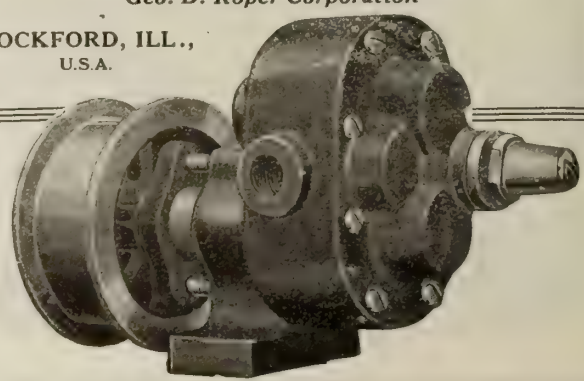
## Coolant Pumps

TRAHERN Coolant Pumps are built as regular equipment into leading Machine Tools. They are easily connected to any machine and will pump any liquid not containing grit.

Deliver 16½ G.P.M. at low speed; smooth, forceful stream free from pulsation. Reverse automatically, supply may be shut off at discharge without stopping pump; operate against 100 lbs. pressure if desired. Will not lose prime when properly installed.

**Write for our Bulletin 44, giving details.**

TRAHERN PUMP DIVISION
*Geo. D. Roper Corporation*
ROCKFORD, ILL., U.S.A.



Emblem of Integrity

LIQUID AIR Co

Standard of Excellence

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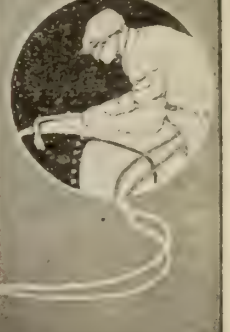
OPERATED IN CONJUNCTION WITH A CONTINENT WIDE NET-WORK OF DISTRIBUTION STATIONS



### "Liquid Air" Oxygen Means a Saving in Transportation

With a network of Factories, not only planned but in actual operation, and a number of Distribution Stations situated at all large centres all over Canada, Purchasers of Oxygen can obtain their supplies at a point very near to the point of consumption. This completely obviates heavy freight charges on cylinders and assures an immediate supply at any time within a few hours and even minutes after the orders are placed.

All cylinders conform to the specifications of the Canadian Railroad Board and are made to ensure safety without unnecessary weight. When purchasing "Liquid Air" Oxygen you not only save on freight, but in very many cases this expense is almost eliminated.



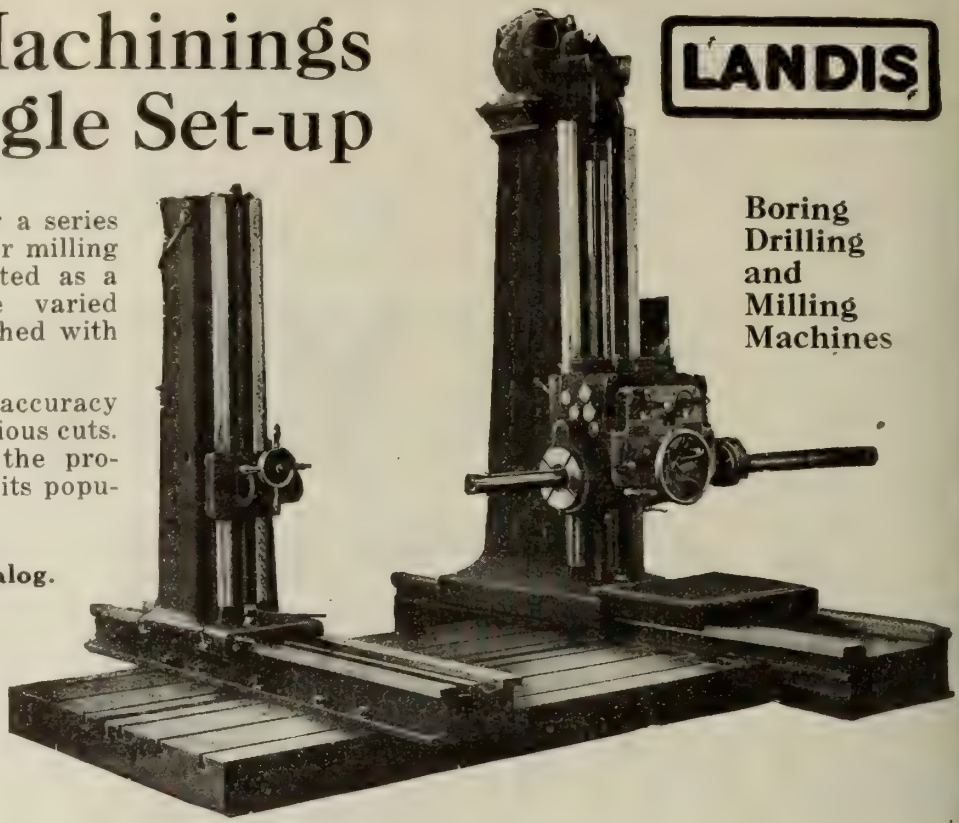
# Several Machinings With a Single Set-up

LANDIS

In machining parts requiring a series of boring, drilling, reaming or milling operations, the Landis is noted as a time saver, because these varied machinings can be accomplished with a single set-up of the work.

This feature further assures accuracy of alignment between the various cuts. The Landis looms large in the production class and this causes its popularity.

**Let us send you a Catalog.**



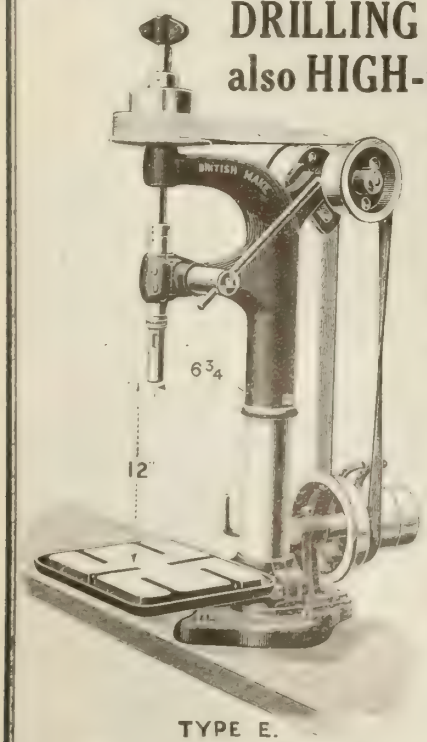
**Boring Drilling and Milling Machines**

## Landis Tool Company

**Waynesboro, Pa.**

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# SENSITIVE BENCH and PILLAR DRILLING MACHINES also HIGH-CLASS BALL BEARING DISC and TOOL GRINDERS




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**TEN DIFFERENT TYPES, ALL FROM STOCK**

**Telegrams:— "BEACO TIPTON" ENGLAND**

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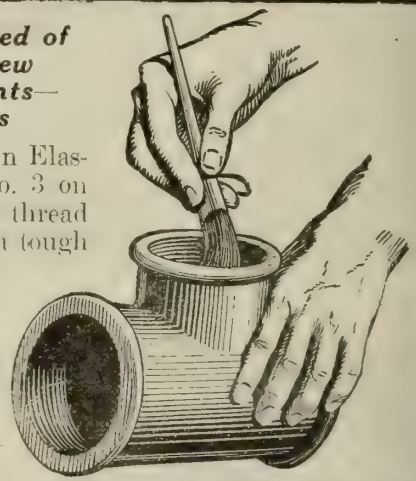
***AGENTS WANTED***

## Beacon Engineering Co.

**TIPTON, ENGLAND**

# SMOOTH-ON IRON CEMENTS

***If you're tired of Leaky Screw Thread Joints— Try This***



Use Smooth-On Elastic Cement No. 3 on just *one* screw thread job—make it a tough one — one of those lines that are always giving trouble. You'll know then, for sure, that a leaky joint—no matter under what conditions—is unnecessary. Smooth-On Elastic Cement No. 3 *is sure.*

*Your Supply House Sells Smooth-On*

Write for 144-page Smooth-On Instruction Book. It's free.

**Canadian Distributor:**
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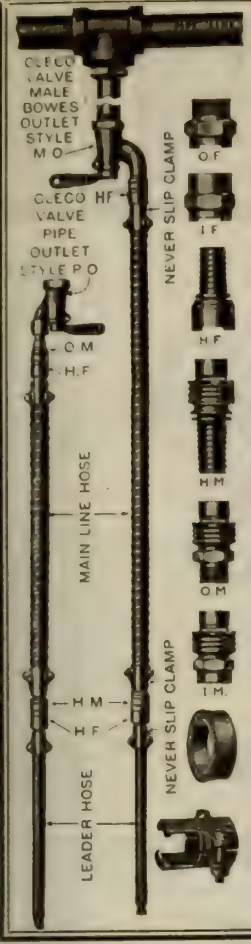
**Manufacturers**

**SMOOTH-ON MANUFACTURING CO.**
ESTABLISHED 1895
**570-574 COMMUNIPAW AVE., JERSEY CITY, N.J. U.S.A.**

21-176

# Cleco Pressure-Seated Air Valves

## Bowes Air Hose Couplings—Cleco Never Slip Hose Clamps and Cleco Grooved Hose Nipples and Hose Clamp Tool




**STYLE O.F.** is an Outside Thread Female Pipe End. Made in sizes ⅜-inch to 1½-inch.

**STYLE I.F.** is an Inside Thread Female Pipe End. Made in sizes ¼-inch to 1½-inch.

**STYLE H.F.** is a Female Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-inch to 1½-inch.

**STYLE H.M.** is a Male Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-inch to 1½-inch.

**STYLE O.M.** is an Inside Thread Male Pipe End. Made in sizes ¼-inch to 1½-inch.

**STYLE I.M.** is an Inside Thread Male Pipe End. Made in sizes ⅜-inch to 1½-inch.

The Male and Female Ends of Bowes Couplings interchange in sizes ¼-inch to ¾-inch. Sizes 1-inch and 1¼-inch interchange. The 1½-inch ends interchange only with themselves.

### BOWES COUPLINGS

Are instantly connected or disconnected.
They are absolutely air-tight under all pressures.
They quickly pay for themselves by stopping costly leaks.
They interchange in sizes most commonly used.
They have no loose parts to be mislaid or lost.
They are made of brass and will not rust.
The U-shaped Gasket interchanges in couplings ¼-inch to ¾-inch.

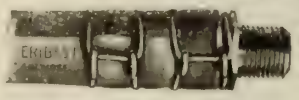
### CLECO VALVES



**Style P.O.** **Style M.O.** **Style A.**

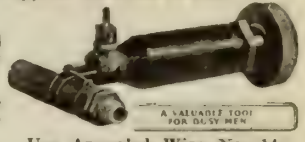
Style P.O.—Made in sizes ¼ in., ⅜ in., ½ in., ¾ in., 1 in., 1¼ in., 1½ in., 1¾ in., and 2 in. Pipe Outlets. Inlets are one pipe size larger.
Style A—30° Angle Valves, are made in sizes ½ in., and ¾ in.
Style M.O. Valve—Has 1 in. Inlet and Bowes Coupling Outlet. Connects with Bowes sizes ¼ in. to ¾ in.

### CLECO GROOVED HOSE NIPPLES



Grooved Nipples when attached to the Hose with Wire Clamps as illustrated cannot "blow out." Wire clamp tool shown below applies the wires to hose.

**The Lightening Hose Clamp Tool** illustrated applies wire clamps at a cost of 1½ cents each.




**In stock:** Riveting and Chipping Hammers, Air Drills, Emery Grinders, Sand Rammers, etc.

**Use Annealed Wire No. 14**

**IMPORTANT:—The Small Leaks in your "AIR LINE" mean serious loss in DOLLARS. Have you any idea of the amount of "Air" wasted in small leaks at your connections? Air Leakage through 1-16 in. opening equals 5.32 cu. ft. per minute at 80 lbs. It will pay you to install Bowes Couplings and Cleco Valves, which will stop costly leaks.**

**Bulletins Nos. 43, 44, 46 and 48 mailed on request.**

**THE MODEL HOSE LINE** illustrated shows correct styles of couplings and valve to use and proper way to attach the Cleco Never Slip Hose Clamps to Bowes Couplings. No "blow-offs" can occur when "Cleco" Clamps are used.

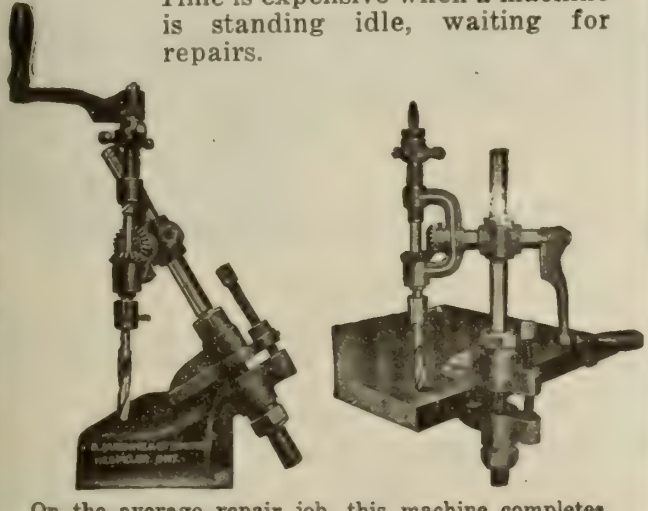
## CLEVELAND PNEUMATIC TOOL CO. OF CANADA, LIMITED

84 Chestnut St., TORONTO, ONT. 337 Craig St. W., MONTREAL, QUE.



# Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

**Weight, 40 lbs. Price, $26.50 net.**

**Sold by all Machinery and Supply Houses.**

## A. B. JARDINE & CO., Limited

HESPELER, ONTARIO



# GREY IRON CASTINGS

*Also*

## Brass, Bronze, Aluminum, Copper, Zinc and Nickel Castings

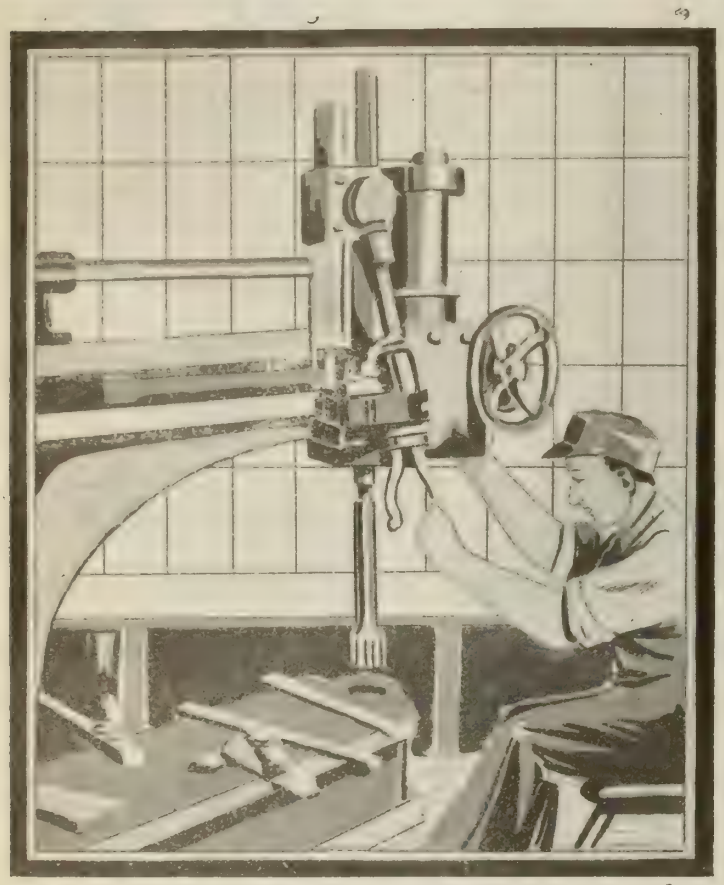
QUALITY!
SERVICE!

## Canadian Hanson and Van Winkle Co., Limited

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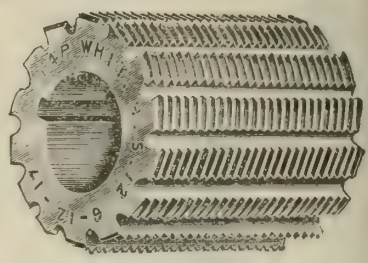
# QUALITY TOOLS

## Drills
## Reamers
## Milling Cutters
## Taps and Dies





THE Butterfield slogan, "The Tools You Buy Again," should not be lightly considered, for it's a fact once you use Butterfield Tools you will hesitate to use any others. Strength and cutting edges that last have brought them into world-wide use. Try them!



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### UNION TWIST DRILL CO.
Rock Island, Que., Canada.

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AGENTS—D. Phillip, 138 Portage Ave., Winnipeg, Man. The Triangle Co., Standard Bank Bldg., Vancouver, B.C.

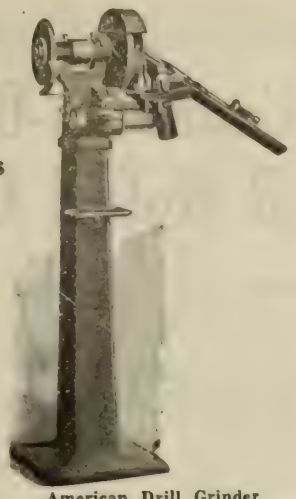
FOREIGN REPRESENTATIVES: Great Britain, Geo. H. Alexander, 83-84 Colesh'll St., Birmingham, England; France, Italy, Belgium and Switzerland, Fenwick Freres, 8 Rue de Rocroy, Paris; Sweden, Norway and Denmark, Ab. Sigfr. Anderson & Co., Malmo; Spain, Casamitjana Hermanos, Barcelona; Japan, Abe-Kobei & Co., Yokohama; Greece, Stephen C. Stephanson, 11 Lycourgan St., Athens; Netherlands, Wynmalen & Hausman, Rotterdam; Australia, H. R. Richardson, 82 Pitt St., Vickery's Chambers, Sydney; South America, Charles Dreyfus, B. Mitre, 785, Buenos Aires, R. A.; South Africa, H. Parker Wood, Cape Town, Durban and Johannesburg.

# "THE TOOLS YOU BUY AGAIN"

# LA SALLE

## Has an Advantage Over Other Grinders

There is some outstanding feature of all La Salle Grinding Machines that lends it exceptional productive ability.
The American Drill Grinder is especially adaptable for grinding twist, flat and three-lipped drills, because it has automatic lip rest and caliper jaw device, which assures proper clearance on all sizes of drills automatically. Send for descriptive matter covering our entire line of grinding machinery.



American Drill Grinder
For Wet or Dry Drill Grinding 1/8" to 2¼". Also 1/8" to 3½" dia.

**LA SALLE TOOL CO.**
La Salle, Illinois, U.S.A.
Represented in Canada by
**A. R. Williams Machinery Co., Ltd.**
64-66 Front Street W., Toronto
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LEVIATHAN AND ANACONDA BELTING
ELEVATING TRANSMITTING CONVEYING

# BELTING

That ensures a big measure of efficient and economical

# SERVICE

We carry in stock Leviathan and Anaconda Belting, from 1" up, all plies, and are prepared to supply any length of belt at any time whether for **conveying, elevating or transmission.**

The belting comes in rolls of 500 ft., but we can supply any portion of this or one or more rolls at a moment's notice. Stocks carried at all points given in addresses below.

**MAIN BELTING COMPANY**
**OF CANADA, LIMITED**

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10 Peter Street
Tel. Main 7853

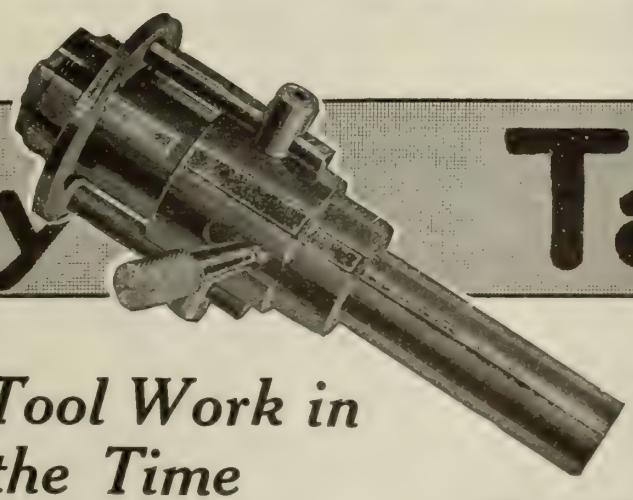
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32 Front Street West
Tel. Main 1838

WINNIPEG
W. W. Hicks, 567 Banning Street

Sherbrooke 30[illegible]2

EDMONTON and CALGARY
Gorman, Clancey & Grindley - Edmonton, Alberta

# Murchey Taps



## *Get Out Your Tool Work in One-half the Time*

Doesn't this sound interesting to you? Doesn't it sound convincing enough to specify Murchey Collapsing Taps in your next order? You'll find by actual experience that every word of it is true. Murchey Taps and Dies will actually boost your production fifty per cent. and do better work than ordinary tools.

### *Collapsible Construction*

The Collapsible and adjusting features of Murchey Taps enable convenience and quick-acting operation. Built for speed, they maintain their rigidity under the heaviest strains.

Murchey Tools have proved their money-saving qualities to others. Let them do the same for you. A sample Murchey Tap and Die will be sent on approval by writing us.

The Coats Machine Tool Co., Ltd., Caxton House, Westminster, London, S.W., England.
Fenwick Freres & Co., 16 Rue Fenelon, Paris, France.

**Murchey Machine & Tool Co., 75 Porter Street, Detroit, Mich.**

*If interested tear out this page and place with letters to be answered.*



# The New Canadian-Detroit Double-D Rolled Drill

***Made in Canada***

PRODUCTION requirements in an ever-increasing number of plants necessitate the use of a strong, accurate drill, specially designed for hard drop forgings, steel castings, and other alloy steels equally tough and difficult to drill.

For this service we have developed a hot rolled process drill known as the Canadian-Detroit Double-D (DD) Rolled Drill. It combines the strength of the forged type drill with the accuracy and uniformity of the milled type.

The flute of the DD is formed straight from the bar stock by successive passes through specially built and patented rolls at a temperature of 1850° F. This mechanical rolling of the flutes produces a refinement and uniformity in the grain of the steel and gives additional density at the centre and at the outer edge. Each drill is rolled separately, and the rolls are so designed and operated as to produce the same uniform increase in web thickness as is obtained in high-grade drills of the milled type.

The fluted drill is reheated and twisted in a specially designed automatic machine. The twisting process is held absolutely uniform, giving the same increase in helix angle from shank to point, 27° to 32°. This standard has been adopted on our milled drills and has been proven by exhaustive experiments to be the most efficient.

The DD has increased production and cut drilling costs in many of the finest plants in Canada. A fair test will convince you.

Manufactured and carried in stock at Walkerville in all sizes from ½ inch to 1½ inches.

We also manufacture and carry in stock all sizes and types of high speed and carbon milled drills.

## CANADIAN-DETROIT TWIST DRILL COMPANY, LIMITED

**Walkerville, Ontario**

# Economical Milling of Square Head Screws

The fixtures used in this set-up are designed to carry 16 screws at each setting. After flats have been milled in the one operation, the table revolves to its loading position, and instead of removing the pieces and setting them up again to mill the other flats, the operator indexes the fixture 90°, which brings it in position for the next operation.

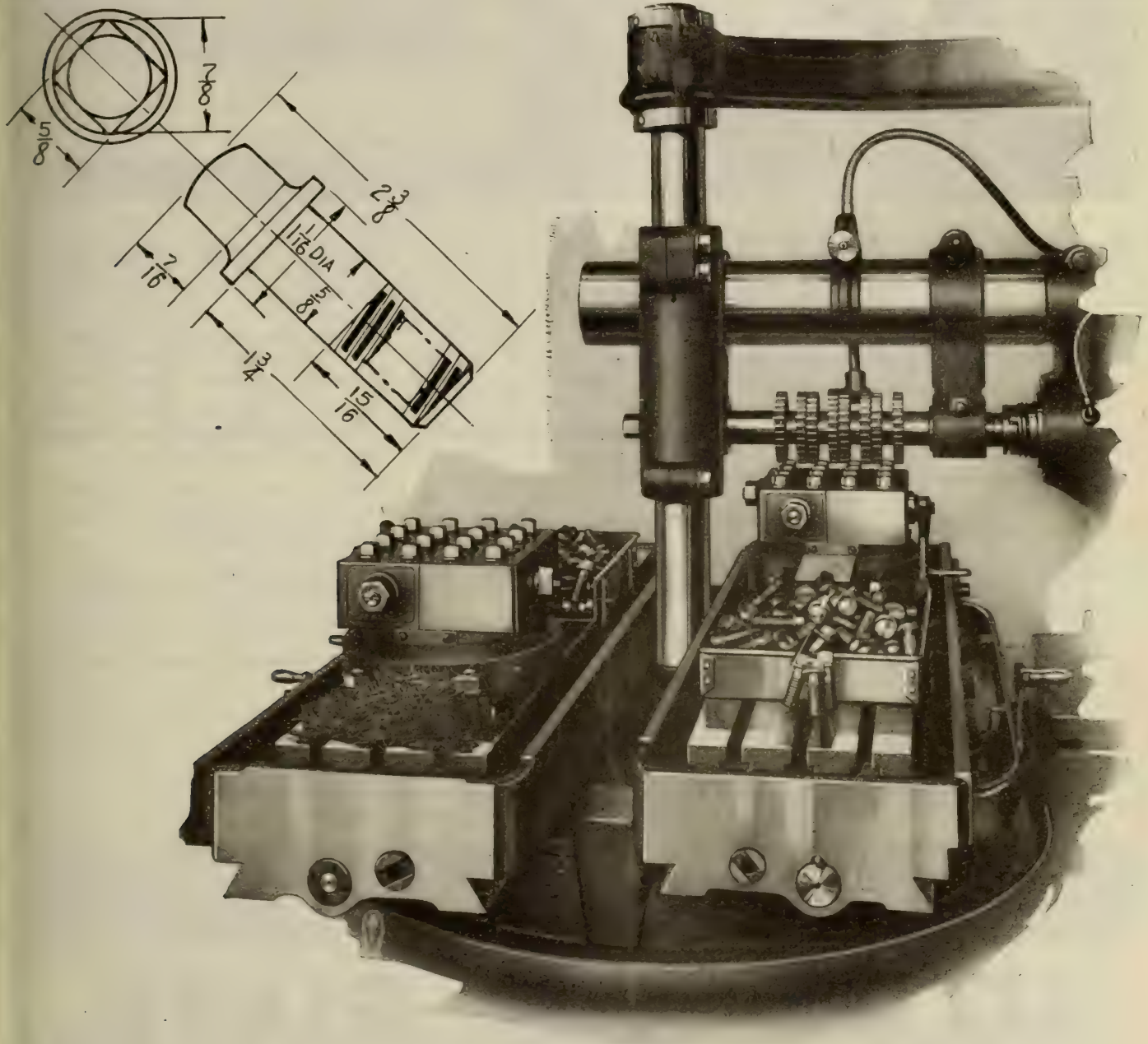
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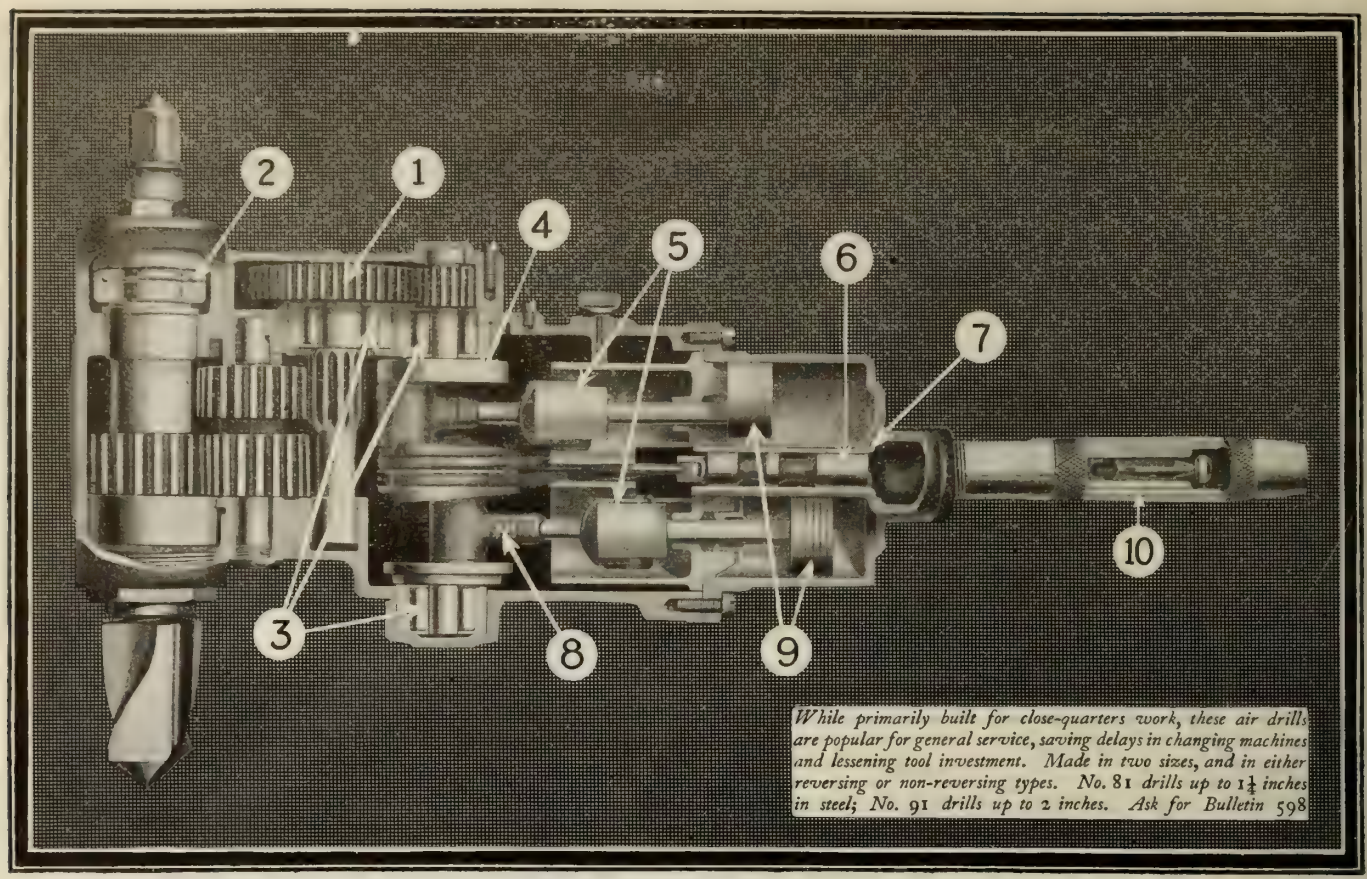
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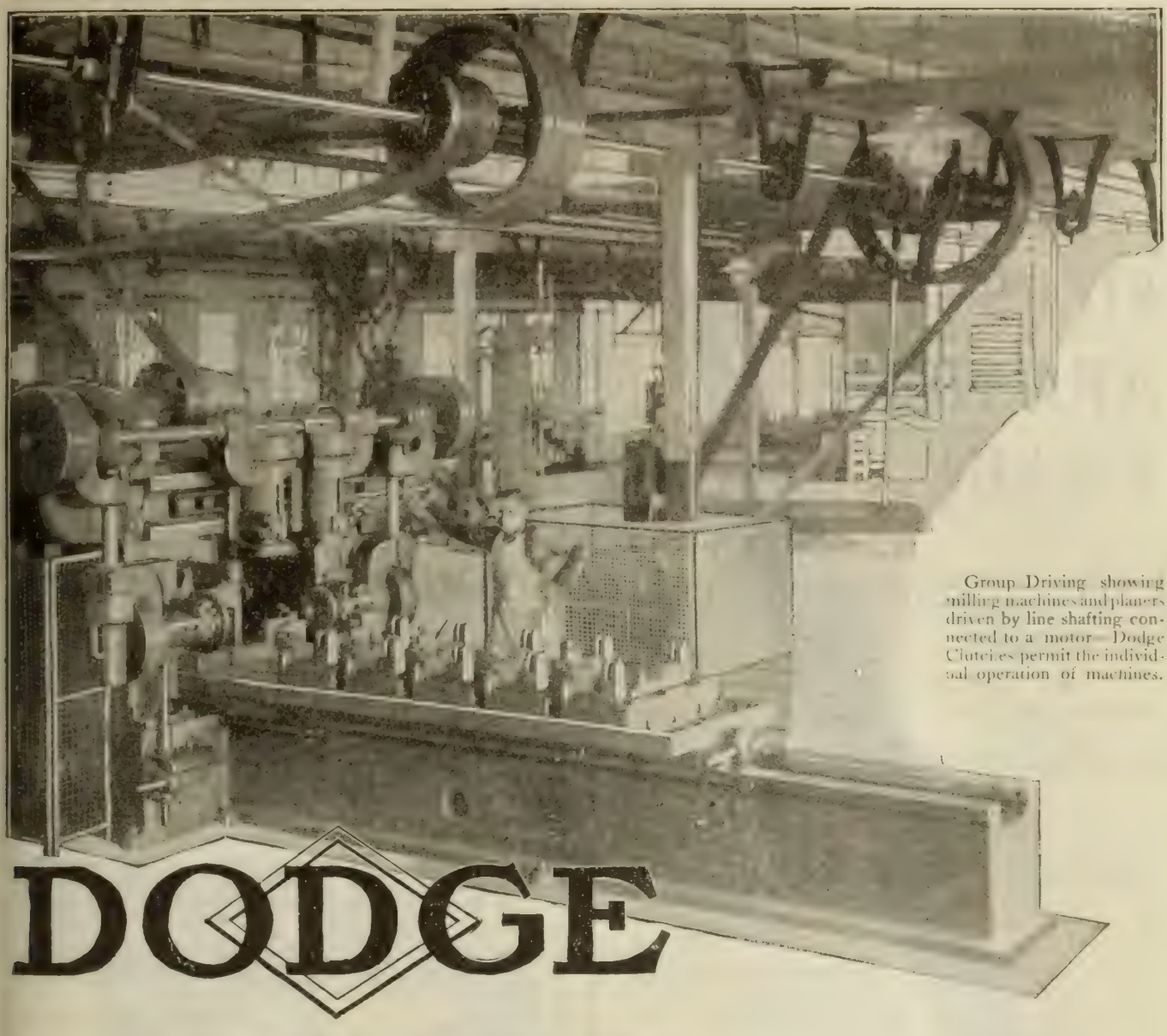
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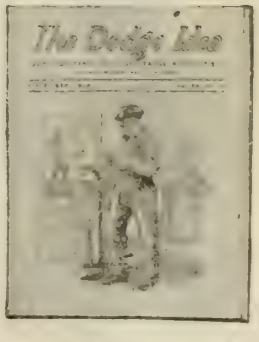
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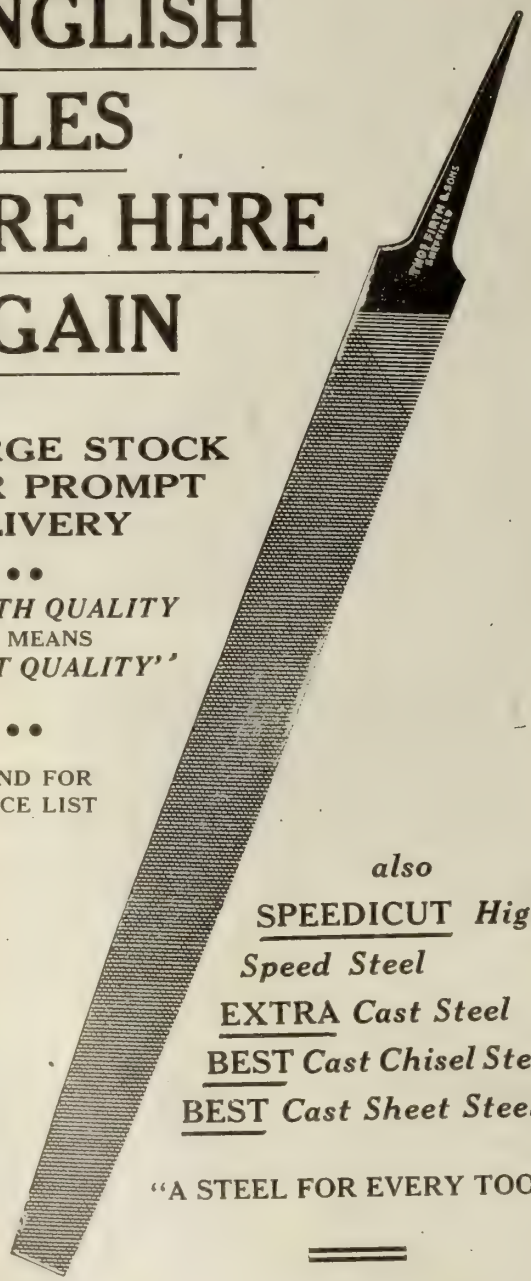

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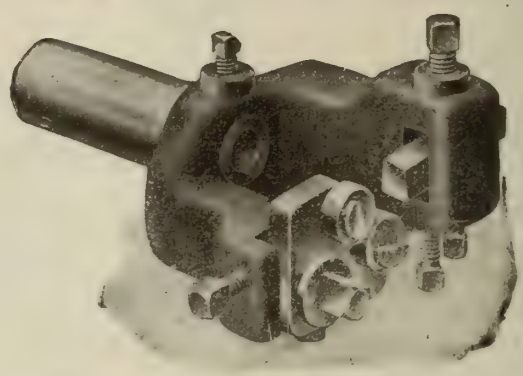
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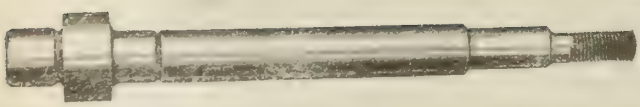
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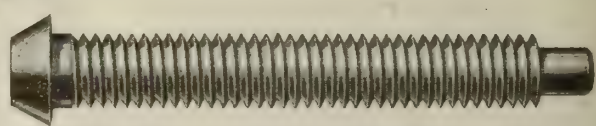
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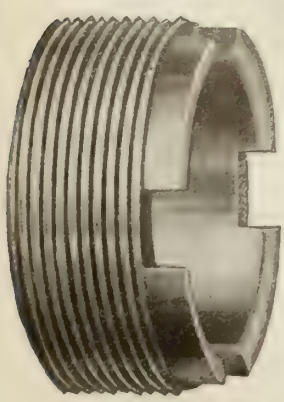
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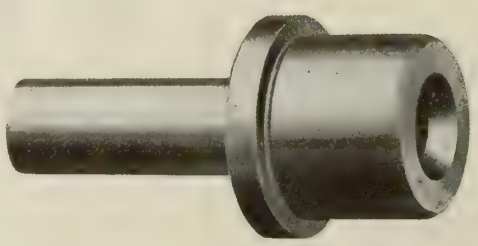
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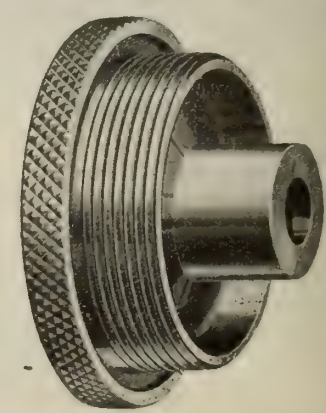
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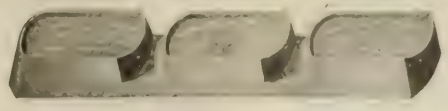
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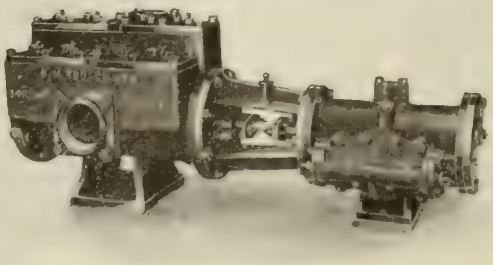
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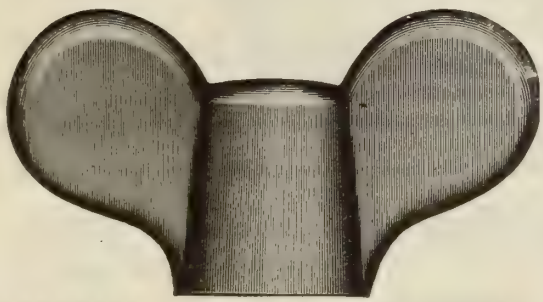
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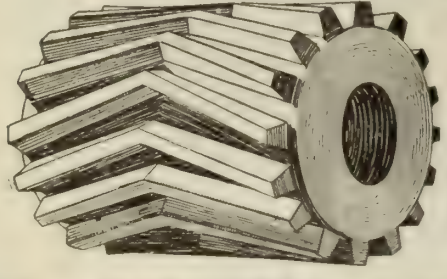
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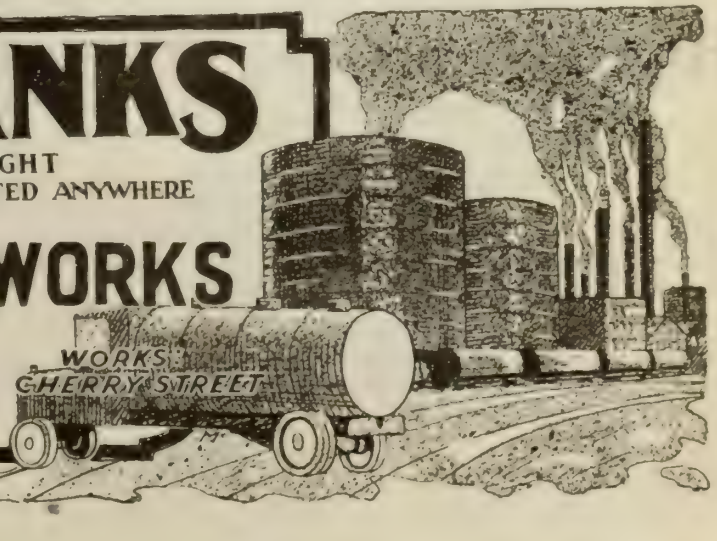
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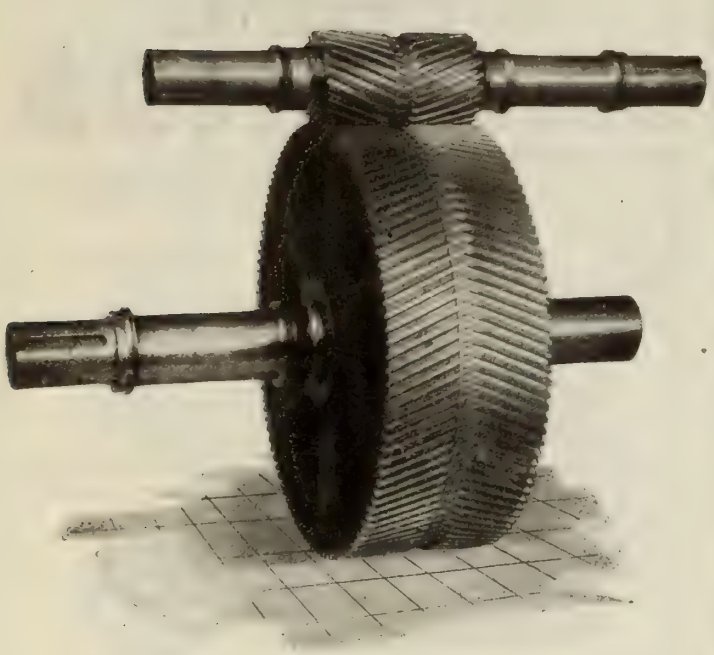
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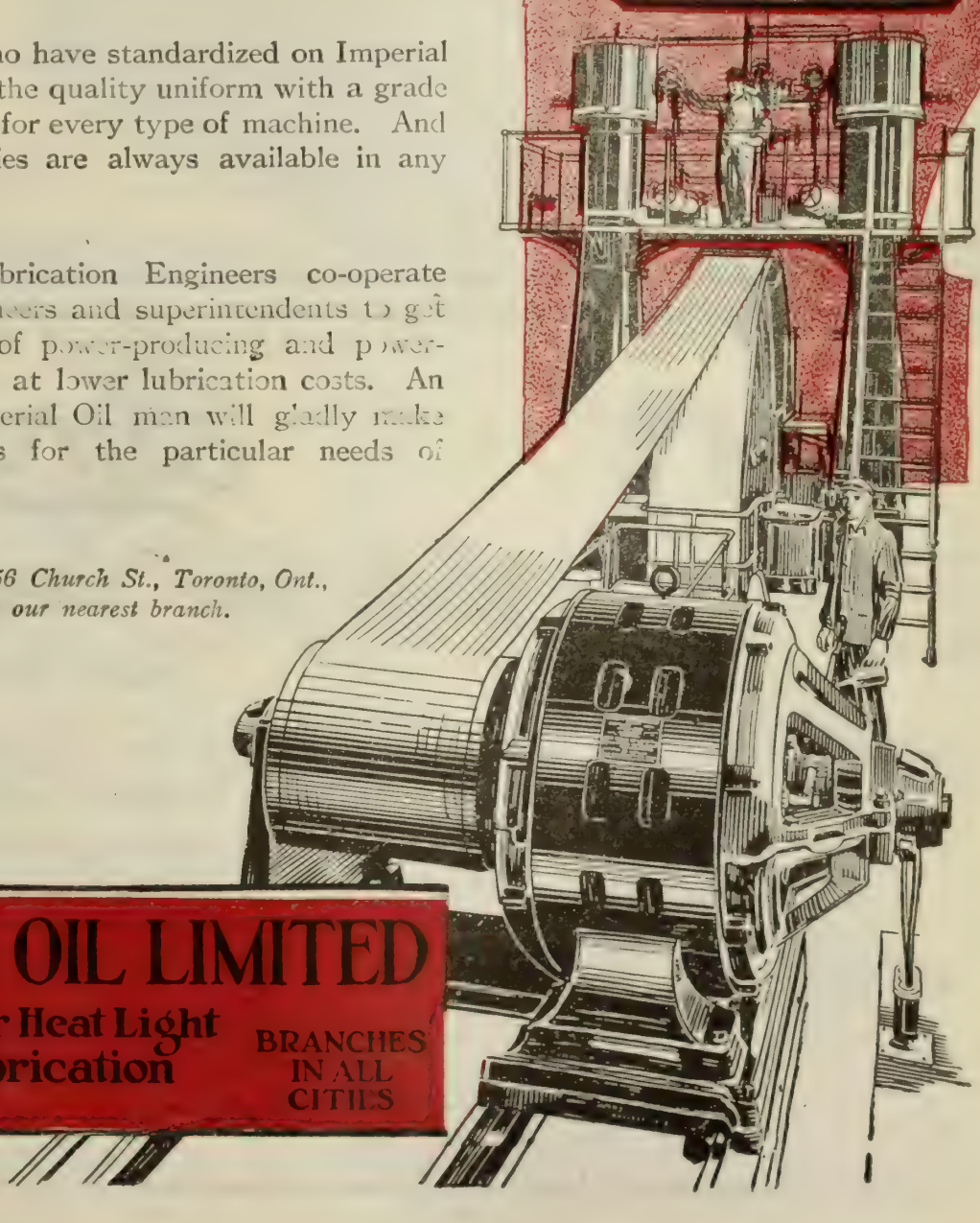
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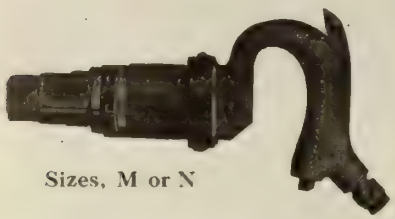
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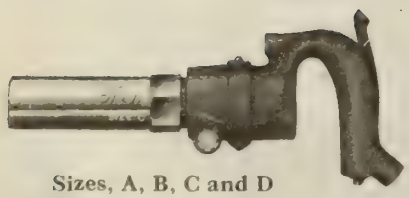
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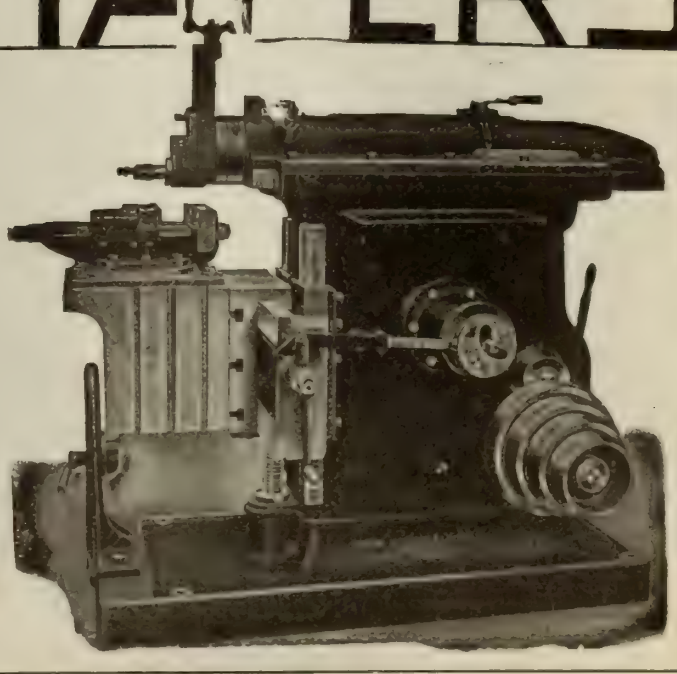
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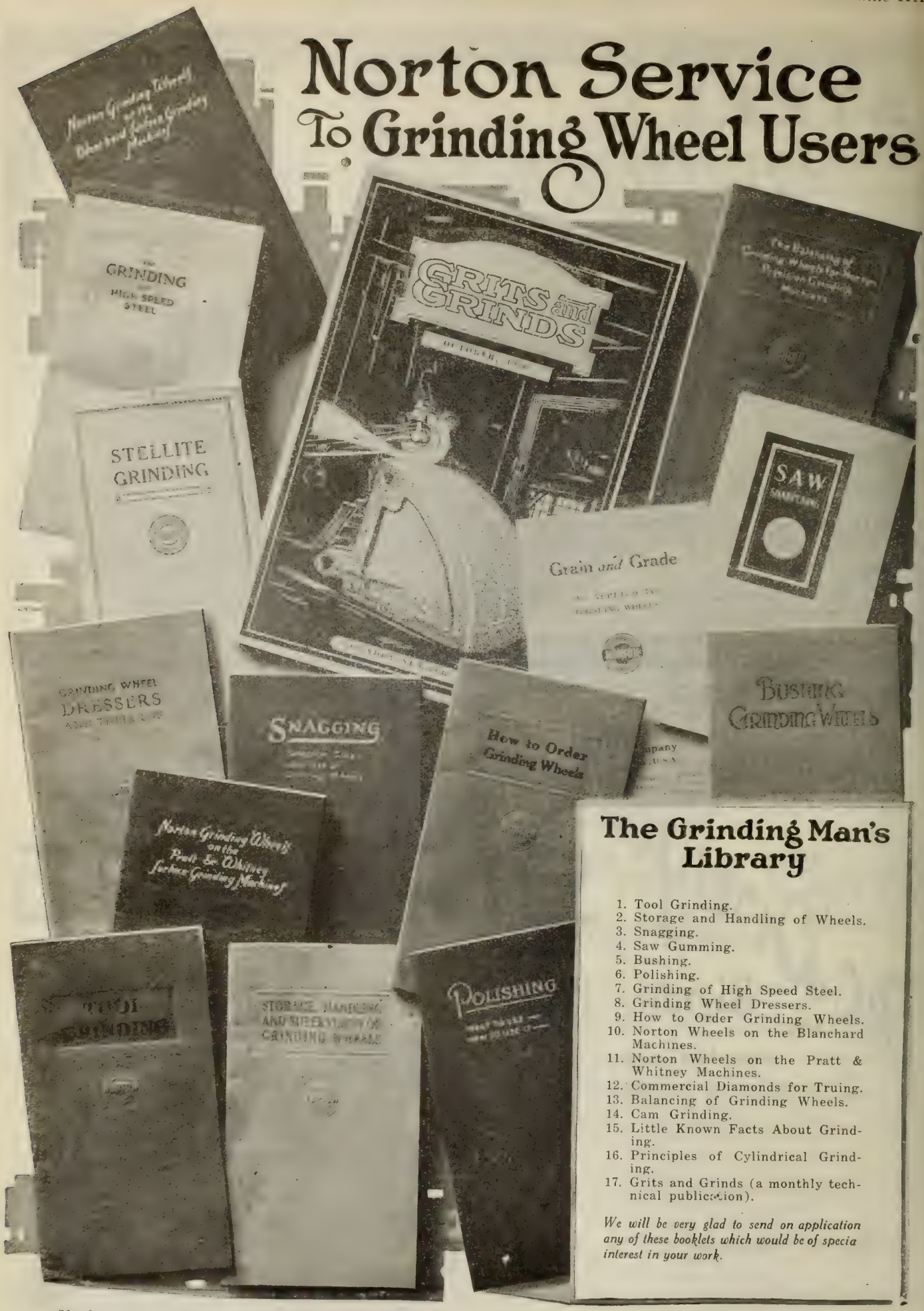
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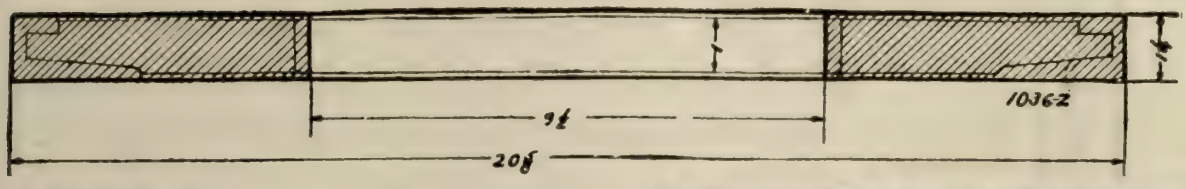

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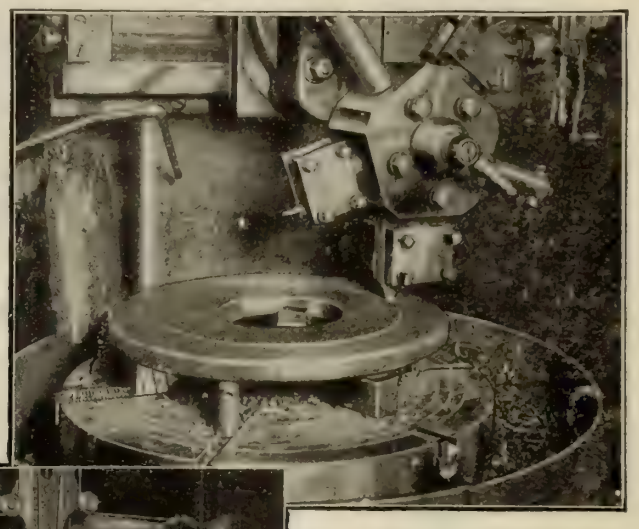
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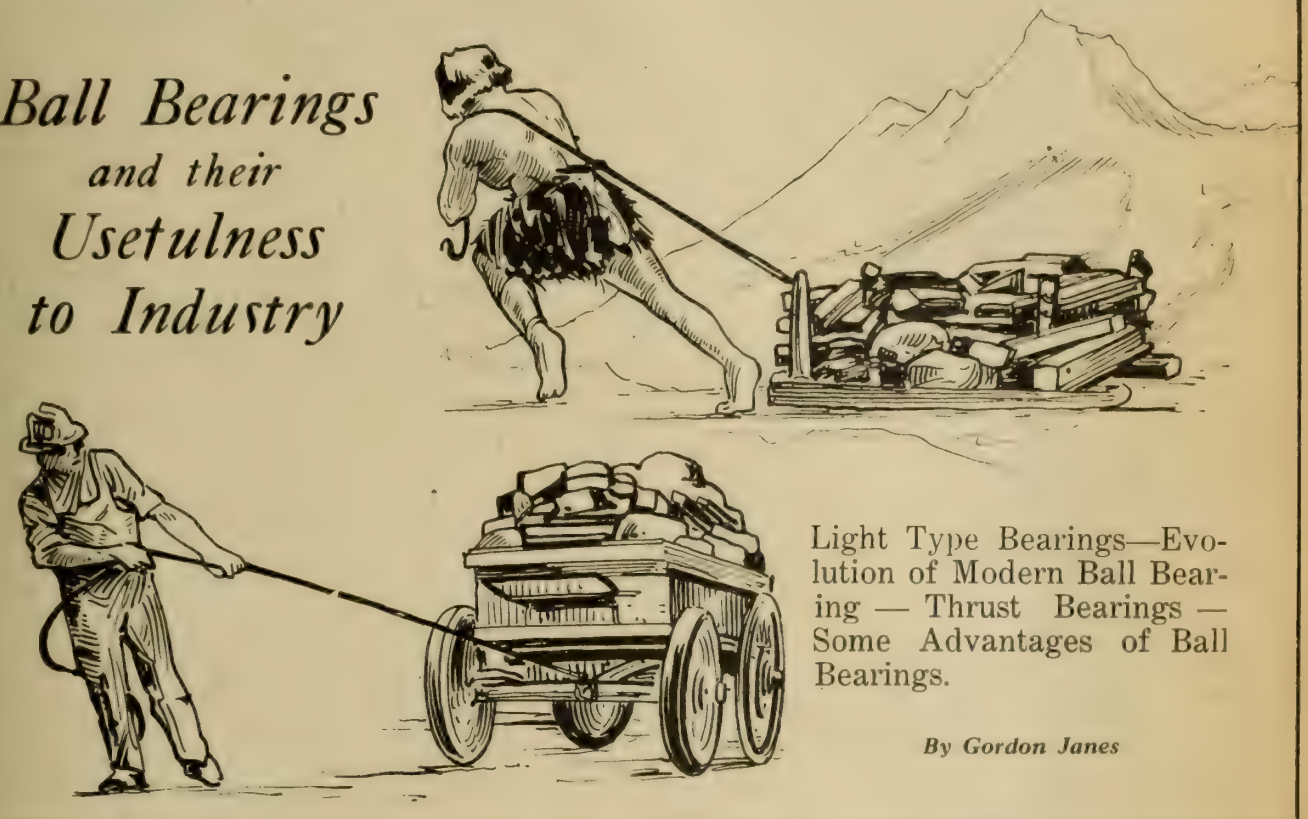
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# CANADIAN MACHINERY AND MANUFACTURING NEWS

VOL. XXV. No. 8. February 24, 1921


# *Ball Bearings and their Usefulness to Industry*

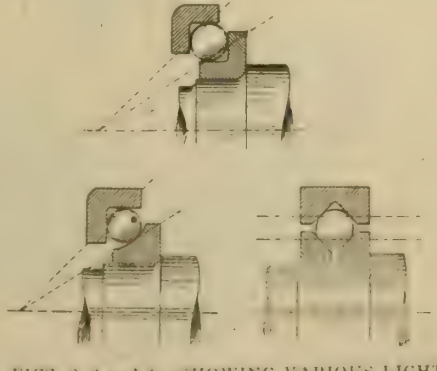


Light Type Bearings—Evolution of Modern Ball Bearing — Thrust Bearings — Some Advantages of Ball Bearings.

*By Gordon Janes*

ACCORDING to the dictionary, a bearing is "that part of a machine which receives the friction." This being the case, it would be necessary to go back much further in history than any existing records permit, to ascertain when the first bearing was used. Nevertheless, from very early times—indeed, long before Archimedes, or even the Pyramids — the wastefulness of plain sliding friction was realized and the fact was appreciated that a weight could be moved with little effort on rollers or balls. But at this point progress in anti-friction science halted for many centuries, as it seemed impossible to find durable rolling members; and the cost of even the simplest anti-friction bearing deterred efforts in that direction until the advent of the bicycle.

The rise of the bicycle and the consequent need of conserving the very limited energy of its human motor brought forth numerous types of two, three and four-point ball bearings of cup and cone and other types; and for the very light service required, these types served very well. Some of these are illustrated in Figs. 1, 2, 3, 4 and 5. All are familiar and all share certain technical features. However, they are all distrusted to-day, due to their inability to endure the heavy loads or high speeds demanded in serious commercial work.



FIGS. 2, 3 and 4. SHOWING VARIOUS LIGHT SERVICE BEARINGS, ALL OF WHICH ARE NOW DISTRUSTED FOR COMMERCIAL WORK.

Thus, while the bicycle performed a great service to anti-friction engineering in making the ball bearing an accomplished fact, it, on the other hand, did much harm to the science, by creating an atmosphere of distrust as to the suitability of these bearings when applied to machines where the service required of them was heavy.

These ball bearings wore out rapidly, for several reasons, none of which were fully understood at first. Among the reasons was inaccuracy of form, which resulted in the load being supported by only one ball at a time. A second reason, which could not be overcome with the steels than in use, was the insufficient hardness of both balls and races. A third, was the failure to exclude dirt, which entered and acted as an abrasive, rapidly destroying both balls and races. A fourth reason was that the cup and

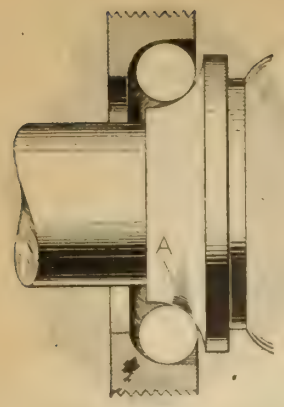


FIG. 5.—ANOTHER TYPE OF EARLY STYLE LIGHT TYPE BEARING.

cone designs first employed, whether of the two, three or four-point type, did not give the balls a pure rolling motion. There was always a spinning (and therefore rubbing) movement in addition. A fifth reason was that adjustability, once thought to be essential, proved to be a serious disadvantage, for no two users set their bearings alike. They either left them too loose or too tight, which compelled one or two balls to take all the load. This, of course, crushed both balls and races. The familiar cup and cone bearings of bicycles and other light machinery have been successful only because of the very light loads employed.

### Evolution of the Modern Radial Ball Bearing

In 1898, Professor Stribeck commenced an exhaustive series of tests on the whole subject of ball bearing performance and design. Briefly stated, the tests, which extended over some years and cost a veritable fortune to make, showed that the condition of successful operation lay simply in the elimination of the usual factors of error, which until then had been deemed of no importance.

Since in a ball bearing the load is borne, not on a liberal surface, but by a few points whose area is due solely to microscopic flattening of the balls and races themselves, and since the loads at these points are not cushioned by an oil film, as in plain bearings, but are carried with direct metal to metal contact, it follows that the materials used must be of extraordinary toughness and hardness. From their very hardness, the balls and races are virtually incompressible, and it follows that errors, negligible in other machinery, simply will not do in ball bearings. If a ball is ever so little over size, it takes the load from its fellows, resulting in abnormal pressure at the points of contact. If undersized, it gets no load, with equally bad results. It is a fact that even a fine watch does not require such minutely exact construction as a durable ball bearing.

The need for uniformity does not end with matters of size and shape. The balls must likewise be uniform in hardness, both between ball and ball, and between different portions of the same ball. It will not even do to have a ball hardened merely on its surface. No two balls thus treated would have exactly the same compressibility, and no two would wear exactly the same. The only safe course is to have every ball hardened right through from surface to centre. A soft ball will show a coarse crystalline structure in its centre when fractured, with increasingly closer and finer grain toward the hardened surface. Some microphotographs of ball fractures are shown in Fig. 6, the right hand ball showing how fine and even a structure it is possible to obtain with proper methods of manufacture.

The relative position of balls and races and the shape of the races themselves underwent numerous changes before the present-day type of annular bearing was evolved. At first there were many attempts to employ a series of rows of balls but in none of these was proper provision made for taking care of the deflection of the shaft under load. After every effort to provide a proper load distribution had failed the simple plan of using a single row of balls was adopted. This resulted in a journal having no appreciable length and accordingly free from deflection. But as the number of balls in a single circle was necessarily limited, it became important to develop the carrying capacities, as affected by the shape of the ball tracks.

### Frictional Resistance

It was found that the frictional resistance was best for balls rolling between straight line sections, or perfectly flat surfaces, giving two points of contact. Increasing the points of contact to three and four, produced higher frictional resistance without materially affecting the carrying capacity. Curving the raceway, however, resulted in an important increase in the carrying capacity. As many believed that the capacity of the bearing would be increased by employing more balls than could be introduced into the bearing by eccentric displacement of the races various forms of filling slots were provided to accomplish this result. Other things equal, this would be true, but it must be remembered that the race cross section plays a vital part in determining the carrying capacity, and any device — such as filling slots, etc. — employed for the insertion of a larger number of balls than can be gotten into the bearing by eccentric displacement, weakens the race and hence results in a decreased carrying capacity.

To Conrad belongs the merit of eliminating the filling opening altogether, and providing an annular bearing of continuous race and uninterrupted groove. Incidentally, this eliminated all troubles due to interference between balls and filling opening. The bearing illustrated in Fig. 7 is the now familiar form of a single row, deep groove bearing manufactured under Conrad's patent. This type of radial bearing will also carry a considerable thrust—that is, load parallel to the axis of the shaft. The reason for this high thrust capacity will be seen from an examination of the race sections in Fig. 8, the groove in the right hand race being very deep.

In 1907, Mr. Sven Winquist, a resident of Sweden, invented and marketed a ball bearing which, owing to its design, is peculiarly adapted to practically all types of machinery, in that it embodies features which are unique and quite distinct from any other ball bearing designs. This bearing is shown in Fig. 9. As will be seen from the illustration, the inner race of the ball bearing contains two grooves, each ground

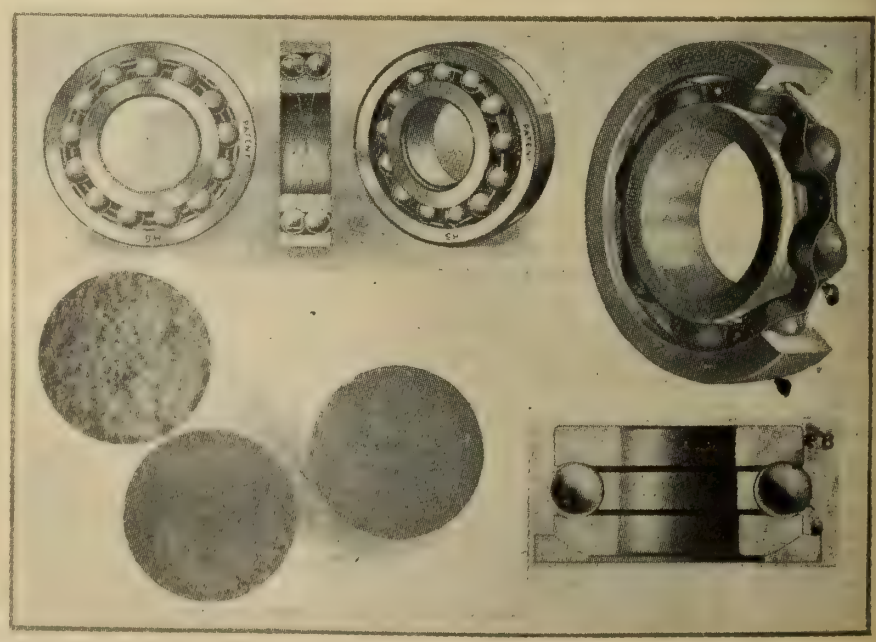


FIG. 9.—LEFT UPPER VIEW. FIG. 6.—LEFT LOWER VIEW. FIG. 7.—RIGHT UPPER VIEW. FIG. 11.—RIGHT LOWER VIEW.

to a radius slightly larger than the radius of the balls. The outer race is ground in the form of a section of a hollow sphere, whose centre



FIG. 13.

of the axis of rotation. As will be seen from Fig. 10, the two rows of balls and inner race are free to rotate at any angle within this spherical outer race without subjecting the races to any undue strains, allowing a perfect ball and socket or self-aligning action. The ease with which this bearing functions under all conditions of shaft misalignment will be appreciated when it is pointed out that the balls roll on the surface of the spherical outer race with a pure rolling motion.

### Thrust Bearings

For carrying thrust, that is, load parallel to the axis of the shaft, a special form of bearing called a "thrust" bearing is employed. In this, the ball tracks are arranged in planes at right angles to the shaft axis and ground concentric with the bore of the bearing to a radius slightly larger than the radius of the balls. In order to secure the full carrying capacity, the two thrust plates or collars must be absolutely parallel. Even so small a deviation as a few ten-thousandths of an inch will concentrate the entire load on a few balls at one side — overload these — and reduce the bearing capacity. Therefore, to secure exact parallelism between the shoulders on the shaft and the housing seat, even under deflection, and the small yet important and unavoidable errors of workmanship, one collar is generally given a spherical surface on the outside, which permits it to adjust itself in the corresponding spherically machined seat of the housing and thus secure the exact parallelism required.

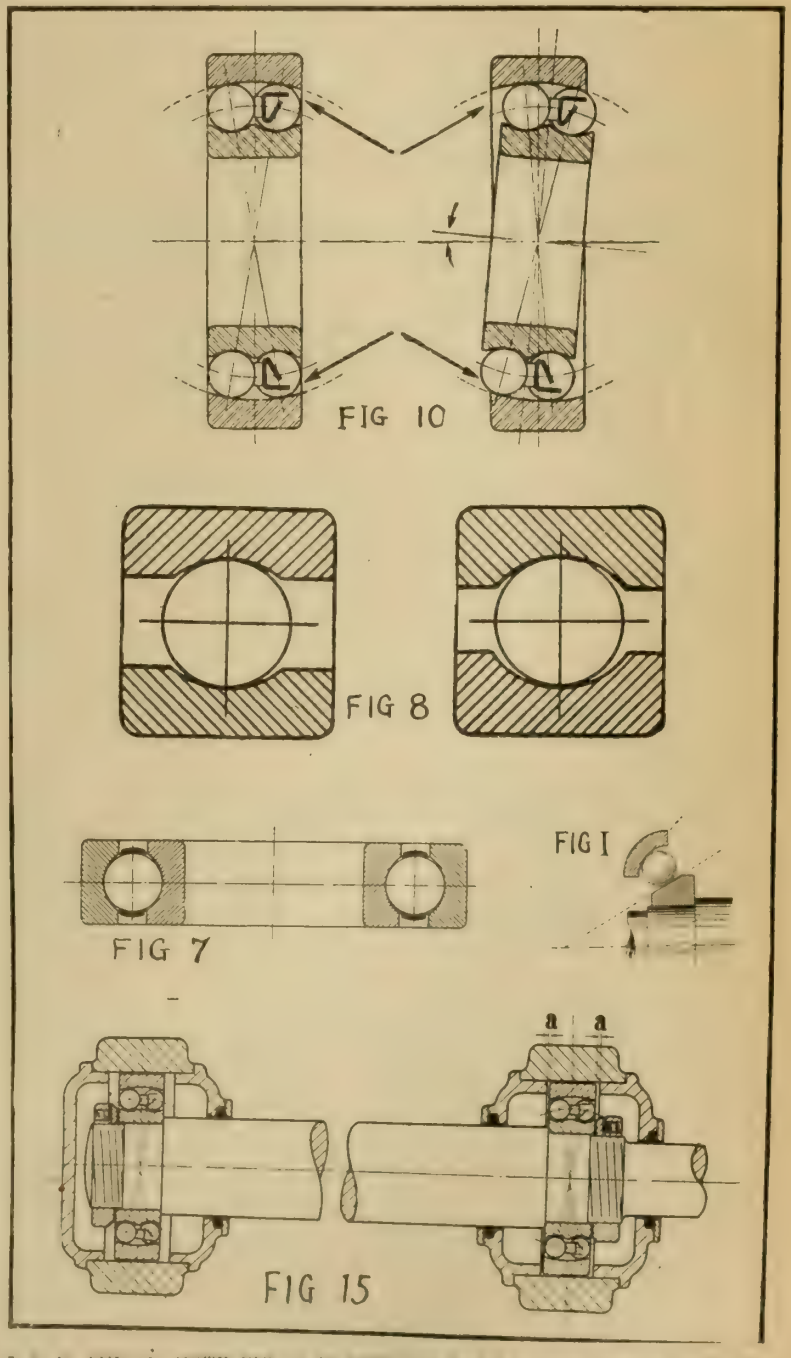
Fig. 11 is an example of a single thrust, self-aligning bearing. The drawing shows this provided with a spherically-ground washer which permits of the bearing being mounted in a flat seated housing without special and difficult machining. It will be noted that the upper ring has a smaller bore than the lower and revolves with the shaft to which it must be securely fixed. Of course, self-aligning thrust bearings are not always essential and in that case both collars are plain rings similar to the upper collar of the bearing shown in Fig. 11. Such a bearing works well, provided it is accurately lined up when first mounted and there is no opportunity for the shaft to deflect while in operation.

The bearings just described are both of the single thrust type—that is, they take load in one direction only, but cases often arise when the load may have to be carried from either side—requiring a bearing of what is called the double thrust type. Such a bearing consists of three rings or collars with two sets of balls—the middle collar of the group being the one to grip and revolve with the shaft and the two outside collars resting in the housing. As in the single thrust bearing, these outer collars may be spherically ground to make the whole unit self-aligning. The centre of this spherical assembly coincides with the axis of rotation. The bearing illustrated in Figs. 12 and 13 is a self-aligning, self-contained double thrust unit. It possesses the great advantage of being easily mounted since there is only one part to handle, and the accurate and, therefore, costly, machine work, often required is greatly reduced.

### Some Advantages of Ball Bearings

A great advantage of ball bearings is the saving of power. The University of Wisconsin made a test some time ago which illustrated that roller bearings required the least amount of power, and that an increase in speed had little effect on the bearings.

As the motion in an annular ball bearing is one of pure rolling, the starting




FIGS 1, 7, 8, 10 AND 15. NOTE FIG 15 IS USED ON PART 2, AND IS NOT DESCRIBED IN THIS PORTION. FIG. 7 IS A SECTION OF THE VIEW SHOWN IN PHOTOGRAPH ON PAGE 34.

friction is no greater than the running friction. This is a very important fact, for as it is not necessary to provide for heavier starting loads, a much smaller motor may be used. Shafts in cast iron, babbitt or bronze bearings frequently become "set" if the equipment is idle for any length of time. The oil is pressed out of these bearings and it is extremely difficult to start the shaft from rest. In addition to the saving in power, there is a saving in lubricant, due to the fact that the oil or grease is sealed in the bearing chamber, which is of sufficiently large dimensions to contain enough lubricant for many months' running. A direct result of this is increased cleanliness and freedom from the annoyance of dripping oil. The bearings, being enclosed in dust-proof housings, can be run under conditions of dust, moisture and grit that would quickly spell ruin to a plain bearing. In a later issue we will consider the mounting and installation of ball bearings.

*MORE TO FOLLOW*

*The author of this article is Toronto manager for the SKF Ball Bearing Co., and is naturally an authority on the subject. He has had a varied experience in ball bearing installations, and will tell us in his next article about different types of machines that have been successfully equipped with ball bearings. This will appear March 17th, and is well worth watching for.*

# Two Ideas That are Well Worth Remembering

## BALL BEARINGS

### Finding Diameter of Ball Race

Herewith are diagram and data for finding the diameters of ball races, when a certain number of balls of a given diameter are to be used, all balls touching.

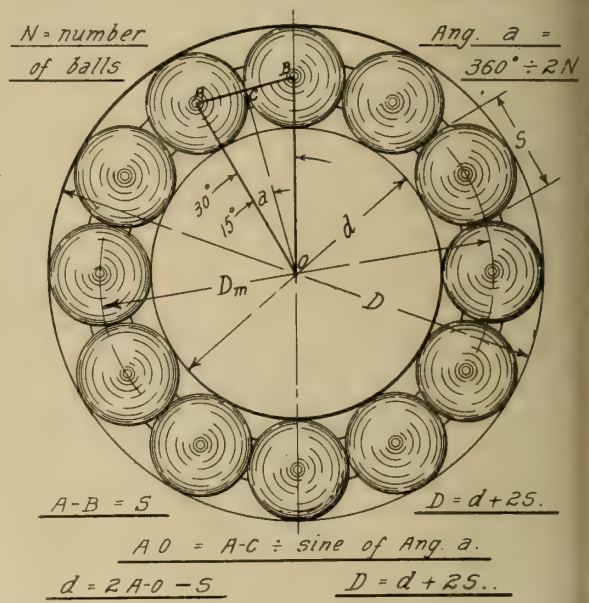
Example:—Twelve ⅞-inch balls are to be used in a radial bearing; what must be the two diameters d and D, when all balls just touch each other?

AB = S the diameter of the ball.

$$AO = AC \div \text{Sin of angle (a)}, \text{ or } \frac{.875}{2} \div .25882 = 1.69 \text{ in.}$$

$$\text{Diameter (d)} = \frac{2AO}{S} = 3.38 - .875 = 2.505 \text{ in.}$$

Diameter D = d + 2S = 2.505 + 1.75 = 4.255 in.

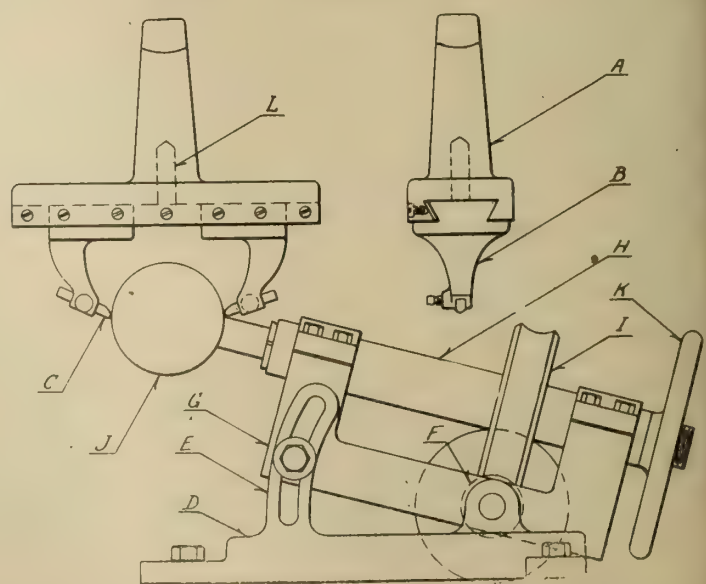



Canadian Machinery

## BALL TURNING

### Fixture for Turning Balls on a Drill Press

Shank A, which fits the drill spindle, is provided with slide to carry the two adjustable tool blocks B. Tools C may be set equal distance from the central line by means of a rod in the hole L. Base of holding fixture D has a slotted quadrant E, which permits incline adjustment. Head G swivels from the shaft that carries the worm F, the latter meshing with worm gear I keyed to the hollow spindle H. Collet chuck and draw spindle (hollow) is fitted inside of H, for holding work, secured by means of wheel K. Fixture may be revolved by hand, or by pulley placed on worm shaft. Tools are slowly fed to the work while spindle revolves.




Canadian Machinery

CHARTS OF SIMILAR NATURE TO THE ABOVE WILL APPEAR EACH WEEK.

# Advisability of Standardizing Jig Design

*By Robert Mawson*

ANYONE who has followed machine shop practice during the past few years, say a decade, will agree that the greatest change has been in duplicate machinery operations. About ten years ago special tools such as jigs and fixtures were the exception rather than the rule in most plants.

The automobile industry has been the great leader in this matter. The writer can well remember where, in the early stages of automobile making, each part was made by trial to fit other components. One can readily see what this meant when repair parts were necessary —the question of repair was then almost a tool room proposition.

Let me cite one case that was followed out in our plant. We had certain cylinders that were cast in pairs. The sequence of operations when machining the bores to suit the pistons was as follows: They were first roughed out with a one point tool, which was then followed with a multiple tool; in other words, a bar having a number of cutting tools. The holes were next reamed approximately to size. A long cast iron lap charged with abrasive and oil was then moved by hand up and down the bored hole until the surface was smooth and brought to size. Each piston was then fitted to one of the holes in the cylinder, and woe be to the workman if he should get these mixed or misplaced, as we scarcely ever found two just the same diameter.

Somewhat similar haphazard methods were also used for other operations, such as milling and drilling. On drilling operations, the earlier method was to lay the positions out with height gauges, etc., the operator working to guide lines when machining. The next development was the use of templates for the drilling operations, but at best these are only makeshifts, as their accuracy depends largely on the care exercised by the man using them.

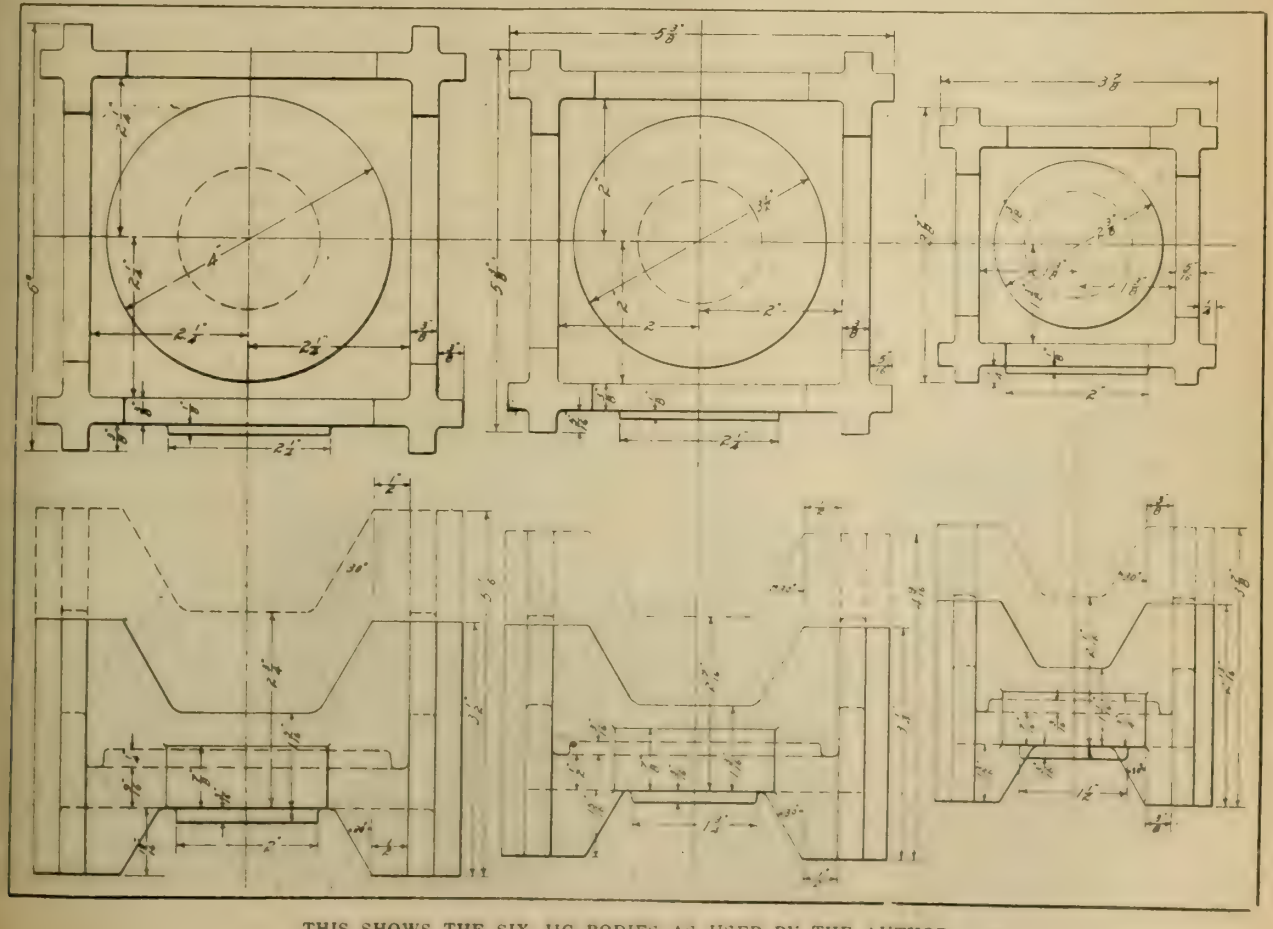
As the automobile and other machine building developed, and in order to meet the demand for new and repair parts, the need of special machining tools was created. This demand also provided for a new profession in the engineering field, namely, tool designers.

This work is quite different from the machine designer's who deals largely with known factors, such as friction, stresses, etc. The tool designer is called upon to deal with an unknown factor—the human element. To meet this requirement he must use very generously his common sense. For this reason, jigs, fixtures, etc., are made fairly heavy and rigid—stresses do not enter into the question. Further, tools should be made as near as possible FOOL PROOF. There are still a few of these people left in the machine shop, and one might be called upon to use the tools.

Some tool designers come via the machine designer route, whilst others step up from the machine shop and tool room. This is perhaps unfortunate in both ways; the designer does not know all he should know about the shop end, and the shop man is usually lacking in designing knowledge. This condition, no doubt, accounts for many of the freakish tools often seen in service.

The question of making patterns for tools is also a matter for consideration. Often only one tool is made from a pattern, which makes the proposition a

Continued on Page 41



THIS SHOWS THE SIX JIG BODIES AS USED BY THE AUTHOR.

# Turret Lathe Applications

The tooling necessary for machining an axle housing, a motor frame, and a piece of work weighing over 600 pounds.

*BY J. H. MOORE*

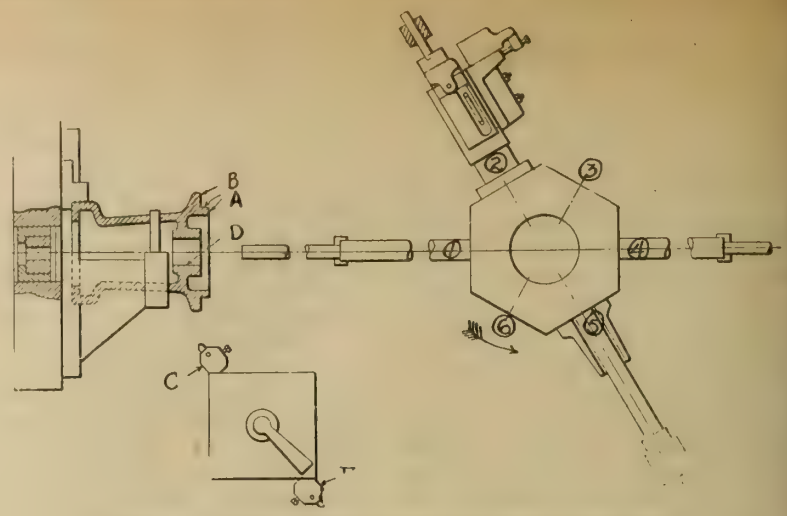



FIG 2—LAYOUT OF TOOLING USED IN FIRST OPERATION

TOOL layout is a study of extreme importance if the best results are to be obtained from any style of turret lathe. This article depicts various examples of work performed on Gisholt turret lathes, and illustrate the benefits of a well planned layout.

At Fig. 1 is shown an axle housing that is used on a tractor. The portions machined in the turret lathe are marked in heavy lines on the sketch. Owing to the irregular shape of this piece, a special fixture, or chuck bonnet as it is often termed, is employed in the second operation for holding the work. The housing is made of cast iron, and the work about to be described was performed on a 24-inch machine.

At Fig. 2 is shown a diagram of the tooling equipment used on the first operation. This work consists of machining the front end of the housing, also boring and reaming the hole. The operations are completed as follows: The housing is held in a special fixture which has an arm that encloses the work, and steadies it near its outer end. This arrangement can be clearly noted at Fig. 2, although Fig. 3 illustrates the fixture still better.

The surfaces A and B are first rough turned and faced with the tool C in the toolpost. The hole D is next rough bored with the cutter held in boring bar at position 1 of the turret. Reference to Fig. 3 will show this bar starting its cut. The hole D is now finish bored with the cutter in the boring bar at position 4 of the turret. In both the rough and finish boring operations the bar is guided by means of a pilot that enters a bushing in the chuck. This bushing is clearly shown at Fig. 2.

The hole D is next reamed with the reamer at position 5 of the turret, after which the surface B is finished with cutters held at position 2 of the turret. During this operation the head is steadied by a bushing on the end of a pilot. This bushing enters the completed hole D, and ensures the concentricity of the

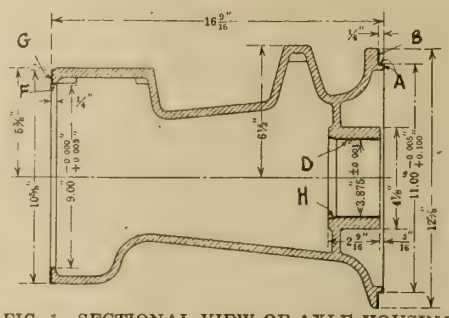



FIG. 1—SECTIONAL VIEW OF AXLE HOUSING FOR TRACTOR.

surface at A. The shoulder B is next finished with the tool E held in the toolpost. This completes the first operation, and the time expended is 8 minutes.

### Second Operation

The second operation layout is shown at Fig. 4, and this work consists of machining the surfaces F and G, also chamfering the portion H, together with tapping the hole J. As already stated, a special chuck plate to hold the work, this plate being attached in turn to the regular faceplate of the machine. The method of holding the work is clearly seen in Fig. 5, which is a close up of the fixture we speak of. The method of carrying out the steps of operations are as follows:—

The housing is mounted on the chuck plate as shown, and held with clamps. The surface G is rough faced with the tool L held in the toolpost. The hole F is next bored and a chamfer produced at H by means of the cutters held in the head at position 1 of the turret, the head being guided by means of pilot that enters the bushing K in the chuck plate. The surface G is now finish faced with the tool H held in the toolpost. The hole at J is the final step, and this is tapped with a tap mounted at position 4 of the turret. The complete operation takes 6 minutes to perform.

### Machining Motor Frame

The next example, Fig. 6, is that of a motor frame machined on the surfaces shown by the heavy lines. Two operations are necessary to complete this piece, and the auxiliary toolpost of the lathe is brought into play as well as the turret and regular toolpost tools. This work is also produced on the 24-inch size of machine. The piece is made from cast steel, and the tool layout for the first operation is shown at Fig. 7. At Fig. 8 is depicted the method of holding the motor frame during this operation.



FIG. 3.- BORING THE HOLE IN FIRST OPERATION.

FIG. 5.—HOLDING THE WORK IN SECOND OPERATION.

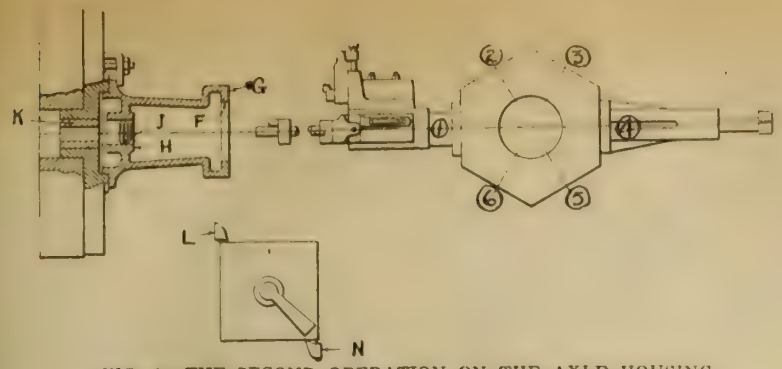



FIG. 4.—THE SECOND OPERATION ON THE AXLE HOUSING.

Here are the steps followed during the first operation.

The work is held in place with special hard chuck jaws, these having clamping screws as shown at Fig. 7. The surfaces A and B are rough bored by the tool C in the toolpost. The surfaces E, F and G are next rough turned and faced by the tool D in the toolpost. After this the outside of the housing at H is rough turned with the tool J held in the wing rest. The outside H is then finished with the tool K held in the wing rest.

The hole L is now rough and finish bored with the cutters held in bar at position 1 of the turret. The end of this bar is piloted in the bushing in the chuck shown at Fig. 7. A second roughing cut is next taken on the surfaces A, B, E and F with the cutters in the head at position 2 of the turret. After this is completed the surfaces A, B, E, F and G are finish turned with the cutters in the head at position 5 of the turret. It will be noted that both these heads, that is, at position 2 and 5, are guided by pilots that enter the bushing in the chuck, also with a bushing that enters the bore L. This arrangement guarantees that the finished surfaces will be concentric. The total time on these various steps is 35 minutes.

### Second Operation

The diagram for the second operation is shown at Fig. 9, while the photographic view of the same operation is shown at Fig. 10. The work is held on a special chuck plate as shown, clamps securing the piece tightly. After this is done, the work goes through the various steps.

The motor frame is first centered on the chuck plate and the clamps tightened. When this is completed the surfaces M, N and O are rough machined with tool P in the toolpost. The outside surface R is turned with tool S in the wing rest, and the bore T is started with

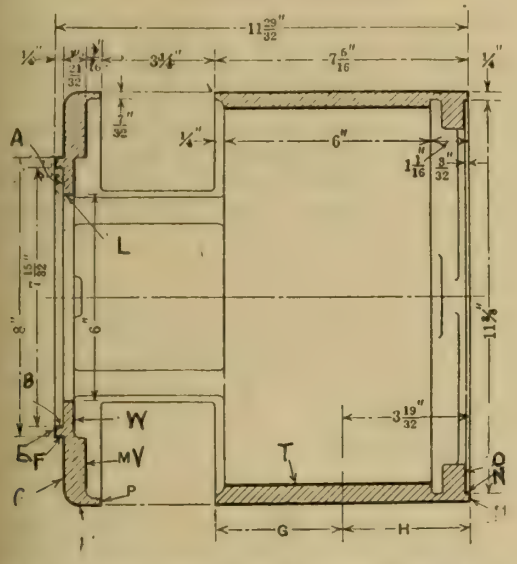



FIG. 6.—SECTIONAL VIEW OF A MOTOR FRAME.

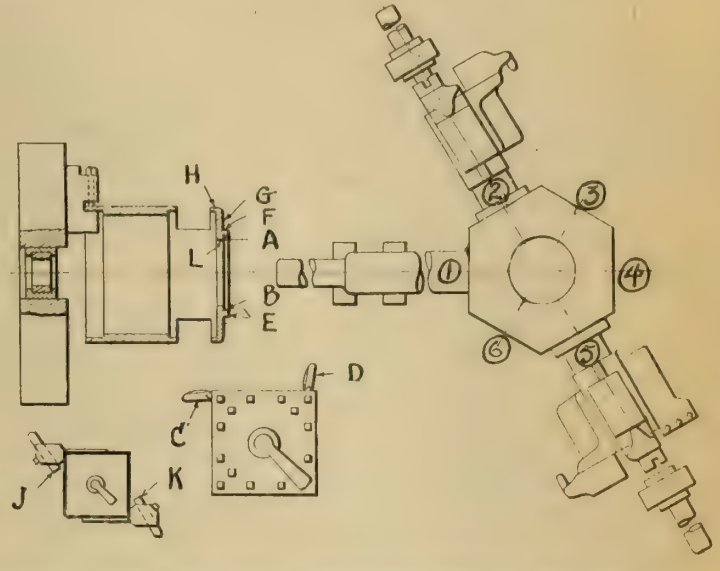



FIG. 7.—TOOL LAYOUT FOR FIRST OPERATION ON MOTOR FRAME.

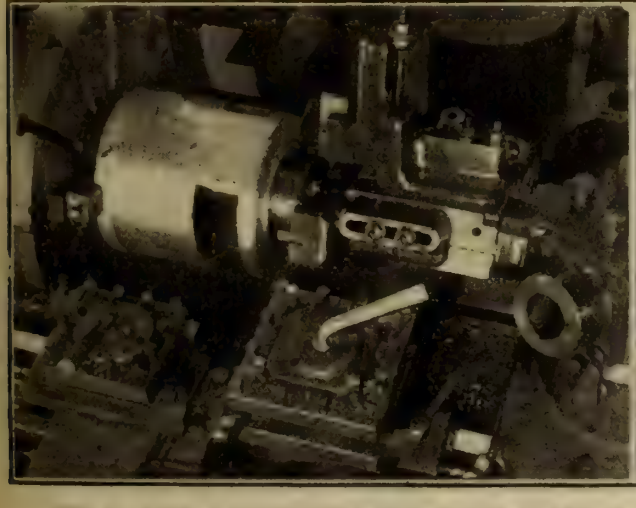


FIG. 9.—VIEW ILLUSTRATING HOW MOTOR FRAME IS HELD IN FIRST OPERATION.

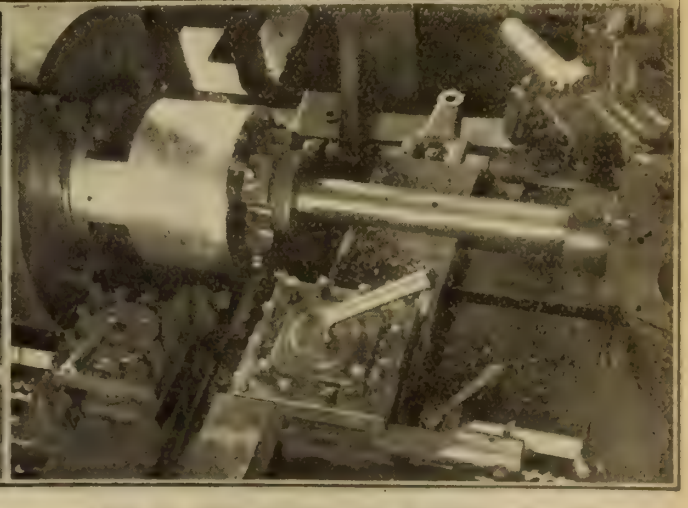


FIG. 10.—THE METHOD OF HOLDING THE FRAME IN SECOND OPERATION

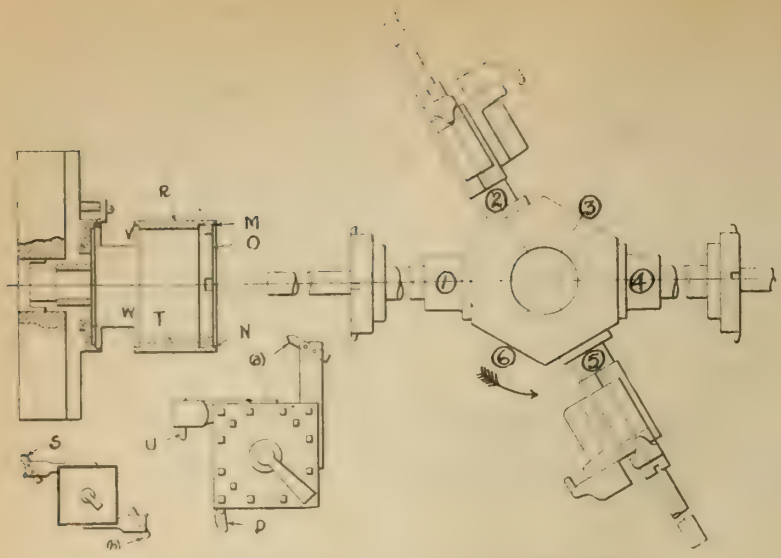



FIG. 9.—SECOND OPERATION ON THE MOTOR FRAME.

the tool V in the toolpost. The bore T is now rough bored with the cutters held in the head at position 1 of the turret, and the same hole is finish bored with the cutters held in the head at position 4 of the turret. Both these heads are guided by a pilot that enters the bushing mounted in the chuck as shown at Fig. 9.

The surfaces M, N and O are next rough turned with the cutters held at position 2 of the turret, and the same surfaces are finished with the cutters in head at position 5 of the turret. The shoulders V and W are finished with the tool (a) held in the toolpost, while the outside surface R is finish turned with the tool (b) held in the wing rest. This completes the operation and the time consumed on this work is 45 minutes.

### Machining Heavy Work

The remaining example in the present article is shown at Fig. 11. The drawing depicts a very large piece of work that weighs over 600 lbs., and is made from cast steel. It is machined on a 28-inch machine, and shows clearly the possibilities of handling large work on such a type of machine. This example also illustrates the benefits of using multiple tools for boring different sizes of holes.

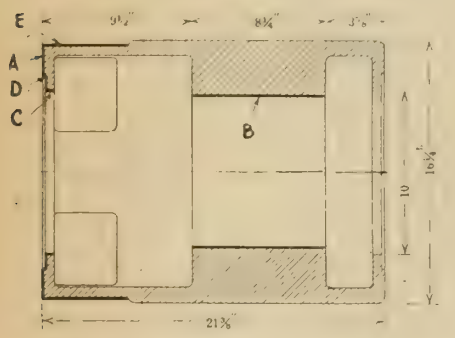



FIG. 11.—AN EXAMPLE OF HEAVY WORK COMPLETED ON A TURRET LATHE.

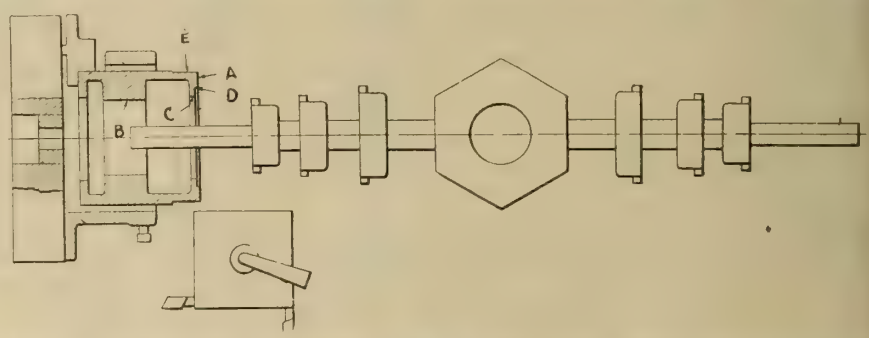



FIG. 12.—THE TOOLING EQUIPMENT USED IN THE FIRST OPERATION ON THE PIECE SHOWN AT FIG. 11.

The tool layout for this part is shown at Fig. 12, while the photographs, Figs. 13, 14, 15 and 16, illustrate other particulars regarding the work being performed. Let us consider the work step by step.

Two operations are necessary to complete this part, and the first of these proceeds as follows:—

A special fixture is used to support the casting, and this is of the sometimes termed, bonnet design, being so called because it bonnets or gives support to the casting at a considerable distance from its end. The end A is first faced with a tool held in the toolpost, after which the holes B and C are rough bored. The counterbore D is now rough machined with the multiple tool heads held in the turret. The bar on which these heads are held is guided by a bushing in the chuck as shown at Fig. 12.

At the same time as the casting is being rough bored, the outside of the casting at E is rough turned with the tool held in the toolpost, after which the same surface is finish turned. Upon this being completed the holes B and C, also the counterbore D, are finished with the multiple cutter heads in the turret. These heads can be noted at Fig. 14.

### Second Operation

In this operation, the casting is held on a face plate that is provided with clamps. Both the face plate and the clamps can be clearly noted at Fig. 15. The work after being located and clamped in position is shown at Fig. 16.

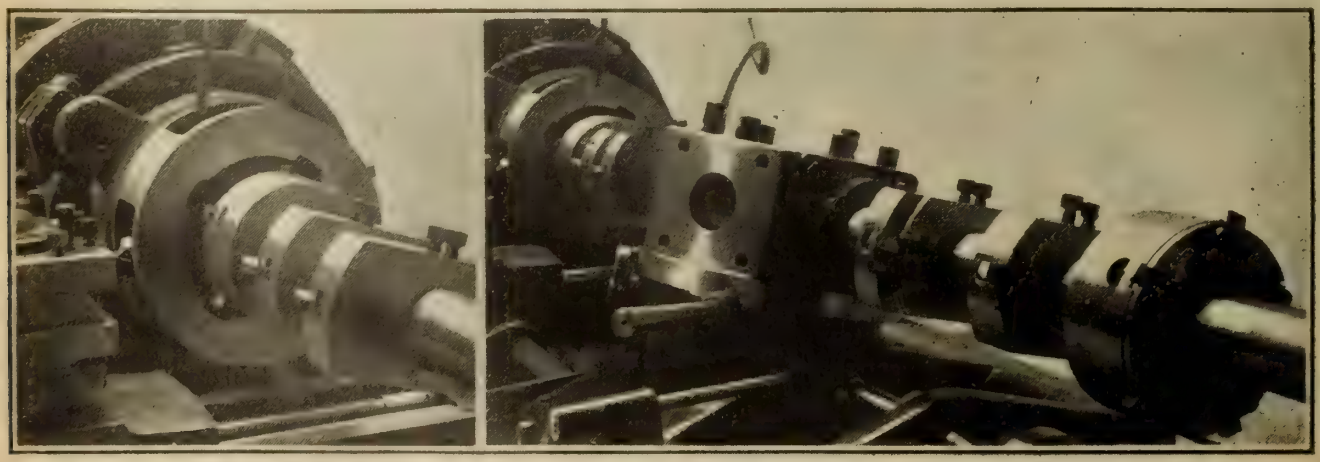


FIG. 13. SPECIAL FIXTURE FOR HOLDING THE WORK.

FIG. 14.—FIXTURE AND MULTIPLE TOOL HEAD USED ON SUCH WORK.

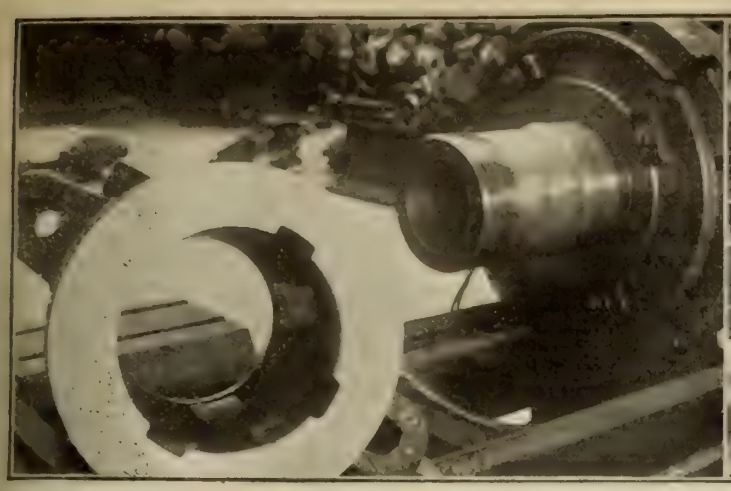


FIG. 15. METHOD OF HOLDING PIECE DURING SECOND OPERATION.

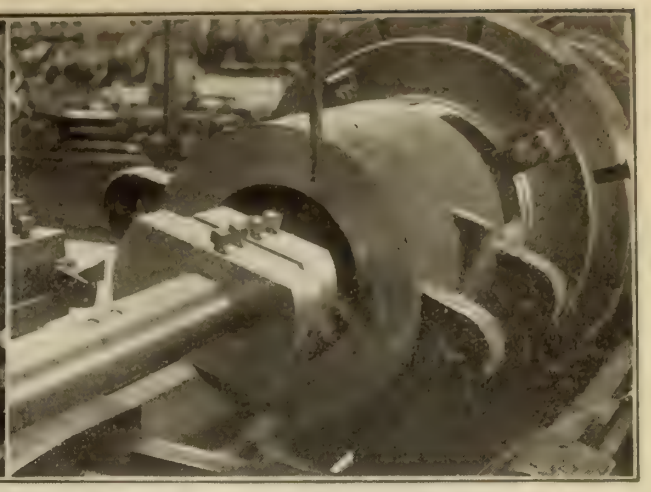


FIG. 16. NOTE THAT THE CASTING IS CLAMPED IN POSITION ON THE CHUCK PLATE.

This operation consists of facing the end of the casting with the tool held in the toolpost, also boring and counterboring the piece at the end by means of a double head boring bar as shown at Fig. 16. As these operations are self-explanatory we need not dwell on the same. Sufficient to say that the total time for both operations is 70 minutes.

This completes the present article, but in a later issue we will present further examples of good turret lathe practice.

## STANDARDIZING JIG DESIGN

Continued from page 37

costly one. Another point is this: Through lack of shop knowledge, some tools are designed which are difficult to machine. Some weak points in design are often apparent, which could be easily remedied if the designer possessed the required knowledge. I well recall seeing a jig which had been made with small pins for the feet, these being of such a size that they were constantly dropping into the slots of the vertical drilling machine table.

In order to meet emergencies such as I have briefly outlined, we recently designed a set of jig bodies, six of which are illustrated at Fig. 1. It will be seen that these tools may be used on six surfaces, the four sides, top and bottom. Wide bearing surfaces are provided, these being of a cross section so that the tool cannot foul in the slots of the table. The sides are cast low, so that chips may be easily removed, and the various bosses are raised so that machining is easily and conveniently performed.

A number of these various jig bodies are carried in stock, and when a jig is to be designed the draftsman lays out the outline of the jig body, taking the size most convenient. The various screws, straps, etc., are shown in position, and their correct locations determined. After the design has been duly finished and checked, it is sent to the tool room in the usual manner. All the various standard parts used on the tool are called for, any special part as straps being detailed separately on the drawing. The jig bodies are designated by number, as "stock body No. 4," and so on.

The tool maker, therefore, goes to the tool room stores and asks for the jig body casting at the same time that he calls for standard parts used. He is then in a position to make up the tool quickly, without inconvenient waits for either the pattern or casting. A further advantage is that the tool maker gets accustomed to machining this type of jig, and knows how to do the various operations to the best advantage, which is also true regarding the manipulation of the tool in service. We do not require a man to go around the shop to illustrate to the operators the correct method of using various types of tools, as this style can be adapted to a large variety of parts. The design is good in principle, the pattern can be cheaply made, castings are easily produced, and the tool room operations are simplified.

## THREE ESSENTIALS

There are three important and essential characteristics which coke for metallurgical purposes must possess, says the Chemical Trade Journal. First, it must be hard and resistant to the abrasive forces to which it is subjected in the course of its transport from the coke oven to the foundry, and it must be able to withstand the crushing strains arising from the weight of the superincumbent charge in the furnace.

Second, it must contain a low proportion of ash, sulphur, and phosphorus—the limiting values demanded under normal conditions by many ironmasters are: ash, 10 per cent.; sulphur, 1 per cent.; phosphorus, 0.05 per cent.

Third, as the coke in certain zones of the blast-furnace reacts with an upcoming stream of carbon dioxide, it is an essential to the smooth working of the furnace that the coke possess a certain porosity, in order that a large surface may be exposed for interaction with the gas.

## NEW TYPE FURNACE

A rather novel type of electric furnace has recently been introduced in America. This furnace is known as the Von Schlegell repelling arc type, and two electrodes are suspended in the furnace chamber, being drawn together nearest the hearth by adjustable weights. As soon as current flows the repulsion between the electrodes forces the two ends apart, thus drawing out the arc. The repulsive forces also drive the arc down towards the charge. The electrodes being approximately parallel when in the operating position, the relative position of their ends is not affected by the wearing of the electrodes, or the melting down of materials. It would appear that all other changes are immediately compensated for by the fact that every decrease in current allows the ends of the electrodes to come closer together, and if any influence should break the arc, it immediately re-establishes itself. Unusual smoothness of operation is, of course, the chief claim. Three of these furnaces are being used in melting non-ferrous metals, and one is employed in the production of aluminium steel.

A project to bring coal from the anthracite regions in Pennsylvania to New York through two 14-inch pipes, by water pressure, is being considered by the city Dock and Health Commissioners. This seemingly wild plan was submitted by Mr. Reginald P. Bolton, a member of the American Society of Mechanical Engineers. Mr. Bolton explained that between Scranton, Pa., and New York there is a fall in elevation of about 2,000 feet, and that it would be as easy to transport coal in this fashion as by water. He estimates that 7,000,000 tons of coal, which would amply supply the city's needs, could be brought through the pipes every year.

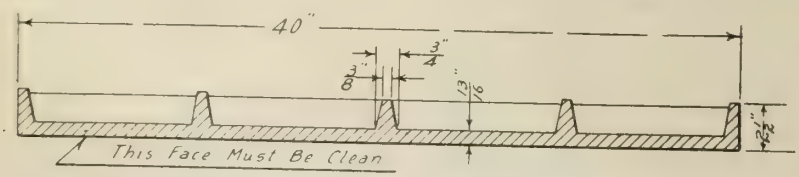
The general contract for erection of repair shop for Pease Foundry Co., Lyon Street, Ottawa, has been awarded to J. Walker, 151 Strathcona Avenue.

# Points in the Production of Surface Plates

*By Donald A. Hampson, Member, A.S.M.E.*

AN EASTERN shop makes a great many special cast iron table tops, or surface plates, and the methods they have adopted are full of interest. A cross section is shown of a typical size which is 40" x 64". These plates are not as deeply ribbed as the surface plates used for scraping bearing surfaces —they have an average thickness of two inches and a rough casting of the size mentioned above weighs 650 lbs.—only about a quarter of what a machine tool surface plant of same area would weigh —this lack of metal has a direct effect on the casting all the way from the foundry to the packing room and calls for different handling on the planers.

Because the "face" of the plate must be clean, it must be cast down, which means that all of the sand forming the pockets between ribs must be suspended in the cope. Wood patterns are used, but these have metal "veneer" attached to a number of ribs to keep the patterns straight. Plenty of draft is allowed and one moulder is able to make a plate a day with such help as is required in turning and lifting flasks. Foundries doing this kind of work have to experiment to get results, just as a machine shop has to try out methods before getting into production. A good grade of pig must be used and this must be heated extremely hot to avoid cold shuts from the long distances the iron has to run in the thin flat bottom space of the mould. A most important phase of the work follows the pouring, i.e., the uncovering of the casting, which must be done a certain section at a time so that the cooling of the wide




SECTION OF SURFACE PLATE AS IT IS MOULDED.

flat solid part does not warp the whole, for the ribs themselves are relatively shallow and not strong enough alone to keep the piece straight.

### Inspection for Warp

Received in the shop, the first move is to inspect for an excess of warp—the foundry is apt to take a chance on a crooked plate that represents $50 on the bills and send it out though they know it is poor. Then the edges of the casting are cleaned, painted and filled. Two or three holes—depending on the size of the plate—are drilled in each end of the castings; these holes are for the clamps and are put in with an electric drill. The castings are now ready for the planer hand and when he is through they require only a coat of paint around the edges to make them ready for packing.

The foundry delivers all castings upside down for in that way they are ready to go on the planer for the first cut, which is over the bearing spots, and raised ¼-inch above the general level. After making the first cut, the casting is turned over, packed up roughly, and a good cut run over the face. "Packed up roughly" because there is no excuse for wasting time to "pack to 0.001" when the casting may spring a thirty-second after the skin is taken off the face.

### Re-packing

Following the rough cut, the clamps are loosened and the job re-packed with care, because there will be no subsequent structural change of any amount since the cuts will be light and over a comparatively level surface of clean metal. The castings always spring up in the centre, which is about the meanest way they could go from the standpoint of the man who has to get a piece of paper or tin in under that casting to support its centre against spring and chatter. And when a metal shim is successfully located there is no guarantee that it will stay put.

There are four or six of these "inland" bearing spots besides an equal or greater number around the outer edge—the spots are arranged in line so there will be a minimum of planing required. A scheme has been devised to avoid packing up in the centre: this is, to plane the centre spots first, then according to the size of the casting to lower the tool a sixteenth or a thirty-second, and cut the outer spots. Now, when a plate is turned over after the under side is cut, it rests hard on the centre spots while the edges are up, but the latter are outside and so get-at-able that it takes only five minutes to put in tin or paper shims. From that point, the finishing takes the usual form of cutting with flat and spring tools and may be carried on rapidly because there is excellent support even though the casting is relatively thin and light.

The method of handling the castings, while it would not appeal to the efficiency expert, has proven to be all that could be desired. Probably for this particular shop, it is more efficient than an overhead track system or one of the various types of cranes. The castings are bought outside and delivered by motor truck, two or three at a time. For the standard sizes, the weights run from 700 lbs. to 1100 pounds.

### Shop-made Trucks

Wooden trucks of skeleton design are made up of 2 x 3 maple with swivel casters on the four legs. The height of the trucks is the same as that of all the planers (which latter have been made alike). And this height is about the same as the motor truck body. This way there is very little lifting. The truckman is paid to deliver the castings in the shop and to carry them away crated from the shop. He is familiar with the shop facilities and does the loading and unloading with his own man unless he happens to be single handed, in which case he is loaned a boy or man for a few minutes. By placing a roller under the plate in his wagon and one on top of the shop truck that is to receive the plate, the latter is shifted very quickly. In fact, the change is made as quickly as a similar one to any other kind of handling device. Once on the truck, a boy can move the load to any part of the shop over the hard, smooth concrete floor.

These trucks are shop-made affairs, just for this one job. Besides the frame, there are half inch tie rods inserted top and bottom in both directions. Where the casters are fastened to the legs, a cast iron socket is used; this surrounds the post, extending up three inches, and makes a far more substantial construction than if the casters were fastened directly to the wood.

While a certain number of finished plates are kept on hand, the number shipped corresponds very nearly to the number received so that the necessity for some sort of live storage is evident —and this method is that of the trucks. The simple scheme of having the plates delivered flat side down makes it very easy to handle the plates on rollers, as well as delivers them the way the planer hands want them. Then after they are turned and finished on the flat side, they are shifted back on the trucks and there packed. The packing crates are standardized; the boards on top (the flat side) run across the plates, while those on the bottom run lengthwise—this latter makes the load as easy to put in the motor truck as it was to get out.

# Hardening and Grinding Milling Cutters

## Process of Hardening Equally Important As Quality of Steel—Care Should Be Taken in Heating—Grinding Wheels Must Be Kept Clean—Clearance Dependent Upon Material To Be Cut

*By F. H. Sweet*

IT IS NEEDLESS to say that the quality of steel used for the making of milling cutters is of great importance, yet the process of hardening is just as important, if not more so, than the quality of steel. Users of milling cutters will agree that a low grade of steel properly hardened and tempered will give better service than a high grade of steel poorly treated. But when both quality of steel and process of hardening and tempering are taken into consideration, a wonderful cutting wheel can be produced.

The methods of hardening, tempering and grinding milling cutters as set forth in this article may not be the best, but I have great confidence that anyone following the method will be quite successful and amply rewarded for the time spent in making the test.

A suitable place for hardening the cutters will be found in some rather dark corner in the shop. At any rate, the direct sunlight should be excluded from the room. The forge may be used for heating or, in case gas is handy, it is to be preferred. However, as many of the shops, especially the ones in the smaller places, have only the common forge for heating, I will consider the forge here.

Preparing the cutter for the hardening process is the first important step. In case it has blind holes or sharp angles, they should be protected with clay. Should there be a weak place which would be liable to crack in quenching, the better plan would be to protect it with asbestos. This asbestos will keep the part soft, allowing a greater expansion and contraction, and many times it saves a very valuable cutter from the junk pile.

### Heat With Care

In heating the cutter, use every precaution to heat it slowly and evenly, or some part of it may be ruined before the heat has been well started. In case the heat has been applied slowly and evenly, a cutter may be heated even without serious damage, although the proper heat is much better. If the cutter is heated unevenly or overheated, there is danger of cracking it in quenching. Many times the teeth will crack and part company with the body of the cutter.

In case a mistake is made in heating, a very good plan is to remove the cutter from the fire and place it to one side. Cover it with finely burned ashes and allow it to cool very slowly. After this, the operation of heating may be repeated.

Large cutters must be handled differently from the small ones; that is, more care must be taken to get a fire that will accommodate the larger one in a uniform manner. Make the fire good and deep in the forge, with plenty of good, well-coked coal as a foundation, and bank the sides well up with fresh coal. Now make a bed in the live coals of the proper size to accommodate the cutter and place it flat and even in the coals, being careful that the air blast will strike evenly under the cutter.

Begin to heat slowly until a uniform red commences to show over the entire cutter, then place some slats or boards about ¾ to 1 inch thick under the cutter. Use the air blast lightly until a bed of live coals is again under the cutter. Turn the cutter again and place a fresh supply of pine slabs under it. The chances are, unless the cutter is very heavy, that a couple of applications of pine slabs will be sufficient, but in case more heat is necessary, continue to use the slabs, each time turning the cutter over. When the cutter has been heated evenly to about the desired heat, continue a little longer so that the heat may be on the rise at the time of quenching.

Remove the cutter from the fire and place in the brine bath, leaving it in the bath for about one minute, after which take it from the brine and put it into a bath of oil, allowing it to remain there until it is entirely cold. The hardening of the cutter is, without doubt, the most particular of any operation entering into the making of milling cutters.

### The Right and Wrong Method

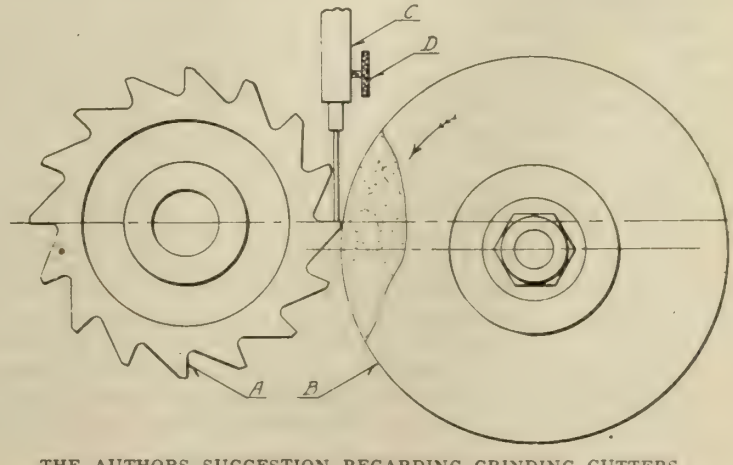
The plunging or quenching is a very simple operation, but there is a right and a wrong way of doing it. Should the cutter be a thin one, the best plan will be to dip it vertically, for the simple reason that if it were applied flat side down the lower side would naturally be cooled the faster and the cutter would have a tendency to cut or warp, so to speak. Although this might be to a very small extent, the cutter might be rendered absolutely useless, so far as answering the purpose for which it was made.

In case we are to dip or plunge a cutter with a long hole, the better plan is to dip it with the hole vertical, allowing the water to circulate freely in the hole. There are special cutters with large recesses, and these should be dipped with the recess up. If they were dipped with the recesses down, steam would be formed and prevent the water from coming in contact with the cutter. This might result in a crack or hard and soft spots in the region of the recesses.

One important rule to be remembered is to cool symmetrical parts simultaneously and let the water have free access to every part of the cutter as nearly at the same time as is possible. Should one prefer, the cutter may be cooled sufficiently so that no color will show at the cutting edge if the cutter is polished immediately.

The large cutters may be removed from the bath just as soon as the cutting teeth are hardened. In a very few minutes the heat in the body of the cutter begins to run out to the teeth, but just before it reaches the teeth the cutter should be again plunged for about a second. This may be repeated three or more times, according to the size of the cutters.

When at last they are cold, they should be put back into the fire and maintained for three or four minutes at a heat sufficient to show color—a very light straw—and let it cool in the air, not draft. The teeth should be as hard




THE AUTHORS SUGGESTION REGARDING GRINDING CUTTERS

as a new file, in fact, they should be hard enough to scratch glass.

One of the first considerations for sharpening milling cutters is the grinding wheel. The grinding wheel should be neither too coarse nor over fine. A coarse grade of wheel, sufficiently hard so that when in use the emery will not fly, is found to be the best suited for most classes of work and less liable to draw the temper of the milling cutter.

### Keep Wheels Clean

The grinding wheel should be kept clean, as a wheel with a dirty or gummy surface will not cut well and will have a tendency to draw the temper from the cutting edge. A gummy, dirty wheel also has a tendency to cut and gouge, leaving a very irregular surface. There are a number of methods employed for cleaning the grinding wheels, but the methods which follow I have found to be very satisfactory.

In case the face of the wheel is gummy, dirty or irregular, the diamond truing tool will be found the most satisfactory, for it not only removes the dirt, but trues the face of the wheel as well.

Should the side of the wheel be dirty and irregular, a very good plan is to sprinkle coarse emery upon the surface plate and rub the surface of the wheel lightly. This will remove the dirt and gum from the wheel, leaving the sharp particles of emery projecting free to cut. In the event of the cutting wheel drawing the temper from the cutter after it is thoroughly cleaned, reduce the cut until the heating is stopped, even though it is necessary to make two or three cuts to get the cutting edge sharp.

In grinding milling cutters or reamers, it is better to plan to run the wheel the entire length of the cut and pass off at the end before setting the cutter for the second cut, as this will eliminate the danger of gouging or scoring the cutter at the extreme outer ends. Much care should be exercised in keeping all bearings and joints tight so that there will be no variation in grinding the different cutting edges of the milling cutter. Cutters should be kept sharp at all times, for a cutter that is kept sharpened will outwear one that is dull and drags, pushing rather than cutting the metal away.

When possible, or rather practicable, it is better to grind cutters with the emery wheel running onto the outer edge, as it secures a finer cutting edge on the tooth. The central axis of the grinding wheel, B, is slightly lower than that of the milling cutter, A. To make sure that the cutting edge will have a clearance and pass freely from one cut to the other is a matter of importance. This, as a matter of fact, can be controlled to a large extent by the adjustable guide shown at C, having a movable leg, E, held in position by locking nut D. By shortening leg E, the cutter may be revolved on its axis, giving more or less clearance, as desired.

*POINTS BROUGHT OUT*

*That a low-grade steel properly hardened and tempered, will give better service than a high-grade steel poorly treated.*

*That direct sunlight should be excluded from the hardening room.*

*That weak parts should be protected with clay or asbestos, thus lessening the size of the scrap heap.*

*Heat cutters slowly and uniformly. It's another case of the more hurry the less speed.*

*That the piece can be ruined in quenching. Be sure to study the nature of the piece, for there is always a right and a wrong method.*

*Cool symmetrical parts simultaneously. Let the water have free access to all parts of the cutter at the same time if possible.*

### Amount of Clearance

The necessary amount of clearance must be decided by the material to be cut, especially in the grinding of reamers to be used on brass, which for free and easy cutting should have a clearance of five to ten degrees. Should we use a reamer on brass with a greater degree of clearance, it will be liable to chatter and leave a wall rough and pitted.

Steel and cast iron to be faced with the milling cutters should first have the scale removed and the cutters ground with the proper clearance. From about five to twelve degrees rake will be found best for materials of this kind. The clearance will vary from three to eight, any many times to even ten degrees, depending upon the hardness of the material cut.

Should there be a tendency to chatter, the cutting edge of the cutter should be treated with the oilstone until the chattering is stopped. Chattering is nothing but the cutting edges biting and letting go in rapid succession. There are times on special jobs of very broad work where it is necessary to grind the cutters so as to remove the rake entirely, allowing the cutter to drag in order to prevent chattering. In nearly every instance, especially on broad heavy work, place the cutter ahead of the centre, slightly exposing a larger cutting edge to the work.

When using multiple cutters, a better plan is to space them unevenly, giving the cutting the "staggering" effect, thus preventing chattering. The nearer the chuck or centre the cutter can be placed, the less liable it is to chatter and the smoother it seems to cut.

As a rule, the angle-clearance on all tools of this kind must be more than the spiral generated by feed at the smallest diameter of the cutting points plus a sufficient clearance to be really forced to the work below the cutter, which is very close to three degrees.

The angle-clearance may be varied by "stoning" to prevent chattering in case it is necessary, but it hardly will be necessary under ordinary circumstances.

## RULES FOR HANDLING DIE BLOCKS

The following rules for the handling of die blocks are given by the Pennsylvania Forge Co., Bridesburg, Philadelphia, Pa., in a recent publication entitled "Die Blocks":

1. Never harden a block unless the impression has been carefully polished. Rough impressions are the cause of many failures.

2. Never charge cold blocks into a hot furnace.

3. Never rush heating operations. Take plenty of time and save trouble.

4. Never quench a block that shows uneven heating. If properly "soaked," the color and temperature will be the same throughout.

5. Never allow a block to become dead cold in the bath.

6. Never postpone the drawing of a die block. Draw it immediately after hardening.

7. Drop-forging dies should never be stored in a cold, draughty place after hardening.

As the result of an examination by the American Bureau of Standards of a large number of specimens of the steel deposited in electrically arc-welded joints it is stated that this metal has mechanical properties like those of an inferior casting. In tension tests the metal showed low ductility, and all of the specimens examined—about seventy in all—showed evidence of unsoundness in their structure, tiny inclosed cavities, oxide inclusions, and lack of intimate union. The conclusions reached are that this unsoundness is a necesary consequence of the method of fusion as now practised, and that it is responsible for the deficiency in ductility of the joint metal. Both a "pure iron" electrode and a low carbon steel electrode were used, with practically equal results. The composition of the material changed in fusion by elimination of carbon and other elements. The use of slight protective coatings on the electrodes did not appear to affect the mechanical properties of the arc-fused metal.

The Swiss Government, which has been exploring for iron-ore deposits for several years, has made a real find in the Frick valley. According to a contemporary, some 15,000,000 tons have been estimated, with less than half of the deposit explored. A furnace plant is to be established with the State as part owner. Electrical smelting will be employed, with a saving, it is anticipated, of nearly three-fourths of the coke burnt in ordinary furnaces.

# Have You Tried This Contest Yet? If not--- Do so Now

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.




The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

## What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

Four contestants had correct lists for the Feb. 3rd issue and we had to resort to the elimination process as described in the Feb. 10th issue before a winner could be announced. Harold Baird, Windsor, N.S., was the lucky one, and Clarence Welsh, Port Hope, George Todd, Penetanguishene, and Wallace A. Powers were the second, third and fourth in place. The interest in this contest is keen, and we request that readers send their answers in as early as possible.

**CONTEST FOR FEBRUARY 24TH ISSUE**

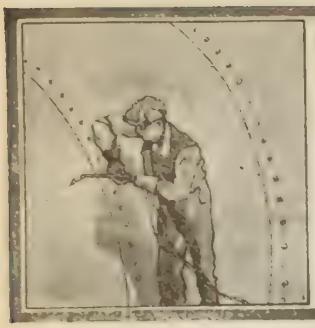
**Contestants are required to write us, stating to which advertisements we refer in this number.**

1—Something that is easy to instal.
2—How to get away from leaky joints.
3—An emphatic statement.
4—Something that should not be lightly considered.
5—How to solve the temperature problem.
6—A reasonable request.
7—Three features of importance on a certain tool.
8—Something that means a serious loss if not watched.
9—A product said to develop maximum power.
10—Something new.
11—Something that obviates heavy freight charges.
12—How to obtain full capacity plant operation.

**These are Correct Answers for List from February 3rd Issue:**

1—Canadian Ingersoll Rand Co.
2—Heald Machine Co.
3—Dominion Rubber System.
4—Rockford Milling Machine Co.
5—E. C. Atkins & Co.
6—The Standard Optical Co.
7—Kearney & Trecker Co.
8—Photostat Corporation.
9—Modern Tool Co.
10—Oliver Machinery Co.
11—Fellows Gear Shaper Co.
12—The Acme Machinery Co.

## Closing Date for This Contest is March 17th.



# WELDING AND CUTTING



## Hints on Oxy-Acetylene Welding and Cutting

### Preparation for Welding—Different Styles of Joints—Examples of Work Performed—Preheating, Reheating and Annealing—Welding Rods Used.

A BOOKLET recently issued by the Oxweld Acetylene Co., Newark, N.J., embodies some helpful instructions in the art of welding which, as they will doubtless prove of interest to our readers, we have secured the privilege of reproducing. The first subjects to be dealt with are proper preparation for welding, reheating, preheating, and annealing and manipulation of blowpipe.

The operator should remember that any job to be welded must be properly prepared, cleaned, lined up, etc., before the blowpipe is lighted. Metals of ⅛ in. in thickness or less are usually butt welded without bevelling, while in welding metal parts more than ⅛ inch in thickness the entire thickness of each side should be bevelled at an angle to give a groove between the edges of from 60 to 90 degrees. Bevelling insures penetration of the weld entirely through the metal. This is especially necessary in heavy sections. When the metal is more than ¾ inch thick and it is possible to weld from both sides it is sometimes advisable to bevel as illustrated by Fig. 6.

For work exceeding ¾ inch in thickness, the bevelling operation, in the case of steel, can be performed by means of the oxy-acetylene cutting blowpipe. On thinner sections, the bevelling can be performed by grinding, or with a hammer and chisel. On the thinnest sections where bevelling is necessary, use a file.

In construction work, on extremely thin sheet metal sections the edges of the parts to be welded should be flanged as shown at Fig. 4. When this is done, no filling material need be used, the metal in the flange serving this purpose. Fig. 5 shows the appearance of a weld made on thin sheets, flanged before welding. Fig. 7 shows a type of clamp that can be used to advantage on thin metal sheets flanged for welding. It can be operated by a helper, who grips the metal a few inches ahead of the weld and moves the clamp when the welder comes up to him. On long seams a number of these clamps can be used, being held in position by the locking ring which is shown around the handle.

The lap weld shown under Fig. 6 has some disadvantages and should only be attempted when butt welding or flange welding is impossible. The weld does not penetrate the total overlap of the parts and is therefore of uncertain strength.

In all welding operations, the parts to be welded should be set in proper alignment before the flame is applied. Too often, operators fail to take enough time at the start to properly line up the parts to be welded. The result is that the work is sometimes found to be out of alignment and the part rendered useless, no matter how good a weld has been made.



Fig. 7.—Method of holding flanged sheets in position for welding.

It is always advisable to have on hand a good supply of different size clamps, "V" blocks and mandrels. These are always useful in setting up various jobs, as shown at Figs. 8 to 11. The inexperienced operator will find it a big help to build a form of fire clay as a support for the broken sections while repairing thin castings. This holds the parts true and also assists in the control of the molten metal.

Whenever it is necessary to weld in a patch, a new piece of the same metal should be cut to the proper size and shape, the edges of both parts bevelled, and the patch held in place temporarily by "tacking," that is, welding at several spots some distance apart along the line to be welded. To hold a large patch in position while being "tacked," it may sometimes be necessary to drill a small hole in the center of the patch into which a length of rod can be inserted, and by which the patch may be handled. This hole may afterward be plugged and welded up. Small patches, to be placed in difficult positions, may be conveniently handled by simply welding a welding rod to the center of the patch. This may later be melted off. All metal should be thoroughly free from grease, oil, dirt, rust and scale in the neighborhood of the weld before the welding flame is applied.

#### Expansion and Contraction

In every case of welding, internal strains are inevitably set up due to expansion when heating and contraction when cooling. When parts being welded form part of a structure and are not free to move during the welding process, the strains produced may cause the metal to crack. This is especially true of cast iron. If the cooling after welding is rapid or irregular, the tendency to crack will be greatly increased. Whenever local strains due to expansion or contraction exceed the strength of the metal a fracture must occur. To relieve internal expansion and contraction strains, caused by the intense heat of the welding flame and subsequent rapid cooling, it is desirable to preheat the whole piece before welding, sometimes heat it during welding, and then to reheat it after the welding is completed. In the case of a

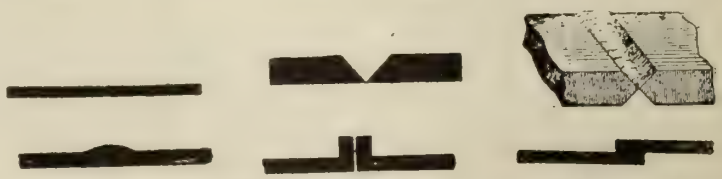
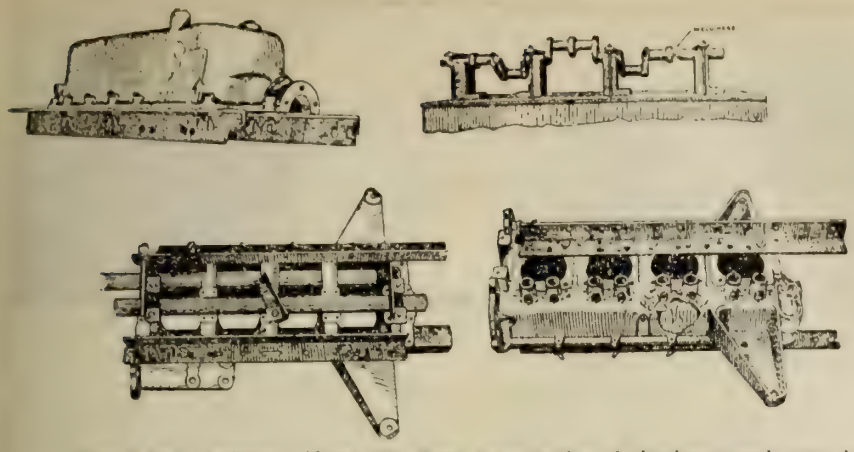


Fig. 4.—Upper left.—This type butt joint is used for sheets up to ⅛" thick.
Fig. 5.—Lower left.—Flange joint for thin sheets after welding.
Upper Centre—Bevel used on plates above ⅛" thick.
Lower Center.—Flange joint for thin sheets before welding.
Fig. 6—Upper right.—Bevel and weld for very heavy sections.
Lower Right.—Lap joint that should not be used.



Figs. 8 to 11 inclusive. Upper left, shows lower section of aluminum crank case clamped to angle iron to insure alignment. Patch is shown ready for welding. The other views also illustrate methods of ensuring proper alignment.

restrained section of a cast iron part, this treatment is imperative—the heating should be carried on slowly and the work kept as free from air draughts as possible. This treatment is not always essential for steel but can never be anything but beneficial.

**Preheating, Reheating and Annealing**

In order to economize in the consumption of acetylene and oxygen it is often desirable to heat the work to be welded as much as possible before the welding flame is applied. In the case of small castings the preheating of the whole piece is generally essential, not merely from an economical point of view, but in order to bring it to a uniform heat and thus insure a uniform contraction while cooling is taking place after the weld is made. In some cases to obtain this result it is necessary after preheating and welding to reheat the piece in order to equalize the temperature (which is naturally highest along the line of weld). This insures uniform contraction and freedom from internal strain.

Welds in steel or iron plates where preheating is not necessary will always be improved if annealing is done along the line of weld. For these operations various sources of heat can be employed. Illuminating gas used in conjunction with air can often be used to advantage. A simple gas torch to do this can be easily constructed from ordinary gas pipe, as shown in Fig. 12. The lower pipe supplies the illuminating gas and

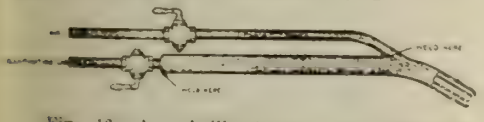


Fig. 12.—An air-illuminating gas preheating torch.

the upper pipe supplies the air, delivered at about two pounds pressure. For the air supply a small blower is quite suitable and inexpensive.

On many occasions oil can be used as a source of auxiliary heat with very good results, and in a wide range of conditions is probably the most economical one to employ.

A coke or charcoal fire is excellent for preheating if the size of the casting renders heating by a torch impractical. Charcoal is better than coke, since it gives a clean fire of about the right temperature and leaves little or no ash. Once started, charcoal burns readily with a small draft. If coke is used, care must be taken to see that the work is not allowed to become overheated and burned. An ordinary blacksmith's forge may be used for heating parts when no other method is available, but great care must be taken to see that the work is not burned, due to overheating on one side.

Preheating preferably should be done in a brick furnace. A picture of a fire-

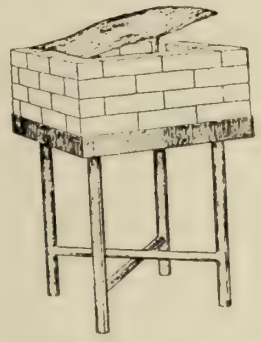


Fig. 14.—Fire brick preheating furnace mounted on small welding table.

brick furnace mounted on a welding table is shown in Fig. 14. The table is built up of gas pipe and sheet metal, welded where necessary. The top is covered with fire brick. Loose fire bricks are used to form the sides of the furnace; these may be arranged in any form to suit the particular job. The top of the furnace consists of a loose piece of sheet iron. A hole for the preheating torch may be left in the side. After the casting has been brought to a dull red heat, the cover is removed and the weld made. After welding, the casting again should be brought to a dull red heat all over and allowed to cool gradually. After this final reheating, all holes in the furnace should be plugged up with fire clay or asbestos to keep the heat in. If it is impossible to do this, then it is advisable to cover the casting entirely with lime, sand or charcoal to keep the air away from it.

Where conditions justify it, a small muffle furnace may be employed. The part being welded is placed on a small car which operates on a track leading into the furnace. Then, if the casting cools before the weld is finished, it may be shoved back into the furnace and brought to the proper temperature before the weld is completed. Something of this kind is very convenient where a number of castings of approximately the same size and shape are to be repaired. It is advisable to provide the operator with a pair of large gauntlets, preferably of asbestos, or other protective material, to protect his hands and wrists from the heat.

**Welding Rods**

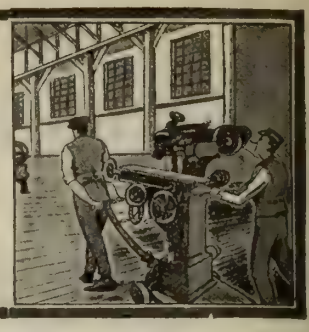
The gap, or crack, that exists between two pieces prepared for welding requires that some additional metal be supplied to fill it up. For this purpose rods or wires known as welding rods of various styles are employed. It will be appreciated that the strength and nature of the welded joint will depend to a great extent on the nature of the filling rod. In order to obtain a joint that will be the same as the metal of the parts being welded it is of course necessary that the added metal after the welding is completed be of the same percentage composition. In order to obtain this ideal result it is often necessary that the rod before it is melted into the gap or crack, contain some excess of the substances (foreign to the pure metal) which give to the sections of the metal part to be joined their particular characteristics of hardness, ductility, or high tensile strength. The necessity at times for adding an additional quantity of this particular quality giving substance is due to the fact that a portion of this substance may be burned out (or volatilized) during the welding. As an example take the case of 0.20 per cent. (20 point) carbon steel—if it was desired to have a welded joint with the carbon content the same, it would probably be best to use a rod that had 0.35 per cent. (35 point) carbon content, and then a good deal would depend on the speed at which the work was performed and the skill of the operator.

Fortunately such ideal results are not often necessary in practice and the employment of good rods supplied by firms of repute will give joints that are of such a nature that they will stand the stress and wear of use. For some classes of welding work it is necessary that the rod contain some foreign substance that is not in the metal to be welded in appreciable quantities, in order to help counteract the tendency to oxidize or assist in making the molten metal flow evenly. As an example, take the case of rod employed for welding grey cast iron. This must containe 3 to 4 per cent. of silicon to act as a deoxidizer and also assist in the prevention of formation of white iron. In most cases these difficulties are overcome by the use of a flux.

To be continued



# DEVELOPMENTS IN SHOP EQUIPMENT



## MOTOR DRIVEN BREAK LATHE

The Canada Machinery Corporation, Ltd., Galt, Ont., recently shipped a rather interesting 74 in. x 10 ft. motor driven break lathe to China. This machine is to be used in one of the large Chinese railroad shops and the illustration shows the general appearance.

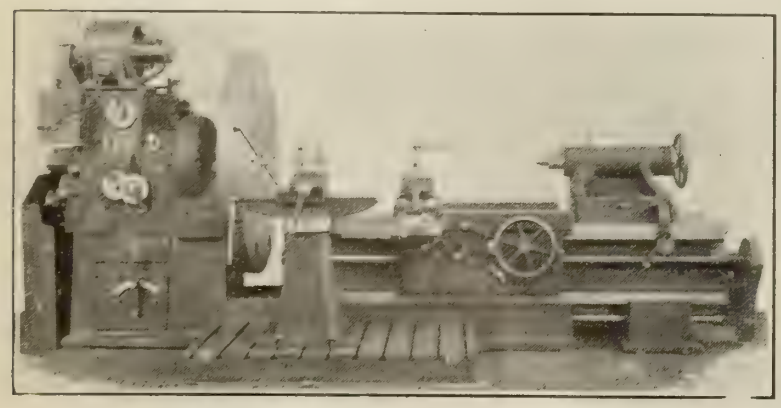
Probably the most interesting part of this lathe is the head which is their standard 27 speed design. 18 of these speeds are obtained through the spindle and 9 through internal gear on the face plate, thus giving a large range of speeds suitable for any class of work. The speed changes are all readily obtained by levers located on the head of machine, the motor being mounted directly on top and driving to head by means of steel and rawhide gears. A friction clutch is mounted in this gearing for convenience in starting and stopping. Due to an interlocking arrangement of the gear changes it is impossible for any two conflicting combination of gears to be meshed together with consequent damage to the machine.

The bed is deep and braced with cross ribs of box section, being provided with three large inverted V's, and while the tailstock rests on one V and one flat surface, the saddle bears on two V's and also on the flat surface. The bed moves on the base by means of a rack and pinion which is operated by a wrench at rear of machine, and is clamped in place by bolts, which fit the tee slots in the base. It is alsc supported by a box leg in order to eliminate any strain from overhang when at its extreme length.

The base is of massive construction and ample weight to support the bed and headstock. It is provided with a planed slot fitting the rack in the bed which acts as a tongue and insures alignment in any position. The extended portion of the base is slotted in order that the pedestal tool post may be placed in any position.

The spindle is turned from special high carbon steel and has a hole bored from the solid through its entire length. On the nose is milled an Acme thread to receive face plates. The gears in the apron are steel, and in order to facilitate the movement of the saddle the hand wheel is not geared directly to the rack in the bed, but indirectly through a reducing intermediate gear. The rack pinion is drawn out of mesh by a knob handle on the end of the pinion stud, when the machine is used for screw cutting. In order to obviate the necessity of reversing the lathe when screw cutting, a thread chasing dial for indicating the correct point for engaging the nut is provided on the carriage.

A compound tool rest on the saddle is provided, as well as a compound pillar rest with English tool post mounted on the extended base. The upper portion of this tool post is pivoted and is graduated so that it may be swung round to any angle. It is subject to variable longitudinal feeding by means of an overhead rocking shaft operated from a lever on the headstock. The tailstock is clamped to the bed by four bolts and is also braced by a pawl engaging in a rack cast solid in the bed in order to relieve the strain when doing heavy work. It may be set over to turn tapers, the base being graduated for this purpose. The lathe weighs approximately 30,000 lbs.



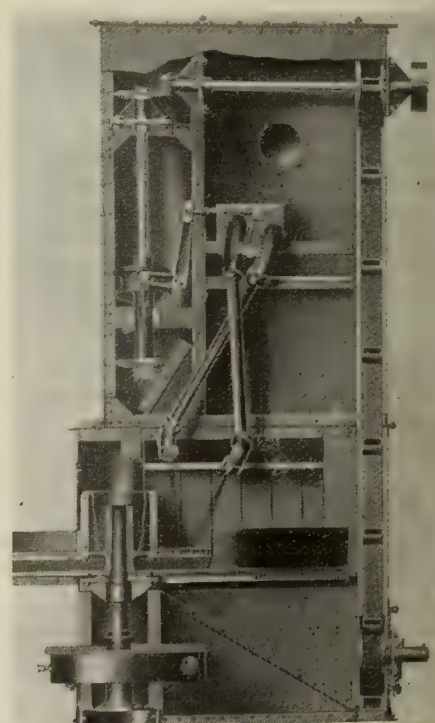
GENERAL VIEW OF THE LATHE

## SAND BLASTING MACHINES

The Pangborn Corporation, Hagerstown, Md., have placed on the market a line of rotary automatic table sand blasting machines. These machines are made in five sizes, and have three different systems of blasting action.

For the larger character of work the direct pressure system is used with the blasting action supplied by a direct pressure hose blast and equipped with elevator and separator, using both mechanical and exhaust means for reclamation and separation of the abrasive. The reclaimed abrasive is accumulated in storage bins from which the hose blast is instantly refilled through a quick acting valve, that makes the operation practically continuous. This machine is made in two sizes, with table 70 inches and 90 inches in diameter, with clearance of 15 inches between the table top and nozzles. Oscillating nozzles (see Fig. 1) cover the entire surface of the blasting zone which is entirely enclosed.

For work less difficult to clean, or where the intensive action of the direct pressure is unnecessary the gravity feed type of machine is equally efficient and permits of an entirely self-contained machine. Mechanical and exhaust action is



SECTIONAL VIEW OF BLASTING MACHINE.

used for reclamation and handling of the abrasive which is fed by gravity in a continuous cycle to the nozzles, where the full force of the air is exerted to the propulsion of the abrasive. This machine, though made in but one size with table diameter of 84 inches, has an adjustment of the nozzle arms that permits a clearance of 10 inches or 15 inches between the table top and the nozzles, making it applicable to the widest range of work. Like the direct pressure the blasting action is entirely confined and movement of the nozzles covers every portion of the work within the closed zone.

For the cleaning of lighter work and requirements of refinishing, etc., a self-contained suction feed type is made.

The used abrasive is reclaimed through screens and the handling is without elevator use. The cleaned abrasive is carried continuously by suction or syphon to the nozzles.

This table is made in two sizes, a 42-inch diameter table with one nozzle with vertical adjustment allowing any distance from 5 inches to 12 inches between the table top and the nozzles.

The larger size of these machines has a table diameter of 70 inches with clearance of 12 inches between the nozzles and table top allowing for reasonably large work or a large quantity of small pieces. Like the other models the blasting action is entirely confined and the nozzle movement covers the full area of the blasting chamber.

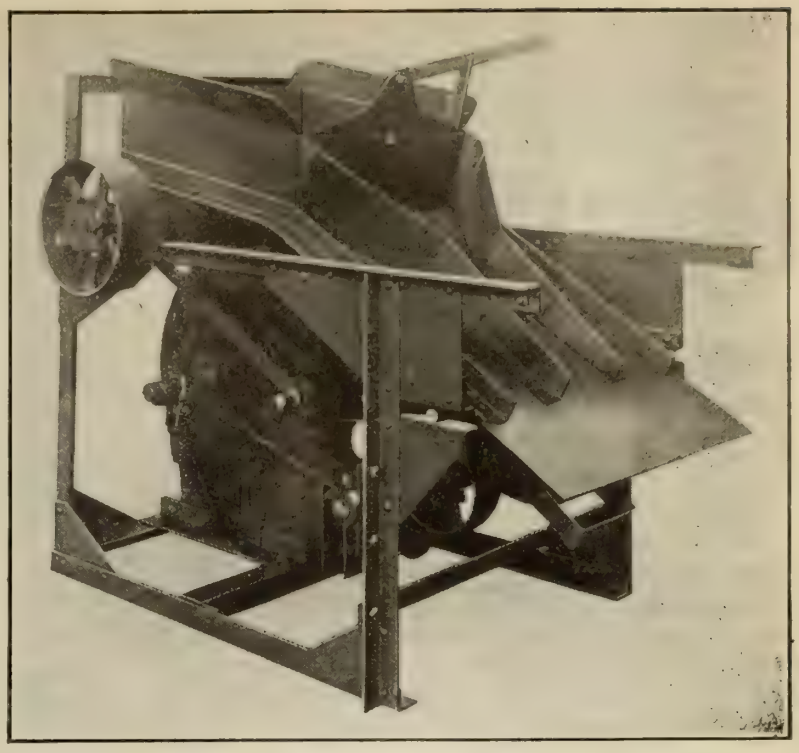
## PNEUMATIC CHIP SEPARATOR

The pneumatic chip separator shown in the accompanying illustration has been placed on the market by the Ideal Concrete Machinery Co., Colerain Ave., Cincinnati, Ohio, for use in separating chips from screw machine products and work of a similar nature. It is claimed that by the use of this machine one operator can handle as much work as three men using riddles, or as much as six men picking by hand.

The work and chips are placed in the hopper of the separator as they come from the machines. The hopper and the inclined slide which is attached to it have a compound vibratory motion. When the gate at the front of the hopper is opened, the vibratory motion causes the work and chips to slide down over the inclined slide. A properly located opening in the slide permits the work to drop into a tote box or pan, while the chips are passed over the opening by means of an air draft from the fan so that they fall off the end of the slide.

The distinctive feature in the operation of this machine is as follows: The compound vibratory motion which spreads out the work and chips as they come down the slide permits a light air draft from the fan to float the chips over an opening in the slide through which the work drops; this method of separating the chips requires a much lighter air draft than would be needed if the chips were blown up into the air, and at the same time effects a satisfactory separation of chips from small as well as large work. In addition, the work does not at any time pass through enclosed passages, a feature which renders it practically impossible to clog the machine by overloading.

The frame of the machine is constructed of angle iron, hot-riveted, and reinforced at the corners with heavy gusset plates. The bearings are lubricated by grease cups and sight-feed oil-cups.



GENERAL VIEW OF THE CHIP SEPARATOR.

## CYLINDER-GRINDING MACHINE

A grinding machine, constructed on the knee-type design, and especially adapted for general repair work, has recently been placed on the market by the Heald Machine Company, of Worcester, Mass. This machine is primarily intended for repair work on automobile engines but its construction makes it highly suitable for all-round work. The size of the table is sufficient to provide plenty of range for large work without excessive overhang. The table travel is adjustable and automatically reversed. The wheel spindle is hardened and ground with solid taper bronze bearing at the front end and self-aligning ball bearing at the rear. Interchangeable pulleys are provided for varying the speed of the wheel spindle.

## PISTON-RING GRINDING MACHINE

An attachment for the automatic grinding of piston rings, for use on their standard rotary table machines, has been brought out by the Persons-Arter Machine Company, of Worcester, Mass. The piston rings are fed on and off the machine automatically, the device being operated by compressed air supplied from the ordinary air lines of the shop. The device consists of a plate containing six recesses for holding the rings, and these are located intermittently beneath the grinding wheel, and while in this position are given the necessary motion for the grinding of the ring. The air cylinder for operating the attachment is located beneath the work table.

## SPRING THREADING TOOL

A new design of spring threading tool has been placed on the market by the Ready Tool Company, of Bridgeport, Conn. The tool holder is of the goose neck type, and the cutter is made of high-speed steel and placed in the holder at an angle of 15 degrees with the vertical, the sides of the tool being ground to provide for the cutting of a 60-degree thread; only the top surface of the tool is ground when sharpening. Teeth are provided both in the tool bit and in the head of the clamping dog. Adjustment of tool resistance is provided for by the addition of a flat spring in the goose neck of the tool holder. The tool has a righ hand off-set and is made of ½ by 1-inch stock and 7 inches long.

The H. Mueller Mfg. Co., Ltd., Sarnia, Ont., are contemplating the erection of an iron foundry.

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## The Use of Ball Bearings

DID you ever watch a lot of huskies heaving and tugging at a heavy load? There's a tremendous amount of energy expended in the stone-age method.

Then some chap takes a walk into the shop and brings out a couple of pipes for rollers. The rest is easy.

The rollers eliminate a good share of the friction, and the more this is done the greater the ease with which the load will move.

And yet there are plants that continue to run their power transmission largely on the idea of the plank on the road. The application of the principle of ball-bearings is so well established that it does not require argument.

The first article in this issue of Canadian Machinery deals with the usefulness of ball-bearings to industry, showing the development of the idea and the extent to which it has been applied to mechanical work. Further instalments will also appear and then again on March 17th the same matter will be taken up from another point, viz., "Direct Application of Ball Bearings to Various Machine Tools."

Shop executives would be well advised to file this material away for future reference. It may suggest some of your own problems and show you very definitely where ball-bearing installations will be your best way out.

## The Buyer in Control Now

THE buyer is in possession of the market now and he knows it. The good salesman is not going to object to this condition as long as the buyer is inclined to play the game square. The average salesman is keen for business and is ready to get down to brass tacks with any man who has business to place.

One dealer was giving his opinion of a certain purchasing agent this week and added, "He is certainly a hard buyer and when he gets his prices just now there is not much left in it for the dealer. But we know he means business when he asks for a quotation. We don't mind that sort of a man, because he is out to place some business in the market and it is his duty to his firm to get the best price he can. But we all know he is not just asking for prices to see how things stand. He buys hard, carefully, keenly—whatever you care to call it—but the big fact is that he buys and does not run away out of the market after getting the whole trade to give him quotations."

It is much better to study the market closely and then buy, than to simply stand on one side and wait until the whole market has adjusted itself to your liking.

## Standards of Practice

CANADIAN MACHINERY is a member of the Canadian National Newspapers' and Periodicals' Association. That bare announcement may mean little in itself, but readers and advertisers are entitled to know what this Association stands for in its practices. It is entirely for the benefit of these two, particularly the readers, that the following standards of practice have been formulated:

1. To consider first the interests of the subscriber.
2. To work for truth and honesty in all departments.
3. To eliminate, in so far as possible, their personal opinions from their news columns, but be leaders in thought in their editorial columns, and make their criticisms constructive.
4. To refuse to publish puffs, free reading notices, or paid write-ups, to keep their reading columns independent of advertising considerations, and to measure all news by the standard "Is it real news?"
5. To decline any advertisement which has a tendency to mislead, or which does not conform to business integrity.
6. To solicit subscriptions and advertising solely upon the merits of the publication.
7. To supply advertisers with full information regarding character and extent of circulation, including detailed circulation statements, subject to proper authentic verification.
8. To co-operate with all organizations and individuals engaged in creative advertising work.
9. To avoid unfair competition.
10. To determine what is the highest and largest function in the field which they serve, and then to strive, in every legitimate way, to promote that function.

We ask the assistance of readers and advertisers in living up to these standards. This paper seeks to serve its field well and is at all times open to suggestions as to how this can best be done.




—From L. P. Miller, Russellville, Tennessee.
**A RUSH ORDER**

# Gradual Improvement Has Been Noticed

FOR several weeks views have been appearing on this page tending to show that there is a gradual improvement in conditions. There has been no attempt made to exaggerate this improvement, neither has there been any move to cut out references that tended to show the conditions were not any more favorable.

There is a growing willingness on the part of manufacturers to give expression to their views on these matters and to pass along any helpful information they may possess.

"The improving condition is not such that it enables us to market cannot be said to have made much progress when compared to a week ago, although it is pretty hard to take it by weeks. But some of the firms were ready to admit that they had done a fairly good week's trading. Others saw improvement in the number of inquiries they had been receiving. Others had releases on orders that had been held up for some time. Not a great deal in any one place, but put together, quite a nice little showing in the aggregate.

Some machine tool dealers were interested in installations they had just completed in shops which had taken advantage of the dull season to improve their method of production. These plants are in good shape to go ahead now and they will be better able to produce than ever before.

### Better Than a Month Ago

Canadian Machinery asked Dominion Forge & Stamping Co., Ltd., at Walkerville, if there was anything that had come under their notice that would indicate an improvement in conditions, and B. W. Vallat, the president, has replied that conditions are better now than they were and he looks for the improvement to be continued. Mr. Vallat adds that "We want to do our bit in furnishing anything along this line that will be of help to you."

"In our own business," he says, "We are pleased to state that things look very much better than they did a month ago. We believe that things have taken a decided turn for the better and I believe this applies to the entire district.

"We feel especially encouraged over the fact that it is possible to figure our work on a more sound basis than we were ever able to do before. Raw materials are more stable and we can get deliveries within a reasonable time. Labor is more efficient and is giving much better results, so that it makes a very much more definite basis for figuring out our work for the present and future.

"To my mind if there is any one thing more than other that would encourage manufacturers at this time it would be an announcement on the Excess Profits Tax, which would tend to either greatly reduce or abolish it altogether for this year.

"If any manufacturer is fortunate enough to make enough profits off of this year's business to go into the excess class he certainly is entitled to keep this money if he is going to stay in business and recover from this depression and the losses to which he has been subjected.

"The manufacturers have borne this burden since 1914 and if there was ever a year that they need a breathing spell it is this one. I have faith that our able representatives in Ottawa will be broad enough and far-sighted enough to make provision for this contingency."

### Have Seen the Worst of It

L. W. Smith, manager of the Greenfield Tap & Die Corporation, Galt, believes, as many other business executives do, that we have touched bottom in a good many lines and from now on it will be a case of hard work and up the hill to normal.

Speaking to Canadian Machinery, Mr. Smith states:

"It is our feeling that the worst has been reached, and that there is a slight improvement in the general condition, that is in regard to the number of orders that we are receiving, and shipping slightly more than we were during November and December.

The improving condition is not such that it enables us to take on more employment as stocks have been brought up to a maximum and it will be necessary for us, as small tool manufacturers, to work on this stock until production orders in quantities are being received.

"I find that some of the factories in the automobile line, are putting on more help, and I am advised by some that in other month they will be in the market for production tools."

### The Stock Order Heard Of

The stock order, that more or less reliable evidence of return to normal business conditions, is again making a voice in the land.

From various sources comes reports of this very encouraging turn of affairs.

"We are more than holding our own," said a Niagara district manufacturer to Canadian Machinery on Friday last. "Not only is there a good undercurrent of enquiry, but yesterday one of our oldest dealers called and placed a very nice stock order, payable in 30 days."

"Yes, there has been a marked improvement during the past few weeks," said a Western Ontario manufacturer of small tools. "Enquiries are good, nice business is coming in by mail and stock orders are beginning to make their appearance."

## Business Morality Ebbs

"THE most painful thing about the difficult business situation which we have just been passing through," said Herbert K. Twitchell, President of the Chemical National Bank, "is the widespread slump in business morality. The war and the business situation that followed the war seem to have left the human race on a lower ethical level than it was before. This is not only true in Europe, in South America and in other parts of the world, but it is, unfortunately, true in America.

"American business men and bankers have been rather fond of pointing with pride to the high standard of business ethics in this country, and there is no doubt that this standard has, until lately, been very high, taking the business world as a whole. But the revelations of the last few months make it necessary for us to revise our good opinion of ourselves as a class.

"Men who a few years ago would not have dreamed of repudiating a contract, or trying to wiggle out of a bad bargain by subterfuges or resorts to technicalities, are doing these things today almost unblushingly. Cancellations of orders given and accepted in good faith are made on the slightest excuse or no excuse at all. Corporations, firms and individuals whose business honor has heretofore been unsmirched have weakened under the strain rather than do what every honest man does—take the loss and stand the consequences. Bankers see every day new evidences of such weakening of the moral fibre of concerns that have long enjoyed the respect and confidence of the business world."



# MARKET DEVELOPMENTS



## Tool Builders are in Session This Week

### Some Announcement May Come, Following the Cleveland Meeting—Steel Prices are Being Trimmed in Order to Get Sales —Scrap Metal Market Dead, and Very Few Sales

THERE has been no continuation of the movement that seemed to be getting under way a few days ago toward lower prices in certain lines of machine tools and steel goods. The machine tool builders of United States are gathering in Cleveland this week and there is no doubt the question will be gone into there. A number of these plants are making machines for stock now and they have not much disposition to go ahead doing this, as the tools they are turning out now are high cost.

The steel market belongs to the buyer just now and he is taking advantage of the situation and buying more to his liking than he has been able to do for a good many months past. Anything that looks like a fair tonnage is pretty well carted around before the placing takes place and as a result there are departures more or less marked from quoted prices. The fact that little money is made on many of these sales is set over against the pleasing reality that it allows the warehouses to liquidate their stock and get in shape to buy to the best advantage whenever the turn in the market may come.

Machine tool dealers have a number of inquiries and they are making some fair sales. Some plants have taken advantage of the slack season to improve their method of production. The automobile shops show a slight improvement in the operation schedules and have hopes of maintaining this. Shops having contracts to make auto parts are getting release instructions on these and more employment is the result.

The scrap metal market remains as it has been for weeks past, viz., as near defunct as it can get. There is such a tremendous surplus of copper on the U.S. market that it may be some time before there is a recovery in price. Buyers cannot afford to sell what stock they have, neither can they take chances on buying, so in that atmosphere business hangs suspended.

## PITTSBURGH MARKET SHOWS THAT BARS ARE BEING SOLD AT TWO CENTS

Special to CANADIAN MACHINERY.

PITTSBURGH, Feb. 24.—Enough time has now elapsed since the Midvale Steel & Ordnance Company began quoting prices below the Industrial Board and Steel Corporation schedule to make some appraisal of the situation. This is that Midvale and a few other independent steel producers are actively soliciting business at reductions of a few dollars a ton on most of the leading products, that practically all the other independents are willing to sell at reduced prices, provided the orders offered are large enough to make this worth while, and that the United States Steel Corporation is standing rigidly by the prices it has maintained since the Industrial Board adjustment of March 21, 1919.

As to the volume of business booked at the reduced prices, that is very small. It seems clear that practically no business was produced by the price cutting, the orders placed being chiefly or wholly orders that would have been placed in any event, orders that could not be held back because the need was pressing. As to the Steel Corporation, prior to the break it was booking rather a fair volume of new business, considering the general dullness. In both December and January the bookings were not far below 50 per cent. of capacity. The volume of new business given the Steel Corporation has now diminished very considerably. A more important effect upon the Steel Corporation is a large decrease in the volume of specifications on old contracts being filed. This is, of course, perfectly natural. Many customers of the corporation were taking shipments on their old contracts at a greater rate than was requisite to take care of current consumption, so that stocks were piling up, and when it was made clear that the contract prices could be shaded the customers naturally curtailed their specifications.

#### Extent of Cuts

The extent of the price cutting may be shown approximately by setting down the lowest prices done or quoted thus far by any independent, together with the Industrial Board prices to which the Steel Corporation strictly adheres, and which some of the independents are nominally quoting, until they are offered orders sufficiently attractive to justify cutting: Bars, 2 to 2.35 cents; shapes, 2.20 to 2.45 cents; plates, 2.25 to 2.65 cents; hoops, 2.85 to 3.05 cents; blue annealed sheets, 3.20 to 3.55 cents; black sheets, 4.15 to 4.35 cents; galvanized sheets, 5.35 to 5.70 cents; plain wire, 3 to 3.25 cents; wire nails, $3.10 to $3.25.

In standard steel pipe there is little if any shading, the standard price being a basing discount of 57½ per cent., but there are various price irregularities in specialties in tubular goods. In tin plate it seems clear that there is absolutely no shading by any mills on orders for actual production from the standard price of $7 per base box, 100-pound, but for quite a while past there have been offerings at second hand from stocks at deep cuts. At first these were chiefly by New York export houses, who had bought tin plate for export and did not complete the transaction, but lately there have been offerings by some domestic consumers.

#### Attitude of Independents

It being quite clear that the volume of steel business secured by the price cutting has not justified the making of

these reductions, for with the high costs ruling, partly due to the reckless manner in which independents operated when they were securing very high prices, and partly due to the light operation at present, there was not much room for cutting, the question arises, why did the independents start to cut prices? There are only two possible answers, that the independents made a mistake and that they did not make a mistake. They might have made a mistake by thinking that a reasonable amount of business could be gathered up by cutting prices, sufficient to give something like a fair operation and thus justify selling at close prices, or even at an apparent loss, by comparison with previous costs, because by economizing during the operation they could pare their costs. Such a result has not come. The amount of business secured is plainly not worth while.

If the independents did not make a mistake, then they expected what has occurred. What has occurred is that they secured very little business, and that the business of the United States Steel Corporation is greatly reduced. The corporation operated at about 92 per cent. in November and December and at an average of about 90 per cent. in January. Its operations were certain to taper off, but probably at no great rate. Now, however, the corporation's operations were at only about 80 per cent. last week and they are at less than that this week, with a prospect that in a very few weeks they will be quite low, under 50 per cent. and perhaps down to 30 or 40 per cent. The corporation's new business and specifications against old contracts have both fallen off, and a good many customers are probably instructing it to delay shipment on some of the material already specified.

This decline in Steel Corporation business is attributable in large part to the price cutting. There may be an advantage in that to the independents, on the theory that whatever steel the corporation makes is irretrievably lost to the independents, whereas by mixing things up the independents may secure a sort of redistribution. This is not theory, but the actual statement, made privately, of some of the independents.

Then there is the matter of wages. The independents have been wanting to reduce wages, and some of them did as long ago as last December, while others have only lately reduced, the Youngstown mills making reductions of about 20 per cent. last week, while the Steel Corporation has not reduced wages. The independents feel that if the corporation has to cut prices it will also reduce wages. Some of the independents did not take kindly to all the wage advances the corporation made during the war, and there was some feeling on the subject in the latter part of 1919, when the independents were disposed to advance prices. The attitude of the Steel Corporation at that time seems to have been "If you advance prices you will have to advance wages—why not advance wages first?" What occurred, however, was that the independents advanced prices and then the corporation advanced wages without advancing prices, the independents then having to advance wages also.

## POINTS IN WEEK'S MARKETING NOTES

**Only one or two odd price changes were noticed this week in the machinery market. It is felt that some announcement may be made following the meeting of the Machine Tool Builders in Cleveland this week.**

—

**Some of the automobile shops are beginning to operate at a fair rate and orders are being released to firms that had contracts held up on the making of auto parts.**

—

**The steel market distinctly belongs to the buyer at the present time, and there is a decided tendency on his part to take full advantage of the situation, with the result that prices are being cut pretty close in this district.**

—

**Merchant bar mill material is quoted at 4½ cents a pound in Toronto, while Montreal puts the price this week at 4¼.**

—

**United States machine tool builders are not inclined to go ahead building more machines for stock, and some of them are considering further curtailing their operations.**

—

**There is no improvement whatever on the scrap metal market. The yards are not buying and inquiries coming in are very meagre. The fact that prices are at a very low ebb is not having any effect on increased buying.**

—

**The record of sales in U.S. pig iron market brings out the fact that $25 is going to be more and more recognized as the market price, and sales are being made in several places at that figure.**

—

**Operations of the Steel Corporation are said to be below the 80 per cent. mark now, with the prospect that in a few weeks they will be well down towards the 50 per cent. mark.**

—

**It has been stated by Engineer F. A. Gaby, of the Hydro Commission, that if work progressed at the present rate on the Chippawa Canal power should be ready for delivery about Sept. 1 of this year.**

As the market is extremely quiet as to actual developments, the tactical position and aspirations of the producers seem to be the important feature, as giving a line on what may be expected in the future.

**Pig Iron**

The first sales of basic pig iron of any consequence this year have just occurred, developing a new low price, $25, valley, or a sharp decline, as on January 1 the market declined from $33 to $30 by furnaces voluntarily quoting the lower price. There was no record of any sales of consequence until the $25 sales just made, which included at least one lot of 1,000 tons. Bessemer is now priced at $27, valley, with reports that a few carloads have been sold at this figure. Foundry remains quotable at $28, valley, with an occasional carload going. On any sizable lot these prices would probably be shaded. The prices are below actual cost, based on recent records, but costs will have to come down. The question just now seems to be whether pig iron prices are going to dictate coke and ore prices, or coke and ore prices are going to dictate pig iron prices, as of course furnaces would not sell at a loss for any length of time.

## BETTER SALES ARE REPORTED

**Some Lines Seem to be Gathering in Greater Volume of Business Now**

TORONTO.—The price movement that seemed to be making headway last week finds little more progress this week in the machine tool market. Makers seem to be more confident that prices are not going to change. Nor are there any who claim there is a great clamor for a better figure, while on the other hand there are a few who believe that the new prices they have been able to give have helped in placing some machines.

It must not be imagined that the machine tool market in this district is at a standstill, for there are some very nice sales being made.

The automobile shops are starting to run again, and places that had contracts to make parts are getting under way. It is a rather slow process, as none of the shops feel justified in going ahead full blast until the attitude of the buyer is more marked.

Oshawa shops have taken back all their married men, and a number of single men, who were skilled in certain operations, and who had left when work fell off, are being sent for. A conservative estimate would place the operations in the shops there at 50 per cent. of normal. In Chatham and Walkerville the makers of cars and parts are also getting a start and expect to add to their number from time to time.

Inquiries are better, although it is still difficult to convert these into new business. Nearly all these inquiries are

new ones in the market, and for the most part are pretty well scattered.

Some of the sales that have been made in Ontario particularly are the result of a lot of work on the part of the salesmen. In some cases it has been possible to show firms where they could make a real saving by changing equipment, or where present equipment could be supplemented to advantage by some additions. The past few weeks has provided a good time to get this work done in order to be ready for the start which is now being made in several of the plants.

The buyers are in possession of the steel market, and they know it. Any purchaser who has a good-sized order seldom places it at once. One of the steel merchants, speaking about this a few days ago, remarked that, "Every order, especially if it is of any size, is being peddled to the limit now, and by the time the buyer has made the rounds he has a price that is pretty close to what he wants to pay."

"And are prices sagging as a result?" was asked.

"In some cases they are," was the answer. "Just now warehouses are working off as much of their stock as possible, and when they see a chance to get rid of a slice by naming a close figure they are going to do it. In fact, if it is going to bring business into the market, they have to do it as buyers are needed just now as much or more than they ever have been before."

Another merchant, who has been doing some aggressive publicity work, stated that the first of the week had seen a nice lot of business coming in, more than they had taken in for some time previously. They did not want to place the interpretation on this that business was permanently better, but for the meantime they were willing to admit that the orders were the best they had seen for some weeks past.

None of the warehouses are taking in much material. What is coming in is simply by releasing some of the orders that have been held up.

Both mills and warehouses are out looking for business just now, and prices are suffering a little as a result. Bars, for instance, have been quoted at 4.75 per pound for some time past, but better than that has been done right along, so this week we are changing the figure to 4.50, at which price the bulk of the sales are being put through.

Local steel men are watching with interest the developments at Pittsburgh, the general feeling being that the price of bars will not go much below 2 cents, as costs are still high, and a revision of wage schedules will cause more or less trouble and make buyers look for still greater reductions.

Tube business is coming in fairly well, although the orders are very scattered and smaller than usual. Sheets are quiet, the demand being limited. Plate is not selling to any extent.

# MACHINE TOOL BUILDERS MEETING IN CLEVELAND TO DISCUSS PLANS

Special to Canadian Machinery.

NEW YORK, Feb. 24.—The National Machine Tool Builders' Association will meet on Thursday of this week in Cleveland to discuss the present business situation.

Among the specific subjects scheduled for the conference are "The Present Business Situation and How to Meet It," "Principles of Sound Financing for the Machine Tool Industry" and "How to Run a Machine Tool Shop in a Time of Depression." In connection with these subjects the plans of the executive committee of the association for the adoption of a uniform cost finding method will be under consideration. It is believed by many that the cut-throat competition which existed in the machine tool trade prior to the war was due largely to an imperfect knowledge of costs. The association's executive committee has employed a firm of accountants, Scovell, Wellington & Co., Boston, who have been conducting an investigation during the past few months under the guidance of E. F. Du Brol, general manager of the association. Six district meetings were held at which cost data were produced by all members of the association, and from these data average cost prices have been arrived at to be used as the basis for the cost finding system.

The machine tool trade is making rather slow progress toward an improved business condition. In fact, in some lines it is doubtful whether any progress at all is being made. Some machine tool companies which up to this time have been working at least a few days a week are now seriously considering shutting down their plants entirely, as they no longer feel justified in building machines for stock at present high costs. While buyers naturally point to the continued high prices of tools, it is not in accord with the facts to say that any considerable amount of machine tool business is being held back solely because of high prices. As long as there is so little work for machine tools to do, it follows that there cannot be much demand for tools. In other words, until there is a much better demand for the products which are made on machine tools there cannot be a much better demand for the tools themselves.

Domestic inquiry and sales are light. A little foreign business is trickling through, principally from Japan. The Japanese navy has been buying quietly in this country for a month or so. Among other export inquiries are some from India and Russia.

# CANADIAN ENGINEERING SKILL TO HELP OPEN UP MORE NEW MARKETS

Canada is having a large part in development work that is taking place on the Gold Coast of Africa. H. F. Walker, of Edmonton, who passed through Toronto a few days ago, is one of the first of a field force of about 50 Canadian engineers who will share in the money to be made in the "big job"—which is to open up the rich provinces of the Gold Coast, Nigeria, Togoland and the Cameroons. The entire undertaking to which Stewart & MacDonnell are committed with the Home Government will involve expenditures through them by Great Britain of approximately $60,000,000, work on the first unit beginning April 15, to be completed within seven years, and cost in approximately close figures $7,000,000.

### Canadians Direct Work

Not only will Canadian brains direct operations, but the heads of all departments will be men of Canada, a party of 50 following within 30 days. London operations will be personally directed by Hon. Angus MacDonnell. He was one of the contractors building the Cowichan Lake extension of the C. P. R. lines on Vancouver Island a short while ago. Canadian material and equipment also are to be used as extensively as possible in the Gold Coast operations, transport charges considered and later Canadian cars, steam shovels, locomotives, cement, etc., are to be sent over by shiploads, expectations being that at least $2,500,000 worth of British Columbia Douglas fir alone will be required. Mills at Chemainus are now working on the first orders and looking for bottoms to transport the initial and later cargoes.

### New Markets For Canada

Hydrographic surveys, preliminary to the work, have been conducted during the past year under the direction of Rear-Admiral Sir John Parry, who, during the war, was engaged in surveys for the Admiralty on the Canadian coast. It is expected that development of these hitherto untouched domains of Africa will foster important new markets not only for Great Britain, but particularly for Canada.

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**New Premises.**—The Diamond State Fibre Company of Canada, Limited, are moving into new premises in the Wrigley Building, Carlaw Avenue, Toronto, on or about March 1. This building is twice as large as their present premises. A private railway siding will facilitate greatly the delivery of shipments.

# *Price Tendencies of Iron, Steel and Copper*

THE lack of enough energy to establish a new market level is probably what leaves the U.S. Steel Corporation and its Industrial Board prices as the recognized standard in the steel world.

How long that position can be sustained is a matter of pure and simple guessing, wherein one man's guess is as good as another's.

A definite move has been made by some of the independents toward a lower price—in fact the idea seems to be just now to find out where to establish a price level that will cause buyers to come out and take hold.

The Pittsburgh correspondent of Canadian Machinery says that the price of bars is now recognized at 2c pound, or $7 per ton under the Industrial Board prices. A further drop is hardly to be expected from this figure.

It is interesting to compare this with previous quotations from Pittsburgh. Below we show high and low prices from 1912 to 1919, as well as yearly averages:

| Year | High | Low | Average |
|---|---|---|---|
| 1912 | 1.40 | 1.10 | 1.25 |
| 1913 | 1.40 | 1.22 | 1.38 |
| 1914 | 1.22 | 1.05 | 1.15 |
| 1915 | 1.75 | 1.10 | 1.31 |
| 1916 | 2.93 | 1.87 | 2.48 |
| 1917 | 4.50 | 2.90 | 3.49 |
| 1918 | 2.90 | 2.78 | 2.89 |
| 1919 | 2.70 | 2.35 | 2.43 |

The ten-year average for years previous to the time covered by this table, say from 1904 to 1913, puts bars at 1.403c per pound. So it will be seen that the Industrial Board price at 2.35 is fairly well removed from that figure. The average from 1912 to the end of 1919 is 2.04c per pound, the average being shoved up by the prices of 1917, for taking that year out the average from 1912 to the end of 1919 is 1.84c per pound.

### Pig Iron Prices Compared

Pig iron is having a difficult time standing up to any supposed schedule and a determined effort seems to be under way to batter it down to $25, which would be well above the average of previous normal years. Here is the showing for a ten-year period from 1910 to 1919, taking Buffalo quotations, as that is the principal point of competition Canadians have to meet:

| Year | High | Low | Average |
|---|---|---|---|
| 1910 | 17.25 | 14.50 | 15.55 |
| 1911 | 14.25 | 13.50 | 13.84 |
| 1912 | 17.61 | 13.62 | 14.89 |
| 1913 | 17.25 | 13.07 | 14.87 |
| 1914 | 13.50 | 12.08 | 12.84 |
| 1915 | 17.77 | 12.44 | 13.98 |
| 1916 | 33.56 | 18.00 | 20.63 |
| 1917 | 50.64 | 33.39 | 40.41 |
| 1918 | 35.25 | 33.50 | 33.97 |
| 1919 | 39.19 | 27.00 | 30.53 |

Worked out, it will be seen that the average for those years is $21.16 per ton. This figure has been brought up by the inclusion of high-cost war years. Take the first six years of that period, 1910 to 1915, and it is seen that Buffalo was selling pig iron at an average of $14.38 per ton.

The war years, when the effect was felt on pig, viz., 1916-17-18, shows an average at the same point of $31.67 per ton. The quotation for Buffalo at this writing is $29.25 to $31.25 per ton, or a half-way price of $30.25 per ton.

Summarized, it gives these results:

| | |
|---|---|
| Ten year's average, 1910 to 1919 | $21.16 |
| Six year's average, 1910 to 1915 | 14.38 |
| War year's average, 1916-17-18 | 31.67 |
| Present average | 30.25 |

It is not the purpose of this article to go into the matter of costs, which have increased very largely on every hand. Nor has there been any advances made in the way or method of production that would serve to cut prices, for methods used now are to all intents and purposes the same as in the pre-war, cheap-cost years.

### The Case of Copper

Copper is one of the metals that has taken its "bumps." The statement is made in the trade now that copper cannot be produced at the price at which it is sold to-day, and there is no good reason to doubt the statement. As a matter of fact copper for the thirty-year period from 1890 to 1919 averaged 15.68c per pound, while the quotation at this writing is 13½c per pound.

The highest price on record for Lake copper on the New York market was in 1864 at 55c per pound and the lowest point recorded was in 1894 at 9c per pound. In the war years copper fared well, touching 36c in 1917.

### Where Sheets Stand

The prices on which the following tables and quotations are based are at Pittsburgh. Sheets are usual black sheets, No. 28 gauge. One would hardly believe that at the end of 1914 and the beginning of 1915 sheets were quoted at 1.70 to 1.80c per pound. Take the ten-year performance, 1910 to the end of 1919:

| Year | High | Low | Average |
|---|---|---|---|
| 1910 | 2.40 | 2.15 | 2.29 |
| 1911 | 2.20 | 1.84 | 2.03 |
| 1912 | 2.25 | 1.80 | 2.00 |
| 1913 | 2.35 | 1.98 | 2.20 |
| 1914 | 1.98 | 1.80 | 1.89 |
| 1915 | 2.53 | 1.74 | 1.93 |
| 1916 | 4.40 | 2.60 | 3.06 |
| 1917 | 8.00 | 4.50 | 6.29 |
| 1918 | 5.00 | 4.82 | 4.98 |
| 1919 | 4.70 | 4.35 | 4.43 |

That makes the average of that period 3.11 per pound, hardly a fair comparison. Taking out the three wild years, 1917-18-19, it gives an average of 2.20 for the first seven years, 1910-16. The present price at Pittsburgh is 4.35, although there have been departures from this. Summarized, it gives:

| | |
|---|---|
| Ten years, 1910-19, average | 3.11 |
| Seven years, 1910-16, average | 2.20 |
| Present price | 4.35 |
| Average 1917-18-19-20 | 5.01 |

These four lines, bars, copper, pig and sheets, have been taken because they are quite representative of the iron, steel and metal classes. Copper alone has done more than its share toward coming down to a working basis and it is a very safe guess that the improvement of industrial conditions, already under way, will bring copper up from its lowly position. Iron and steel have so far stood more or less aloof from the tendency of prices to skid. They have receded greatly from some of the "peaks," but these peaks cannot be accepted as market standards, most of them being brought about by the persistent desire of the consumer to secure prompt delivery regardless of price.



B. J. McCORMICK,
General Sales Manager, Canada Foundries & Forgings, Ltd., Welland.

# *Strategic Loss Essential to an Effective Offensive*

## We Are in the Midst of Reconstruction Instead of at the End of It—All Sections Must Have Their Bumps

THAT a strategic loss is essential to an effective offensive in present business conditions, is the view held by B. J. McCormick, general sales manager of Canada Foundries and Forgings, Limited. Speaking to the Ontario Retail Hardware Association in Hamilton a few days ago, Mr. McCormick reviewed many phases of the situation that have a very direct bearing on the machine tool, small tool, iron and steel markets in general.

Referring to business prospects for 1921, Mr. McCormick said that "consciously or unconsciously factory managers are answering this question by the plans which they are now laying for future operations. No one can answer correctly with assurance, but a knowledge of conditions and the economic laws that govern those conditions will aid in making the answer more authoritative. All the ablest theorists and members of the oldest and wisest schools of economics have guessed during the last three months about what was the matter with industry, and what would happen within the near future. You ask for my opinion, but all I intend to do is to discuss the matter with you.

"The year 1920 with its profits and losses, and mostly losses, has passed into history. There are several viewpoints from which to look into 1921. The productive and distributing machinery of Canada is very finely balanced and it is a well-known fact that all industry and commerce prospers and suffers together. We have experienced seven-year periods of depression or trade fluctuation. The average length of previous depressions have been about one year, some of shorter periods and some longer.

### Reconstruction

"Most merchants seem to think that one big slash in prices would have the same effect as a fairy waving her wand, that all our troubles would at once vanish and be over, and that our readjustment would be completed. A good many of us thought that the year 1920 was to be the readjustment period, but we were all wrong. The year 1920 started with an unprecedented demand for every article known to commerce, and factories were so crowded with work that they had no time to readjust. In fact, labor asked for and received more concessions in 1920 than during any previous year of the war. During the month of April, 1920, we offended our customers by refusing to bid on over a million dollars' worth of inquiries because our production chart was filled for the entire year on that class of goods.

"Then came the shock, and industry mediately went into low gear about October, and here we are.

"My opinion is that this is the real period of readjustment, and our whole industrial and commercial structure is being tested by the strain, but those who have builded wisely and well have no cause for alarm.

### It Rests With Steel

"My personal vision of the future is bright, pleasant and a reassuring one, but the process of reconstruction must continue until every factor contributes to the result which we attain. Wheat, cotton, tobacco, sugar, leather, rubber, lumber tea, and coffee and other raw materials, including copper and zinc, have taken a big slump in the last three months, some of them going even below pre-war prices, but I wish to call your attention to the one point which I wish to impress upon you to-day, and that is, that iron ore is the only raw material which has held firm.

"Why? Because wages have not been revised by the steel interests who perform the first seven processes of this great industry.

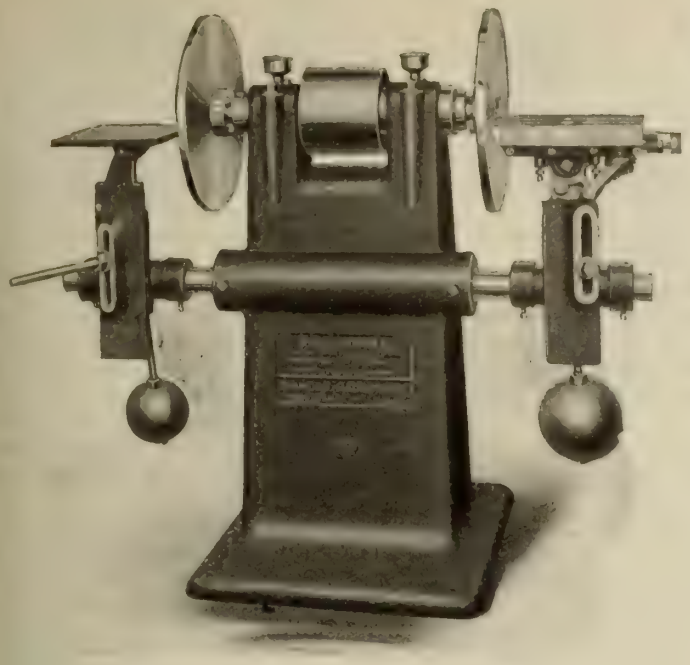
"Manufacturing implies buying. If nobody wants to buy what the factories make, the factories very soon have to switch off the power and put a padlock on the door. There never has been a time and there never can be a time when nobody wants to buy; but enough people can stop buying, or can curtail their buying, to make a big dent in manufacturing processes and that is just what has happened in this country at this time. There has been, and at the present time of writing there still is, a buyers' strike. It was, and is, psychological. Nobody could have done anything to prevent it. No one alone and unassisted can do very much to stop it. Buying is based on confidence—confidence that prices are fairly stable—that they will not decline recklessly over night. This is true of both individuals and of corporations. It is clear that business and industry in general must take certain broad steps before confidence is returned. It remains for the industry, whether it be manufacturer, jobber, or retailer, that has not already done so, to make the plunge; to sacrifice if sacrifices are necessary, but in any event to get back again on a workable basis of confidence. What we all want to know to-day is when will that period of relative stability likely be reached, and then and only then will the wheels of commerce speed up.

"In New York there was a meeting in January of jobbers at which they formed a policy to trade among each other, rather than purchase direct from manufacturers. Their slogan was 'Don't buy anything from the maker until he is down to pre-war prices.'

"This buyers' strike will and has slowed up production in our factories with all its disastrous effects of non-employment. Slow production begets higher costs.

### Pig Iron

"This is an expression used by most hardware buyers, 'Pig iron is down $5 or $10 per ton.' This is a stock phrase and generally used as an opener with most of the hardware salesmen. Do not use this poor, old, hackneyed phrase because it shows at once that you are not familiar with the basic principles of your own business, and it makes you look like



# DIAMOND
## DISC GRINDERS

Good grinding in fast time has made the Diamond popular in a host of shops. The right design and build eliminate vibration and give the operator a perfect surface every time. There is a suitable size and equipment for every surface grinding job you have. Workmanship and material of "Diamond" quality throughout.

May we send you catalogue?

**The A. R. Williams Machinery Company, Limited**

ST. JOHN, N.B.
WINNIPEG, VANCOUVER

*If It's Machinery, Write "Williams"*

64 Front Street West
TORONTO

a man coming into a ball game at the seventh inning, and asking your neighbor what is the score. It would be just as reasonable for you to ask the price of iron ore at Lake Erie ports, or even more reasonable still to ask what is the rate of pay at the mines at Oliver, Minn.

"The foundation of the whole structure known as the steel industry is what is commonly called labor. In using this word—labor—I wish to impress you with the fact that I do not use it as a hostile expression, but with thoughts most respectful and friendly. I would ask when I use the world labor that you would immediately interpret it as meaning 'Physical application of human energy, plus intelligence, knowledge and skill, applied to material things such as woods and metals.'

"Labor is the greatest contributing factor to costs in our industry to-day, and in fact, the determining one, with transportation coming next. Labor again is the chief factor in transportation charges.

### U. S. Steel Method

"The United States Steel Corporation in their system of cost practice value iron ore in the ground at only 10 cents per ton because it is only just plain mud. They reason that by the application of human energy, plus intelligence and skill, and aided with modern tools and equipment and with a further application of heat, they can convert this mud into merchant bar and pass it along to the general steel working industry at a profit. I figure the steel industry on the same basis as a nine inning ball game, the seventh inning or operation is the blast furnace turning the ore into pig iron, while the eighth and ninth processes are where the metal working industries of Canada begin to function, and the greatest contributing factor which we have to reckon with is wages—because no industry with too heavy a burden in this respect can produce its wares or deliver its services at reasonable prices unless this factor of remuneration contributes.

### Remuneration

"The man who first takes a rough bar of wrought iron may be a blacksmith who has only partly learned his trade and has no ambition to rise above the anvil. The best possible thing he can do with his bar of iron is to make it into horseshoes, and he congratulates himself upon his success. He reasons that the rough lump of iron is worth only three or four cents per pound and that it is not worth while to spend much time or labor upon it. However, his enormous muscle and small skill has raised the value of this lump of iron say from $1 to $10. In modern factory practice this man's remuneration would probably be based on weight, and the market price of pig iron might possibly be considered in naming a selling price.

"Along comes another artisan known as a cutler, with a little better education and a little more ambition, and looking at the blacksmith and his product says: 'Is this all you can see in that lump of iron? Give me a bar and I will show you what brain and skill plus hard work can make of it.' He has seen a little farther into the rough bar. He has studied many processes of hardening and tempering. He has acquired tools and grinding and polishing wheels and an annealing furnace. Under his hand the iron is further fused, carbonized into steel, drawn out, forged, tempered, heat soaked and quenched in liquid of some nature to improve its tempering and finally ground and polished with great care and patience. When this work is done he shows the astonished blacksmith $1,000 worth of knife blades, where the latter only saw $10 worth of crude horseshoes.

"In our present shop practice this man's remuneration would be based on count and quality.

"Along comes another artisan and looking at the product of the cutler, he says: 'Knife blades are all very well if you can make nothing better, but you haven't half brought out what is in that bar of iron.' He can see higher and better uses. The third artisan has a more delicate touch, finer perception, higher ideals, better training and superior de-

termination, which enable him to look still further into this rough bar—past the horseshoes and past the knife blades—and he turns this crude iron into the finest needles, with eyes cut with microscopic exactness. The production of the invisible points requires a more delicate process, a finer grade of skill than the cutler possessed. This feat is considered marvelous and the third artisan thinks he has exhausted all the possibilities of the iron because he has multiplied the value of the cutler's product many times.

"This man's daily remuneration would undoubtedly be based on quality only.

"Along comes still another skilled mechanic with a mind more finely organized and a still more delicate touch, more patience, more industrious and higher order of skill, together with better training, and he passes with ease by the horseshoes, the knife blades, and needles and returns the product of his bar of iron in fine hairsprings for watches. Where the others saw horseshoes, knife blades and needles only worth a few thousand dollars, his penetrating eye shows a product worth tens of thousands and following the process down still further we find the little barbed instruments used by dentists to draw out the finest branches of dental nerves being sold at a price worth hundreds of times as much per pound as gold itself.

"The remuneration of this classification of man is fixed neither on weight, count nor quality. His type is so scarce and so much in demand that he commands the maximum wage with the minimum output.

"By the application of this human energy, intelligence, skill, patience and scientific training, together with the use of modern plant equipment and machinery, our products of commerce are produced, and in some particular lines the price of pig iron per ton at the blast furnace practically has no meaning at all, because the one main thought, the one big factor that enters into the whole proposition, is the value of the human energy involved.

"These are my reasons for advising you never to use the old stereotyped phrase—that pig iron is down.

### Decline Comparison

"Comparing advances of average commodities between the years 1914 and 1920 we find the following comparative views. The United States has reduced these advances 66 2-3 per cent., England 40 per cent., France 25 per cent. and Canada 30 per cent.

"Therefore, taking these other countries as a competitive basis, we must have a further average reduction of 10 per cent. to be on a par with Great Britain, or a further average reduction of 36 2-3 per cent. to be on the same footing as the United States.

### Equal Contribution

"When the manufacturer and the jobber and the retail man contribute to deliver goods to the consumer and having done their bit by contributing their surplus profit, and the ultimate consumer still maintains the attitude that the price is still too high, only one factor remains, namely, wages, and if wages will not contribute, then production ceases until it does. Wages must conform to the new basis of commodity prices, not because we want it so, but from the very nature of things.

"When I use the word 'normal' I do not by any means mean to convey pre-war prices, because I feel that we could be a happier and more prosperous community if wages received their better share of reward than in the old pre-war days, and I am inclined to think that wages will.

### Retailers' Attitude

"Recently the Financial Post sent out a questionnaire to the bank managers from coast to coast on which were six questions, and one of the most important questions included was: 'Is the retailer reducing prices as far as conditions warrant?' Two hundred and sixty-eight centres reported that retailers were NOT making price reductions warranted by conditions; thirty centres repofted doubtful replies, and two hundred and fifteen reported Yes. The genuineness of sales being held in many places was seriously questioned by the bank managers, who pointed out that the retail trade does NOT feel disposed to take its losses.

### Dull Seasons

"Dull seasons call for economies and it is always good business practice to keep your assets liquid. Cash on hand is more useful than shelves full of stagnant stock bought at prices the public will not meet. Ready money makes it possible to purchase new fresh goods at present values and puts the merchant on an up-to-date selling basis. It is sometimes better strategy in taking a loss than by sitting tight and playing a waiting game. A strategic loss nowadays seems to be essential to a most effective offensive. The manufacturers and jobbers have taken theirs—WHY NO YOU?

"All elements in our national make-u seem to be willing to go down the bum the-bumps but labor, and it seems t prefer to simply look on as a bystande and watch the sport.

"We are all anxious to get back t normal, but can we do so until ever factor contributes, and normal wages an profits are resumed?

"Nobody knows whether prices are g ing down to pre-war levels or not. does not now seem probable that the will in view of the difficulty of deflatin wages; but one man's guess is as goo as another, so all we can do is 'hope Not the hope that sits idly and waits i uncertainty, but the hope that works an makes dreams come true. Normal time will return when the minds of men be come normal.

### Well, Here's a Slogan

"In the meantime, let us adopt th new Canadian slogan—'Let us throw th hooks into our job instead of into eac others.'"

The various processes in the produc tion of iron from the ore, showing th relation of labor, were described a follows:

First—Steam shovel from mines an tools or burden.

Second—Railroad to upper lake por and burden ore.

Third—Dock organization—loading in to boats—burden.

Fourth—Lake transportation—burder

Fifth—Unloading at Lake Erie port burden.

Sixth—Railway transportation to fur nace—burden.

Seventh—Blasting ore into pig—bur den.

Eighth—Rolling mill—pig iron int bars—burden.

Ninth—Manufacturing bars into tools etc.

Note—It takes four tons of iron or besides limestone and coke to make on ton of steel. Three tons ore plus all it burden are waste.

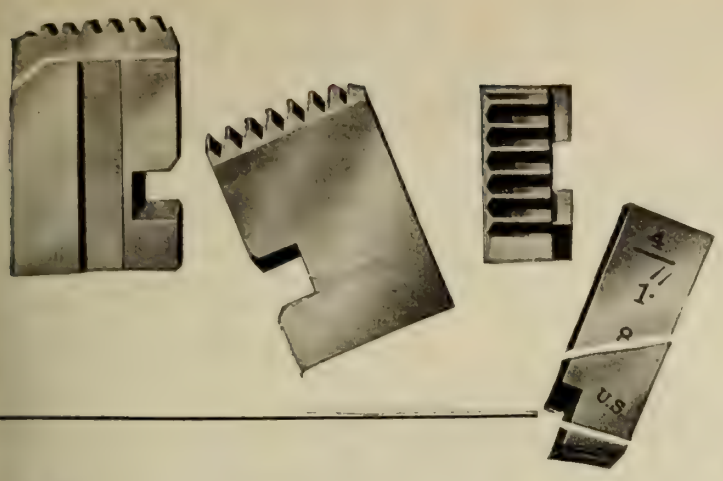
## WELL, HERE'S A SLOGAN FOR 1921

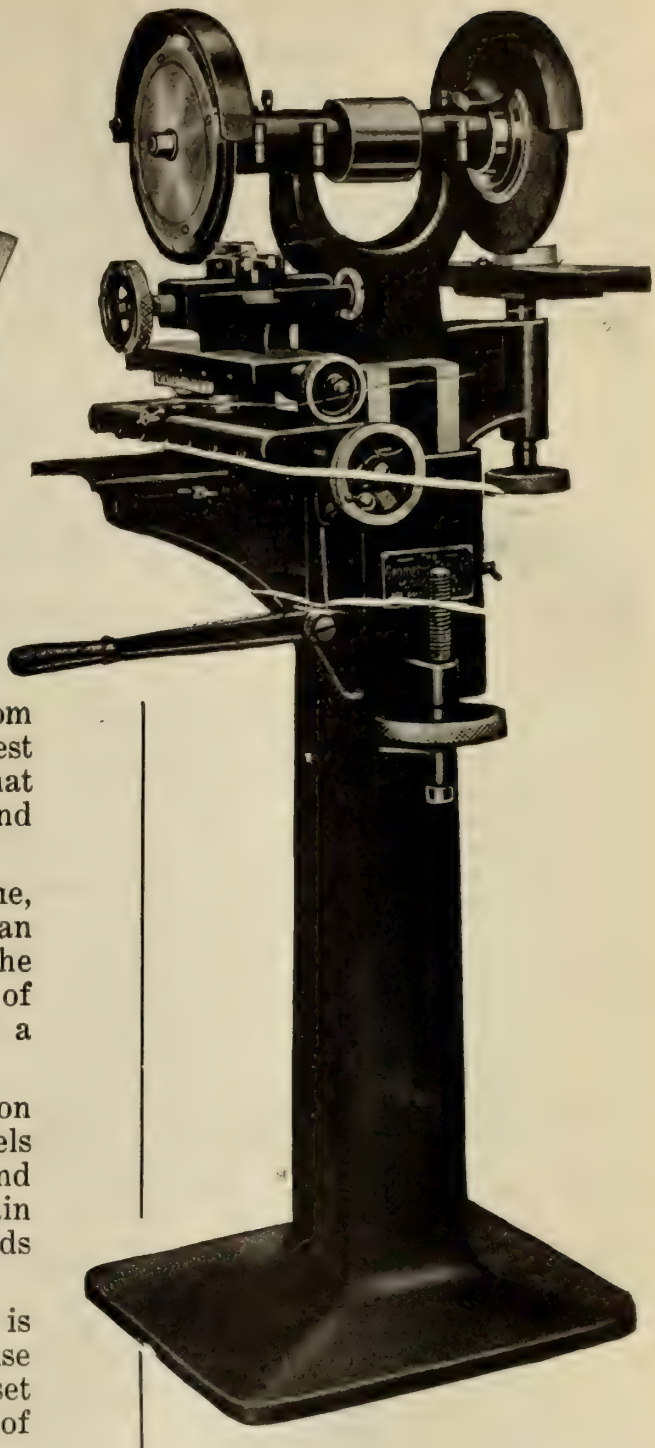
A LOT of people are spending good time right now standing around in a sort of business circle, wondering when the other chap is going to come down—wondering if some competitor is going to come along and cut the ground from under his feet—wondering if things are going to get much worse before they start to get better—wondering if they can throw the harpoon into some competitor who looks as though he were getting ready to make a start.

Well, in this address Mr. McCormick hands out a pretty good cure for this sort of business dizziness and industrial liver complaint. Short, but pithy, here it is:—

"Let us throw the hooks into our jobs instead of into each other."

Pretty fair, isn't it? We don't know whether it came out of the Welland shop, whether it has been heat-treated or quenched, but it has quite a little sermon in it just the same.





# Sharp Chasers Cut Clean Threads

Accurate, uniform threads result only from chasers which are maintained in the highest state of cutting efficiency. This means that chasers must be kept sharp, and ground uniformly.

Even if just touched up from time to time, the chasers respond splendidly, with clean threads. And with this machine — the Geometric Chaser Grinder—the matter of keeping threading tools up to scratch is a comparatively simple matter.

Various makes of chasers can be ground on this adaptable machine. The two wheels permit the easy grinding of both milled and tapped chasers. In addition, the plain wheel lends itself readily to various kinds of tool grinding.

Uniform grinding of a set of chasers is purely a mechanical matter through the use of adjustments which can be accurately set to govern the grinding of an entire set of chasers.

***The Catalogue describing this machine is a mine of information on chaser grinding. Write for it.***

## THE GEOMETRIC TOOL COMPANY

**NEW HAVEN, CONNECTICUT**

*Canadian Agents:*

Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Toronto, Winnipeg, St. John, N.B., Halifax, N.S.

*If interested tear out this page and place with letters to be answered.*

# SELECTED MARKET QUOTATIONS

**Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.**

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $32 46 |
| Lake Superior, charcoal, Chicago. | 40 50 |
| Standard low phos., Philadelphia. | 33 25 |
| Bessemer, Pittsburgh | 33 96 |
| Basic, Valley furnace | 30 00 |
| Toronto price:— | |
| Silicon, 2.25% to 2.75% | 39 25 |

## IRON AND STEEL

| Per lb. to Large Buyers | Cents |
|---|---|
| Iron bars, base, Toronto | $ 4 50 |
| Steel bars, base, Toronto | 4 50 |
| Iron bars, base, Montreal | 4 25 |
| Steel bars, base, Montreal | 4 25 |
| Reinforcing bars, base | 4 50 |
| Steel hoops | 6 00 |
| Tire steel | 5 00 |
| Spring steel | 8 00 |
| Band steel, No. 10 gauge and 3-16 in. base | 5 50 |
| Chequered floor plate 3-16 aud heavier | 7 50 |
| Bessemer rails, heavy, at mill | 2 35 |
| Steel bars, Pittsburgh | 3 00-4 00 |
| Tank plates, Pittsburgh | 3 50 |
| Structural shapes, Pittsburgh | 2 45 |
| Steel hoops, Pittsburgh | 3 05 |
| F.O.B., Toronto Warehouse | |
| Small shapes | 5 00 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 3 48 |
| Structural shapes | 3 58 |
| Plates | 3 78 |
| Small shapes under 3-in. | 3 48 |

## FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

| | C.L. | L.C.L. |
|---|---|---|
| Montreal | 58½ | 73 |
| St. John, N.B. | 84½ | 106½ |
| Halifax | 86 | 108 |
| Toronto | 38 | 54 |
| Guelph | 38 | 54 |
| London | 38 | 54 |
| Windsor | 35 | 50½ |

## METALS

| | Gross. Montreal | Toronto |
|---|---|---|
| Lake copper | $18 50 | $17 50 |
| Electric copper | 18 00 | 17 50 |
| Castings, copper | 17 75 | 18 00 |
| Tin | 39 00 | 40 00 |
| Spelter | 7 75 | 7 50 |
| Lead | 6 75 | 7 50 |
| Antimony | 8 00 | 8 25 |
| Aluminum | 34 50 | 30 00 |

Prices per 100 lbs.

## PLATES

| | | |
|---|---|---|
| Plates, 3-16 in. | $ 5 25 | $ 5 50 |
| Plates, ¼ up | 4 75 | 5 50 |

## PIPE—WROUGHT

Standard Buttweld Pipe

Per 100 Ft.

| | Steel Blk. | Steel Galv. | Gen. Wrought Iron Blk. | Gen. Wrought Iron Galv. |
|---|---|---|---|---|
| ⅛ | $ 6 50 | $ 8 50 | $..... | $..... |
| ¼ | 5 31 | 7 41 | 5 91 | 8 01 |
| ⅜ | 5 31 | 7 41 | 5 91 | 8 01 |
| ½ | 7 10 | 8 63 | 7 95 | 9 48 |
| ¾ | 8 80 | 10 87 | 9 95 | 12 02 |
| 1 | 13 01 | 16 07 | 14 71 | 17 77 |
| 1¼ | 17 60 | 21 74 | 19 90 | 24 04 |
| 1½ | 21 04 | 25 99 | 23 79 | 27 84 |
| 2 | 28 31 | 34 97 | 32 01 | 38 67 |
| 2½ | 44 75 | 55 28 | .... | .... |
| 3 | 58 52 | 72 29 | .... | .... |
| 3½ | 74 06 | 90 62 | .... | .... |
| 4 | 87 75 | 107 37 | .... | .... |

Standard Lapweld Pipe

Per 100 Ft.

| | Steel Blk. | Steel Galv. | Gen. Wrought Iron Blk. | Gen. Wrought Iron Galv. |
|---|---|---|---|---|
| 2 | $32 01 | $ 38 67 | $35 71 | $42 37 |
| 2½ | 48 26 | 58 79 | 54 11 | 64 64 |
| 3 | 63 11 | 76 88 | 70 76 | 84 53 |
| 3½ | 75 90 | 92 46 | 85 10 | 101 66 |
| 4 | 89 93 | 107 55 | 100 83 | 120 45 |
| 4½ | 1 05 | 1 29 | 1 30 | 1 54 |
| 5 | 1 22 | 1 50 | 1 52 | 1 80 |
| 6 | 1 58 | 1 95 | 1 97 | 2 33 |
| 7 | 2 06 | 2 53 | 2 53 | 3 01 |
| 8L | 2 16 | 2 66 | 2 66 | 3 16 |
| 8 | 2 49 | 3 07 | 3 07 | 3 64 |
| 9 | 2 98 | 3 67 | 3 67 | 4 36 |
| 10L | 2 77 | 3 41 | 3 41 | 4 05 |
| 10 | 3 56 | 4 39 | 4 39 | 5 21 |

Prices—Ontario, Quebec and Maritime Provinces

## WROUGHT NIPPLES

4-in. and under, 50 per cent.

4½-in. and larger, 40 per cent.

4-in. and under, running thread, 20%.

Standard couplings, 4-in. and under, 20%

Dd., 4½-in. and larger, net.

## OLD MATERIAL

Dealers' Average Buying Prices

Per 100 Pounds.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $10 50 | $ 9 00 |
| Copper, crucible | 13 00 | 11 00 |
| Copper, heavy | 12 00 | 11 00 |
| Copper wire | 12 00 | 11 00 |
| No. 1 machine composition | 13 00 | 9 75 |
| New brass cuttings | 7 00 | 8 00 |
| Red brass turnings | 8 00 | 8 00 |
| Yellow brass turnings | 7 00 | 6 00 |
| Light brass | 5 00 | 5 00 |
| Medium brass | 6 50 | 6 00 |
| Scrap zinc | 5 00 | 4 00 |
| Heavy lead | 4 50 | 4 00 |
| Tea lead | 2 50 | 2 00 |
| Aluminum | 15 00 | 10 00 |

| | Per Ton | Gross |
|---|---|---|
| Boiler plate | $11 00 | $12 00 |
| Heavy melting steel | 15 00 | 14 00 |
| Axles (wrought iron) | 25 00 | 20 00 |
| Rails (scrap) | 15 00 | 14 00 |
| Malleable scrap | 20 00 | 20 00 |
| No. 1 machine cast iron | 30 00 | 25 00 |
| Pipe, wrought | 8 50 | 8 00 |
| Car wheel | 30 00 | 25 00 |
| Steel axles | 20 00 | 18 00 |
| Mach. shop turnings | 8 00 | 6 00 |
| Stove plate | 23 00 | 20 00 |
| Cast boring | 8 00 | 7 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, 7-16 and up | Net list |
| Carriage bolts, ⅜" and less | 15 |
| Coach and lag screws | —20 |
| Stove bolts | 55 |
| Wrought washers | —25 |
| Elevator bolts | Net |
| Machine bolts, 7-16 and over | —5 |
| Machine bolts, ⅜-in. and less | —30 |
| Blank bolts | Net |
| Bolt ends | —5 |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | +25 |
| Machine screws, fl. and rd. hd., brass | Net |
| Machine screws, o. and fil. hd., brass | Net |
| Nuts, square, blank | +25 add $2 00 |
| Nuts, square, tapped | add 2 25 |
| Nuts, hex., blank | add 2 25 |
| Nuts, hex., tapped | add 2 75 |
| Copper rivets and burrs, list less. | 27½ |
| Burrs only, list plus | 10 |
| Iron rivets and burrs | 37½ and 5 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, bright | 67½ |
| Wood screws, flat, brass | 55 |
| Wood screws, O. & R., brass | 55½ |
| Wood screws, flat, bronze | 50 |
| Wood screws, O. & R., bronze | 47½ |

## MILLED PRODUCTS

(Prices on unbroken packages)

| | Per Cent |
|---|---|
| Set screws | Less 40% |
| Square and hexagon head cap screws | Less 30% |
| Round head cap screws | Plus 10% |
| Fillister head cap screws | Less 10% |
| Flat head cap screws | Net list |
| Button head cap screws | Plus 10% |
| Studs | Less 20% |
| Semi-finished nuts up to and including 1-in. | Less 35% |
| Semi-finished nuts 1⅛ to 1½" | Less 30% |
| Semi-finished nuts 1⅝ to 2 in. | Net list |
| Coupling bolts | Plus 10% |
| Taper pins | Less 40% |
| Planer bolts without fillet | Plus 40% |
| Planer bolts with fillet | Pus 50% |
| Patch bolts | Plus 80% |
| Hollow set screws | Plus 20% |
| Thumb screws | Less 35% |
| Thumb nuts | Less 65% |

## BILLETS

F.O.B. Pittsburgh.

| | Per gross ton |
|---|---|
| Bessemer billets | $43 50 |
| Open-hearth billets | 43 50 |
| O.H. sheet bars | 47 00 |
| Forging billets | 48 50 |
| Wire rods | 57 00 |

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails, base | $5 10 |
| Cut nails, base | 5 75 |
| Miscellaneous wire nails | 50% |

## ROPE AND PACKING

| | |
|---|---|
| Plumbers' oakum, per lb. | 0 10¼ |
| Packing, square braided | 0 38 |
| Packing, No. 1 Italian | 0 44 |
| Packing, No. 2 Italian | 0 36 |
| Pure Manila rope | 0 26 |
| British Manila rope | 0 20 |
| New Zealand hemp | 0 20 |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | Net |

# STEEL & IRON PRODUCTS

Quality Service

## OF EVERY DESCRIPTION

## HAMILTON PIG IRON

Basic Malleable Foundry

## STEEL AND IRON BARS

## OPEN HEARTH STEEL SHEETS

## RAILROAD TRACK MATERIAL

Angle Bars Track Bolts Tie Plates Tie Rods Spikes

| SCREWS | WIRE | NAILS |
|---|---|---|
| Steel | Steel and Brass, Copper and | Wire |
| Brass | Bronze, Heavy and Fine, | Cut |
| Bronze | Bright, Annealed, Coppered, | Boat |
| Wood and | Galvanized, Tinned, Stranded, | Horseshoe |
| Machine | Steel and Copper Cable, | Shoe Nails |
| Screws | Barb, Woven Clothes Line | Tacks |

## POLE LINE HARDWARE

Pole Steps Cross Arm Braces Guy Clamps Guy Rods

| WROUGHT PIPE | FORGINGS | LEAD PRODUCTS |
|---|---|---|
| Black Pipe | Car Axles | Lead Pipe |
| Galvanized Pipe | Shape and Drop Forgings | White Lead |
| Nipples | Carriage and Automobile | Shot |
| Couplings | Hardware | Putty |

BLOOMS
BILLETS
PLOW BEAMS
ANGLES
CHANNELS

THE
## STEEL COMPANY
OF
## CANADA
LIMITED

HAMILTON MONTREAL

WIRE RODS
HORSE SHOES
FENCING
RIVETS
BURRS

*If interested tear out this page and place with letters to be answered.*

# Shorter Work Day Means *Less Production*

## Results of a Practical Test With a Work Week of 48 Hours or Less—In Some Industries Automatics Determine the Rate of Production in the Factory

AN important statement has just been released by the National Industrial Conference Board, New York, regarding the effect of the shorter work-day on production. Anything given out by this organization can be accepted in a spirit of fairness by either employer or employee, as their object is at all times to have facts available for the better understanding of any situation. The report states:

An extensive investigation of practical experience of manufacturers who, since the beginning of 1919, have reduced their weekly working schedule to 48 hours or less has shown that in a great majority of cases the reduction of hours was accompanied by a decrease in weekly output per worker, according to a report issued to-day by the National Industrial Conference Board.

### Took in 436 Plants

This investigation, which is of timely interest because of the importance of the hours-of-work problem arising out of present industrial conditions, covered the collective experience of 436 manufacturing establishments employing together 373,536 workers, including establishments in the cotton, wool, silk, boot and shoe, metal, and a group of miscellaneous manufacturing industries, and ranging in size from very small plants employing only a few workers to extremely large ones with many thousands of employees. Most of the plants in the textile and boot and shoe industries were located in the East, but those in the metal and miscellaneous industries represent practically all the large manufacturing centers in the country.

In 87.2 per cent. of the establishments studied a reduction to a work week of 48 hours or less was accompanied by a decrease in weekly output per worker. In 8.7 per cent. of the plants the workers were able to maintain weekly production per worker, and in a very few cases (4.1 per cent.) weekly output per worker was increased.

In somewhat more than two-fifths of the establishments which noted a falling off in weekly production, the decrease was approximately in proportion to the reduction in hours. In about one-fifth of the establishments showing reduced weekly production, the loss in weekly output was less than proportional to the reduction in hours, and in approximately a sixth of the establishments which decreased weekly production, the decrease was greater than proportional to the reduction in hours.

It was found, the report says, that the character of the work, that is, whether the process was largely handwork or machine work, for the most part determined whether or not it was possible to increase hourly output. In those industries, such as cotton manufacturing, where highly automatic machine processes predominated, the output was limited almost entirely by the speed of the machine. In those industries, however, where hand-work predominated, or where the skill and speed of the worker in handling machines were the controlling factors—such as in the boot and shoe industry, or in certain kinds of metal manufacturing—it was possible to increase the hourly output of the workers, in some cases to the extent of entirely compensating for the loss in work time and even exceeding the previous weekly production.

Other factors which were found in the investigation to largely affect production under the reduced working schedule were the general attitude and characteristics of the working force, the supply of skilled labor, regularity in attendance, changes in the personnel of the management or the introduction of improved methods of management or the installation of different or improved machines, all of which accounted in some instances for marked increases in output.

As a rule it was not found that increases in wage rates had any effect upon the efficiency of workers, but in almost every case where a change in output was noted the pieceworkers were more successful in maintaining output than were day workers, and a bonus system in some cases proved an incentive to increased production. It was not found in this investigation that the size of the establishment in itself had any apparent relation to the ability of a plant to maintain output.

With regard to experience in various industries it was found that in cotton manufacturing all the establishments investigated experienced a decrease in weekly output under the reduced hours. In wool manufacturing only one establishment out of 60 was able to maintain weekly output, and in silk manufacturing only one out of the 23 plants studied. In boot and shoe manufacturing, out of the 88 plants covered, it was found that three were able to increase weekly output and 13 to maintain it, while in the metal manufacturing industries, out of 117 plants investigated, nine reported that their weekly output had been increased and 16 that they had been able to maintain weekly production.

## FIRMS WANT TO SELL OUR GOODS

### Two Glasgow Houses Are Interested in Handling Canadian Lines

Information regarding the following lines can be obtained by communicating with this paper and mentioning key numbers:

2730. **Concrete machinery.** — Glasgow firm asks to be placed in touch with manufacturers of concrete machinery, including block-making bricks and slabs, and concrete mixers. Cement equal to British standard requirements.

2731. **Iron and steel products** and engineering specialties.—A Glasgow firm wishes to hear from Canadian manufacturers of iron and steel products and engineering specialties.

### SEMI-AUTOMATIC TAPPING MACHINE

A semi-automatic multiple-spindle tapping machine has been developed by the Langelier Manufacturing Company, of Arlington, R.I., which is quite similar to designs previously brought out by this firm. The main spindle is driven by means of a motor located beneath the machine, and by means of belting and gears. The spindles in the multiple head are crank driven and are secured with fixed centres in bronze bearings. The tapping heads are made interchangeable so that different layouts may be obtained. A feature of the machine is the arrangement of the spindle so that taps of different pitch may be used on the different spindles, each tap following its own lead. The work is carried on a table that is raised automatically at the same speed as that of the tap entering the work. The machine is stopped automatically when the tap has entered the desired distance.

The coal mining industry promises to become the most important enterprise of the island of Formosa. Production has risen from less than 350,000 tons in 1914 to over 1,000,000 tons in 1919, and it is estimated that by next year the mines will be close to a 2,000,000-ton basis. In 1919, exports, principally to Hong Kong, Philippine Islands, Shanghai, and Singapore, accounted for approximately 480,000 tons; bunker sales were 100,000 tons; while Formosan consumption was estimated at 570,000 tons. The total coal deposits of Formosa are variously estimated at figures between 691,840,000 tons and 850,000,000 tons. Production could be greatly increased, and an output of as much as 5,000,000 tons per annum is easy of attainment, were it not for defective harbor and transport facilities.

# GARLOCK WALKER

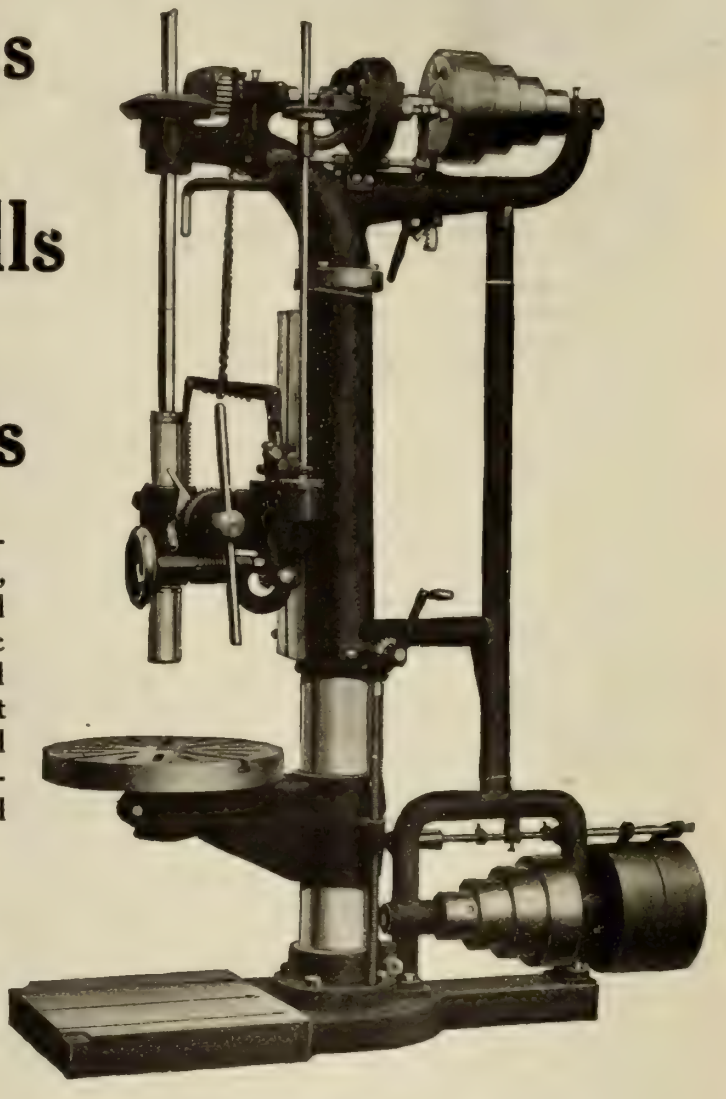
HIGH GRADE MACHINE TOOLS

## Drill Presses

## Portable Electric Drills

## High Speed Twist Drills

We carry a complete line of Sensitive Drills, Stationary Head Drills, Back Geared Drills, Sliding Head All Geared Radial Drills, Electric Portable Drills, and High Speed Twist Drills, with taper or straight shanks—all high-class tools and warranted to give satisfactory service. Enquiries promptly attended to.








*IN STOCK—READY TO SHIP*

## Garlock-Walker Machinery Co., Limited

32 Front St. West TORONTO Telephone Main 5346

MONTREAL and WINNIPEG


*If interested tear out this page and place with letters to be answered.*



# INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES



## BALDWINS INTEND TO MAKE THEIR OWN STEEL BARS AT TORONTO PLANT

LONDON, England.—The ever-growthe meetings of the boards of the manufacturing corporations in the industrial development of Canada is again demonstrated in a recent statement made by Sir John Roper Wright, Bart., chairman of Baldwins, Limited, the big English firm of engineers.

Addressing the shareholders at Birmingham Sir John said that he was pleased to be able to say that Baldwins' enterprise in Canada was proceeding satisfactorily, and had now reached the manufacturing stage. They had held, as was well known, a very valuable and long-established connection in Canada for their various products, and in order to retain that they found it necessary, owing to the ever-increasing American competition in that market, to consider means of combating it. Therefore, when it was brought to their notice by their agents in Canada that the site and plant of the British Forgings, Limited, at Ashbridge's Bay, Toronto, was for disposal they decided after careful consideration and investigation to enter into negotiation for the purchase, which was completed at the end of May, 1919.

The works as then existed comprised, in addition, to machine and pattern shops, etc., a most modern and well-equipped foundry which proved of great assistance to them in the manufacture of various castings required during construction of the rolling mills. They have also a battery of ten electric furnaces, some of which are being utilized for the manufacture of steel castings.

### Will Have Sixteen Mills

"Four out of the eight mills we have put down are engaged in the manufacture of black and tin plates and galvanized sheets," Sir John Roper Wright said, "the other four are now ready. We have the foundations laid for another eight mills, and the finishing departments are already fully equipped to deal with the output of sixteen mills. We are not yet producing our own steel bars, but it is our intention to do so eventually. We have made a very promising start, and can now confidently look forward to not only retaining, but considerably expanding our trading operations in Canada."

The establishment in the Dominion of Baldwins, with a working capital of £8,000,000 sterling, and a world-known name, is fraught with gratifying possibilities for the expansion of Canadian trade. Other British concerns of outstanding importance are watching with interest the progress of the British firms who have acquired interests in Canadian industry with a view to following their example, and undoubtedly the placing of British capital in existing Canadian manufacturing plants or the actual establishment of branch factories will become in the near future a prominent factor in the industrial expansion of the Dominion.

## ON LONG TRIP FOR HIS COMPANY

**T. A. Ross, of Armstrong-Whitworth, Has Been Spending Few Weeks in Canada**

T. A. Ross, of Armstrong-Whitworth Co., Elswick, Eng., has been in Eastern Canada for several weeks, leaving a day or so ago for Vancouver, on the way to New Zealand. His firm is interested in large installations there, and also in Australia, and Mr. Ross expects to spend some time there before leaving for other points. He will call at various points in New Guinea, China, India, Malta and other places before returning to the old country, expecting in all to be away for at least two years and to cover 20,000 miles yet before reaching home.

Speaking to a representative of Canadian Machinery Mr. Ross stated that industrial conditions in England were still in the process of changing from war conditions to peace, and that it might take a little time yet for labor to become accustomed to the new rates it would be possible to pay under the changed conditions. He was quite certain, though, that under all the trouble that appeared on the surface, conditions were solid and good and would work out all right.

---

A special train was run to Sault Ste. Marie on February 21, taking expert medical aid to Charles E. Duncan, superintendent of the Algoma Steel Corporation. Mr. Duncan is suffering from an attack of acute appendicitis.

## MERGER THROUGH IN SMALLER SHAPE

**British Empire Steel Corporation Takes on Form in New Arrangement**

MONTREAL.—At the conclusion of ing participation of leading British Dominion Steel Corporation and the Nova Scotia Steel & Coal Companies, it was officially announced that directors of these companies had arrived at an agreement for the consolidation of the Dominion Steel Corporation, Ltd., the Nova Scotia Steel & Coal Co. and the Halifax Shipyards, Ltd., under the name of the British Empire Steel Corporation, Ltd.

The agreements are subject to the underwriting of certain securities, upon the completion of which the boards of the companies will again meet for the purpose of approving the underwriting and fixing the date when the agreements will be laid before the shareholders of the interested companies for their approval.

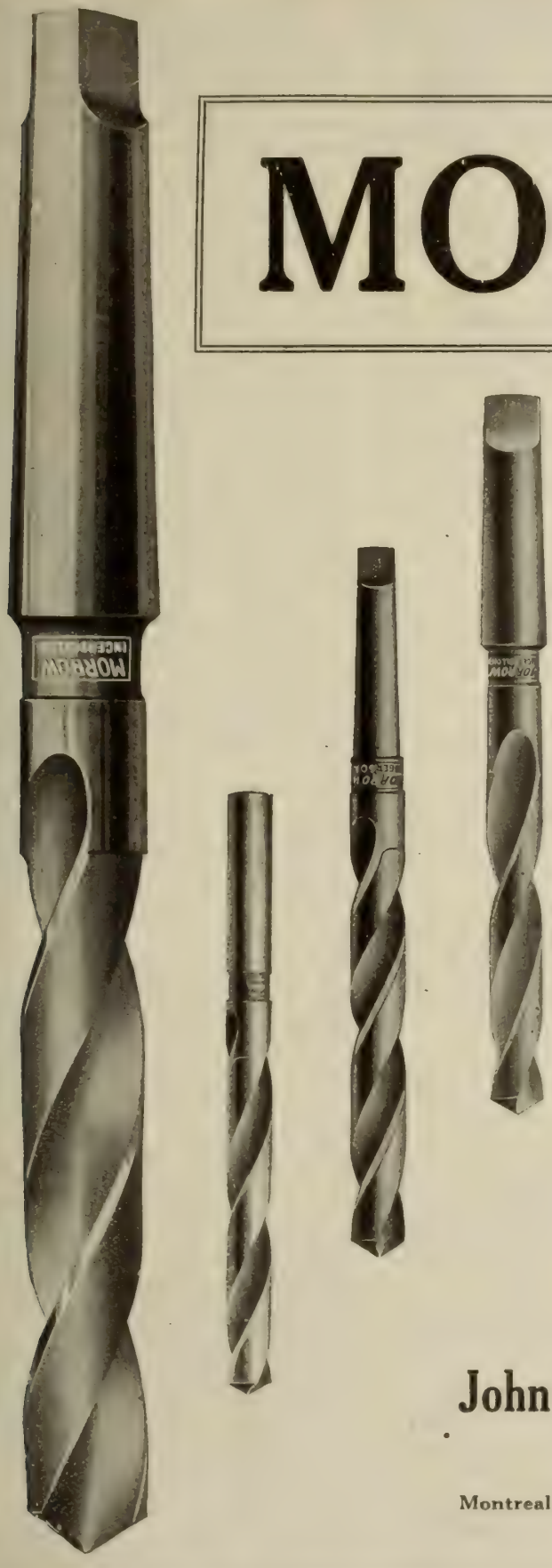
No indication of what the amount to be underwritten will be is given, or in what form it will be, so that the next meeting of the directors for its approval is a matter of conjecture.

The amalgamation of the Dominion Steel Corporation and the Nova Scotia Steel & Coal Company has been considered by some a logical proposition, owing to the situations and workings of the two industries. The inclusion of the Halifax Shipyards will come as a surprise to some, but not to others. The Canada Steamship Lines have not been mentioned, although a cable from London states that in an interview with Col. Grant Morden the latter says the steamship company will closely co-operate.

Any appendage to the amalgamation of the two big steel concerns will be a source of disappointment to many in the street here, who had hoped that the two enterprises would work alone, their merging having been advocated for years.

---

Possibly the greatest feat in the history of the telephone took place a few days ago when a man in Ottawa called up a friend in Vancouver. The call was routed via Montreal, New York, Chicago, San Francisco and Vancouver, which is a distance of about 4,500 miles. This has been made possible as the result of the scientific research of the past quarter century.



# MORROW

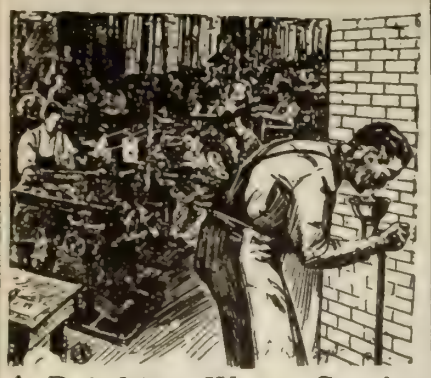
The Drills that Make More Holes with Less Regrinding

*Largest and Best Equipped Plant in the Dominion Manufacturing Set and Cap Screws, Engine Studs, Nuts, Files and Rasps*

**John Morrow Screw & Nut Co., Ltd.**

INGERSOLL, CANADA

7 Hop Exchange, Southwark St., London, England
Montreal, 489 St. Paul St. West Winnipeg, Confederation Life Building
Vancouver, 1290 Homer St.



**A Drinking Water Service that will last a LIFETIME**

What you pay for a few ordinary drinking cups will meet the cost of the

**PURO** **SANITARY DRINKING FOUNTAIN**

**(MADE IN CANADA)**

DRINKING CUPS ARE UNSANITARY but the "Puro" delivers clean, fresh water at a reduction of 15 per cent. to 35 per cent. in water bill.

"PURO" WILL SAFEGUARD THE HEALTH OF YOUR EMPLOYEES and protect your staff against disorganization by sickness.

Easily attached. Simply unscrew the ordinary faucet and put on the "Puro."

Write us to-day for full information regarding the cost of installation of the "PURO" Sanitary Drinking Fountain Service.

**Puro Sanitary Drinking Fountain Co.**

*Canadian Agents:*

**McKENZIE BROS.**

**888 F. St. Andre St., Montreal, P.Q., Canada**




### INTERESTING CATALOGUE

The Mason Regulator and Engineering Co., Ltd., Montreal, P.Q., have issued a new catalogue of their products. Every means of condensing the information has been adopted and the data have been made short and concise as possible. In other words it is a condensed catalogue. Should a reader of the book desire further information he is told how to secure it from the larger specialized catalogues published by this firm.

## Engineering

Tenders will be opened on March 1 for the erection of the proposed new palatial hotel at Windsor, Ont., for the Border Cities Hotel Company.

W. Davidson & Co., 188 Duke Street, Toronto, have received the general contract for repairs to factory for Burgess Mfg. Co., 35 Brant Street, Toronto.

A factory will be erected at Welland, Ont., by the British-American Drug Co., Ltd., which recently incorporated under a provincial charter with a capital of $300,000.

Tenders will be called in March for the erection of factory, estimated to cost $25,000, for British Columbia Impermeaite Co., Ltd., Seventh Avenue West, Vancouver.

The Baltimore Drydocks & Shipbuilding Co., Baltimore, on February 17 cut the wages of 3,000 of their 4,000 employees. The cut amounted to approximately 10 per cent.

The F. R. Dingwall Co., Winnipeg, Man., are erecting a warehouse on Albert Street. Carter-Halls-Aldinger Co., Ltd., Union Bank Bldg., have secured the general contract.

Tenders are expected to be called shortly for the erection of hotel, theatre and stores, estimated to cost $125,000, for the Peninsula Hotel and Amusement Co., Ltd., St. Catharines, Ont.

John Hayman & Sons, 432 Wellington Street, London, Ont., have received the general contract for erecting an addition to factory costing $35,000 for E. Leonard & Sons, York Street.

Plans have been prepared by F. S. Mallory, architect, 164 Bay Street, Toronto, for warehouse to cost $14,000 and addition to garage, $3,000, for Lake Simcoe Ice Co., corner Jarvis and King Streets.

## Incorporations

Graveline and Kennedy, Ltd., has been incorporated with capital stock of $150,000 with head office at Quebec City, to carry on the business of wholesale and retail importers and exporters of sporting goods generally—bicycles, motorcycles, automobiles, etc.

Brydges Limited, with capital stock of $100,000, head office at Montreal, has been granted incorporation to carry on business of iron masters and of manufacturers and rollers of steels and iron, into any and all forms.

Sumbling Machinery Co., Ltd., with capital stock of $1,000,000, has been incorporated with head office at Toronto, to carry on the business of manufacturing, buying, selling, repairing, etc., of washing machines, ironers, and all kinds of laundry and other machinery.

## Trade Gossip

**Big Season's Work.**—It was announced on February 19, by Mayor Church, after a conference with Finance Commissioner Ross and Chief Engineer Cousins of the Harbor Commission, that they hoped to do between two and three million dollars worth of work on the Toronto Harbor during the coming season.

**Change in Business.**—Announcement is made to the effect that the Cincinnati Milling Machine Company has become financially interested in the Cincinnati Grinder Company. It is purposed to manufacture the latter company's line of universal and plain cylindrical grinding machines and internal grinding machines in the plant of the Cincinnati Milling Machine Company. The latter company has recently made extensive plant additions.

**Gravity Carrier Company.**—At a meeting of the shareholders of the Matthews Gravity Carrier Company at Port Hope, it was shown that the past year had been a satisfactory one, and that prospects for the future were good. Mr. F. P. Moore, of Ellwood City, Pa., occupied the chair. The following officers were elected: President, F. B. Moore; vice-president, O. C. Sylvester; treasurer and managing director, L. O. Sylvester; secretary, A. Richly.

**A New Section.**—A new section of the Montreal branch of the Canadian Manufacturers' Association to be known as the "Steel and Iron" section has been organized. It is stated that there were over 150 firms in Montreal engaged in the manufacture of iron, steel or machinery and other metallic goods, and it is expected that this branch will eventually become one of the most important in the local organization. Steps are also being taken to organize other sections, including the dry goods, electrical apparatus, leather goods and foodstuffs trades.

**Run Open Shop.**—The Robert Mitchell Co., Ltd., 64 Belair St., Montreal, who have been making heavy castings in their foundry for the last five years, have made some new installations in their plant during the last year and are now operating on a new basis and specializing in a jobbing shop business in high-grade, light, soft iron castings. Amongst the improvements in their plant is the installation of seven Arcade air squeezers and an overhead trolley. A notable change in policy of this company towards their employees is the announcement that since the foundrymen's strike of May 1st last they have been operating on an open shop basis, replacing their former policy of the closed shop, which had always been in force in this plant.

## 27 NEW FIRMS IN HAMILTON IN 1920

**Report of Industrial Commissioner Shows That Progress Has Been Quite Marked**

Industrial Commissioner Kirkpatrick has presented his annual report to Hamilton Board of Control. New industries with capital of $7,440,000 were located during the year. The following is the list:—

Canadian Libbey-Owens Sheet Glass Co., sheet glass.
Electric Material & Products Co., electric lamps.
Peterson Core Oil Co., oils and chemicals.
Canadian Nathan Co., brass goods.
Maple Leaf Milling Co., flour and feed
W. D. Shambrook & Co., aluminum ware
Tresidder Bros., Ltd., paper boxes.
Canadian Sidecar Co., sidecars.
Sapon Soap Co., Ltd., soaps.
Mortimer & Richmond, soaps.
Malone & Morley, ice cream cones.
Canada Color Type Co., embossed enamelware.
Don-O-Lac Co. of Canada, shellacs.
Canadian Metlskin Co., boiler room supplies.
Hamilton Soap Co., soaps.
Candy Specialties, Ltd., candies.
Hamilton Pleating Co., pleated goods.
Motor-Meter Co., motometers.
Never Fail Products, sheet metal products.
Orange Crush Rolling Co., soft drinks.
Hamilton Aluminum Co., aluminum.
Spinning Mill for Canada Cottons, Ltd.
Wire Products Mill for Steel Co. of Canada.
Pocock Manufacturing Co., flat rods.
Taylor Brasco Co., Ltd., store fronts.
Imperial Oil Co., divisional headquarters
Canadian Line Material Co.

## SCRAP MARKET STILL VERY QUIET

**Dealers Claim They Can't Afford To Either Go In To Buy or Sell**

The scrap metal market remains where it has been for some weeks, in the dumps. The market for yellows appears to be very narrow. Estimates have it that there are 400,000,000 pounds of copper in the United States market just now, and this cannot possibly be marketed for a good many months to come.

Dealers are in the peculiar position of not being able to either buy or sell, claiming they can't afford it either way. The stock they are holding was, for the most part, taken in at a much higher price than could be secured for it today, hence they feel they cannot afford to sell. On the other hand, they are afraid of prices, although they are low, and for that reason claim they cannot afford to buy. So there the matter stands.

Many of the yards are not making expenses, in fact some of them are taking losses every day they are in business at the present.

## CANNOT CANCEL THE ORDER HERE

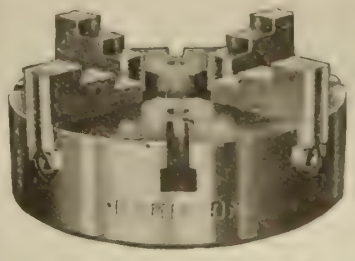
**Cutler-Hammer Mfg. Co., Announce a Reduction and State Their Policy**

Cutler-Hammer Mfg. Co., of Milwaukee, have sent out the following notice:—

"Please be advised that an approximate 10 per cent. reduction of all controller prices has been effected as of February 14th by a change in discounts.

"All orders received bearing date after February 14th will be shipped at the reduced price. All orders now in the house will be shipped at price in effect at time of receipt and will not be subject to cancellation."

The briquette plant at Bienfait, Sask., which is subsidized by the Manitoba, Saskatchewan and Federal Governments, will begin manufacturing briquettes early in May, it was announced. The buildings are completed and only a little additional machinery remains to be installed. Several tests will be made before the briquettes are placed on the market. The plant was built at a cost of $500,000.

DOMINION CHUCKS

STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY



All Screws Are Reversible

SCREWS are made of the best grade steel. Both ends are broached and are heat treated after machining. They are reversible, so that either end may be used, are large enough in diameter to stand the torsional strains applied by operator when setting up his work. They are made to give the best service—and may be depended upon to stand up under the hardest usage.

DOMINION STEEL PRODUCTS CO. LIMITED
*Engineers • Manufacturers*
BRANTFORD, CANADA

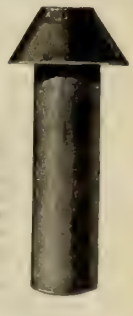
**DROP FORGE DIES**

Send us your blueprints and specifications. Entrust your requirements to experienced workmen and up-to-date equipment. Have your dies made in Canada. First-class workmanship guaranteed.

THE KIMBER & HILLIER MFG. CO.,
Thorold Road, - St. Catharines, Ont.



BOLTS AND RIVETS



We are equipped to fill the requirements of the Marine trade promptly. Square head, hexagon head and all kinds of Machine, Deck, Carriage Bolts and Rivets.

*QUALITY PRODUCTS*
LONDON BOLT & HINGE WORKS
LONDON, CANADA

HAMILTON ENGINEERING SERVICE
LIMITED

*Consulting and Designing* — Tools, Jigs, Fixtures and Special Machinery. Let us shoulder your problems.

17 MAIN ST. EAST, HAMILTON

# Classified Opportunities

## MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (etfm)

## AGENCIES WANTED

SOLE AGENCIES WANTED BY WELL-known, reputable and established English engineering firm, represented all over the world, for Contractors' or Municipalities' small Engineering equipment, which must be first-class, competitive in price, and in constant large demand. British made and patented preferred; if Colonial or Foreign privilege of manufacturing in England required. Big sales assured for the right Equipment. Write giving details to "Engineering," P.O. Box 1934, Montreal. (c8m)

## HELP WANTED

WANTED AS ASSISTANT EDITOR, ON group of technical papers, live-wire mechanical engineer. Qualifications required are: Age, under 45; good education; certain amount of practical experience; ability to express ideas on paper; good mixer and aggressive worker. Splendid opportunity for the right man. State full particulars in first letter, mentioning present salary. Box 152, Canadian Machinery.

## POSITIONS WANTED

YOUNG MAN, MARRIED, 35 YEARS, AMERIcan, technical and metallurgical training, tool room foreman, superintendent or manager. Position where opportunity assured. Combined shop and office experience. Box 55, Canadian Machinery, 128 Bleury St., Montreal. (c9m)

I WILL BE IN A POSITION WITHIN TWO weeks to accept charge of a drop forge, or machinery blacksmithing plant. Can design all types of bending and forming dies, and have had 30 years' experience in this class of work. Box 753, Canadian Machinery.

MECHANICAL ENGINEER WITH 16 YEARS' experience in mechanical shops and drawing offices, executive for the last 7 years, and 2 years' selling experience, is looking for responsible position with good manufacturing concern. Familiar with building construction, plant maintenance, fire protection, and efficiency principles. Age 35. Box 754, Canadian Machinery. (c9m)


PARTIAL LIST

**Machine Shop Equipment**

***At Extremely Low Prices***

LATHES—All sizes and lengths of bed. Special price quoted on rebuilt 20 in. x 8 ft. C.M.C.

AIR COMPRESSOR—8 in. x 8 in. Chicago Pneumatic.

TANKS—10 Tanks 10 ft. 6 in. diam. x 29 ft. 6 in. long. 19,000 gals.
3 Tanks, 10 ft. 0 in. diam. x 39 ft. 0 in. long, ⅜ in. Heads. 22,893 gals.
Full line of other Steel Storage Tanks, open and closed, all sizes.

PUMPS—1 Triplex Power Pump, 1½ in. x 6 in. Hydraulic Machy. Co. Also 1 in. x 5 in. West Tire Setter.
1—Centrifugal Pump, 2½ in. x 1½ in. Gould.
1—Gould Triplex Power Pump, 2 in. x 3 in.

Milling Cutters and Reamers, full assortment, all sizes and shapes, at less than half price. Send us your enquiries.

**Standard Equipment & Tool Works**

Dept. K. 307 St. James St.
Main 2286 MONTREAL
(20)


## PATTERNS

TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (ctfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)


**PATTERNS**

Wragge's Pattern Works, 10 George St. South, Galt, Ont., Phone 1105 W. Equipped for best service in wood or metal patterns to any specification. Most reasonable prices. Expert workmanship. "Nothing ragged but the name." (cxxvi3m)

**Modern Marine Machinery**

Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

**MACHINE WORK WANTED**

We are equipped to handle all kinds of general or special machine work. All operations in our plant are done under the most careful supervision and we can satisfy you as to price. Always available for consultation.

PERFECT MACHINE COMPANY, GALT
Builders of Reliable Machinery.

**Grey Iron Castings**

Light and Medium-Bench and Floor Repetition Castings; Capacity 15 tons per day.
Expert Metal and Wood Pattern Work. Our advice and estimates will save you money.
Semi-finishing operations on Lathe or Grill on Castings supplied if required.
ASK US.
THE KATIE FOUNDRY, GALT, ONT.

REGO
**WELDING**
*and*
**CUTTING APPARATUS**

Oxygen, Acetylene, and a complete line of Welding and Cutting Supplies.

**Carter Welding Co.**
of Toronto, Limited
7-11 Sheppard St., Toronto, Ont.
Phones: Adelaide 2841 and 1524
(TF)


## MACHINERY WANTED

WANTED—NEW AND RE-MANUFACTURED gas and gasoline engines, boilers, saw-mill machinery, planing mill and sash and door factory machinery. New and manufactured iron and wood-working machinery. Electric motors, dynamos, direct connected steam operated generators, portable electric tools. Builders' hoists, elevators. Box 739F, Canadian Machinery.

IF YOU HAVE IRON-WORKING OR WOODworking machines for sale, or idle machine shop equipment, call or write Canada's largest dealers in new and used machinery. H. W. Petrie Limited, Toronto, Ont. (cfm)

WANTED — WOODWORKING MACHINERY and mining machinery, machine tools, boilers and steam pumps, alternating or direct current motors. Contractors' equipment. Apply Box 737F, Canadian Machinery.

ONE SINGLE STAND 9 x 18 ROLL IN GOOD condition; one receiving separator, capacity about 1,000 bushels per hour. Crane Bros., 817 Ferry St., Niagara Falls, Ont.

WANTED—WOODWORKING MACHINERY OR woodworking plant. State particulars and price. Address Buyer, 749 Talbot St., St. Thomas, Ont.

## FOR SALE

2—ROTARY STEAM DRIERS—6′ DIAM. x 25′ long; complete.
2—ENDLESS DOUBLE LEATHER BELTS, 13″ x 50′ total length each.
1—8″ x 12″ DOUBLE DRUM BEATTY HOIST and boiler.
1—6″ x 12″ DOUBLE DRUM BEATTY HOIST and boiler.
2—AIR COMPRESSORS, 800 FT. CAPACITY; belted.
Box 752F, Canadian Machinery.

**IN WRITING ADVERTISERS, PLEASE MENTION THIS PAPER.**


**CANADIAN MACHINE SHOP**

—

Will handle medium Specialty Line — Manufacturing and Selling

—

**Apply Quickly**

**Box No. 715F**
**CANADIAN MACHINERY**

# Classified Opportunities


MACGOVERN & COMPANY TRI-LOCK CRATED POWER MACHINERY

## SYNCHRONOUS MOTORS
### AVAILABLE IN CANADA
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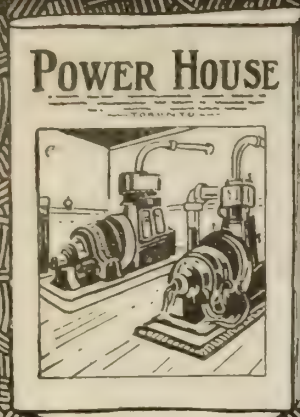
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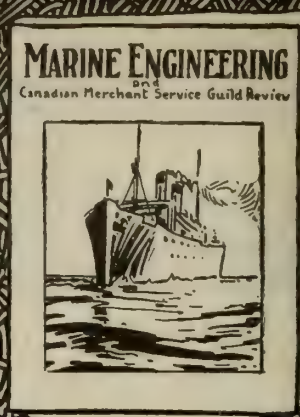
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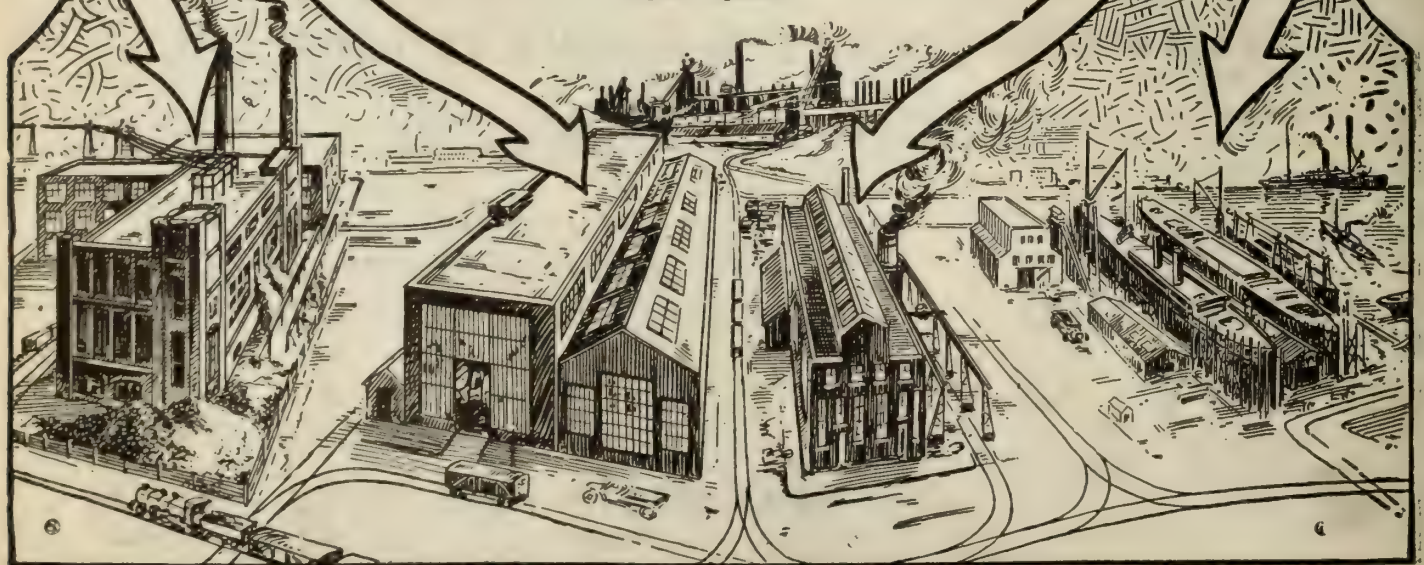
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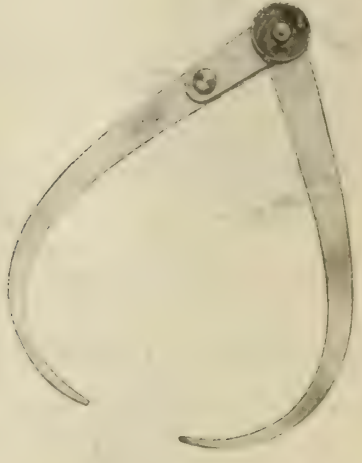
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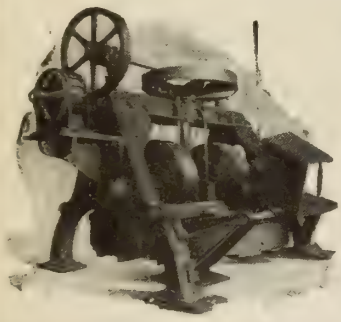
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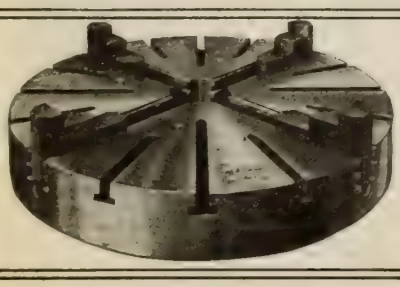
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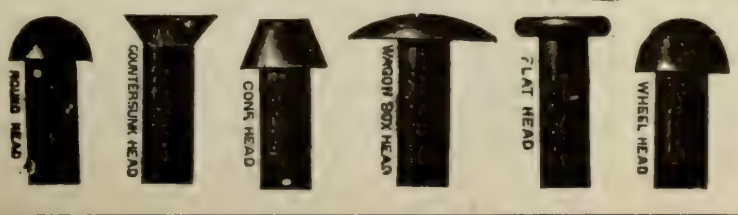
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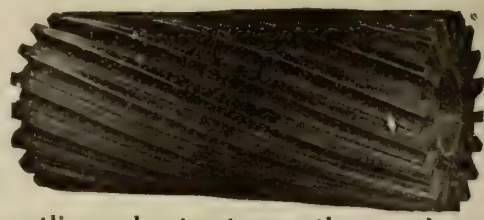
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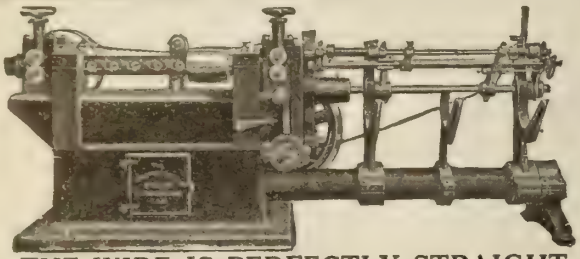
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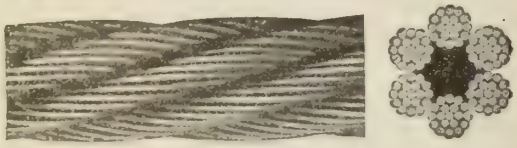
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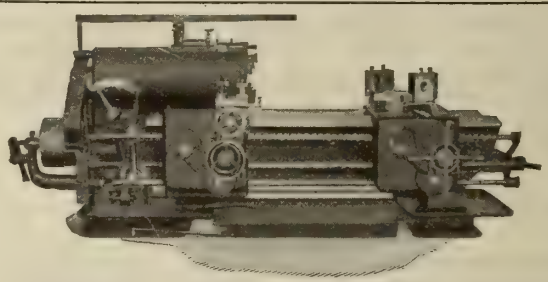
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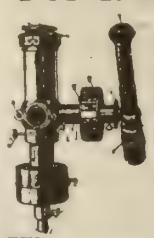
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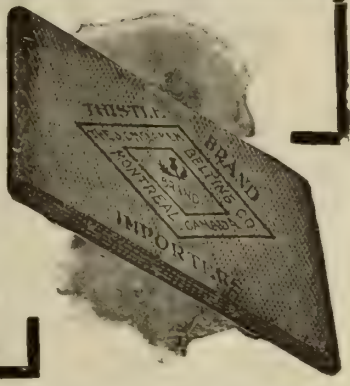
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**Abrasive Discs**
Norton Co. of Can., Ltd., Hamilton, Ont.
Oakey & Sons, Ltd., John London S.E., Eng
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Abrasive Materials**
Dom Abrasive Wheel Co., Ltd., Mimico, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.
Waltham Grinding Wheel Co of Canada, Ltd., Brantford, Ont
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Acetylene, Dissolved**
L'Air Liquide Society, Toronto, Ont.

**Accumulators, Hydraulic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Air Lifts**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Air Purifiers and Coolers**
Sturtevant Co., B. F., Boston, Mass.

**Analyses, Chemical**
Toronto Testing Laboratory, Toronto, Ont.

**Angle Bars**
Steel Co of Canada, Ltd., Hamilton, Ont.

**Anvils**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Columbia Hdwe. Division, Cleveland, O.
Petrie, Ltd., H. W., Toronto, Ont.

**Arbors**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Cleveland Twist Drill Co., Cleveland, O.
Ford-Smith Machine Co., Hamilton, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Jacobs Mfg. Co., Hartford, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.

**Axles, Car**
Dom. Foundries & Steel, Hamilton, Ont.

**Babbitt Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Tallman Brass & Metal Co, Hamilton, Ont.

**Balls, Brass, Bronze and Steel**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian SKF Co., Toronto, Ont.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y

**Barrels, Tumbling**
Baird Machine Co., Bridgeport, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Bars, Boring**
Armstrong Bros. Tool Co., Chicago, Ill.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis
Madison Mfg. Co., Muskegon, Mich.

**Bars, Boring, Portable**
Underwood Corp., H. B., Philadelphia, Pa

**Bars, Bronze Cored**
Moore & Son, Thos., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

**Bars, Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Bars, Steel**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Dom Foundries & Steel, Hamilton, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Pilot Steel & Tool Co., Montreal, Que.
Steel Co of Canada, Ltd., Hamilton, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.

**Bearings, Ball**
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Railway Roller Bearing Co., Syracuse, N.Y.

**Bearings, Bronze**
Tallman Brass & Metal Co, Hamilton, Ont.
Railway Roller Bearing Co., Syracuse, N.Y.

**Bearings, Die-Cast**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Tallman Brass & Metal Co, Hamilton, Ont.

**Bearings, Journal**
Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metal Co, Hamilton, Ont.

**Bearings, Roller**
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co, Syracuse, N.Y.

**Belt Cement**
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

**Belt Clamps**
Graton & Knight Mfg. Co., Worcester, Mass.

**Belt Dressings and Fillers**
Aikenhead Hardware Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Grafon & Knight Mfg. Co., Worcester, Mass.

**Belt Fasteners**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Belt Lacing**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

**Belt Lacing Machines**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
McLaren Belting Co., J. C., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Belt Tools**
Graton & Knight Mfg. Co., Worcester, Mass.

**Belting, Chain**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glasco, Montreal, Que
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Belting, Fabric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Goodyear Tire & Rubber Co. of Can, Ltd., Toronto, Ont.
Dom Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
McLaren Belting Co., J. C., Montreal, Que.
Sumner & Co., New York City.

**Belting, Leather**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Ltd., Montreal Q.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que
Smith Belting Co., Toronto, Ont.
Sumner & Co., New York City.
Tullis & Son, Ltd., John, Glasgow, Scot.

**Belting, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.
Quaker City Rubber Co., Philadelphia, Pa.

**Belts, Abrasive**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.

**Bench Countershaft Standards**
Ford-Smith Machine Co., Hamilton, Ont

**Benches, Work**
Aikenhead Hardware Ltd., Toronto, Ont.

**Bending Machines, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bertrams Ltd., Edinburgh, Scotland.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Bins, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Blocks**
Ford Chain Block Co., Philadelphia, Pa.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Chain (See Hoists, Hand)**
Aikenhead Hardware Ltd., Toronto, Ont.
Ford Chain Block Co., Philadelphia, Pa.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co, Lisbon, Ohio.

**Blocks, Die**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Swedish Crucible Steel Co of Canada, Ltd., Windsor, Ont

**Blocks, Pillow**
Can. Link-Belt Co., Toronto, Ont.

**Blowers**
Can. Blower & Forge Co., Ltd., Kitchener.
General Combustion Co. of Can., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Sturtevant Co., B. F., Boston, Mass

**Bolt and Nut Machinery**
Acme Machinery Co., Cleveland, Ohio
Bertram & Son Co., Ltd., The John, Dundas, Ont
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Landis Machine Co., Inc., Waynesboro, Pa
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Bolt and Nut Machinery, Automatic**
National Acme Co., Cleveland, Ohio.

**Bolts and Nuts**
London Bolt & Hinge Works, London, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Petrie, Ltd., H. W., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont

**Bolt Threading Die Heads**
Jones & Lamson Machine Co., Springfield, Vermont
Landis Machine Co., Inc., Waynesboro, Pa

**Boosters**
Sturtevant Co., B. F., Boston, Mass.

**Boring and Turning Mills, Vertical**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.

**Boring, Drilling and Milling Machines, Horizontal**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa

**Boring, Drilling and Milling Mach., Vertical**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont

**Boring Heads**
Aikenhead Hardware Ltd., Toronto, Ont.

**Boring Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Gisholt Machine Co., Madison, Wis.

**Brakes, Magnetic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont

**Brass**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Bricks, Fire**
Elk Firebrick Co. of Can., Ltd., Hamilton, Ont.

**Bridges**
Hamilton Bridge Works Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

**Broaching Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Bronze**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Bronze, Phosphor**
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.

**Bucket Carriers, Pivoted**
Can Link-Belt Co., Toronto, Ont

**Buffing or Polishing Machines (See Polishing and Buffing Machines)**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.

**Bulldozers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy Co., Toronto, Ont.

**Burners, Oil and Gas**
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

**Bushings**
Fisher Motor Co., Ltd., Orillia, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Cabinets, Oil**
S. F. Bowser & Co., Ltd., Toronto, Ont

**Calipers**
Brown & Sharpe Mfg. Co., Providence, R.I.
Starrett Co, L. S., Athol, Mass.

**Cams**
Canada Foundries & Forgings Co., Welland, Ont.

**Can-Making Machinery (See Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que

**Cars, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Castings, Aluminum**
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

# BUYERS' DIRECTORY

**Castings, Brass and Bronze**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Copper**
Can. Hanson & Van Winkle Co., Toronto, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Marine**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Castings, Die Molded**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Ferro-Alloy**
Can. Steel Foundries, Montreal, Que.

**Castings, Iron**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Hyd. Press**
Can. Steel Foundries, Montreal, Que.

**Castings, Monel Metal**
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

**Castings, Naval Bronze**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Nichrome**
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Nickel**
Can. Hanson & Van Winkle Co., Toronto, Ont.

**Castings, Semi-Steel**
Davidson Mfg. Co., Thos., Montreal, Que.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

**Castings, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

**Cements, Iron**
Smooth Mfg. Co., Jersey City, N.J.

**Centering Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Chains (See Sprockets and Chains)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chains, Driving**
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chasers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chemists**
Toronto Testing Laboratory, Toronto, Ont.

**Chucking Machines**
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Chucks, Drill**
Jacobs Mfg. Co., Hartford, Conn.

**Chucks, Drill and Tap**
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Lathe**
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Magnetic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**
Columbia Hdwe. Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

**Cleaners, Metal, Waste, General**
Oakley Chemical Co., New York, N.Y.

**Clocks, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Clutches, Friction**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**
Can. Link-Belt Co., Toronto, Ont.

**Collars, Shaft or Set**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

**Collets**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compressors, Air**
Curtis Pneumatic Machinery Co., St. Louis, Mo.

**Compressors, Air and Gas**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**
Ford-Smith Machine Co., Hamilton, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Copper**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Cored Bronze Bars**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Cotter Pins**
Morrow Screw & Nut Co., Ltd., Jonn, Ingersoll, Ont.

**Counterbores**
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Countershafts**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Couplers, Car and Locomotive**
Can. Steel Foundries, Montreal, Que.

**Couplings, Flexible**
Holden Co., Ltd., Montreal, Que.

**Couplings, Rigid**
Bernard Industrial Co., A., Fortierville, Que.

**Couplings, Shaft**
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

**Cranes, Electric**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont

**Cranes, Hand (See Hoists, Hand)**
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

**Cranes, Locomotive**
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Cranes, Traveling**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Crank Pin Turning Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia, Pa.

**Cutters, Flue**
Holden Co., Ltd., Montreal, Que.

**Cutters, Gear**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Milling**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Milling Machine Co., Cleveland.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.

**Cutters, Stay Bolt**
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Thread**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.

**Cutting-Off Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Cutting-Off Machines, Pipe (See Pipe Cutting and Threading Machines)**
Landis Machine Co., Inc., Waynesboro, Pa.
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Cutting-Off Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Pilot Steel & Tool Co., Montreal, Que.

**Cutting Oil Filters (See Oil Filtering Systems)**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Cataract Refining Co., Toronto, Ont.

**Cutting, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

**Cutting, Oxy-Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Dealers, Machinery (See Searchlight Section)**
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Deckle Straps**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Diamonds, Black and Rough**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond, Carbon and Bortz**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Desmond-Stephan Co., Hamilton, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Wheel Trueing Tool Co., Detroit, Mich.

**Diamond Crossings**
Can. Steel Foundries, Montreal, Que.

**Die-Castings**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Dies, Pipe-Threading**
Jones & Lamson Machine Co., Springfield, Vt.

**Die Sinking Machines, Automatic**
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

**Die Sinkers**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Screw and Thread Cutting**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

**Dies, Forging**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

# BUYERS' DIRECTORY

**Dies, Hammer**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Self-Opening, Adjustable**
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Dies, Threading-Opening**
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Disc Cement**
Ritchey Supply Co., Toronto, Ont.
Watson Abrasives Co., Chicago, Ill.

**Dividing Heads**
Ackworthie, Ltd., John, Birmingham, Eng
Dickow, Fred. C., Machinery Co., Chicago, Ill.
Ford Smith Machine Co., Hamilton, Ont
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis
Petrie, Ltd., H. W., Toronto, Ont.

**Dogs, Lathe and Milling Machine**
Armstrong Bros. Tool Co., Chicago, Ill

**Drafting Boards and Tables**
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Drafting Materials**
American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Dressers, Grinding Wheel**
Dom Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Jones-Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Drill Holders**
Armstrong Bros. Tool Co., Chicago, Ill

**Drill Rods**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Drill Speeders**
Canada Machinery Corp., Galt, Ont.

**Drilling Machine Heads**
Henry & Wright Mfg Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

**Drilling Machines, Automatic**
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

**Drilling Machines, Bench**
Beacon Engineering Co., Tipton, England.
Can. Blower & Forge Co., Ltd., Kitchener.
Henry & Wright Mfg Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng
U. S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Electric and Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Gang**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drilling Machines, Heavy Duty**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill
Rockford Lathe & Drill Co., Rockford Ill

**Drilling Machines, Multiple Spindle**
Beacon Engineering Co., Tipton, England
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn
Henry & Wright Mfg. Co., Hartford, Conn
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng

**Drilling Machines, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill

**Drilling Machines, Portable**
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Radial**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Drilling Machines, Sensitive**
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Turret**
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis
Williams Machinery Co., A. R., Toronto, Ont.

**Drilling Machines, Vertical**
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng
Strobinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Drills, Center**
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drills, High Speed Twist**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Drills, Twist and Flat**
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.

**Dust Handling Equipment**
Can. Blower & Forge Co., Ltd., Kitchener.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass

**Electrical Instruments**
Bristol Co., Waterbury, Conn
Northern Electric Co., Montreal, Que.

**Electrical Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que
U. S. Electrical Tool Co., Cincinnati, O

**Elevating Trucks (See Trucks)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Elevators and Conveyors**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que
Lyman Tube & Supply Co., Montreal Que.
Main Belting Co. of Can., Montreal, Que
Mathews Gravity Carrier Co., Port Hope, Ont.

**Emery Wheels (See Grinding Wheels)**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Dom Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont

**Engines, Capstan**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Engineers, Mechanical**
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.

**Expanders, Tube**
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Eyeglasses, Safety (See Goggles, Safety)**
Prest-O-Lite Co. of Can., Toronto, Ont.
Willson Goggles, Inc., Reading, Pa.

**Fans, Electric**
Can. Blower & Forge Co., Ltd., Kitchener
Northern Electric Co., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Exhaust**
Can. Blower & Forge Co., Ltd., Kitchener.
Petrie, Ltd., H. W., Toronto, Ont
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Ventilating**
Can. Blower & Forge Co., Ltd., Kitchener
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fibre**
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**File Handles**
Ingersoll File Co., Ltd., Ingersoll, Ont.

**Files and Rasps**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Canada Saw Co., Montreal, Que

**Filing Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Filler, Iron (See Cements, Iron)**
Smooth Mfg. Co., Jersey City, N.J.

**Fire Extinguishers**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Fittings, Pipe**
International Malleable Iron Co., Guelph, Ont

**Flexible Shafts**
Aikenhead Hardware Ltd., Toronto, Ont.

**Flux, Galvanizing**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Fluxes, Welding**
L'Air Liquide Society, Toronto, Ont.

**Forging Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio
Stewart & Co., Duncan, Glasgow, Scot.

**Forgings, Drop**
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd., Toronto, Ont.

**Forgings, Hammer**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Foundry Equipment**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont
Rice Lewis & Son, Ltd., Toronto, Ont.

**Foundry Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Frogs, Spring or Rigid**
Can. Steel Foundries, Montreal, Que

**Fuel Oil Burning System**
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Heat Treating Coal**
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City

**Furnaces, Heat Treating Oil and Gas**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Bellevue Industrial Furnace Co., Detroit.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces and Ovens, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont
Volta Mfg. Co., Welland, Ont
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces, Tempering and Annealing**
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furniture, Machine Shop**
Garlock-Walker Mchy. Co., Toronto, Ont.

**Gages, Comparator**
Jones & Lamson Machine Co., Springfield, Vt.
Herbert Ltd., Alfred, Toronto, Ont
Johansson Inc., C. E., Windsor, Ont.
Perdue, W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass

**Gages, Measuring (See Tool Work)**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Q.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont
Starrett Co., L. S., Athol, Mass

**Gages, Recording**
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont

# BUYERS' DIRECTORY

**Gages, Snap, Thread and Cylindrical**
Ackworthie, Ltd., John, Birmingham, Eng.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Standard**
Armstrong Whitworth Co. of Can., Lt Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis, Johansson Inc., C. E., Windsor, Ont.

**Gages, Thread**
Ackworthie, Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Garnet, Emery and Flint Paper and Cloth**
Ritchey Supply Co., Toronto, Ont.

**Gas, Coal Compressed**
L'Air Liquide Society, Toronto, Ont.

**Gas, Compressed**
Prest-O-Lite Co. of Can., Toronto, Ont.

**Gaskets**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

**Gear Blanks**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario
Philadelphia Gear Works, Philadelphia, Pa

**Gear-Cutting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

**Gear Testing Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Gears, Cast**
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

**Gears, Cut**
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hamilton Gear & Machine Co., Toronto, Ontario
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Gears, Dressed**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Gears, Forged**
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Gears, Herringbone**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa

**Gears, Machine Moulded**
Can. Steel Foundries, Montreal, Que.

**Gears, Rawhide (See Gears, Cut)**
Hamilton Gear & Machine Co., Toronto, Ontario
Philadelphia Gear Works, Philadelphia, Pa

**Gear, Silent Chain**
Gardner & Son, Robt., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Can. Link-Belt Co., Ltd., Toronto, Can.
Hans Renold of Canada, Ltd., Montreal, Quebec

**Gears, Worm**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario

**Generators, Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Generators, Electric**
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Goggles, Safety**
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

**Grab Buckets**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Grease Cups, Pressed Steel and Brass**
Can. Winkley Co., Ltd., Windsor, Ont.

**Greases, Lubricating**
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

**Grinding Discs**
Ritchey Supply Co., Toronto, Ont.

**Grinding Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Grinding Machines, Abrasive Belt**
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Automatic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Bench**
Aikenhead Hardware Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Grinding Machines, Center**
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines Chaser**
Jones & Lamson Machine Co., Springfield, Vt

**Grinding Machines, Cutter and Reamer**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Cylindrical**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Die**
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

**Grinding Machines, Disc**
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont

**Grinding Machines, Drill**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Face**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Floor and Tool**
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Grinding Machines, Internal**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Portable**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Power Oscillating Tool**
Herbert Ltd., Alfred, Toronto, Ont.

**Grinding Machines, Ring Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Snagging**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Surface**
Garlock-Walker Mchy. Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machinery, Tool Post**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Universal**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.

**Grinding Wheels**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont

**Guards, Machinery and Window**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Gun-Barrel Machinery**
Steinle Turret Machine Co., Madison, Wis.

**Hack Saws, Power**
Ackworthie, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Hamilton, Canada.
Garlock-Walker Mchy. Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hammers, Chipping**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hammers, Drop**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

**Hammers, Electric**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Hammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Hammers, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hammers, Riveting**
Cleveland Pneumatic Tool Co., Toron Ont.

**Hangers, Shafting**
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, O
Foss Machinery & Supply Co., Geo. Montreal, Que.
Terry & Co., John C., Birmingham, E
Williams Machinery & Supply Co., A. I Montreal, Que.

**Hardening, Case-Hardening and Tempering**
Hamilton Gear & Machine Co., Toront Ont.

**Hardness Testing Apparatus**
Shore Instrument Co., Jamaica, N.Y.

**Heating**
Skinner Bros. Mfg. Co., Inc., St Loui Mo.

**Hobbing Machines**
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hobs**
Armstrong-Whitworth of Canada, Ltd Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R.
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.

**Hoists, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Morris Crane & Hoist Co., Ltd., Niagar Falls, Ont.
Northern Crane Works, Walkerville, Ont
Volta Mfg. Co., Welland, Ont.

**Hoists, Hand**
Lyman Tube & Supply Co., Montreal, Que
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Hoists, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont

**Holders-On, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill

**Hose, Industrial**
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Hose, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Foamite Firefoam Co., Hamilton, Ont.

**Hydraulic Leather**
Graton & Knight Mfg. Co., Worcester, Mass.

**Hydraulic Machinery**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot

**Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Index Centers**
Dickow, Fred. C., Machinery Co., Chicago, Ill.

**Igniters, Gas Engine**
Canada Foundries & Forgings Co., Welland, Ont.

**Indicators, Speed and Test**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.

**Insulation**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Jacks, Hydraulic**
Norton, A. O., Boston, Mass.

**Jacks, Planer**
Armstrong Bros. Tool Co., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que
Crescent Machine Co., Ltd., Montreal, Q.

# BUYERS' DIRECTORY

**Jigs and Fixtures (See Tool Work)**
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Keyseating Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Keys, Machine**
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

**Knives, Machine**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Simonds Canada Saw Co., Montreal, Que.

**Knurl Holders**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lacing Leather**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

**Lamps, Electric**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**Lathe Attachments**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.

**Lathe Pans, Portable**
Canada Machinery Corp., Galt, Ont.

**Lathe Tools**
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

**Lathes, Automatic and Semi-Automatic**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Bench**
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lathes, Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
McDougall Co., Ltd., R., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Engine**
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Sidney Machine Tool Co., Sidney, Ohio.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Extension and Gap**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Lathes, Heavy Duty Projectile Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blaskill Wire Machy. Co., Ltd., Montreal
Sidney Machine Tool Co., Sidney, Ohio.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Polishing (See Polishing and Buffing Machines)**
Ford-Smith Machine Co., Hamilton, Ont

**Lathes, Relieving**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Lathe, Universal Hand**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Lathes, Screw-Cutting**
Jones & Lamson Machine Co., Springfield, Vt.

**Lathe, Speed and Hand**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Lathes, Spinning**
Terry & Co., John C., Birmingham, Eng.

**Lathes, Threading**
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

**Lathes, Vertical Turret**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

**Lathes, Wood Turning**
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Lead Pipe**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Lighting Fixtures**
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

**Linoleum Mill Machinery**
Bertrams Ltd., Edinburgh, Scotland

**Liquid Air Plants**
L'Air Liquide Society, Toronto, Ont.

**Lockers, Clothes**
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

**Lubricants**
Cateract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Lubricating Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Machinists' Small Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Streilinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Mandrels, Expanding**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Mandrels, Solid**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Measuring Machines**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Metals, Alloy**
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Tallman Brass & Metal, Ltd., Hamilton, Ontario.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Metalite Cloth**
Ritchey Supply Co., Toronto, Ont.

**Micrometer Calipers**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Milling Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Milling Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Milling Machines, Automatic**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Bench**
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Hand**
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

**Milling Machines, Horizontal and Planer Type**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal Q.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Milling Machines, Plain**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Milling Machines, Universal**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Milling Machines, Vertical**
Cincinnati Milling Machine Co., Cincinnati, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

**Monel Metal**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Motors, Electric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Moulded Rubber Goods**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Nail Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Nails and Staples**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Nickel, Bars, Sheets, Wire, Etc.**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Nickel Plating Outfits**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Nickel Silver**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Nitrogen**
L'Air Liquide Society, Toronto, Ont.

**Nut Tappers (See Bolt and Nut Machinery)**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

**Nuts, Finished and Semi-finished**
Galt Machine Screw Co., Galt, Ont.

**Nuts, S.A.E., Plain and Castellated**
Galt Machine Screw Co., Galt, Ont.

**Oil Filtering and Storage Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oil Storage Engineers**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oils**
Canadian Oil Companies, Ltd., Toronto, Ont
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Hole Covers**
Can. Winkley Co., Ltd., Windsor, Ont.

**Oils, Soluble**
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oxygen**
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

**Oxy-Acetylene Apparatus**
L'Air Liquide Society, Toronto, Ont.

**Packing, Hydraulic**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

**Packing, Steam**
Can. Consolidated Rubber Co., Ltd., Montreal, Que
Graton & Knight Mfg. Co., Worcester, Mass
Guildford & Sons, Ltd., Halifax, N.S

**Paper Mill Conveyors**
Bertrams Ltd., Edinburgh, Scotland.

**Patents**
Fetherstonhaugh & Co., Ottawa, Ont
Marion & Marion, Montreal, Que

**Pans, Wet and Dry**
Frost Mfg. Co., Chicago, Ill

**Pattern-Shop Machinery (See Woodworking Machinery)**
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Patterns, Wood and Metal**
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Wraggis Pattern Works, Galt, Ont.

**Penstocks, Steel**
MacKinnon Steel Co., Sherbrooke, Que

# BUYERS' DIRECTORY

**Phosphor Tin**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Photographic Duplicating Machines**
Commercial Camera Co., Providence, R.I.

**Pig Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Bending Machines**
American Pipe Bending Machine Co., Boston, Mass
Underwood Corp., H. B., Philadelphia, Pa
Williams Machinery Co., A. R., Toronto, Ont.

**Pipe Couplings**
Steel Co. of Canada, Ltd., Hamilton, Ont

**Pipe Cutting and Threading Machines**
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**
Landis Machine Co., Inc., Waynesboro, Pa.

**Pipe Fitters' Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa.

**Piston-Ring Machines**
National Acme Co., Cleveland, Ohio
Steinle Turret Machine Co., Madison, Wis.

**Planers, Parallels**
L. & P. Mfg. Co., Niagara Falls, Ont.

**Planing Machines**
Bertram & Son Co., Ltd., The John Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Planing Machines, Rotary**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Pneumatic Tools**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Pots, Steel**
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Pressed Steel Parts**
Ackworthie, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Presses, Drop and Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Toledo Machine & Tool Co., Toledo, Ohio

**Presses, Foot and Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

**Presses, Forcing**
Atlas Press Co., Kalamazoo, Mich.
Stewart & Co., Duncan, Glasgow, Scot.

**Presses, Hydraulic**
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Perrin Ltd., W. B., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

**Presses, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Protractors**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Propellers**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Pulleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal and Fibre**
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Pulp and Paper Mill Equipment**
MacKinnon Steel Co., Sherbrooke, Que.

**Pumps, Automobile Tire**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Pumps, Barrel and Boiler-feed**
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coalant**
Trahern Pump Co., Rockford, Ill.

**Pumps, Geared and Hand**
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

**Pumps, Lubricant and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener
Jardine & Co., A. B., Hespeler, Ont.

**Punches, Power**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo, Ohio

**Punching Machines, Horizontal**
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Racks, Cut**
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**
Holden Co., Ltd., Montreal, Que.

**Reamer Holders**
Cleveland Twist Drill Co., Cleveland, O.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

**Reamers, Expanding**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Reamers, Solid**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Reamers, Taper**
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Recorders, Temperature**
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Recorders, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Rheostats**
Northern Electric Co., Montreal, Que.

**Resistance Materials**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Respirators**
Willson Goggles, Inc., Reading, Pa.

**Rivets**
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Rivet Heaters**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.

**Riveting Machines**
Bilton Machine Co., Bridgeport, Conn.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**
Stewart & Co., Duncan, Glasgow, Scot.

**Rolls (Rubber Covered)**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rudder Frames, Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Rubber Goods, Mechanical**
Quaker City Rubber Co., Philadelphia, Pa.

**Rules, Steel**
Chesterman & Co., Ltd., J., Sheffield, Eng.

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Rust Preventatives**
Oakley Chemical Co., New York, N.Y.

**Sand Equipment**
Can. Link-Belt Co., Toronto, Ont.

**Sand Mills**
Frost Mfg. Co., Chicago, Ill.

**Sanding Machinery**
Oliver Machy. Co., Grand Rapids, Mich.

**Sand Rammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Saw Frames and Blades, Hack**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que

**Sawing Machines, Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Sawing Machines, Power Hack**
Ackworthie, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Saw Sharpening Machines**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saw Tables, Universal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Hot and Cold**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Saws, High Speed Steel**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Metal Band**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saws, Metal, Power**
Clemson Bros., Inc., Hamilton, Ont.

**Saws, Metal Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

**Saws, Milling**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Saws, Screw Slotting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Swing Cut-off**
Oliver Machinery Co., Grand Rapids, Mich.

**Scales**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal, Q.

**Screens**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Screw Driving Machine**
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Screw Extractors**
Cleveland Twist Drill Co., Cleveland, O.

# BUYERS' DIRECTORY

**Screw Machine Work**
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
Tallman Brass & Metal Co., Hamilton, Ont

**Screw Machinery, Wood and Lag**
Cook Co., Asa S., Hartford, Conn.

**Screw Machines**
Brown & Sharpe Mfg Co., Providence, R I.

**Screw Machines, Automatic**
Gisholt Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

**Screw Machines, Plain or Hand**
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio.

**Screw Plates**
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

**Screws, Cap and Set**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Screws, Machine**
Barnes Co., Wallace, Bristol, Conn.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Screws, Safety Set**
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Second-Hand Machinery**
**( See Searchlight Section)**
Petrie Ltd., H. W., Toronto, Ont.

**Separators, Moisture and Oil**
Bowser S F & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que

**Separators, Oil and Waste**
Bowser S F. & Co., Ltd., Toronto, Can.

**Shafting**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N S Steel Co., Ltd., New Glasgow, N.S.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Shapes, Cold-Drawn Special Steel**
Union Drawn Steel Co., Hamilton, Ont

**Shaping Machines**
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Roelefson Machine & Tool Co., Toronto, Ont
Smith & Mills Co., Cincinnati, Ohio
Walker Lathe Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont

**Shapers, Wood**
Oliver Machinery Co., Grand Rapids, Mich.

**Shears, Hand**
Can. Blower & Forge Co., Ltd., Kitchener.

**Shears, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y.
Stewart & Co., Duncan, Glasgow, Scot.
Toledo Machine & Tool Co., Toledo, Ohio
Williams Machinery Co., A. R., Toronto, Ont.

**Shearing Machines, Angle, Iron Bar and Gate**
Bertrams Ltd., Edinburgh, Scotland

**Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng
Toledo Machine & Tool Co., Toledo, Ohio.

**Sheets, Nickel, Resist, Alloy**
International Nickel Co. of Can., Ltd., Toronto, Ont

**Sheets, Nickel, Monel and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont

**Side Frames, Locomotive**
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont

**Slotting Attachments**
Ford-Smith Machine Co., Ltd., Hamilton, Ont
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

**Slotting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

**Solders**
British Smelting & Refining Co., Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Canada.

**Snap Flasks**
Oliver Machy Co., Grand Rapids, Mich

**Special Machinery and Tools**
Brown Engineering Corp., Ltd., Toronto
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Spectacles, Industrial**
Willson Goggles, Inc., Reading, Pa.

**Springs**
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

**Spring-making Machinery**
Sleeper & Hartley, Inc., Worcester, Mass

**Sprockets and Chains**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Squares**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Stamping, Metal**
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Stamps, Steel**
Diamond Saw & Stamping Works, Buffalo, N.Y.

**Stairways, Wrought Iron**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Steam Specialties**
Crane Ltd., Montreal, Que.

**Steel Plate**
Dom. Foundries & Steel, Hamilton, Ont.

**Steels, Tool**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa

**Steel Blooms and Billets**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steel, Cold-Rolled Strip**
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont
Firth & Sons, Ltd., Thos., Montreal, Q

**Steel Castings**
Dom. Foundries & Steel, Hamilton, Ont

**Steel Forgings**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Steel, Shafting and Free Cutting Screw**
Barnes Co., Wallace, Bristol, Conn
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont

**Steel, Sheet**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

**Steel, Tanks**
Can. John Wood Mfg. Co., Toronto, Ont.

**Steel, Stainless**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel Wire Rods**
Steel Co. of Canada, Ltd., Hamilton, Ont

**Steels, Alloy, Open Hearth and Electric**
United Alloy Steel Corp., Canton, Ohio

**Steels, Alloy and Carbon**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont
Firth & Sons, Ltd., Thos., Montreal, Q
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que
Rice Lewis & Son, Ltd., Toronto, Ont
Steel Co. of Can., Ltd., Hamilton, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa

**Steels, High-Speed**
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que
Atkins & Co., Ltd., Wm., Sheffield, Eng
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que
Firth & Sons, Ltd., Thos., Montreal, Q
Pilot Steel & Tool Co., Montreal, Que
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa

**Steel, Magnet**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel, Structural**
MacKinnon Steel Co., Sherbrooke, Que.

**Steel Tubing, Close Joint and Welded**
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

**Stern Frames, Cast Steel**
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont

**Straightening Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Studs**
Galt Machine Screw Co., Galt, Ont

**Surface Plates**
Bilton Machine Co., Bridgeport, Conn.

**Swaging Machines**
Atkins & Co., Inc., E. C., Indianapolis, I

**Switches, Railway**
Can. Steel Foundries, Montreal, Que

**Switches and Switchboards**
Northern Electric Co., Montreal, Que.

**Tablets, Bronze, Memorial**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Tachometers**
Aikenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

**Tanks, Steel**
MacKinnon Steel Co., Sherbrooke, Que

**Tanks and Pumps, Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

**Taper Cutting Dies**
Jones & Lamson Machine Co., Springfield, Vt

**Tap Holders**
Greenfield Tap & Die Corp., Galt, Ont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont

**Taper Pins**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Tapes, Measuring**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass

**Tapping Machines and Attachments**
Ackworthie, Ltd., John, Birmingham, Eng
Archibald & Co., Chas. P., Montreal, Q
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass

**Taps and Dies**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont
International Machinery & Supply Co., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taps, Collapsing**
Geometric Tool Co., New Haven, Conn
Jardine & Co., A. B., Hespeler, Ont.
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio
Victor Tool Co., Waynesboro, Pa.

**Teeth, Dredge Bucket**
Kennedy & Sons, Wm., Owen Sound, Ont

**Testing Metals and Materials**
Toronto Testing Laboratory, Toronto, Ont

**Thermometers**
Bristol Co., Waterbury, Conn.

**Thread-Cutting Tools**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont
Jones & Lamson Machine Co., Springfield, Vermont
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Thread Cutting Machines**
Jones & Lamson Machine Co., Springfield, Vermont
Landis Machine Co., Inc., Waynesboro, Pa

**Threading Machines**
Acme Machinery Co., Cleveland, Ohio.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

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Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Thread-Rolling Machines**
Bliss Co., E. W., Brooklyn, N.Y.

**Tongs**
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**Tool Cases**
Rice Lewis & Son, Ltd., Toronto, Ont.

**Tool Holders**
Armstrong Bros. Tool Co., Chicago, Ill.
Bilton Machine Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Markers, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Tool Posts, Lathe**
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Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

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**Tools, Small (See Machinists' Small Tools)**
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Burgess & Marchand, Montreal, Que.
Chesterman & Co., Ltd., J., Sheffield, Eng.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Hamilton Engineering Service, Ltd., Hamilton, Ont
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Starrett Co., L. S., Athol, Mass.
**Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.**
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Williams Machinery & Supply Co., A. R., Montreal, Que.

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Kennedy & Sons, Wm., Owen Sound, Ont
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Toronto, Ont.
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Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
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Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Canada, Ltd., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

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Prest-O-Lite Co. of Can., Toronto, Ont.
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Canada Foundries & Forgings Co., Welland, Ont.

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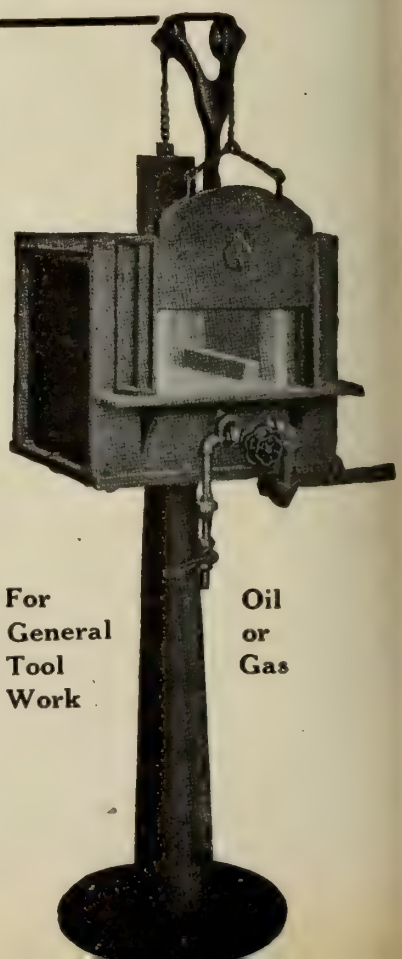
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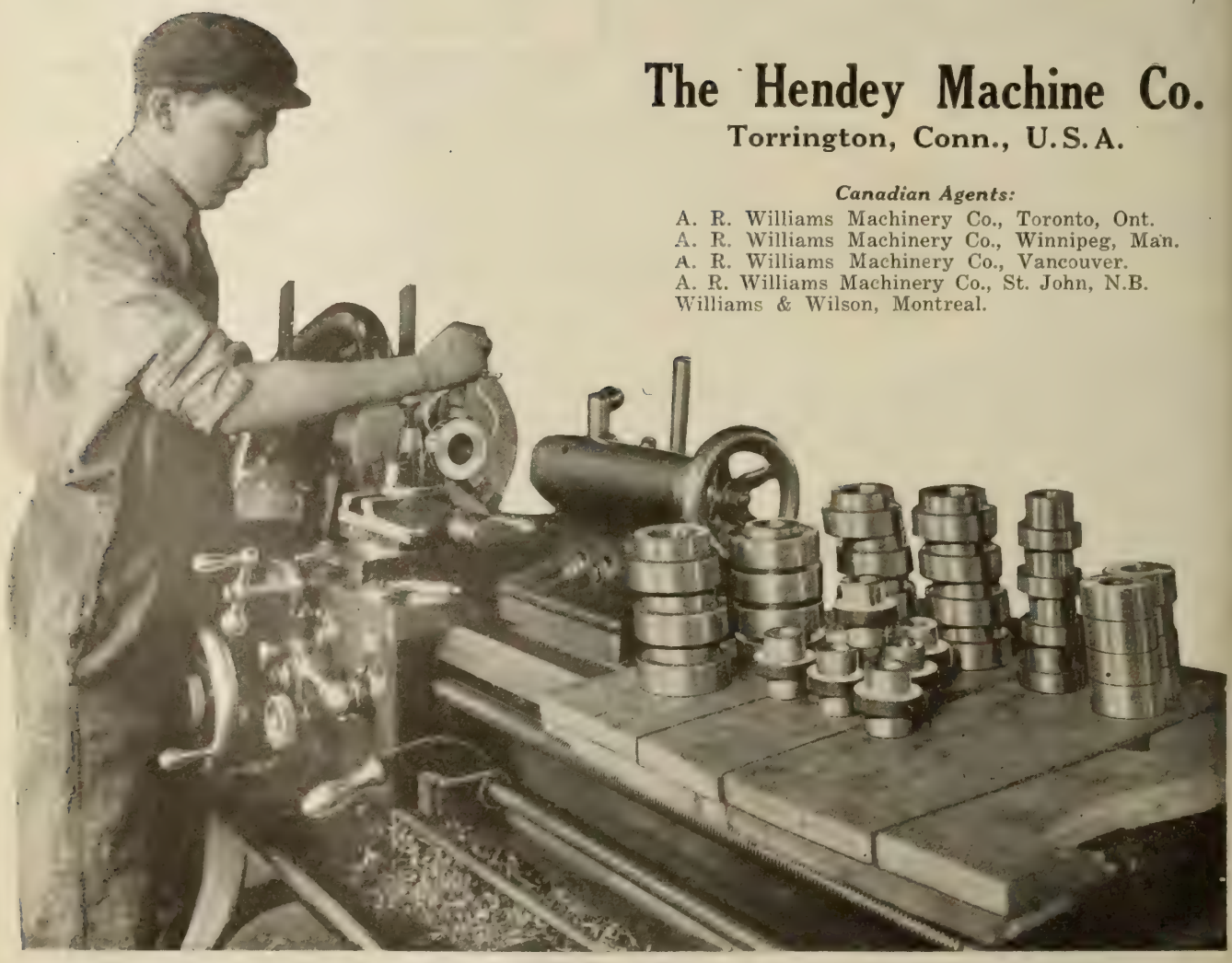
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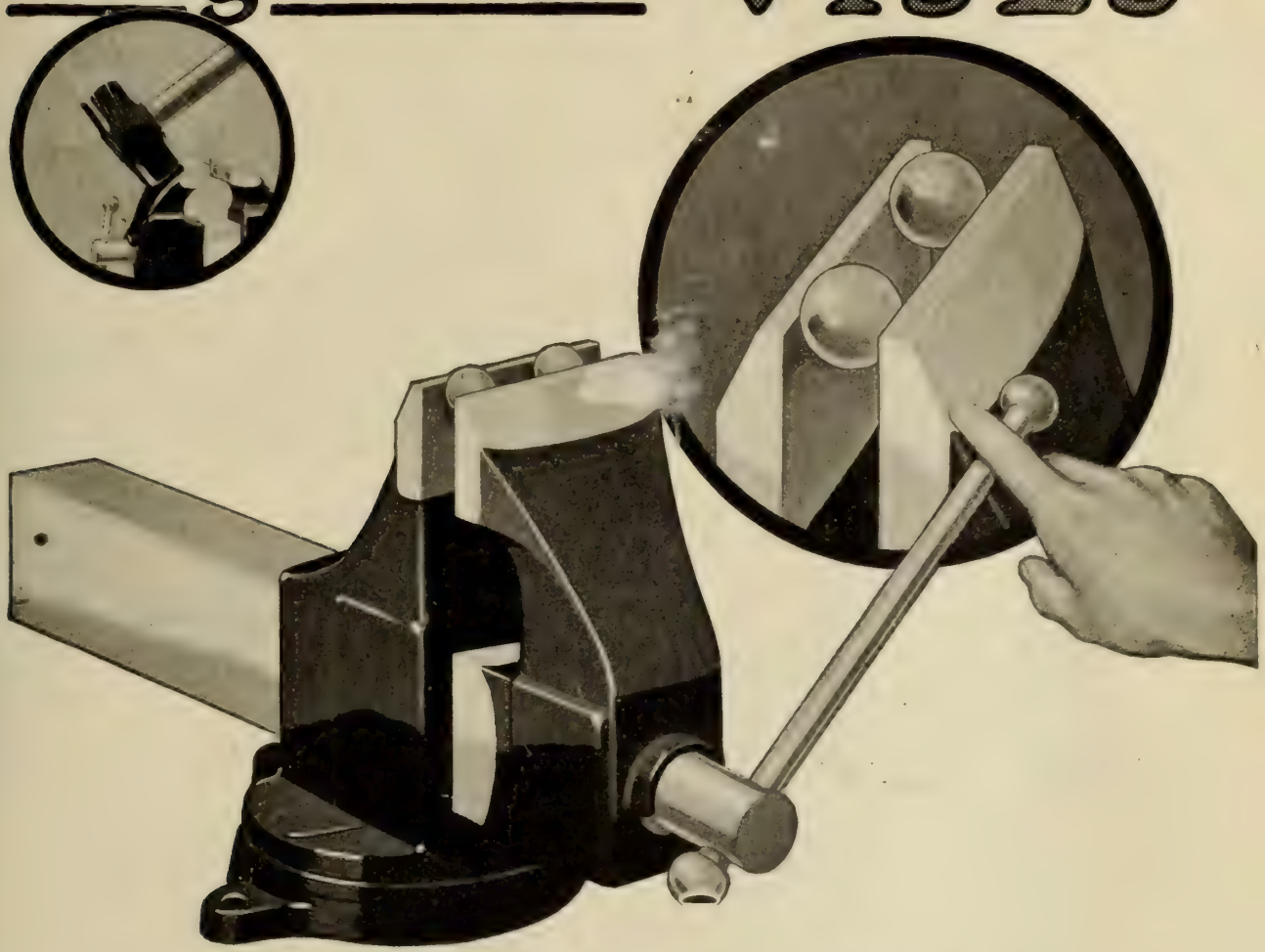
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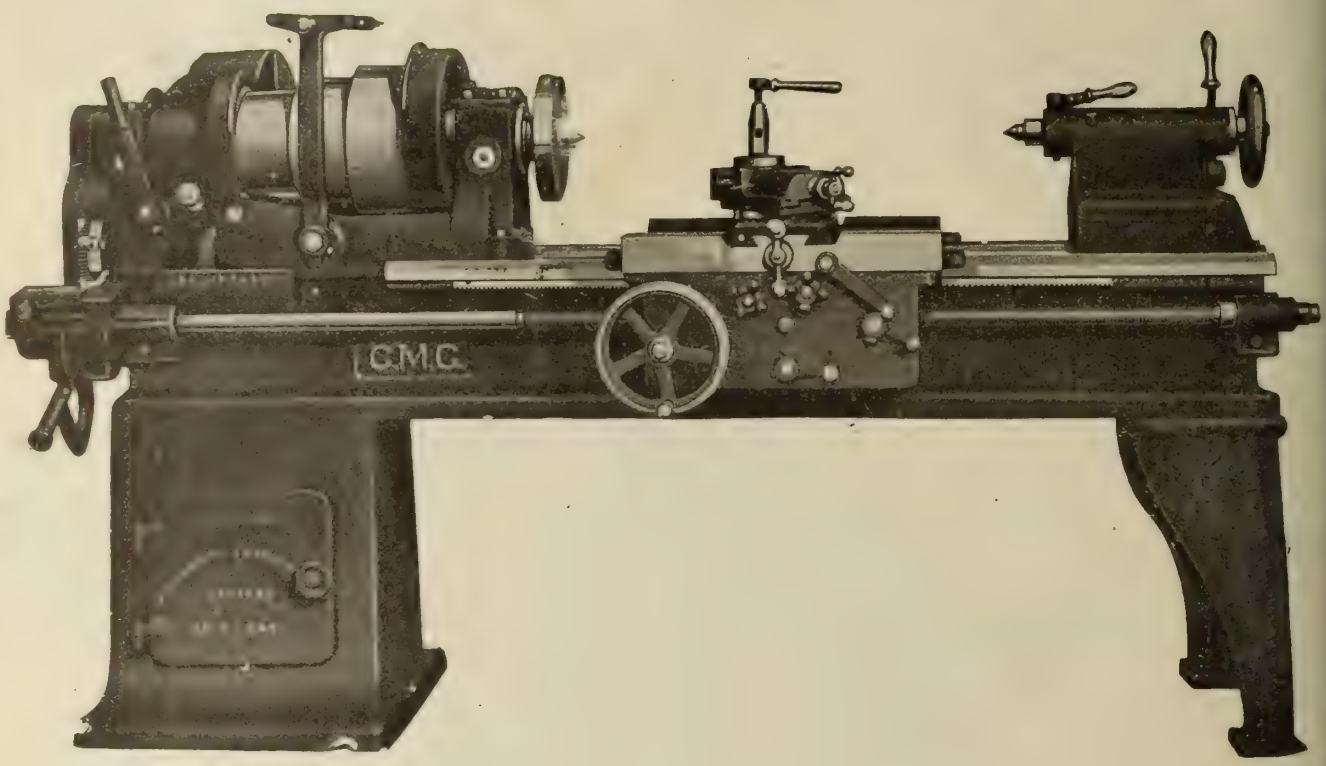
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# CANADIAN MACHINERY
## AND MANUFACTURING NEWS

Vol. XXV., No. 9 Published by the MacLean Publishing Company, Limited Toronto March 3, 1921 $4.00 a Year Subscription Price

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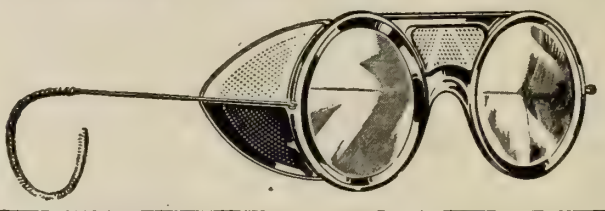
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# Chippers Need STOCO SAFETY GOGGLES with "CELOGLAS" Shatter-Proof Lenses

(Pat. Dec. 12, 1916)

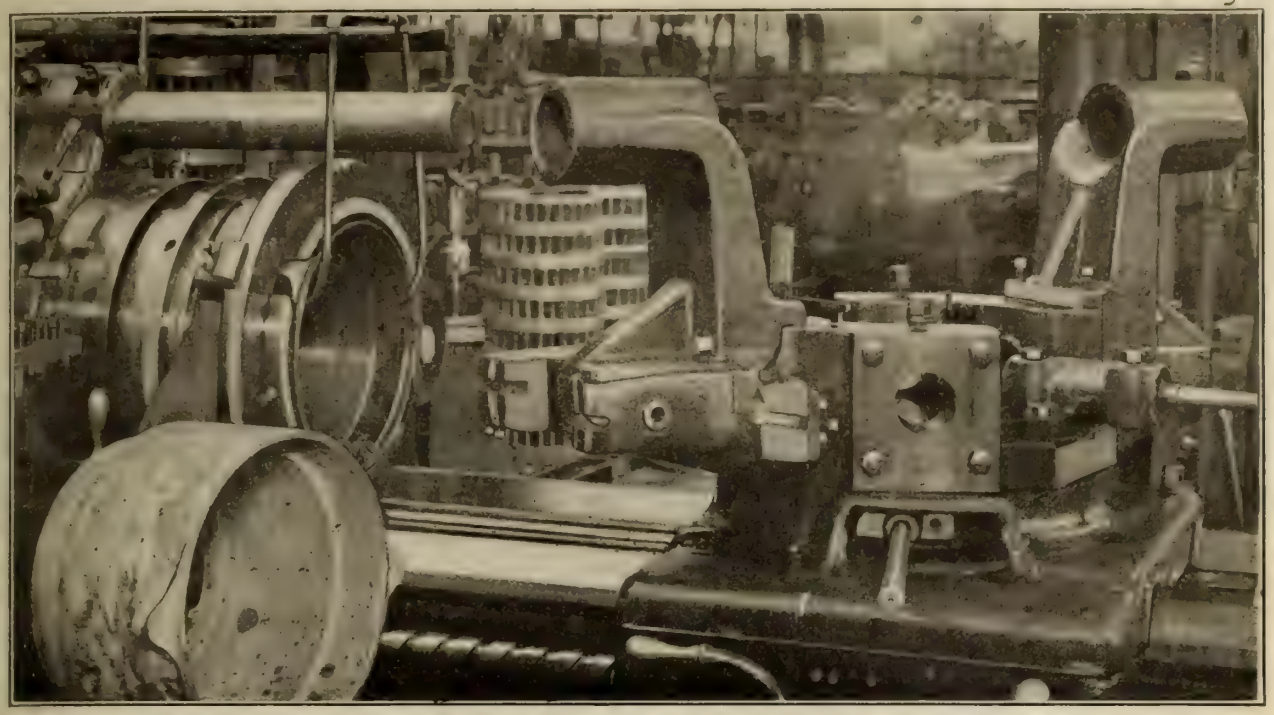


In spite of its husky strength the STOCO Safety Goggle is light, comfortable, and easy to wear—a glass that will take a lot of punishment and yet may be worn long hours at a stretch without discomfort to the eyes or face. Doubtless there are jobs in your plant that require the STOCO Safety Goggle.

The STOCO Safety Goggle.
Price each (f.o.b. Geneva, N.Y.)
With "Celoglas" Shatter-proof Lenses ..... $1.15
With Optical Glass Lenses ... .90
Attractive Discounts for Quantity Orders.
Comfortable earbows, or black elastic headbands at the same price.

NOTE—A sample STOCO Safety Goggle will be sent interested responsible people on receipt of request on letterhead.

**THE STANDARD OPTICAL CO.**
**GENEVA, N.Y. U.S.A.**



# Machining Delco Generator Frames

The photograph above shows a tool set-up on a Steinle 24-in. Turret Lathe for turning out Delco Generator Frames at the plant of the Delco Light Company of Dayton, Ohio.

The chucking fixture revolves in a steady rest and is equipped with centering and stop pins for centering and locating rear end of frame by pulling sleeve collar forward. Set screws hold the front end in place. The turret fixture is reinforced in the machining operation by the overhead bar support; thus preventing undue chatter or jar under the heavy cuts taken.

This is only one of a number of installations in plants manufacturing electrical equipment where the Steinle is called upon to produce various parts from castings, forgings or bar stock.

In view of present manufacturing conditions it is invariably performance that counts and the Steinle qualities of accuracy, speed, ease of operation, power, reliability and economy of upkeep are guarantees of satisfactory performance on your own work.

**Material—Cast Steel**

**Finish—Bore, Counterbore, Face Bottom, Face Lugs**

**Time—25 Minutes Each**

***Why not send us your blueprints if your requirements call for the installation of equipment o this character? We shall be glad to furnish you with production and tooling estimates, or to have a qualified representative call and take up the question of Steinle methods as applied to your production problems.***

## STEINLE TURRET MACHINE CO.

***Originators of the full swing side carriage turret lathe***

MADISON, WIS., U.S.A.

**AGENTS—Machine Tool Engineering Company, Singer Building, New York City; Cadillac Tool Company, Dodge Power Building, Detroit, Michigan; L. G. Henes, 75 Fremont Street, San Francisco, California, and Title Insurance Building, Los Angeles, California. FOREIGN—Leo. C. Steinle, 53 Victoria Street, London, England.**

*If interested tear out this page and place with letters to be answered.*

MARK OF ALGOMA O.H. QUALITY



View of the Algoma Steel Corporation's Plant from the water front

**American Standard Sections of BEAMS and CHANNELS up to and including 15", all standard sections of ANGLES from 6" x 6" down to 1¼" x 1¼", ZEEBARS for car builders and general purposes, small and large ROUNDS and SQUARES and FLAT BARS up to 14" wide.**

The quality of our product is of the very best—and is exclusively steel made by the Open Hearth Process, and can be furnished in all grades, from the softest rivet stock to high carbon special spring material. Order from us and you'll get both quality and prompt service. A trial is convincing.

Open Hearth
ALLOY STEELS

Chrome-Vanadium, Chrome-Nickel, Nickel.

All of these steels we supply in **Hot Rolled Bars.** We also furnish in **Bloom, Billet** and **Slab** form.

STEEL RAILS

Open Hearth Quality (all sections from 12 lbs. to 100 lbs. per yard).

SPLICE BARS
STEEL TIE PLATES
PIG IRON
(Basic, Foundry, Malleable)
SULPHATE OF AMMONIA

*Prompt Shipments from Stock*

BLOOMS
BILLETS SLABS
STRUCTURAL STEEL
MERCHANT BARS
CONCRETE REINFORCING BARS
IRON, BRASS AND BRONZE CASTINGS

*SULPHURIC ACID*
*NITRE CAKE*

# ALGOMA STEEL CORPORATION, LTD.

SAULT STE. MARIE, ONTARIO

SALES OFFICES:

Montreal: 606 McGill Building

Toronto: Bank of Hamilton Building

# IMCO TOOLS



## "The Thinker"

The purchasing of tools is a serious matter. A slight difference in the "possible efficiency" will make a considerable difference in the ultimate cost of your products. The law of averages has involved an average cost for almost all work. If your costs come below that average in your drilling, reaming and milling, consider your advantage over competitors!

The thinking buyer considers carefully the merits of every tool on the market, tests each on his own work—and abides by the results.

Catalog of "Imco" 3 and 4 lip drills, reamers and milling cutters upon request.

*Eastern Representatives:* WATT MACHINERY & EQUIPMENT CO., 344 St. James St., Montreal, Que.

## Ingersoll Machine & Tool Co., Ltd.

Ingersoll, Ontario.

Toronto Office — 80 Bay St. Phone Adelaide 7227.

Chas. A. Strelinger Co. Ltd. Windsor, Ont.

*If interested tear out this page and place with letters to be answered.*

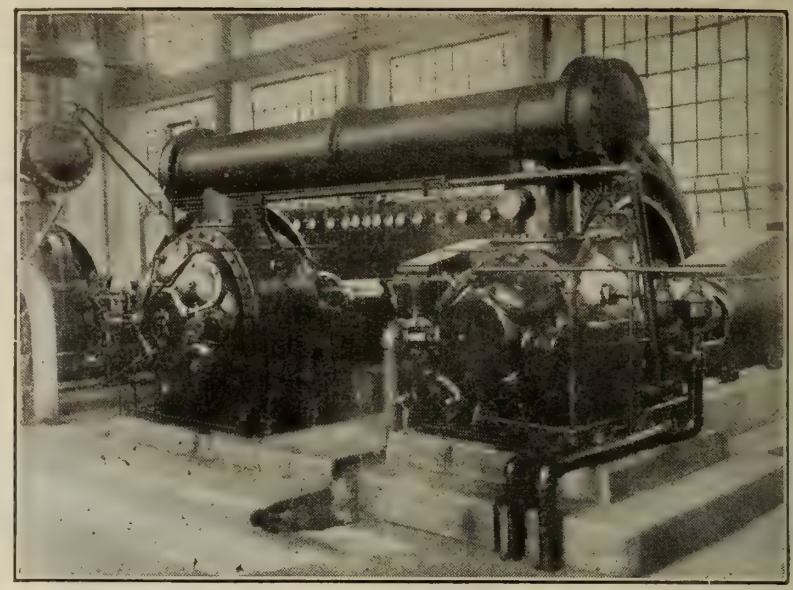
# An Acid Test of Quality is the Repeat Order

IT is a significant fact that in most Canadian mines, shipyards and industrial plants, where careful performance records are kept, Canadian Ingersoll-Rand Compressors have become "standard equipment."

Starting ten, fifteen, or perhaps twenty-five years ago, with one of our old "Rand" compressors, new machines have been added to meet the increased demand for air and, as a result of the good service rendered by the original machine, later additions have been of our make.

Our experience in compressor building has been so varied and extensive that it qualifies us as leaders in this line of manufacture and has enabled us to place before the compressor buyer a line of machines that will meet every need efficiently and economically.

*Write for bulletins*

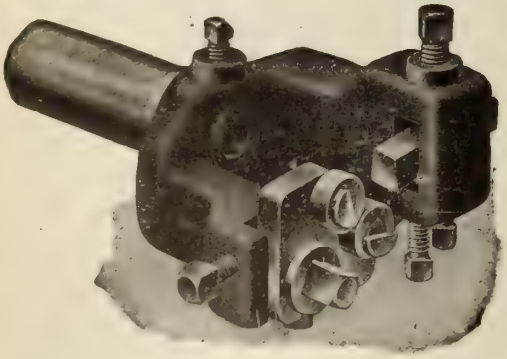


**The 2,230 cubic foot Direct Connected Motor Driven Class PRE-2 Compressor illustrated herewith is one of five C. I. R. Co. Machines installed in the Longue Pointe Plant of the Canadian Steel Foundries during the past ten years. In speaking of their performance their chief engineer said: "I have been eight years with this Company and your machines and am very well satisfied with them."**

**CANADIAN INGERSOLL-RAND CO.**
**LIMITED**

Sydney Sherbrooke Montreal Toronto Cobalt
Winnipeg Nelson Vancouver

# TURRET-LATHE
## TOOLS & HOLDERS



**COMPLETE EQUIPMENT FOR CAPSTAN LATHES FULLY ILLUSTRATED IN OUR TOOL LIST E.**

*Sales Agents Wanted*

**J. ACKWORTHIE LTD.**
COLESHILL STREET,
BIRMINGHAM
ENGLAND

# MAPLE LEAF
## MOTOR TRUCKS

***Built Like a Bridge***

It's not merely an accidental resemblance between the rear-end housing of a Mapleleaf Truck and the tremendous ruggedness of a steel bridge. The Mapleleaf rear axle is designed to carry heavy loads with as much indifference as a big bridge does.

The axle shafts are of the same big, husky design. They are made of the strongest steel alloy known, and revolve in the wheel on roller bearings.

You ought to see this axle. You will have a great respect for the truck of which it is a part.

**Mapleleaf Manufacturing Company**
**LIMITED**
**MONTREAL - CANADA**




*New Truths and Old Fallacies*

# Hardness of Alloys—*Continued*

Referring again to the test made by Professor Robert H. Smith, concerning the hardness of Magnolia, he said: "The longer the Magnolia bearing is used, and the more severe the duty imposed on it, the better becomes its condition."

When these tests were made by Professors Smith and Goodman, it is questionable whether either of them had considered the fusibility of alloys as affecting the values, but Professor Smith specifically says that he found Magnolia much superior to either Babbitt (Genuine) or Gun Metal (bronze).

The mention of bronze reminds the writer of an incident related to him by Mr. F. L. Johnson, once Associate Editor on "Power" and previously for many years a practical operating manager of large plants. When he was in charge of the Baltimore Copper Works a delay occurred in delivery of bronze bearings for the rolls. Without consulting him a supply of Magnolia was sent to tide over this critical period.

As there was no help for it, he poured the Magnolia bearings and then waited around for the expected trouble. To his great surprise the Magnolia lined bearings ran cool and far surpassed the bronze bearing in wear, and from that day he never used any metal on any bearings other than Magnolia, when he could get it.

Such demonstrations of Magnolia's capacity to sustain heavy loads and without injury, do not happen from chance. Magnolia is not only sufficiently hard, but is protected by its other qualities from heating and rapid wear on bearings, which are destructive to most babbitts.

Magnolia also favors adjustment to any inequalities of bearing or shaft, thereby distributing the load uniformly over the entire surface.

(Continued next month)

For Copy of complete article :
*"New Truths and Old Fallacies"*
Address our Montreal Office

*Sold by Leading Dealers Everywhere or by*

**Magnolia Metal Co. of Canada**
Limited
Office and Factory :
37-39 Shannon Street, Montreal, Que.



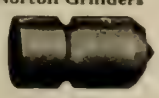
# DIAMOND HAND TOOL

For the dressing of precision grinders there has not yet been discovered any satisfactory substitute for diamonds.

Our diamonds are selected and mounted with great care, and the quality of work and stones is fully guaranteed.

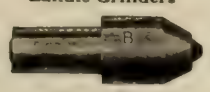
**The Canadian Desmond-Stephan Mfg. Company, Limited**
Hamilton - - Ontario

Diamond Tool for Norton Grinders



Actual Size

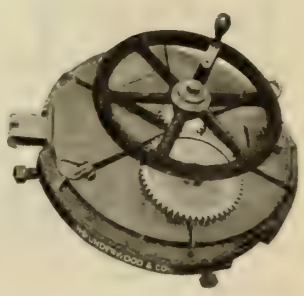
Diamond Tool for Landis Grinders



Actual Size

# Locomotive Cylinder or Dome Facing Machine

Users of this improved tool are eloquent in their praises of its performance.



All working parts are covered and easily oiled. Gearing is all cut from the solid. When working the clutch is thrown in by moving the lever with clutch pin attached (shown in cut, on top near the hand crank) and the machine will feed automatically. Made in sizes to suit requirements.

Taper socket can be furnished to take the place of hand wheel for air motor drive.

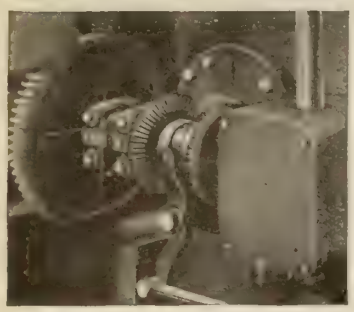
**When ordering give the inside diameter of the work for which they are wanted. Details on request.**

**H. B. UNDERWOOD CORPORATION**
1015-1025 Hamilton St., Philadelphia, Pa., U. S. A.

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# THE JOHNSON FRICTION CLUTCH

## Clutches for Reversing Functions



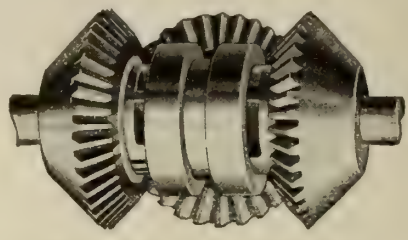
Johnston Clutch Installation on a Newton Milling Machine

A reversing clutch is a very common requirement on machinery, and one which is encountered in many different forms. Whatever the situation may be, a Johnson Clutch offers the best method of handling it.

The bevel gear assembly shown here is one of the ways in which a Johnson Double Clutch is frequently applied for reversing functions. Many of the best machine tools are equipped in this manner.

**Write for our Yellow Catalog and Booklet,**

**"Clutches As Applied To Machine Building."**



Double Clutch in Nest of Bevel Gears

CANADIAN AGENTS:

WILLIAMS & WILSON, LTD., 84 Inspector St., Montreal

CANADIAN FAIRBANKS-MORSE CO., LIMITED, Montreal, Toronto, Winnipeg

**THE CARLYLE JOHNSON MACHINE CO.** MANCHESTER, CONN.

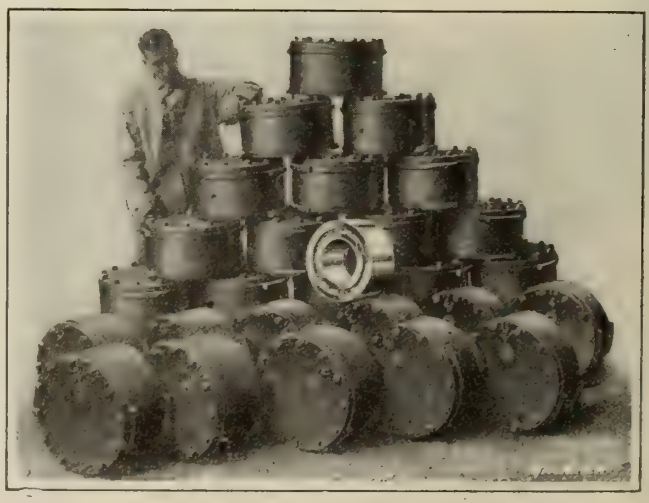
# A Mighty Test of Bearing Strength

At Lakehurst, N.J., the huge structural steel doors of the United States Government dirigible hangar are mounted on trucks provided with unusually large Rollway Roller Bearing Journal Boxes. Each journal box weighs 392 pounds when assembled. The tremendous weight resting on these

# ROLLWAY HEAVY DUTY BEARINGS

can be more readily appreciated when it is stated that these doors are 135 feet high, 165 feet wide, 13 feet thick at the base and weigh 3,500 tons. Each door is mounted on four electrically-operated trucks which run on two standard gage railroad tracks 165 feet apart.

Rollway Bearings represent economy and durability. For use wherever a Bearing is necessary.



Set of thirty-two Journal Boxes which is required for each of the four Hangar Doors. Each door weighs 7,000,000 lbs.

## RAILWAY ROLLER BEARING CO.

SYRACUSE, N.Y.

# CANADIAN STEEL FOUNDRIES LIMITED

## AMONG OUR PRODUCTS

**O. H. STEEL**
- Bolsters
- Couplers
- Draft Arms
- Locomotive Side Frames
- Machinery Castings
- Marine Castings
- Rolling Mill Rolls
- Wheel Centres

**FERRO-ALLOYS**

**MANGANESE-STEEL**
- Bucket Lips
- Crusher Jaws
- Dipper Teeth
- Mixer Teeth
- Special Trackwork

**OTHER ALLOYS**
- Crank Pins
- Crank Shafts
- Locomotive Frames
- Rolls
- Roll Shells

**TRACKWORK**
- Diamond Crossings
- Crosses
- Frogs
- Mates
- Switches
- Rail Braces
- Guard Rail Clamps
- Complete Intersections

This list is merely an indication

General Offices:
Transportation Building, Montreal

## WE CAN SUPPLY

# STEEL PLATE

—IN—

**Universal Edge** - up to 40 in. wide

**Sheared Edge** - up to 60 in. wide

**Any Thickness** **Any Lengths**

*Send Us Your Enquiries.*

## Dominion Foundries & Steel, Limited
**HAMILTON, ONTARIO**


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# Ford-Smith

## Machine Tools of Quality, Canadian Made



Heavy Type Polishing Machine.

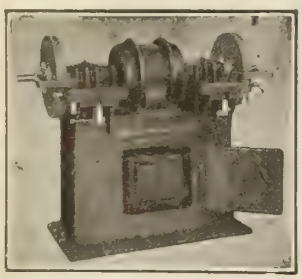
## MILLERS AND GRINDERS

**Built to Meet Your Requirements**



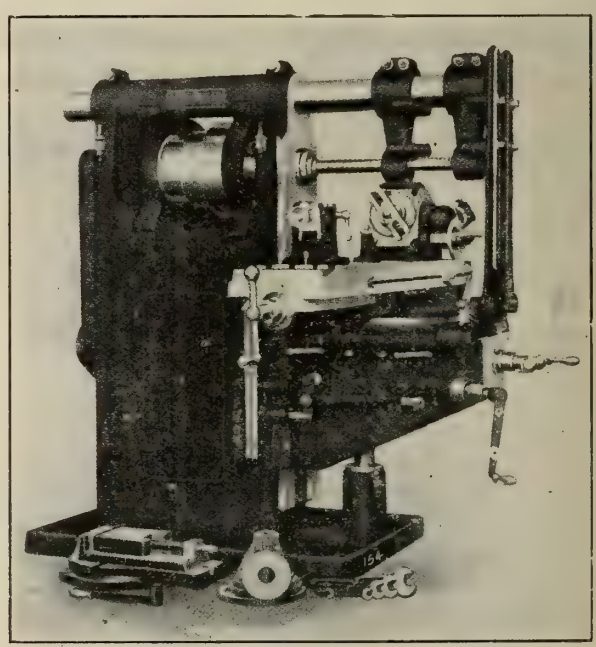
Heavy Type Floor Grinder.

"Built for Service" aptly describes Ford-Smith Millers and Grinders. No other phrase would do as well; and after all, Service is what you are most interested in. That's what you pay your good dollars for, and that's what you **get** in Ford-Smith Tools.



Motor Driven Floor Grinder.

Particular attention is directed to our Milling Machines —they are correct in design, built to last, and insure rapid quality production. Extensive use throughout the country is proof of their popularity.



Ford-Smith Grinders are built in designs to suit every grinding need—Motor Driven Grinders, Floor Grinders, Disc Grinders, Water Tool Grinders, Special Grinding Machinery, Buffers and Polishers.
**Write for our complete catalogue.**

## THE FORD-SMITH MACHINE COMPANY

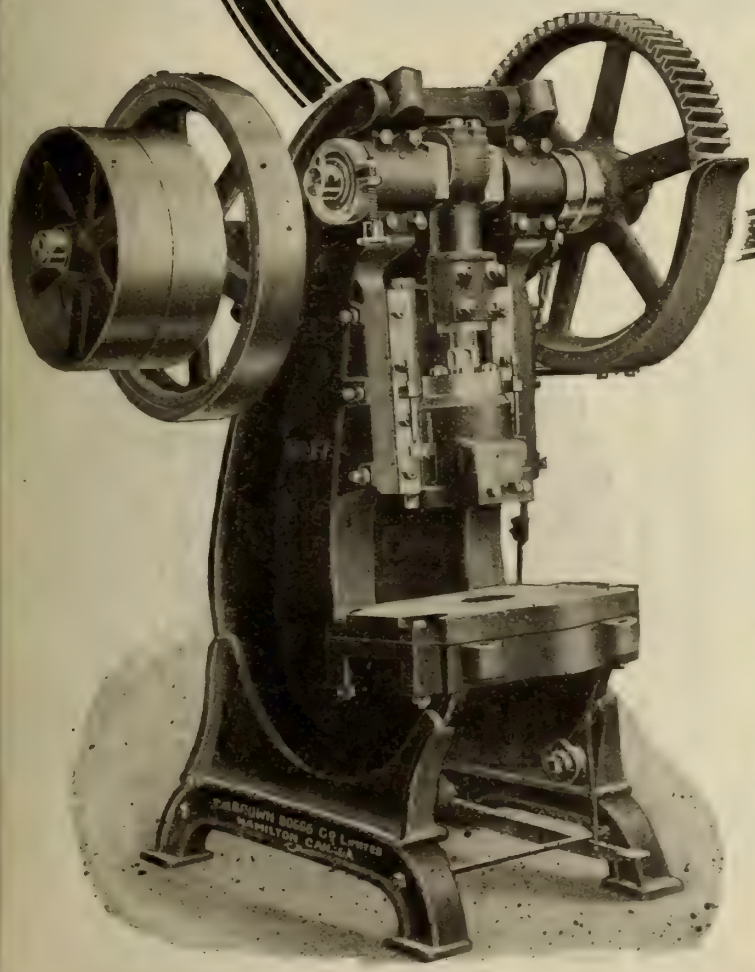
LIMITED

HAMILTON, ONTARIO, CANADA

FOREIGN AGENTS: W. E. Storey, 3 Arundel St., London, England; Gollin & Co., Melbourne, Australia; Atchier Demoor, Brussels, Belgium; British & Canadian Hydraulic Tube Co., Johannesburg, So. Africa.

# EXPORT ORDERS RECEIVE OUR SPECIAL ATTENTION

# "B-B" POWER PRESSES



No. 17—Geared Inclinable Press

**"B-B" Power Presses** are amply powered machines with a reputation for sturdy dependability.

Made in different types for blanking, forming, punching, trimming, etc. Let us send you full particulars.

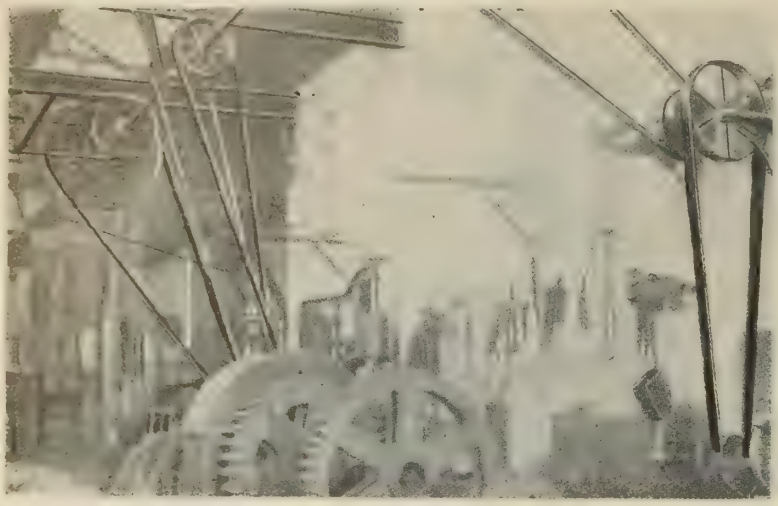
*The*

**Brown-Boggs Company, Limited**

**Hamilton, Ontario**

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# Solid Woven Belting



Solid Woven Hair Belting
Driving Heavy Machine Tools

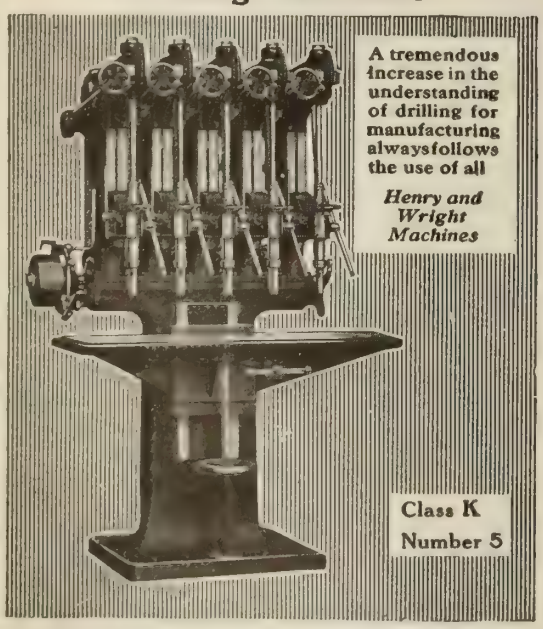
## Solid Woven
## Cotton
## Hair
## Twintex

*These beltings will solve your driving problems and save you money.*

**SUMNER & CO.**
108 WORTH ST.
NEW YORK

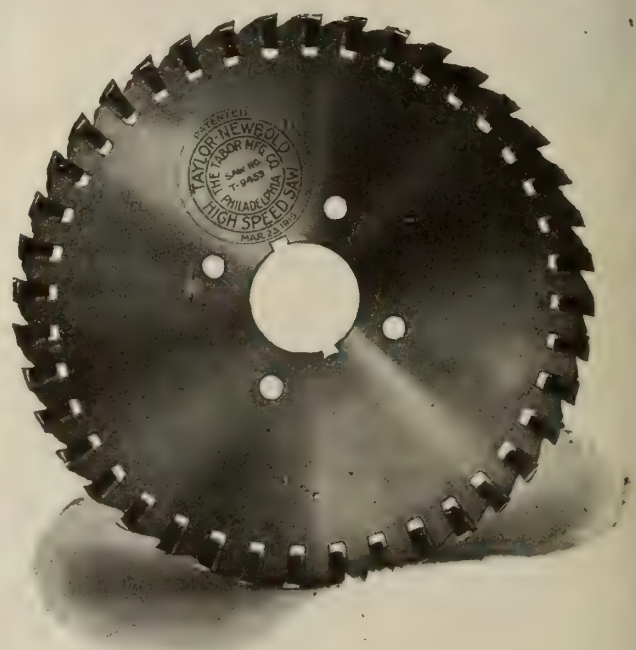
Representative for Eastern Canada
GEORGE F. SHEPPARD
702 Southam Bldg., Montreal

## HENRY & WRIGHT
### Drilling Machines




**The Henry & Wright Mfg. Co.**
Hartford, Conn.
New York Office: 136 Cedar Street
Canadian Fairbanks-Morse Co., Montreal, Toronto, Winnipeg; A. R. Williams Machinery Co., Toronto, St. John, N.B.; H. W. Petrie, Ltd., Toronto; Williams & Wilson, Montreal; Rudel-Belnap Machinery Co, Montreal; Canada Machinery Corp., Galt, Ont.; Geo. F. Foss Machinery & Supply Co., Montreal; General Supply Co., Montreal.

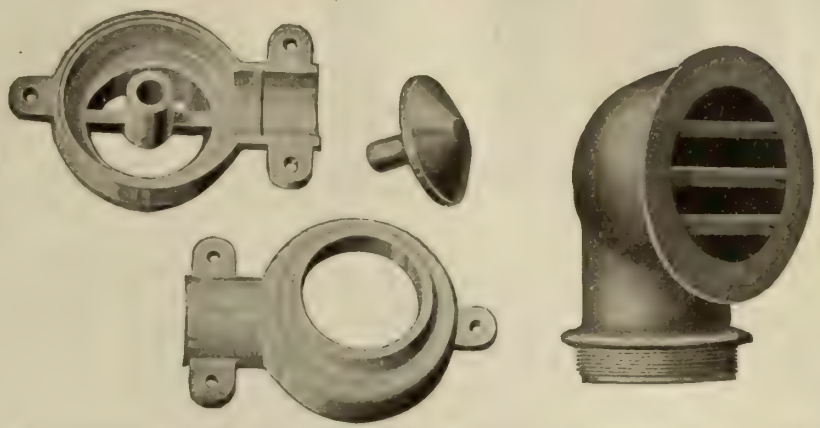
THE IMPROVED
## TAYLOR-NEWBOLD




INSERTED TOOTH COLD SAW
WRITE FOR BULLETIN T-S
**Tabor Mfg. Co., Philadelphia, Pa., U.S.A.**

# DIE-CASTINGS

DOEHLER PROCESS



MADE IN CANADA

Note the smooth appearance of the Die-Castings in the illustration. No burrs—no rough spots. Cored holes are perfectly round and centred. Require practically no machining

SEND BLUE PRINTS TO US FOR ESTIMATES

*Manufactured by*



Tallman Brass & Metal Limited
HAMILTON, ONT.



# LA SALLE

**Has an Advantage Over Other Grinders**

There is some outstanding feature of all La Salle Grinding Machines that lends it exceptional productive ability.

The American Drill Grinder is especially adaptable for grinding twist, flat and three-lipped drills, because it has automatic lip rest and caliper jaw device, which assures proper clearance on all sizes of drills automatically. Send for descriptive matter covering our entire line of grinding machinery.



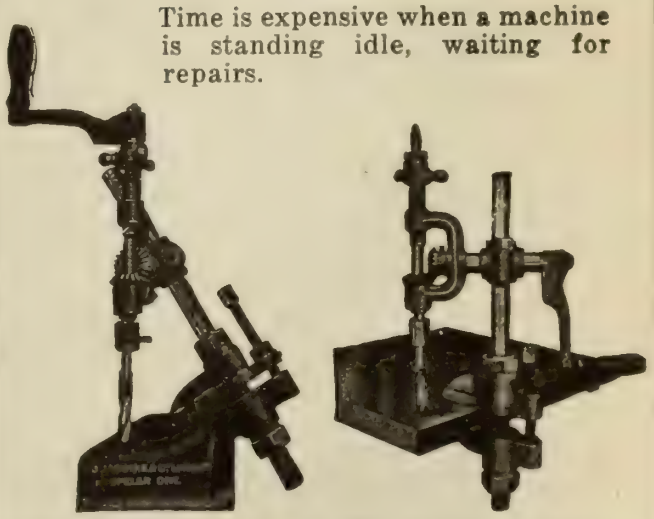
American Drill Grinder
For Wet or Dry Drill Grinding 1/8" to 2¼". Also 1/8" to 3½" dia.

**LA SALLE TOOL CO.**
La Salle, Illinois, U.S.A.

Represented in Canada by
**A. R. Williams Machinery Co., Ltd.**
64-66 Front Street W., Toronto
Halifax St. John, N.B. Montreal Winnipeg Vancouver

# Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



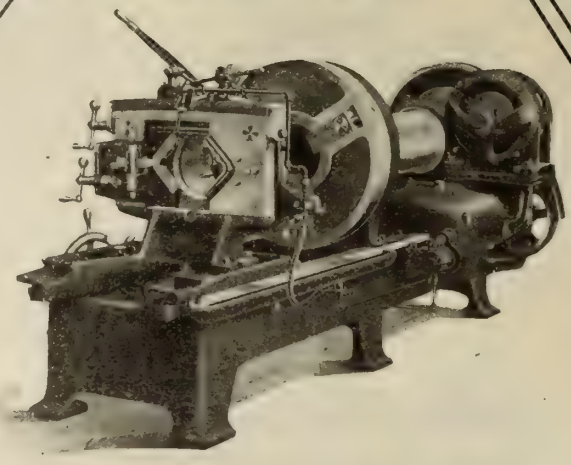
On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.
Sold by all Machinery and Supply Houses.

**A. B. JARDINE & CO., Limited**
HESPELER, ONTARIO


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# WILLIAMS



# PIPE MACHINES

***Outstanding Features:***

1—Single Pulley Drive, through.
2—Dodge Friction Clutch, on machine.
3—Clutch Lever at operator's left hand.
4—Rigid Bearing Bracket on drive shaft.
5—Gear Box Drive away from operator.
6—Individual Adjustment for each bearing.
7—Large Spindle Bearings are ring oiling.
8—Compact Control Levers on operator's side.
9—Large Die Cabinet and Tool Tray.
10—Substantial Oil Trough around top of ways.
11—Specially constructed Reservoir and Filterer.
12—Low-down Sliding Head.
13—Rotary Geared Pump reversible for left-hand thread.
14—Specially designed Carriage to drain off oil and cuttings.
15—All Gears amply protected.

*Send for Catalog of Various Styles*

## WILLIAMS TOOL CORPORATION

of Canada, Limited - Brantford, Ontario

*Successors to*

JOHN H. HALL & SONS, LIMITED




# Have You the Missing Tool?

For laying out work any Starrett dealer can supply you with as many as twelve Bevel Protractors, three Universal Bevel Protractors, or twelve Combination Sets, which include slide, square, center and protractor heads.

Six of the Bevel Protractors are made with the head extending over both sides of the blade. Of the three Universal Protractors, two are equipped with verniers.



Have you the tool this man should be using? Look it up in Catalog No. 22 "3".

**THE L. S. STARRETT COMPANY**

*The World's Greatest Toolmakers*
*Manufacturers of Hack Saws Unexcelled*
ATHOL, MASS.

42-156

# Use Starrett Tools

*If interested tear out this page and place with letters to be answered.*

# OAKITE

## GRINDING COMPOUND

*—Keeps wheel clean.*
*Helps prevent loading.*
*Keeps work clean and wheel at even temperature.*
*Increases production.*
*Is economical—Saves power.*
*Saves diamonds used for dressing or truing.*
*Lengthens wheel life*



## No Rust After Grinding

**A factory that now uses Oakite Grinding Compound on ball bearing parts, reports entire elimination of rust experienced in past when soda solution was used.**

Another plant uses Oakite Grinding Compound on steel razor blades, and has done away with the rust encountered when kerosene and soda ash compound was used.

This advertisement is one of a series based on actual occurrences. a. w.

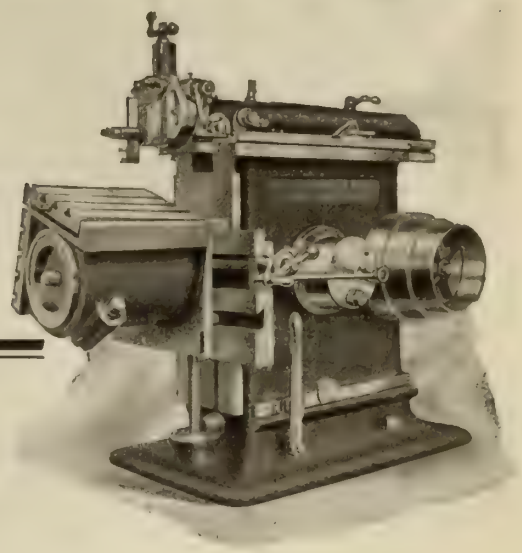
A gas engine factory reports they are grinding 18 shafts before dressing wheel, whereas before using Oakite Grinding Compound they could not grind more than 10 shafts without dressing.

*Have you a grinding problem?*

**OAKLEY CHEMICAL CO.**
**44 THAMES STREET · NEW YORK**

# UNIVERSAL

## SHAPING MACHINES



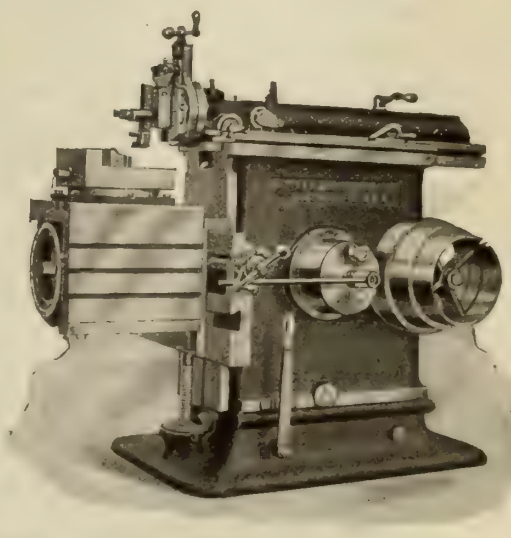
No special vises or fixtures needed; the Universal features of these machines take care of everything, making them particularly adapted to—

Die Work
Tool making and
General Manufacturing.

Machines regularly furnished with—

Swivelling Graduated Table
Auxiliary Tilting Side for Compound Angles.
Power Down Feed on any angle, with any variation of feed
Automatic Feed Stop
Graduated Collars on Tool Head Feed Screw and Table Feed Screw
Swivel Vise and Graduated Base
Table raised and lowered by power on 24-in. size.

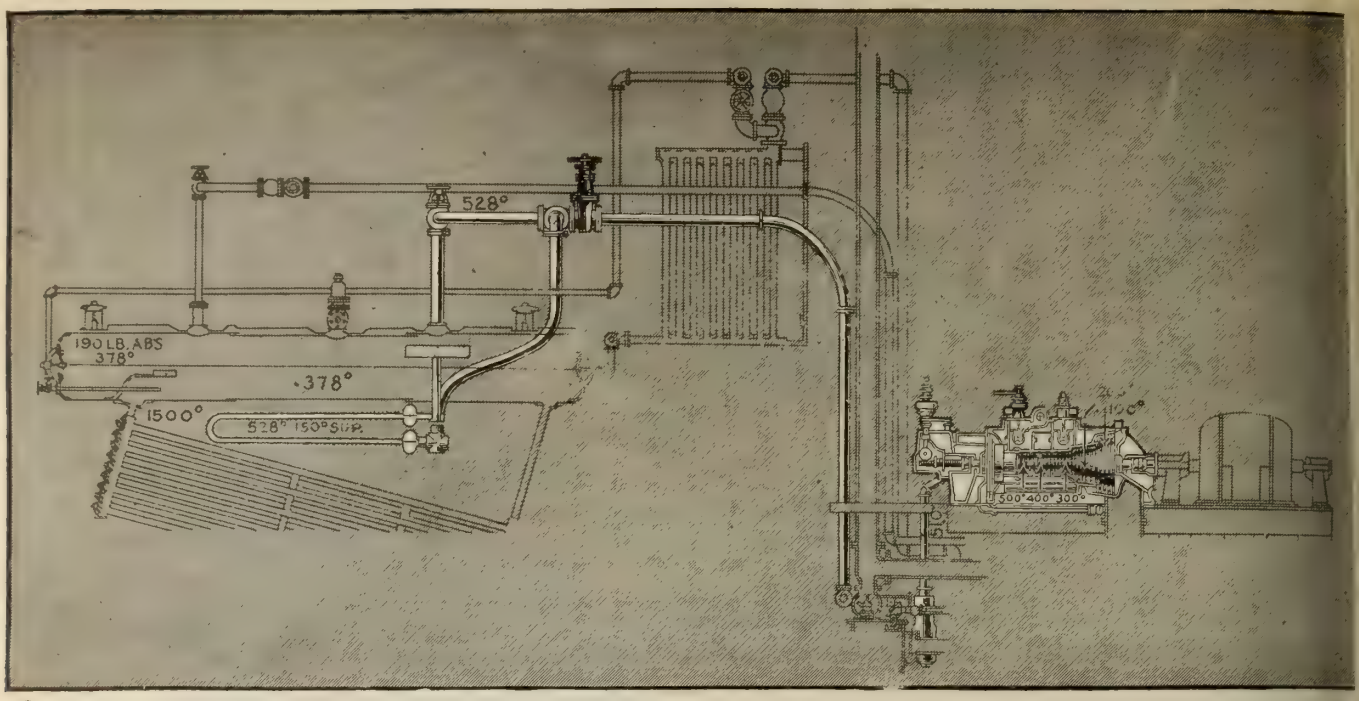
We carry large stocks of our 15-inch and 24-inch shapers in our Toronto show rooms—all ready for immediate shipment.



*Canadian Offices:* **POTTER & JOHNSTON MACHINE CO.**

## ROELOFSON MACHINE & TOOL CO., LIMITED

*Head Office and Show Rooms:*
**11 Wellington Street East - TORONTO, CANADA**




# Monel metal for superheat

HIGH machine speeds, constantly increasing demands on already installed steam lines, have forced power plants to superheat.

Commonly used "steam" metals cannot survive the chiseling attack of steam, superheated and under high pressures. So leading designers specify Monel metal.

Monel is used for guide stems, wedges, seat rings, spindles, pistons, etc., in great valves built by Chapman, Crane, Jenkins, Lunkenheimer, Nelson, Pratt & Cady and others equally prominent. It is used as blading, poppet valve parts, etc., in large steam turbines.

In power plant condensing and auxiliary apparatus Monel is used as meter parts, valve trim, pump rods and liners, etc. For only Monel combines the strength of steel with the ability to withstand the combined chemical and mechanical attack of high pressure and superheated steam, most acids and alkalies. Steam wear and water slippage is reduced to the minimum, machine life is lengthened, service is uninterrupted by costly shut-downs and expensive repairs.

Monel is being rapidly adopted for service calling for acid, alkali, high heat and steam wear resistance. It has a prominent place in the specifications of the largest engineering organizations in the country.

**The International Nickel Company of Canada, Ltd.**
**Harbor Commission Building, Toronto, Ont.**

The name Monel identifies the natural nickel alloy—67% nickel, 28% copper and 5% other metals—produced by The International Nickel Company. Monel products include Monel blocks, Monel rods, Monel castings, Monel sheet, Monel wire, Monel strip stock, etc.

INCo Monel metal

THE INTERNATIONAL NICKEL COMPANY

INCo MONEL METAL INCo NICKEL

*If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.*

## Vitrified
### Grinding Wheels

These wheels are the most generally used and give the greatest satisfaction for the majority of grinding jobs, since the bond is less affected by heat and may be used wet or dry. The Vitrified process affords a wider range of grades, the wheel is more open in texture and more free-cutting. It takes from 20 to 30 days to carefully manufacture a wheel by this process.




## Silicate
### Grinding Wheels

Silicate Wheels may be manufactured in 24 hours. They are often substituted for Vitrified wheels when it is inconvenient to wait the longer time required to manufacture wheels by the Vitrified process. These wheels derive their name from the large portion of silicate contained in the bond. We manufacture Silicate wheels with or without web as specified by the customer.

# CANADIAN HART WHEELS

*Made-in-Canada*

IN ALL grinding, the main problem is found in the dissipation of the heat generated. A wheel manufactured of proper abrasive grains, of a proper degree of hardness, will produce a minimum of heat, and this heat will be dissipated with the least injury to the wheel or material ground.

Once you find the correct grade and grain, you want to feel **sure** that **every** future wheel you order will give the same satisfactory service as the first.

The unvarying uniformity of Canadian Hart Wheels is a recognized fact which more and more shops are coming to depend upon. **Why not you?**

***Tell us what you have to grind***
***and we'll tell you the wheel to use.***

## CANADIAN HART PRODUCTS
LIMITED

HAMILTON, CANADA

*If interested tear out this page and place with letters to be answered.*

# Correct Lighting in your Plant means More Work and Better Work





## Let Us Ease the Eye Strain

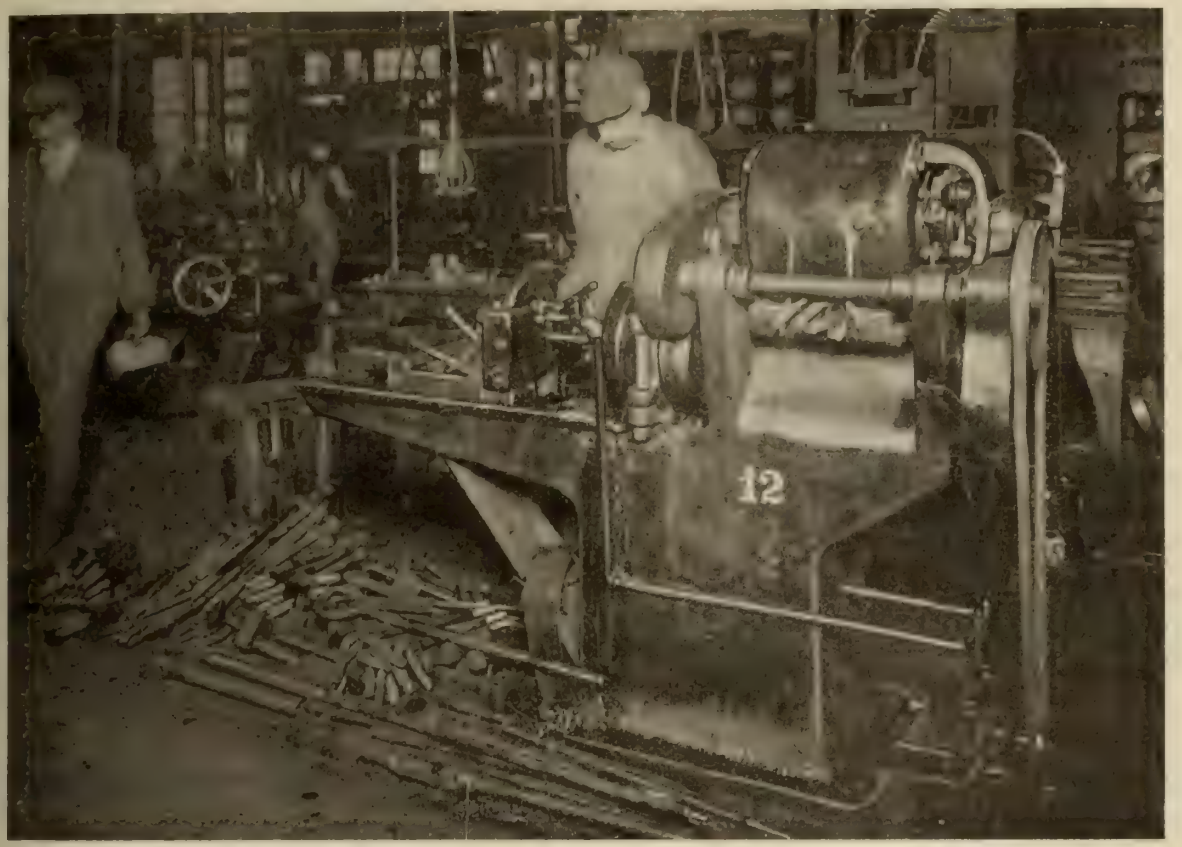
Good lighting is a factor of first consideration in any effort to improve workmanship, increase production, reduce spoilage and safeguard employees.

A poorly lighted plant breeds weariness and discontent, resulting in uneven production and waste. Ease the eye-strain and get more and better work from a happier staff by installing a correct Industrial Lighting System in your plant.

Our Illumination Engineers will gladly help in solving your particular lighting problem by planning the system that will most efficiently and economically meet your need. Such well-known names as Benjamin, Adams & Bagnall and Overbaugh and Ayres are included in our stocks of Illumination Equipment.

**Northern Electric Company**
LIMITED

**Montreal Quebec Hamilton Toronto Winnipeg Regina Vancouver**
**Halifax Ottawa London Windsor Calgary Edmonton**




***"We just keep feeding 'em to 'er and she eats 'em just like any other Landis."***

That was the foreman's reply at the Reading Iron Co.., Reading, Pa., when we asked him about the upkeep of this Landis Bolt Threading Machine during his three years in the plant.

This machine has been threading bolts 2" in diameter for the past 10 years and is as good to-day as when first installed.

# Landis Threading Machines

are rapid, rigid, durable and dependable. They are built to withstand the roughest usage and insure long life. It will pay you to investigate the merits of Landis Pipe and Bolt Threading Machines and Landis Die Heads. Write for full particulars to-day.

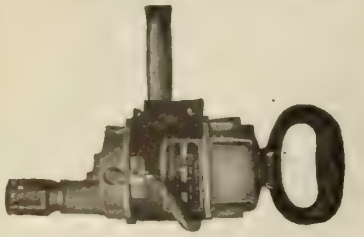
## LANDIS MACHINE COMPANY

**WAYNESBORO, PA.**

*If interested tear out this page and place with letters to be answered.*

# U. S. Electric Drills and Grinders

**Save Time, Labor and Money**



They can be attached to any lamp socket.

For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

3 SIZES
3-16 in., W.G.T., 6 lbs.
¼ in., W.G.T. 9 lbs.
⅜ in., W.G.T. 12 lbs.

All motors wound for 110 or 220 volts.

Direct or alternating current.

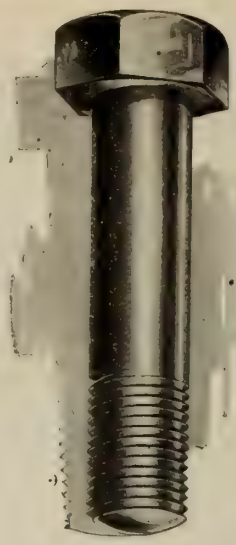
Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



⅜ and 1¼ Universal Motor DRILL.

For Sale By
**The Canadian Fairbanks-Morse Co., Limited**
Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver

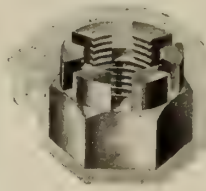
**THE UNITED STATES ELECTRICAL TOOL CO.**
CINCINNATI, OHIO



# ACCURACY

Just now all jobbers should have a complete stock of SAE Cap Screws, Plain and Castellated Nuts and Taper Pins to meet the automobile repair trade requirements.

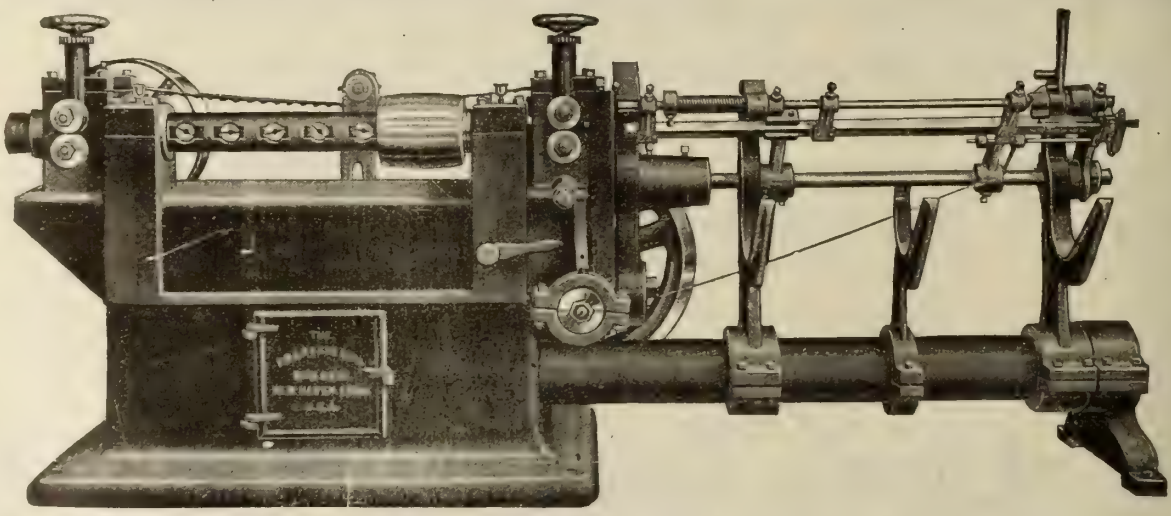
Your rush orders filled promptly by



**The Galt Machine Screw Co., Limited**
GALT, ONTARIO

*Eastern Representatives:*
Messrs. F. BACON & COMPANY
131 St. Paul Street West, Montreal, Que.

*Western Representative:*
Mr. D. PHILIP
138 Portage Avenue, Winnipeg, Man.



**Perfect Wire Straightening Quickly and Profitably Done on Our**

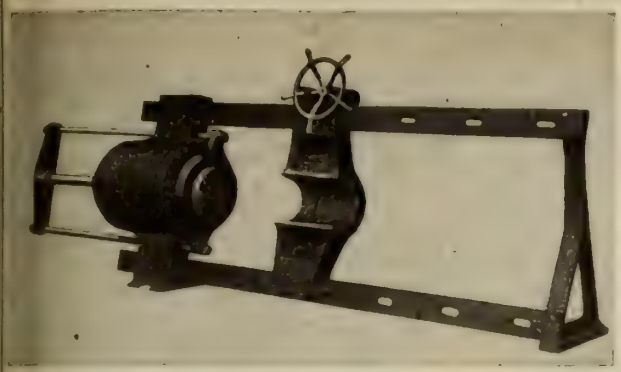
# Automatic Wire Straightening and Cutting Machine

Just put your coil of wire on the reel, adjust the rolls and dies, and set the gauge for the length you want. The machine does the rest—thousands of feet per day, perfectly straight and cut to accurate lengths.

Catalogue tells more about them, and we will be glad to send you a copy.

# THE F. B. SHUSTER CO., New Haven, Conn.

FORMERLY JOHN ADT & SON ESTABLISHED 1886
*ALSO MAKERS OF STRAIGHTENERS FOR SQUARES, HEXAGONS, FLATS, ETC.*



# PERRIN
## 400-Ton Hydraulic Wheel Press

This Made-in-Canada Press is built to operate direct from Accumulator at 1500 pounds per square inch pressure.

*Perrin for Reliability*

**WILLIAM R. PERRIN, LIMITED**
TORONTO

# WHY EXPERIMENT ?
## WE DID IT FOR YOU YEARS AGO



**IMPERIAL GENUINE**




For Heavy Engines and Extraordinary Hard Work

**HARRIS HEAVY PRESSURE**

THE COPPER COATED CAKE

For Donkey Engines, Saw Carriages, Small Motors, Transmission Line Shafting and all steady heavy pressure duty.

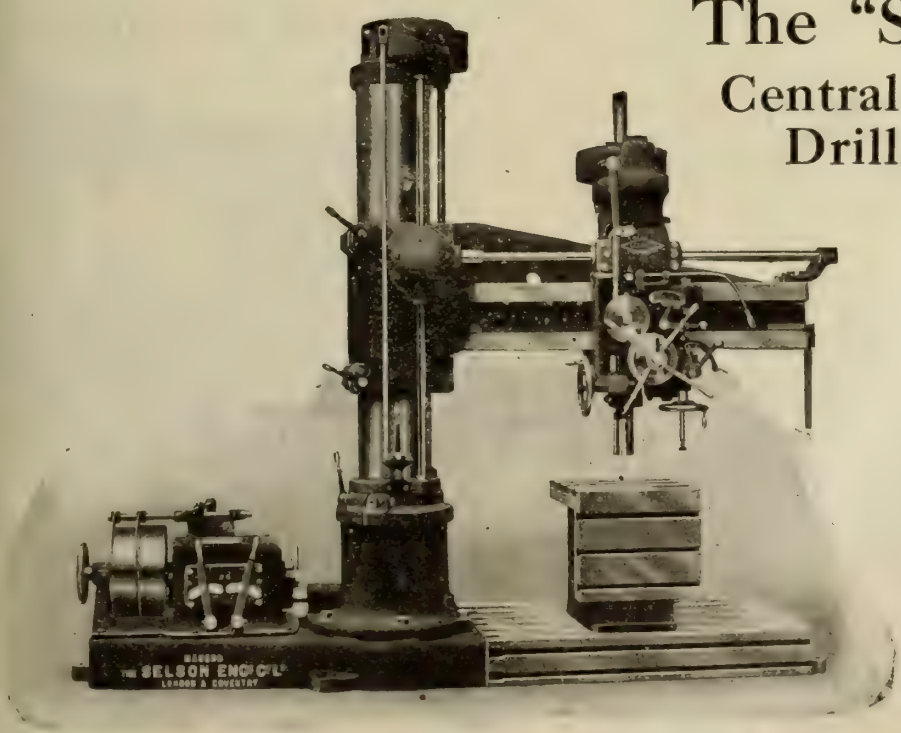


**Matchless**

Suitable For Slow-Moving Bearings

Write For Prices

**THE CANADA METAL CO., LIMITED**
TORONTO HAMILTON MONTREAL
WINNIPEG VANCOUVER




# The "Selson"
## Central Thrust Radial Drilling Machine

Do you appreciate the advantage of the Central Thrust? Write and we will explain.

# SELSON
***Engineering Co., Ltd.***

SELSON HOUSE, 83 and 85 QUEEN VICTORIA STREET
LONDON, E.C. 4, ENGLAND. WORKS: COVENTRY
*Branches: Paris, Brussels, Turin, Milan, Melbourne, New York*

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# MILWAUKEE MILLING MACHINES



## Increase Your Dividends

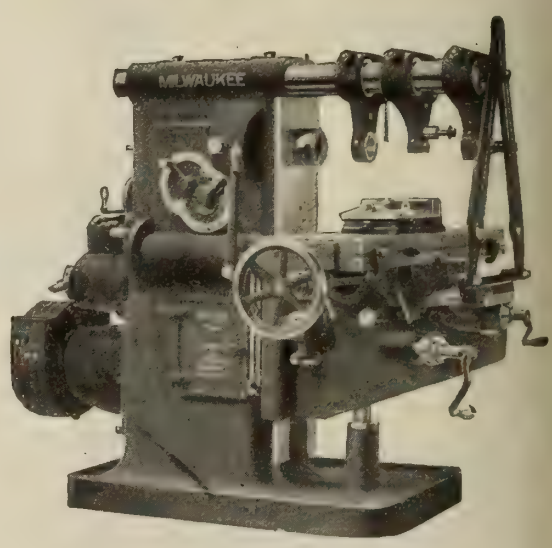
**Economy and increase in quality and production of work follows the installation of—**

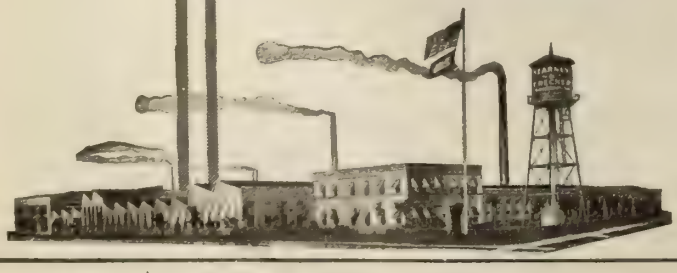
## Milwaukee
### Milling Machines

ECONOMY—greater economy—is the demand of the day. It will surprise you how profitably and economically the Milwaukee Milling Machine will do your milling.

"Milwaukee" engineers' forethought in superior design and construction, together with actual accomplishments, are responsible for the unprecedented choice of Milwaukee Milling Machines by leading manufacturers throughout the world. Unquestionable dependability to economically and efficiently meet the demands of production milling or work varying widely in character has won for them a memorable place in the hearts of discriminating mechanics and manufacturers.

Let us show you how you can cut your milling costs and increase your dividends. Permit us to send our catalogue as a forerunner.



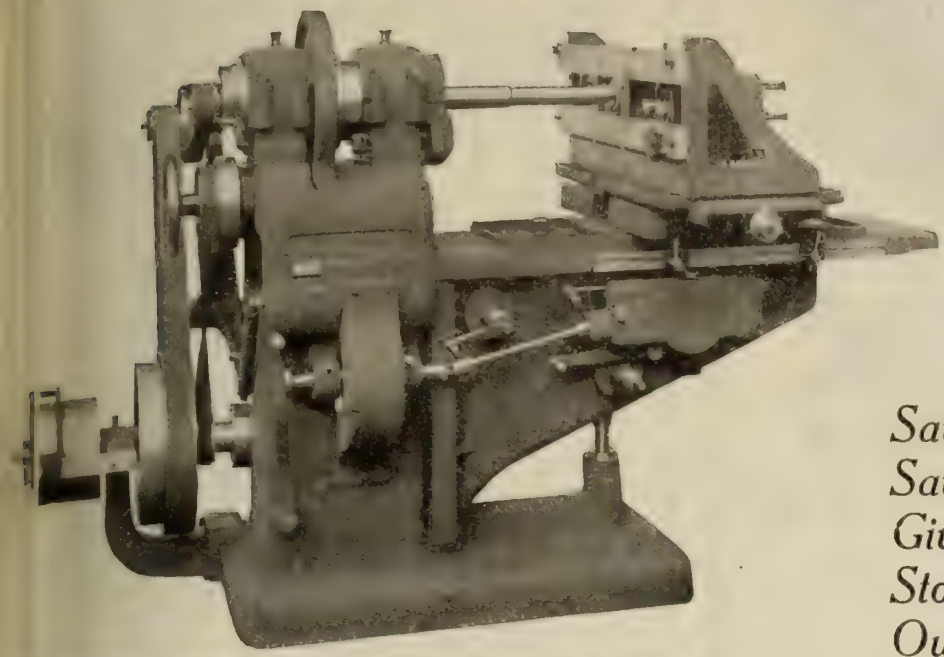



KEARNEY & TRECKER
CORPORATION
MILWAUKEE, WIS., U.S.A.

Canadian Representatives:
WILLIAMS & WILSON, LTD., Montreal
F. F. BARBER MCHY. CO., Toronto
A. R. WILLIAMS MCHY. CO., Vancouver and Winnipeg.

HEALD

# New Business Possibilities



A real regrinding machine. See how easily it handles a six-cylinder en bloc.

## Regrinding Cylinders

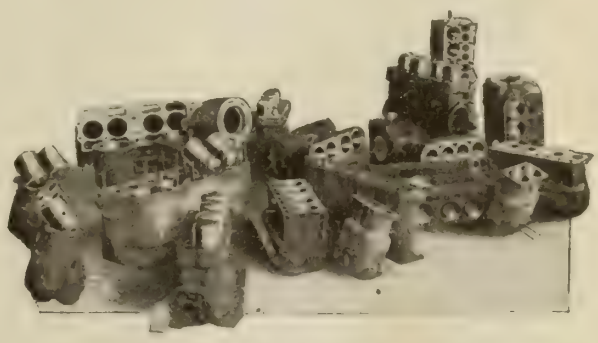
*Saves Gas*
*Saves Oil*
*Gives More Power*
*Stops Smoking*
*Owners Demand It*

Whether you are already interested in automobile repairing or are seeking some profitable business to go into, be sure to consider the regrinding of motor cylinders. Here is a new field of opportunity that has been barely scratched. With some thousands of registered cars that are being overhauled and whose worn and scored cylinders will require regrinding to bring back the original power, pep and economy of a new car, the possibilities are unequaled in any other business at the present time.

The Heald Style No. 55 has been just put on the market for this work. The capacity and range is such that it will handle all sizes and styles of cylinders usually found in the regrinding shop. It can be bought at a fair price, easy to set up, simple to run and maintain, with a capacity that will give you jobs you never planned on.

**Some one in your vicinity is going to buy a Heald and get the cream of a profitable business.**

**Are you the one?**



Handles all sizes and shapes of cylinders.

## The Heald Machine Co.

51 New Bond Street
WORCESTER, MASS.

Branches at Chicago, Detroit, Cleveland, Buffalo, Cincinnati, Philadelphia and New York

*If interested tear out this page and place with letters to be answered.*




# LARCUL CUTTING OILS Did the Trick

A large manufacturer of fittings recently had some malleable iron unions that were so hard they had to be annealed before they could be properly threaded.

The superintendent was very pessimistic and did not believe that any kind of cutting compound would keep his tools in shape to machine these castings. We assured him that Larcul Ebony and Amber Cutting Oils would "do the trick," and his letter to us proves that they did!

> "Machined up all the unions that we used to send back to be annealed and they were as hard as flint, and I never believed there was an oil made that would touch them until you sent us those oils and we cleaned up all the unions we had on hand which were giving us a great deal of trouble and the threads were as good as we are getting on our regular run of castings."

Larcul Cutting Oil is made in two grades: Amber, a transparent oil, for all types of automatics, turret machines, gear cutters, etc., and Ebony, for pipe and bolt threading, nut tapping, turrets, automatic turning and boring, etc.

Larcul makes the "impossible" job possible, and the regular job easier.

*Let us give you a demonstration.*

**Cataract Refining Company**
Limited
TORONTO ONTARIO

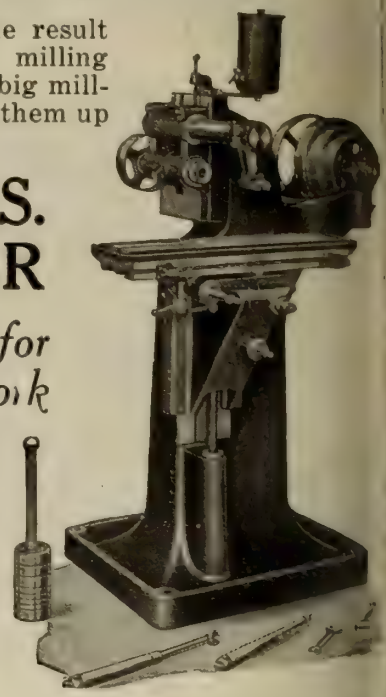
SCIENTIFIC LUBRICANTS for SCIENTIFIC LUBRICATION

# 1/3 to 1/2 Reduction in Milling Cost

This will be the result of taking small milling jobs from your big millers and putting them up to

## The U.S. MILLER

*The Miller for Small Work*

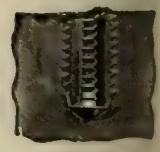


A small machine takes up less space, requires less power, is easier to operate and is more accurate.

**The Paramount Miller of its size.** Drop us a line for full details.

**United States Machine Tool Company**
Cincinnati, Ohio, U.S.A.

# Buried in the Work and Broke!



Next time a tap breaks below the surface of a large casting, don't let some makeshift method of removing it injure the thread and waste half an hour of valuable production time. Instead—



## Walton it Out in a Jiffy

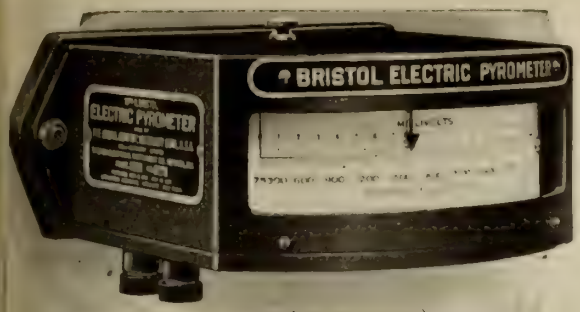
And save the casting.

Special analysis steel fingers of the Walton Extractor drop into the flutes of the broken tap—and grip. Then a few turns of a wrench applied to the squared end of the Extractor backs out the buried tap.

**Sixty-day trial offer** proves the Walton Extractor pays for itself.

**Write.**

**The Walton Co.**
Hartford, Conn.




# ELIMINATE GUESS WORK
## In Heat Treating

Heat-treating Furnaces equipped with BRISTOL'S Pyrometers assure perfect heat treated products through the elimination of all guess work.

The Patented Automatic Internal Cold End Compensator is an exclusive feature with Bristol's Pyrometers. It makes of every pyrometer a direct-reading instrument—no allowance to be made for cold and errors.

**Get copy of Bulletin I-291.**

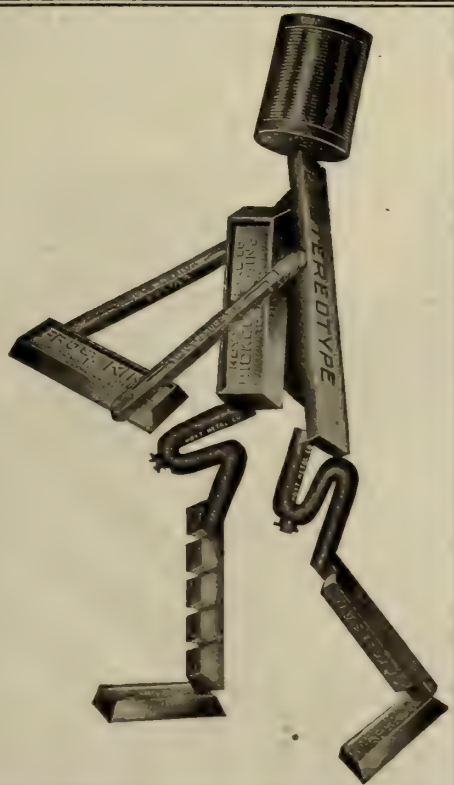
**THE BRISTOL COMPANY**
Waterbury, Conn.
Canadian Distributors: A. H. WINTER JOYNER, Toronto and Montreal

FROST KING BABBITT

will withstand heavy pressure without increasing its temperature.

For general machinery bearings it is without a peer.

If you are from Missouri try a sample lot and be convinced.




**HOYT METAL COMPANY**
MONTREAL TORONTO WINNIPEG



Franklin Die-Castings in Office Appliances

## *The Growing Needs of Business*

Not long ago the steel pen was practically the only mechanical instrument used in transacting business. To-day typewriters, telephones, multigraphs, adding machines, filing cabinets, billing machines, stamp affixers and an ever-increasing list of other appliances meet the growing needs of business.

The Die-Casting Process is prominent among the manufacturing methods that have made possible this extraordinary development.

In 1892 we originated the Die-Casting Process, and for nearly thirty years we have been applying it to many fields of industry. Our long experience should be of value to progressive engineers.

We cast in Aluminum, Tin, Lead, and Zinc base alloys, and quote from samples or blueprints.

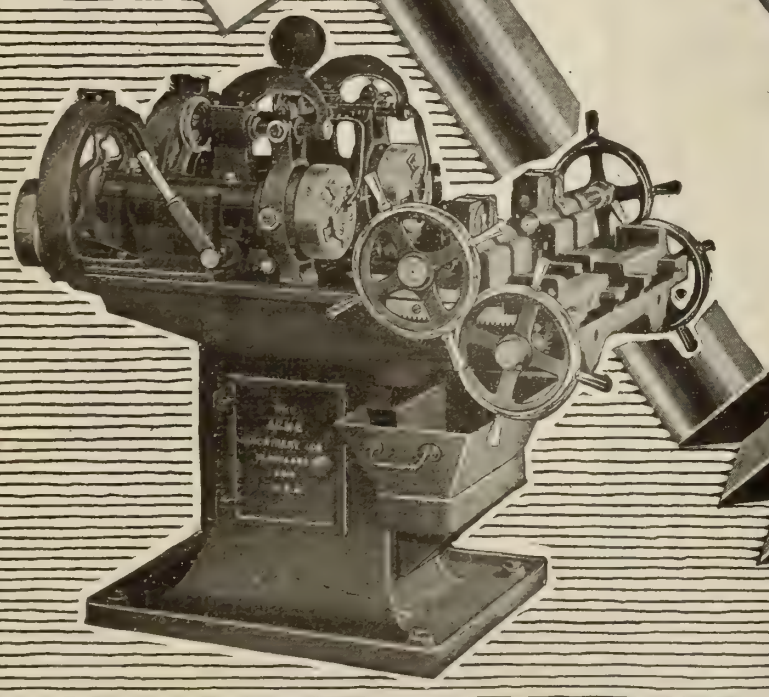
**FRANKLIN**
**DIE-CASTING CORPORATION**
Gifford and Magnolia Sts., Syracuse, N. Y.

*Write for booklet "Franklin Die-Castings in Many Fields."*

FRANKLIN DIE-CASTINGS

# BOLTS

## SQUARE · HEXAGON TEE-HEAD



### Cut Them In Your Own Plant

*and Save Money on Cost and Delay in Deliveries*

### ACME BOLT CUTTERS

are made in various sizes for cutting bolts from ¼ to 1 in. diameter. Their heads allow micrometer adjustments while they are in motion. The dies can be changed from one size to another in less than one minute and produce clean, accurate, highly-finished threads.

**May we send catalog?**

### The Acme Machinery Co.

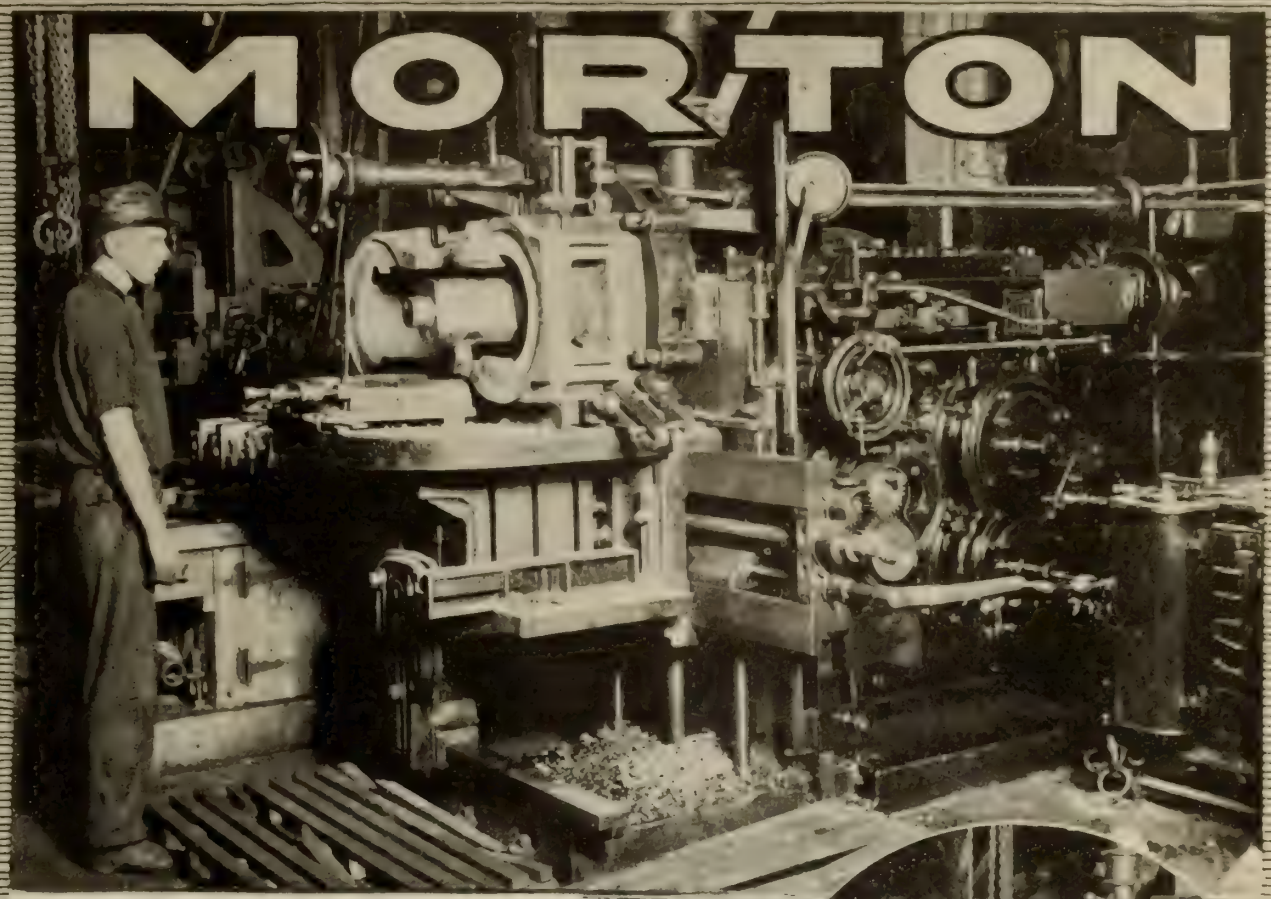
**4530 St. Clair Ave. Cleveland, Ohio**

We make a complete line of Bolts, Rivet, Heading, Upsetting and Forging Machines, Bolt Cutters, Hot Pressed Nut Machines, Hammer Heads, Bolt Pointers, Nut Tappers.

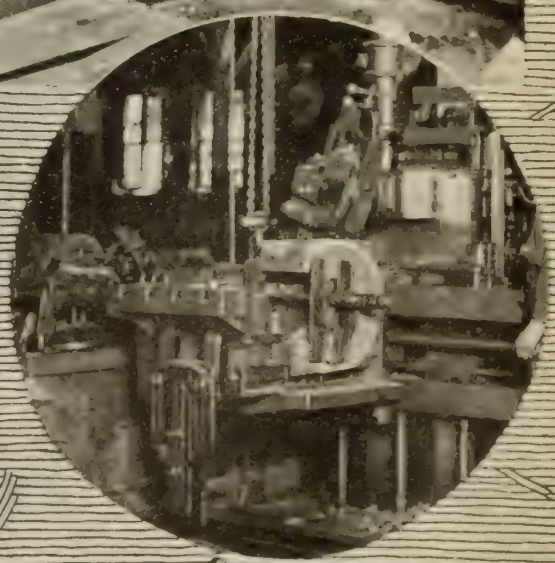
**Representatives for Canada:**
**The John Bertram & Sons Company, Limited, Dundas, Ont.**

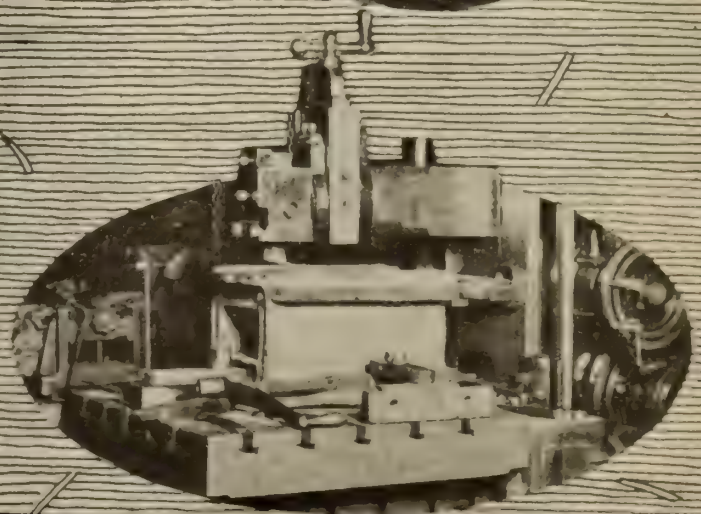
# ACME BOLT CUTTERS

MORTON



# Increased Driving Box Repairs Forced the Purchase of this Morton Draw Cut Shaper





Delays to output were traced direct to driving box repairs in this busy shop. Time element and shortage of man power were considered and the installation of this "Morton" reflects the good judgment of these thoughtful officials to install machines of guaranteed production power.

This Morton handles all the machine work on driving boxes—planing to thickness, planing shoe and wedge faces and crowning for bearing brass. It simplifies handling and reduces machine time.

May we send Bulletin A-6 explaining numerous points of merit?

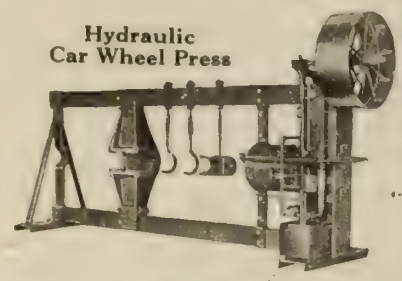
**MORTON MFG. CO.**

**Muskegon Heights - Michigan**

## LOURIE HYDRAULIC PRESSES

**For Every Purpose Requiring Pressure**

Hydraulic Car Wheel Press



We manufacture a complete line of presses for bending, straightening, forcing, forming, broaching, welding, baling, and many other purposes.

Hydraulic Bulldozer



*Write for Catalogue*

**LOURIE MANUFACTURING CO.**
SPRINGFIELD, ILLINOIS, U.S.A.

# "MORSE" DRILLS

## BOTH CARBON AND HIGH-SPEED

Have always maintained a

## High Grade of Efficiency



We still use the best material in their manufacture and stand back of every drill we put out. **If you want the best, use**

**Morse Twist Drill & Machine Co.**
New Bedford, Mass.
U.S.A.

# "MORSE"

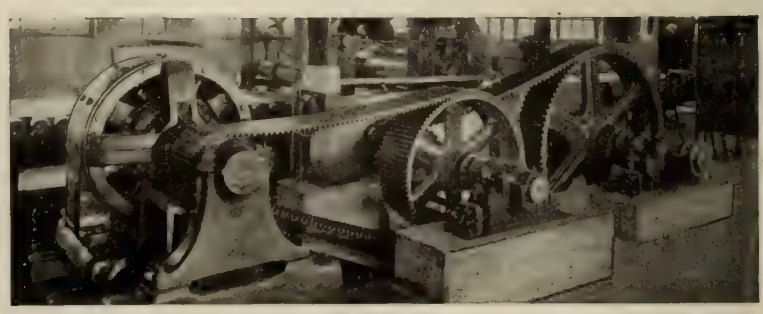
## THE MORSE CHAIN CO.

are the
Largest Manufacturers in the world
of
High Speed Silent Chains

**Why?**

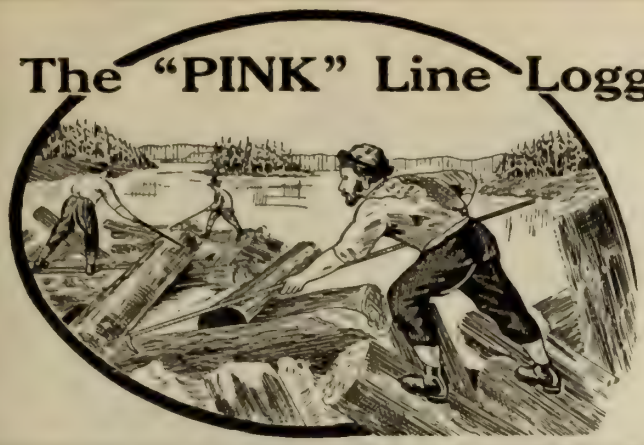
Morse Chain possesses the exclusive
**Rocker Joint**
Frictionless—Requires no Oilbath.

**Jones & Glassco** (Reg'd.)
Canadian Agents
Montreal - - Toronto



80 H.P. Morse Drive to Rolls, reverses direction every 45 seconds

# The "PINK" Line Logging Tools and Handles



**MADE-IN-CANADA Products---Headquarters for British Empire for all Lumbering Tools**

In every lumber camp in Canada you'll find PINK'S famous lumbering tools. They are the favorites there and have won the esteem of all woodsmen through their superior merit. They are world-renowned and are extensively used in Australia, New Zealand and other countries where the lumbering industry thrives.

**EXPORTERS TO EUROPE**

We export the same good quality of lumbering tools that have made PINK'S TOOLS a by-word in the matter of good tools in all Canadian lumber camps. Enquiries cordially solicited.

**Thomas Pink Co., Limited**

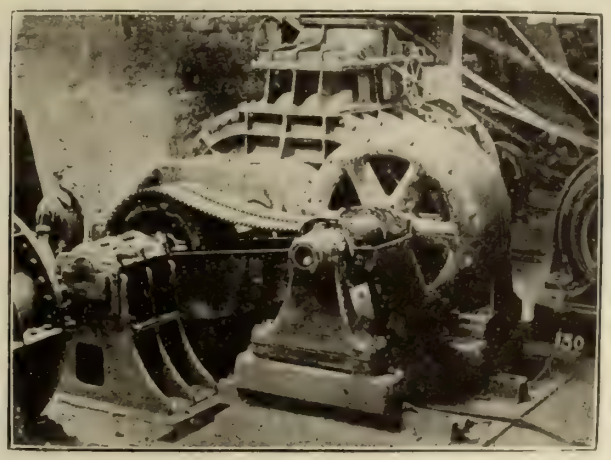
PEMBROKE, ONT., CANADA

# RENOLD DRIVING CHAINS

(THE CHAINS OF UNIVERSAL REPUTE)

ONE
QUALITY ONLY—
**THE BEST**

OUR POLICY SINCE
1879



RELIABLE, COMPACT,
EFFICIENT and DURABLE

Note particularly compact features of 350 H.P. Renold Silent Chain Drive to Roots Pressure Blower.

If YOU are interested in increasing YOUR Production, also improving the Quality of YOUR product, YOU MUST consider

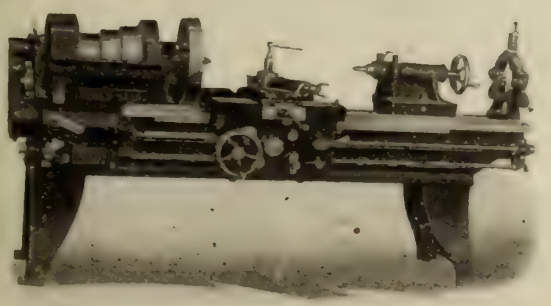
**RENOLD DRIVING CHAINS FOR POWER TRANSMISSION**

WRITE FOR BOOKLET NO. 200/5—"NOTES ON SELECTION OF CHAIN GEAR."

## HANS RENOLD of CANADA, LIMITED

11 ST. SACRAMENT STREET
MONTREAL

32 FRONT STREET W.
TORONTO



*An Easy Master of Big Jobs*

# SIDNEY

## Heavy Duty Engine Lathes

The surplus strength and rigidity of the Sidney makes it the ideal lathe for the "Big Job."

Illustration shows 25-inch Heavy Duty, Quick Change. Bed lengths in 10, 12, 14, 16, 18 and 20 feet. Write for details.

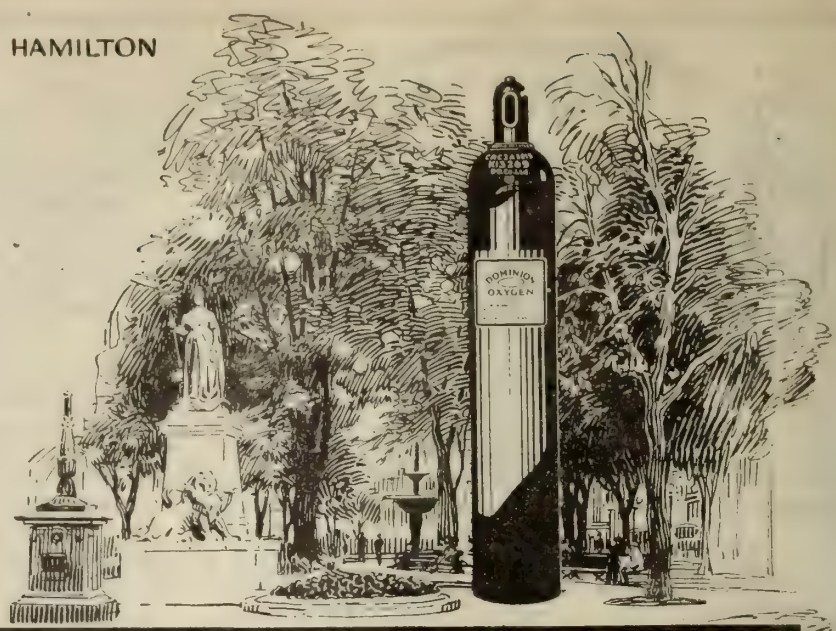
**The Sidney Tool Company, Sidney, Ohio, U.S.A.**

*Canadian Agents*

Yeates Machinery & Supply Co., Montreal, Que. H. W. Petrie, Limited, Toronto, Ont.


*If interested tear out this page and place with letters to be answered.*







# Dominion Oxygen

## *when and where you want it*

FROM four centrally located points the Dominion Oxygen Company, Limited, supplies Canadian industry with the commercial oxygen it needs. Thanks to the completion of these first four distributing stations, Canadian manufacturers can now rely on a never-failing source of immediate oxygen supply.

*Delivery of pure oxygen in any quantity, at any point, at any time, is made certain by Dominion's producing and distributing organization.*

The manufacture of uniformly pure oxygen in quantities large enough to insure prompt attention to your needs has been the aim of the Dominion Oxygen Company, Limited, since the formal announcement of its building plans. The fact that every order for oxygen is filled on the day it is received is evidence of the efficiency already reached.

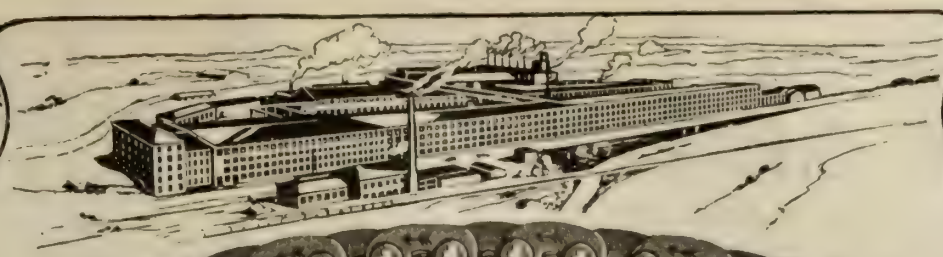
Dominion Oxygen Service is based on the Company's realization of Canada's need of an always available supply of uniformly pure oxygen. Dominion oxygen, in the high capacity cylinder built for economical and safe handling, fills that need.

**DOMINION OXYGEN COMPANY, LIMITED**

Hillcrest Park, Toronto

Hamilton Montreal Windsor

D-15



The Sign of Efficiency — The Sign of Durability

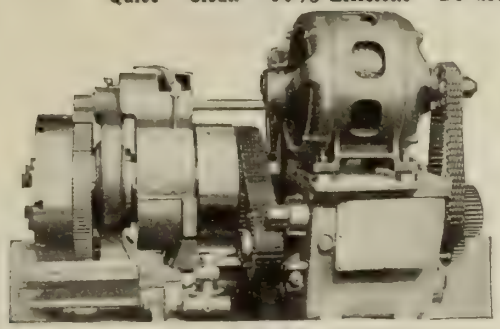
# MORSE DRIVES

THE MORSE ROCKER JOINT

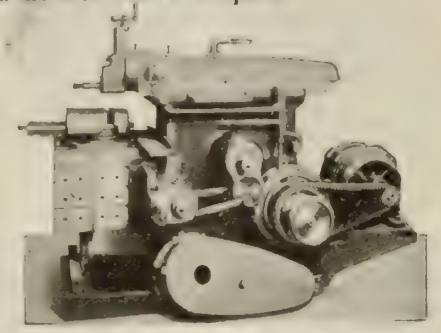
Positive as Gears — Flexible as a Belt

Longer Life

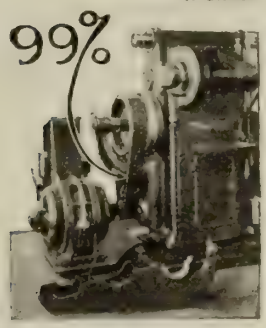
**Quiet Clean 99% Efficient Do not run hot Oil baths not required**



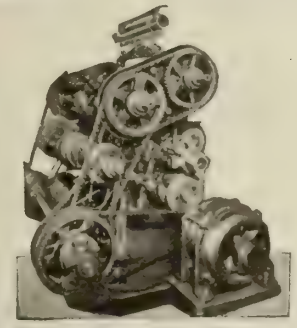
Typical Example: Morse Silent Chain as positive speed ratio drive in head of Gisholt lathe



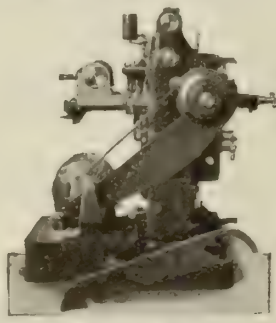
Morse Silent Chain driving Hendey Shaper from Individual Motor




Individual Motor driving Milling Machine. Chain case removed



Seven Morse Silent Chain Drives giving positive speed ratios in Automatic Hub Machine



Morse Silent Chain Drive from Individual Motor to Cincinnati Milling Machine. Chain case removed

THAT the Advantages of Morse Drives merit careful investigation by manufacturers requiring individual motor drives or silent drives of positive speed ratio is shown by the constantly increasing number of prominent designing engineers standardizing on Morse Silent Chain Drives.

Our Sales Engineers are Power Transmission Experts who make it their business to design the drive that gives best efficiency.

**MORSE CHAIN CO.,** *Morse Engineering Service*

LARGEST MANUFACTURERS OF SILENT CHAINS IN THE WORLD

**ITHACA, N. Y.** *Assistance Without Obligation*

*Address Nearest Office*

BALTIMORE, MD. ..... 1402 Lexington Bldg.
BOSTON, MASS. ..... 141 Milk Street
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CLEVELAND, OHIO ..... Engineers Bldg.
DETROIT, MICH. ..... Cor. 8th & Abbott Sts.
CHARLOTTE, N. C. ..... 404 Commercial Bk. Bldg.
NEW YORK CITY ..... 50 Church St., Hudson Term. Bldg.
PITTSBURGH, PA. ..... Westinghouse Bldg.
PHILADELPHIA, PA. ..... 302 Harrison Bldg.
SAN FRANCISCO, CALIF. ..... Monadnock Bldg.
ATLANTA, GA., Earl F. Scott, M. E. ..... 702 Candler Bldg.
CANADA ..... Jones & Glassco, Reg'd.
MONTREAL ..... St. Nicholas Bldg.
TORONTO ..... Traders' Bk. Bldg.
KANSAS CITY, MO., Morse Engineering Co. ..... Finance Bldg.
MINNEAPOLIS, MINN. ..... Strong-Scott Mfg. Co. 413 Third St., S.
ST. LOUIS, Mo., Morse Engineering Co. ..... Chemical Bldg.

**"Morse" is the Guarantee Always Behind the Efficiency, Durability and Service**

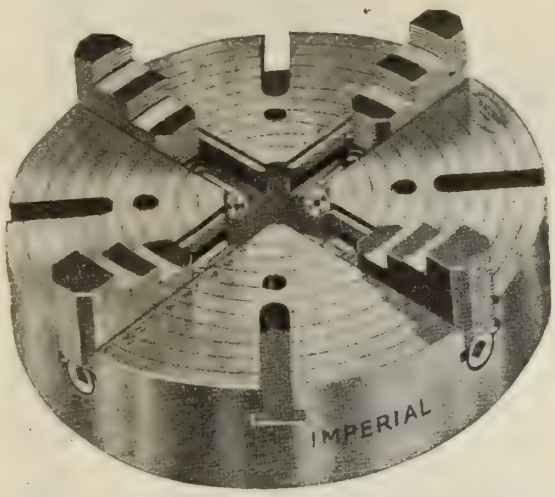
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# IMPERIAL LATHE CHUCKS

*Highly Endorsed by Canada's Best Manufacturers*

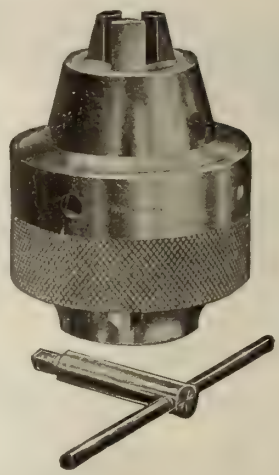
Sturdy long-wearing "Made-in-Canada" Chucks that are making good everywhere.

Specify them in your next order.




**Ker & Goodwin Machinery Co.**
BRANTFORD, Ont. LIMITED

# Built For Production Not For Price



The Skinner Geared Pattern Drill Chuck has no superiors and few, if any, equals. It is as accurate as it is convenient. The gears being enclosed beneath the surface, there is no danger of pinched fingers.

Made of steel throughout, this chuck is operated by hand, the final grip being secured by a mere turn of the wrench.

**THE SKINNER CHUCK COMPANY**

NEW BRITAIN, CONN U S A

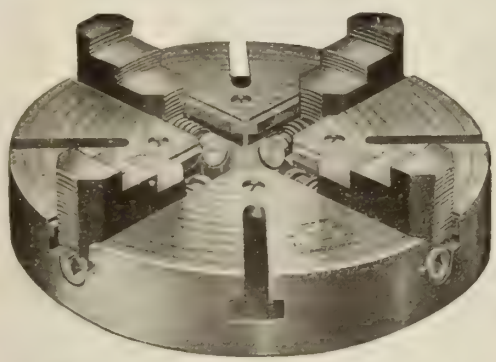
ESTABLISHED 1887

NEW YORK OFFICE: 94 READE ST.
SAN FRANCISCO OFFICE: RIALTO BLDG.
LONDON OFFICE: 139 QUEEN VICTORIA ST., LONDON, E.C.4.

ALL STEEL

# INDEPENDENT CHUCKS

are not an experiment — they have come to stay. They are a necessity with the modern machinery and high-speed steel cutting tools.



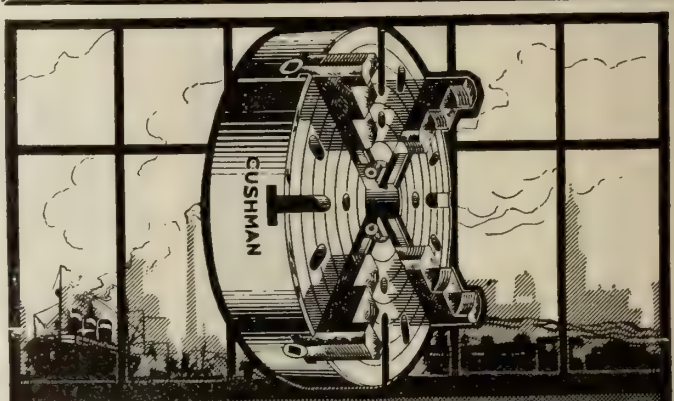
THE UNION STEEL BODY CHUCKS

are well designed and have all the elements of strength and durability for which they are designed. We make other types in steel also, including the Geared Scroll Chucks and the Geared Scroll Combination—all designed for heavy work and hard usage.

**UNION MANUFACTURING COMPANY**
New Britain, Conn.

*New York Office:* 26 Cortlandt Street

*Makers of a complete line of chucks*

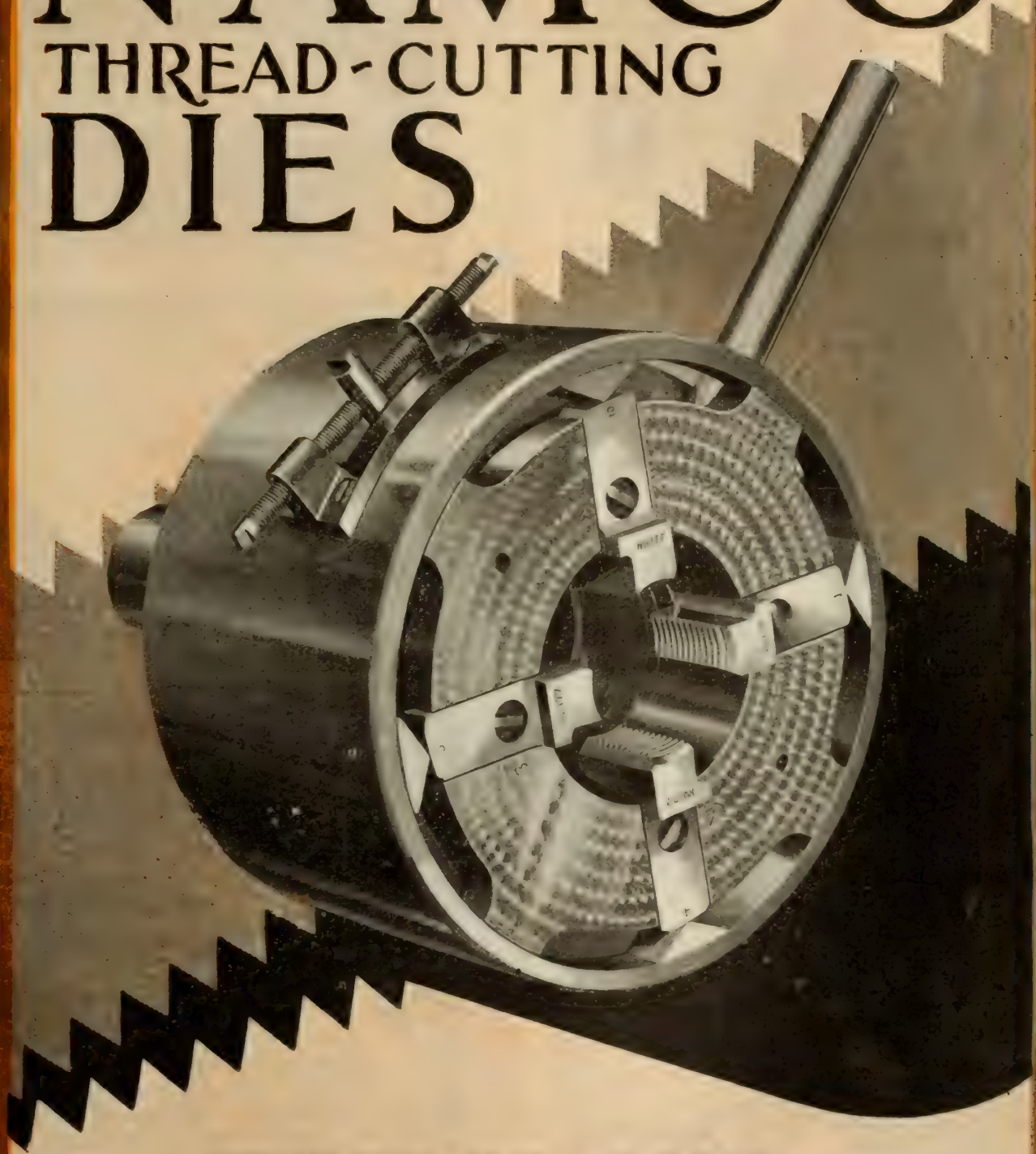



# THE CHUCK WITH A REPUTATION TO MAINTAIN

"CUSHMAN" CHUCKS 1862

THE CUSHMAN CHUCK CO.
HARTFORD, CONN.

# NAMCO
## THREAD-CUTTING
# DIES



## THREE REASONS—

Three reasons for the continuously accurate threads cut by NAMCO Self-Opening Dies are correct design, careful workmanship, excellent materials.

**There's a NAMCO Die for every requirement.**

## THE NATIONAL ACME COMPANY

**CLEVELAND, OHIO**

New York Boston Chicago Detroit Buffalo Windsor, Vt. Montreal

# VENUS PENCILS

*The largest selling Quality pencil in the world*

THE well-known VENUS pencil with the water-mark finish—there is an individuality, a luxury, a satisfying quality, about its smooth firm, gritless leads, that make the engineer always say: "Here, indeed, is Pencil Perfection."

**17 Black Degrees**
**3 Copying**

For bold, heavy lines
6B-5B-4B-3B

For writing, sketching
2B-B-HB-F-H

For clean, fine lines
2H-3H-4H-5H-6H

For delicate, thin lines
7 H-8H-9H

**Plain Ends, per doz. $1.50**
**Rubber Ends, per doz. $1.75**

*At Stationers and Stores throughout the World*

American Lead Pencil Company
238 Fifth Ave., New York

Factory: Hoboken, U.S.A.
Factory: London, Eng.

# Wood Screw Making Machinery

SEND FOR CATALOGUE
Series



For sixty years we have constantly manufactured machinery for making screws, always studying to improve and refine our product.

**Write or Wire us.**

Cable address: "Cook,"
Hartford, U.S.A.
Codes: Liebers
Western Union

**Asa S. Cook Co.**
**Hartford, Conn.**

# KELLER-MASTER



KELLER-MASTER
ROTARY GRINDER

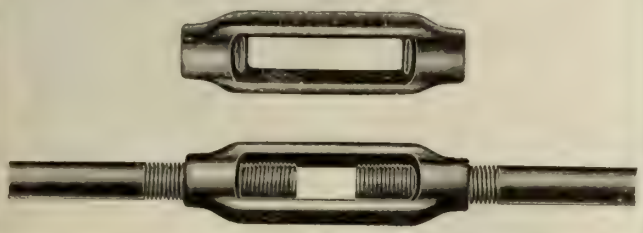
**Ten pounds lighter, yet more rugged than other types with same power and speed—free from vibration, which insures endurance in operator and tool—ample power to sustain speed under load—are the salient features of the NEW Keller-Master Rotary Grinder.**

KELLER-MADE
MASTER-BUILT

**KELLER**
**PNEUMATIC TOOL COMPANY**
**GRAND HAVEN, MICHIGAN**
BANK OF NOVA SCOTIA BLDG., MONTREAL

CANADA
FOUNDRIES & FORGINGS
LIMITED

Drop Forged Steel



SOLID—NOT WELDED

16 Sizes with / without } Stubs

Canada Foundries & Forgings
Welland, Ont.

THERE is as much difference in the various makes of High Speed Steel as there is in men—

The practice and methods of manufacturers differ widely in every mill and anyone who is at all familiar with the manufacture of High Speed Steel thoroughly understands this

"Red Cut Superior"

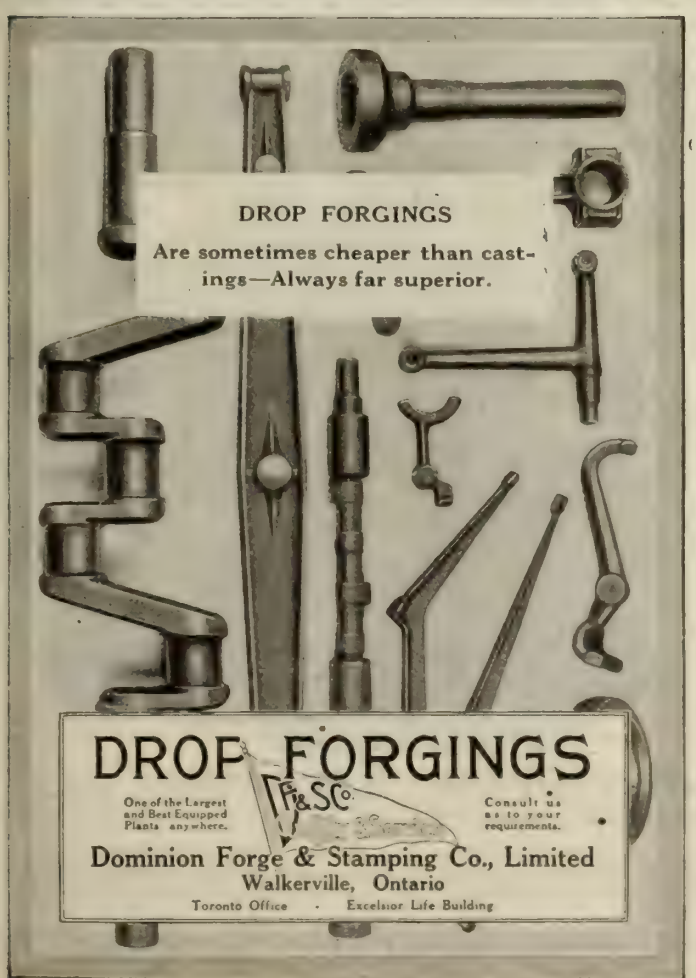
*The Nationally Known—First Quality*
HIGH SPEED STEEL
is the best for all Machine Work

ARE YOUR TOOLS MADE OF "Red Cut"?

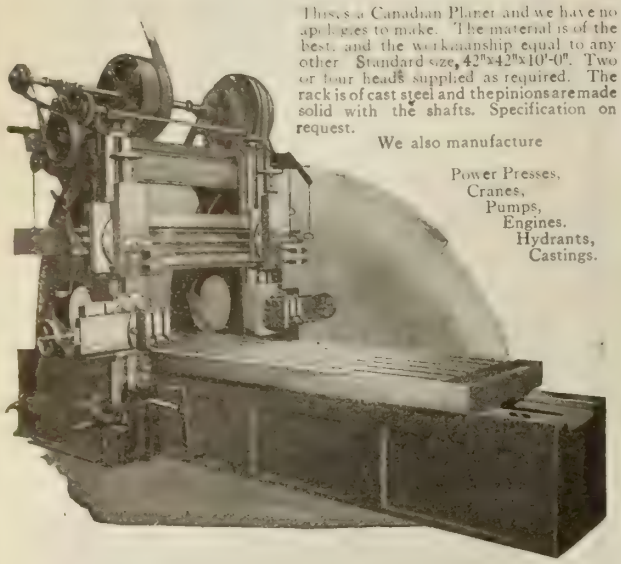
VANADIUM-ALLOYS STEEL COMPANY
Main Office and Works :
Latrobe, Pa.

BRANCH OFFICES:
TORONTO BUFFALO CLEVELAND CINCINNATI
MONTREAL BOSTON CHICAGO DETROIT
NEW YORK PHILADELPHIA PITTSBURGH





# HEPBURN
## HIGH-SPEED PLANER



This is a Canadian Planer and we have no apologies to make. The material is of the best, and the workmanship equal to any other Standard size, 42"x42"x10'-0". Two or four heads supplied as required. The rack is of cast steel and the pinions are made solid with the shafts. Specification on request.

We also manufacture

Power Presses,
Cranes,
Pumps,
Engines.
Hydrants,
Castings.

**John T. Hepburn, Limited**

*Engineers and Iron Founders*

18-60 Van Horne St., Toronto, Ontario, Canada

# The FORD TRIPLOC




**A Chain Hoist that gives perfect service**

Catalog sent upon request

**FORD CHAIN BLOCK CO.**
2ND & DIAMOND STREETS PHILADELPHIA, PA.

OVER-SEAS REPRESENTATIVE
ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA
51 CHAMBERS ST NEW YORK U.S.A.

PARIS BRUSSELS TURIN BARCELONA RIO DE JANEIRO

Saves Time, Labor, Expedites Production

# ROCKFORD Milling Machine

***Its speed, simplicity of operation and great utility Assures Big Profits in whatever work it is used.***

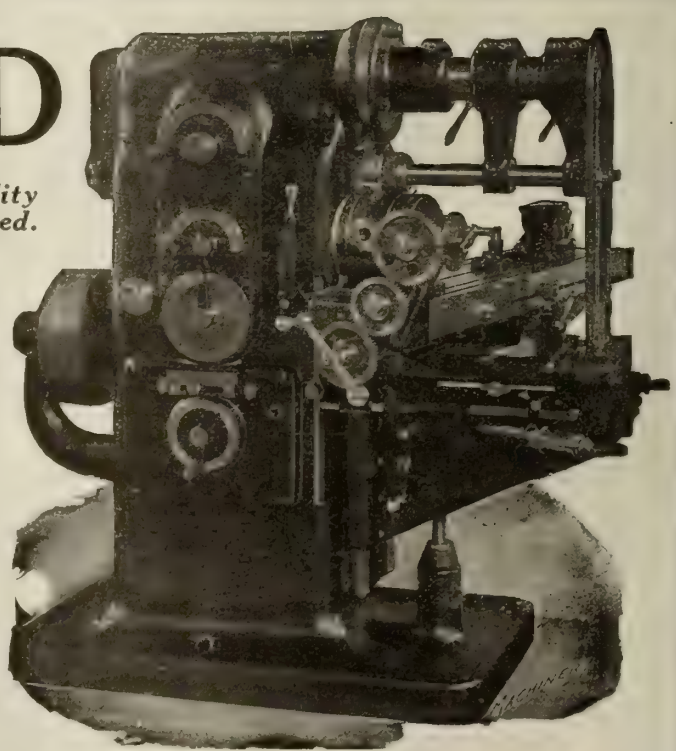
And another profit-making feature of the "Rockford" Miller lies in its unusual capacity to do all classes of work.

In the tool room, in the shop, in the manufacturing or jobbing establishment this "Miller" is beyond comparison.

## Has Power to Spare

Put the power of the "Rockford" to the severest tests. It's built to more than meet the demands likely to be made upon it. It is the pace-maker of the machine shop.

**Look into the merits of this machine. Write to us without delay.**



**ROCKFORD MILLING MACHINE COMPANY, ROCKFORD, ILL.**

**Canada: Rudel-Belnap Machinery Co., Toronto, Ontario.**

FOREIGN REPRESENTATIVES: Great Britain, A. A. Jones & Shipman, Ltd., Leicester, England. France and Belgium, Louis Besse Paris, France. Italy and Colonies, Societa Anonima Adler & Co., Milano. Scandinavia, Rylander & Asplund, Stockholm, Sweden. Spain and Portugal, Casamitjana Hermanos, Barcelona, Spain. Australia, Selson Engineering Co., Melbourne, Australia. Russia, M. Mett Engineering Co., Petrograd, Russia.

NOVO-SUPERIOR

HIGH SPEED STEEL
INTRA STEEL GIBRALTAR STEEL
Tool Steel for Every Purpose
Swedish Lancashire Iron

Twist Drills, Taps, Hack Saw Blades, Milling Cutters,
Files, Etc., Music Wire for Springs, Steel Balls.
Cold Rolled Tool Steel in Strips and Sheets,
Circular Saws, Machine Knives.

PILOT STEEL & TOOL COMPANY,
LIMITED
332 St. James Street, Montreal

*Sole Agents for*

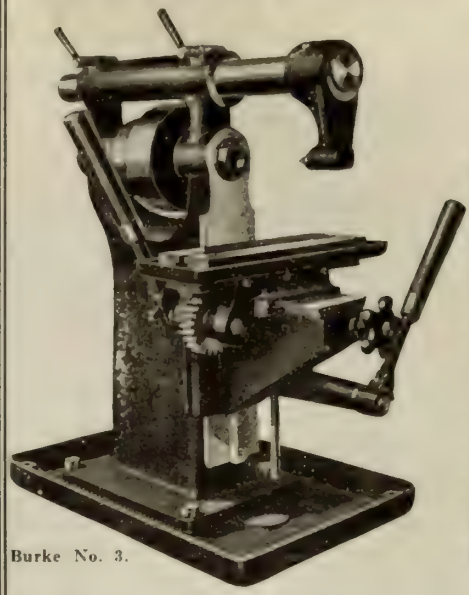
JONAS & COLVER, LIMITED
Novo and Continental Steel Works,
Sheffield, Eng.

H. BOKER & CO., Inc.
New York, N.Y.



*It pays to use high-grade machine tools*

THIS HAND FEED MILLER



Burke No. 3.

$155
Canadian
Moneys

This accurate little machine will soon pay for itself in the variety of jobs it will handle. It will economically take care of much of the work usually done on the large machines In these days of high priced machinery this is worth considering.

Catalog shows other sizes of milling machines, both hand and power feed, with or without overhanging arm, bench or column type, also Tapping Machines, Drill Presses, and Cold Saws.

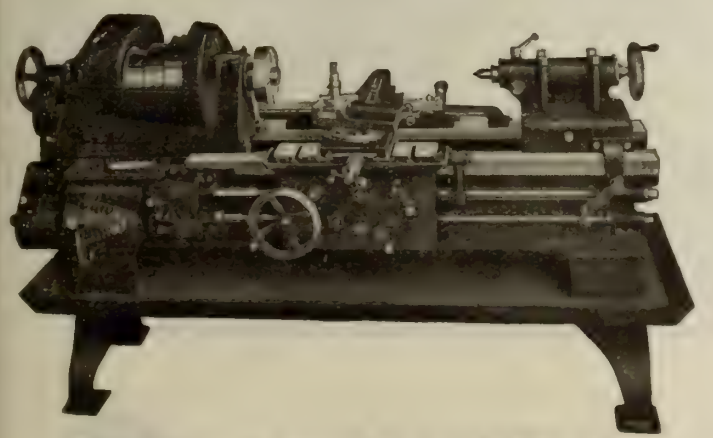
THE BURKE MACHINE TOOL CO.
520 Sandusky St., Conneaut, Ohio, U.S.A.

Canadian Dealers:—H. W. Petrie Ltd., National Machinery & Supply Co., A. R. Williams Machinery and Supply Co., Canadian Fairbanks-Morse Co., Williams & Wilson, Garlock-Walker Machinery Co., Yeates Machinery Co., Cope & Sons, Geo. F. Foss Machinery & Supply Co.



"LEHMANN LATHES"

Will Put the Same Degree of Efficiency Into
*Your* Shops as They Have in Many Others



TWO SIZES—16", Swing 18¼" and 18", Swing 20¼"

Because they are constructed "right" of the best material, workmanship and design, and therefore are adaptable to all conditions, whether it be work requiring accuracy to the highest standards or for the heavy duty where power, strength and rigidity are required.

Convince yourself of these facts! Let us send you complete specifications of this superior lathe and the names of some of the larger concerns who are using "LEHMANN LATHES" for better results.

*We know you are interested, so don't put off writing us. Do it to-day. Now!*

LEHMANN MACHINE COMPANY, 3566 CHOUTEAU AVE. ST. LOUIS, U.S.A.

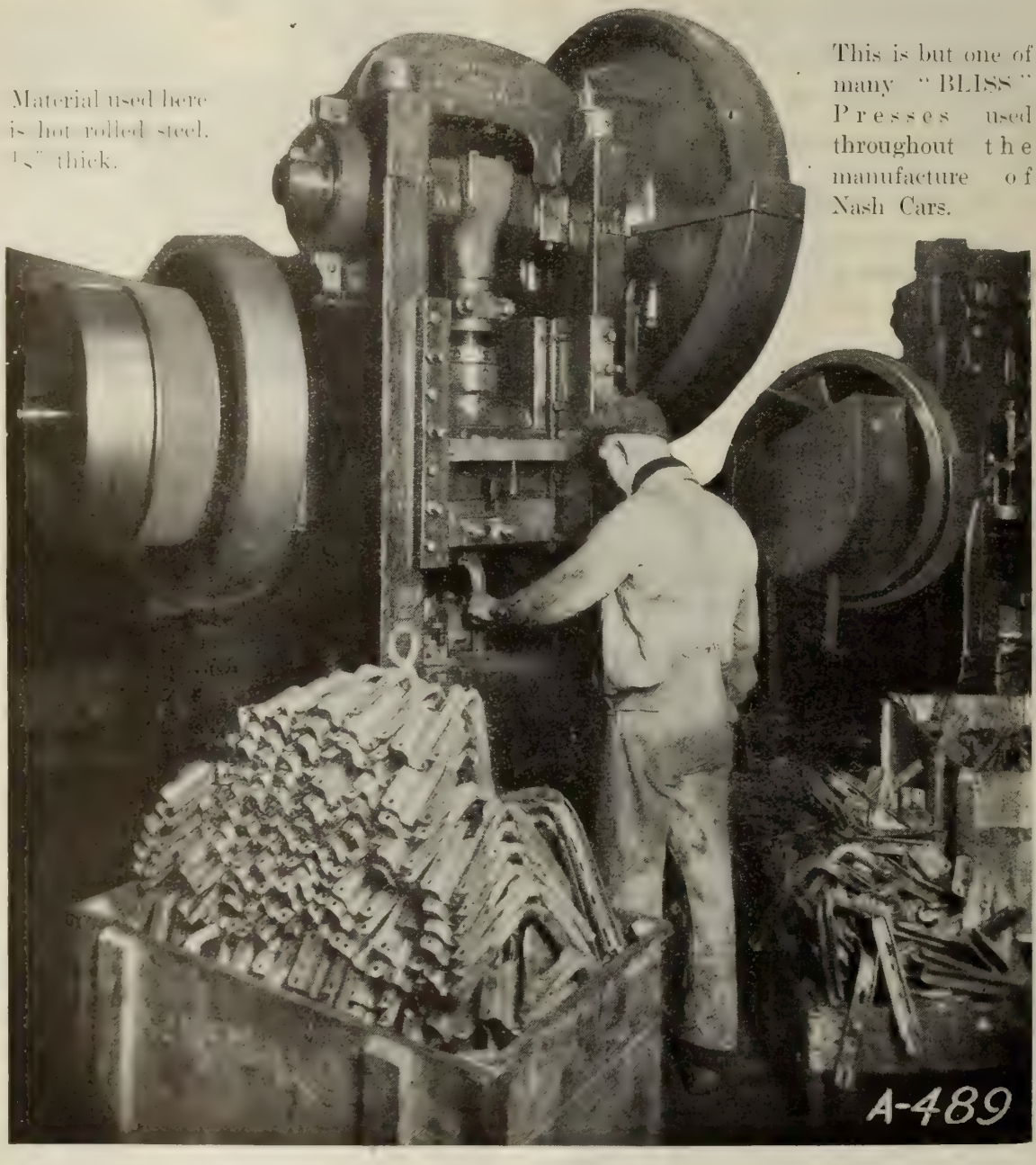

*If interested tear out this page and place with letters to be answered.*

# Spring Run-Board Hangers

This "BLISS" No. 74½ Straight Side Press, at the Nash Motors Co. plant, Kenosha, Wis., forms the clearance on 350 of these spring run-board hangers per hour.

Material used here is hot rolled steel. ⅛" thick.

This is but one of many "BLISS" Presses used throughout the manufacture of Nash Cars.




BLISS 1857

## E. W. Bliss Company

BLISS 1921

*Main Offices:* BROOKLYN, N. Y., U. S. A.

*American Factories:* BROOKLYN, N. Y.; HASTINGS, MICH.; CLEVELAND, O.; SALEM, O.

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FOREIGN SALES OFFICES *and* FACTORIES

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108

# MORRIS CRANES



## STRENGTH AND EFFICIENCY

Together with easy operation keep Morris Cranes and Hoists on the job.

They will save you money — save your time — and increase your plant production.

There's a type to meet your particular needs.

ELECTRIC AND HAND OPERATED OVERHEAD CRANES

**THE HERBERT MORRIS CRANE & HOIST COMPANY, LIMITED**

*Head Office and Works:*
NIAGARA FALLS, CANADA

CHAIN BLOCKS
JIB CRANES
RUNWAYS

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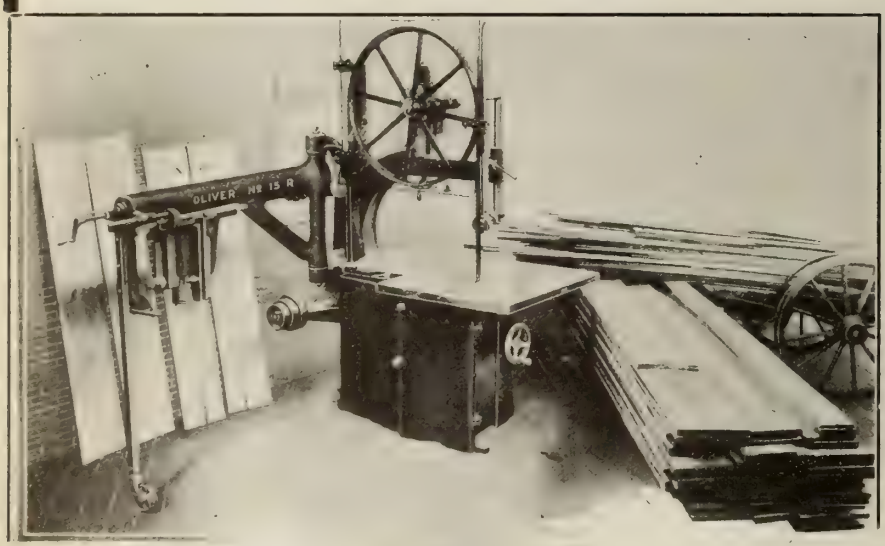
# HANNA

IRON ORE - PIG IRON

*Sales Agents:*

Cleveland Cincinnati Pittsburgh Toronto Buffalo Detroit

# The Oliver Combination Band Re-Saw and Scroll Saw




Photograph shows one of the many installations of a general utility tool of more than ordinary merit, both as a Re-Saw and as a Scroll Saw.

It has many excellent features of construction and design, and especial attention has been devoted to making the entire equipment as safe for the operation as modern safety appliances could devise.

*Special literature on this and other "Oliver Quality" Wood Working Machinery and Pattern Shop Equipment*

**Oliver Machinery Company**
Grand Rapids, Michigan, U.S.A.

# CUT GEARS

*Theoretically Correct*

PROMPT SERVICE

**ROBERT GARDNER & SON**
LIMITED
52 NAZARETH ST., MONTREAL, P. Q.

RAWHIDE OR METAL

# Announcement

GENERAL Combustion Co. of Canada, Limited, have much pleasure in announcing that they have completed arrangements with T. H. Watson & Co., Sheffield, England, under which they will enjoy exclusive rights in Canada and Newfoundland to manufacture and sell the various Electric Smelting, Melting and Refining Furnaces which Watson & Co. have perfected.

THE Canadian rights for the "Greaves-Etchells" type of furnace, which has been widely adopted in the United States, England, France and Spain are also included in the arrangements made.

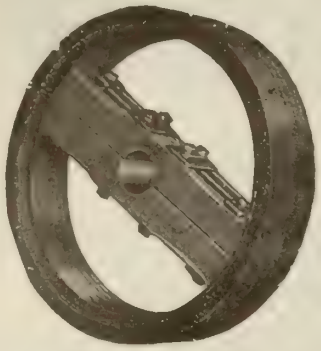
THE General Combustion Co. of Canada are also taking over the designs of the Electric Furnace Construction Company, Philadelphia, on their various types of electrically-heated Core Ovens, Annealing and Heat Treating Furnaces, and will have the active co-operation of the American Company on electric furnace problems generally.

## General Combustion Company of Canada, Limited

**619-623 New Birks Bldg.**
**MONTREAL**

***"Industrial Furnaces for Every Duty"***

# BERNARD
## Wood Split Pulleys

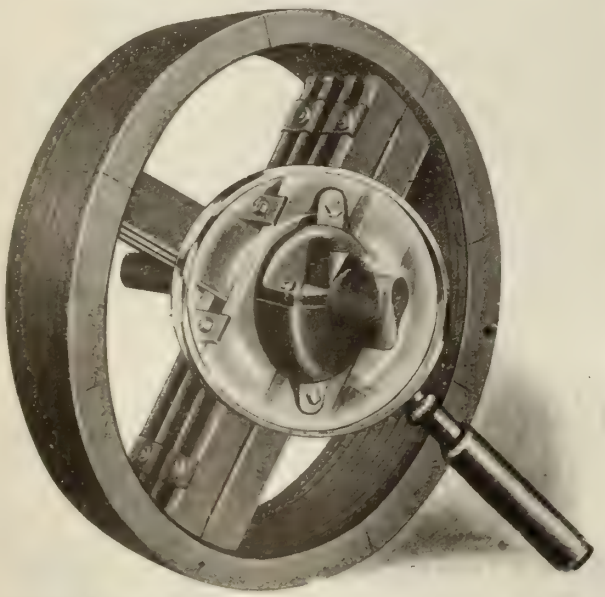


## Save Power

***Wood Split Pulleys are lighter and they have an efficient Belt Gripping Surface***

With the installation of Bernard Wood Split Pulleys you start on the road to lower overhead. Their cost is low.

**Safety** **Satisfaction**



## BERNARD SAFETY COLLAR

***Put them to the test.***

**The A. Bernard Industrial Co.**

*Manufacturers of High-Grade Power Transmission Appliance*

**Office and Works: Fortierville, Que., Canada**

# DENBIGH DRILLING MACHINES



## BUILT IN FOURTEEN SIZES

By the aid of a very efficient plant and organization, we manufacture these machines in large numbers by mass production.

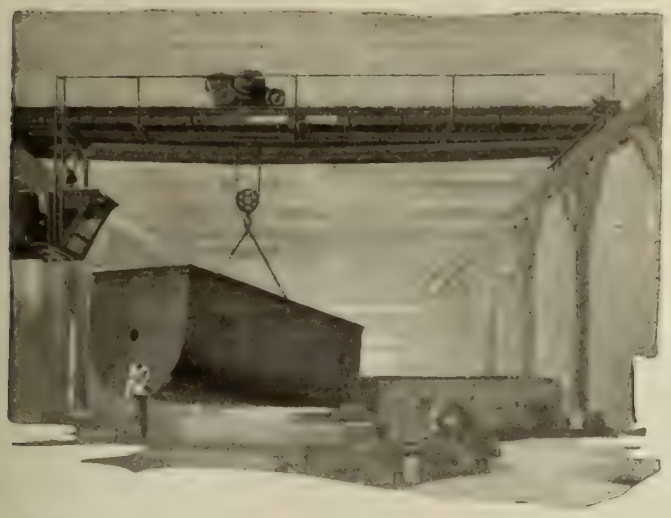
***Prices and Deliveries are Right***

## John M. Terry & Co.

**85 Newington Causeway, London, S.E. 1.**

**CABLES—ATHENIAN, SEDIST, LONDON**

SHEPARD
ELECTRIC CRANES & HOISTS



## With ease and precision

A Shepard Electric Traveling Crane will pick a tonnage piece and quickly convey it to any part of the bay.

Shepard cranes and hoists are installed to meet the peculiar needs of individual shops and factories. Shepard engineers offer their services in designing the equipment which will most efficiently and economically handle your material.

Electric Cranes 1 to 50 tons; Electric Hoists ½ to 30 tons; Electric Winches and Cargo Handling Equipment for Docks and Ships.

The Shepard is thoroughly lubricated; and tight metal housings encase the operative mechanisms, eliminating dirt, dust, dampness, and fumes.

**Shepard Electric Crane & Hoist Co.**
**426 Schuyler Ave., Montour Falls, N.Y.**

| | | | |
|---|---|---|---|
| New York | Philadelphia | Chicago | Pittsburgh |
| Boston | Baltimore | Cleveland | San Francisco |
| Detroit | Melbourne | Montreal | London |

Canadian Representative: RUDEL-BELNAP, Montreal

*Member Electric Hoist Manufacturers' Assn.* 2159-S

# A File Has Limits

A file can't do good work after it has lost its original sharpness.

Remember this and throw a file away as soon as it shows signs of getting dull.

It will repay you in the end.

The following brands do not get dull until they have given you full value for your money. Specify one of them when ordering:

**Kearney & Foot**
**Great Western**
**American**
**Arcade**
**Globe**

# FILES

*Made in Canada by*

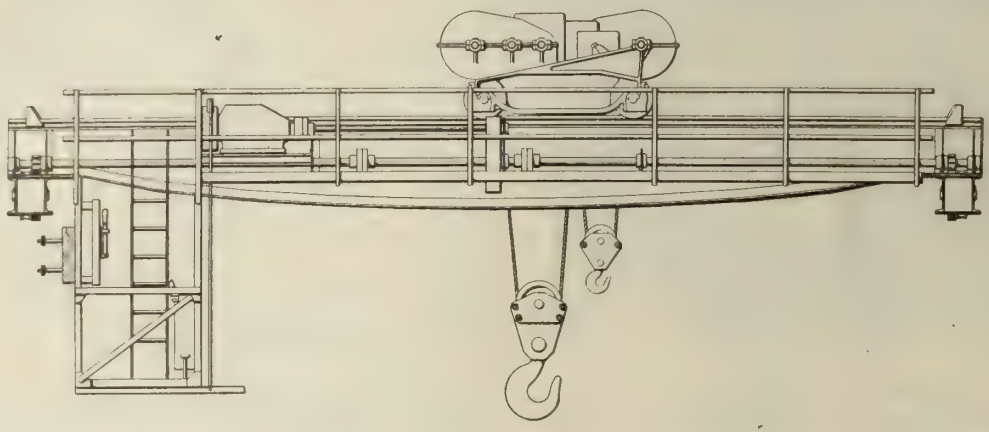
## Nicholson File Company

**Port Hope - Ontario**

*If interested tear out this page and place with letters to be answered.*

# CRANES

## ELECTRIC AND HAND OPERATED



**DOMINION BRIDGE COMPANY LIMITED**

HEAD OFFICE & WORKS: MONTREAL BRANCHES:-OTTAWA, TORONTO, WINNIPEG

# HYDRAULIC TURBINES AND PUMPS

Our shops are equipped for building TURBINES of the largest sizes —also high speed PUMPS of large capacity for medium and low heads. Two turbines of 20,000 H.P. are now under construction.

# PAPER MILL MACHINERY

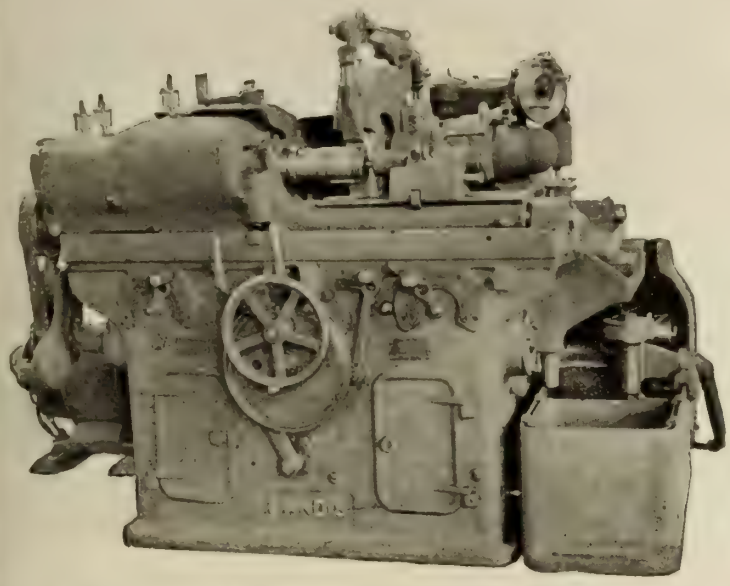
Pulp Drying Machines.
Millspaugh Suction Rolls.
Millspaugh Shower Pipes.
Davies Oscillating Suction Boxes.
Press and Felt Rolls.
Brass Covered Rolls.
Pulp Digestors.
Barking Drums.
P.A.P.A. Screens (Spangenburg System) for pulp and paper.

# DOMINION ENGINEERING WORKS, LIMITED

MONTREAL - QUE.

LANDIS

# 100 Per Cent. Production



THE New Landis Piston Grinding Machine meets both essentials 100 per cent. strong.

A brief summary of the principal features and what they accomplish in better pistons and greater production:

Cylinder part and relief, ground complete without removing from the machine, insuring concentricity of all grinding operations. Work practically remains in plane with grinding wheel centre at all times as the work swings directly over the fulcrum point. A number of different sized or shaped cams can be placed in attachment at the same time, thus enabling different shaped pistons to be ground with slight adjustment.

Universal driver furnished with each attachment, facilitating round and accurate work.

**Write to-day for complete description.**

## Landis Tool Company, Waynesboro, Pa.

*Canadian Agents:* A. R. Williams Mach'y Co., Toronto, Winnipeg, Vancouver; Williams and Wilson, Montreal

# Open a Bank Account in Canada

The present abnormal exchange situation between Canada and the United States is affecting trade relations between the two countries. Exporters in the United States can meet this by opening Bank Accounts in Canada.

**This Bank has 725 Branches, of which 625 are located in Canada from the Atlantic to the Pacific Coast. Write for a complete list of Branches and for terms respecting a Canadian account.**

# THE ROYAL BANK OF CANADA

**Capital and Reserves $40,000,000** **Total Resources $550,000,000**

***Head Office:*** MONTREAL

*If interested tear out this page and place with letters to be answered.*



# Automotive Industry Watching Costs

IT TOOK a price reduction to "sell" automotive manufacturers on the idea (which they all know in the backs of their heads) that when you can't make a profit by increasing or maintaining prices—you can still make a profit on reduced prices, by

1. **Watching costs.**
2. **Increasing production (which is the same as lowering overhead per unit).**

What a crisis showed one group of manufacturers, can be adopted to the advantage of other manufacturers (without the crisis, perhaps) if they will profit by the experience.

GTD has maintained and proved by many experiences that in the work of screw-threading, GTD tools, particularly "*Gun*" Taps, "*Acorn*" Dies and GTD Gages, reduce costs and increase production.

*We will gladly supply you with details regarding these GTD tools. Just clip the coupon and send it in. No obligation, of course.*

### This is the "*Gun*" Tap

Its features are a shearing cut—no chips to clog flutes and break tap — shallow flutes giving great strength —requires one-half power necessary to drive ordinary



tap — cuts true to size until ground down to last three or four teeth. The "*Gun*" Tap will outlast two or three ordinary taps, and *wears out before it breaks.*

### This is the "*Acorn*" Die

It has a positive, concentric adjustment on all cutting lands, making it practically a solid die, and insuring great accuracy. By means of its various holders, it is adapted to



all kinds of machines using threading dies, lathes, drill presses, hand or automatic screw machines, turret lathes, bolt cutters, etc. Its life is many times that of the ordinary die.

### GTD *Gages*

There is only one standard inch. The U.S. Government sets that standard — **GTD** gages accurately reproduce it. A certificate of the Bureau of Standards will be furnished with any of our gages, when requested. **GTD**



manufactures both thread and cylindrical gages and designs complete gaging equipment for any product. **GTD** gages increase production and lower costs. Our gage experts are always at your service.

**GREENFIELD TAP AND DIE CORPORATION**
GALT, ONTARIO

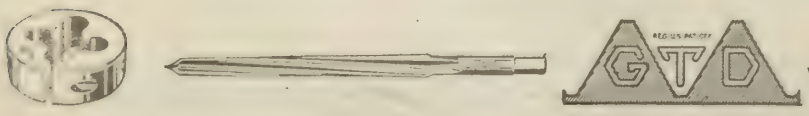
**Successors to Wells Bros. Co. of Canada, Ltd., Galt, Ontario.**

**GTD Screw Plates, Taps, Dies, Twist Drills, Milling Cutters, Reamers, Gages, Pipe Wrenches**

**GTD Corporation of Canada, Ltd., Galt, Ont.**

I am interested in increasing production and lowering costs. Without obligation please send me complete information regarding the GTD tools I have checked.
[ ] "Gun" Tap. [ ] "Acorn" Die.
[ ] GTD Gages

Name .....
Position .....
Firm .....
Address .....C.M.203





# His Work Guide is a PHOTOSTAT Print

(REG. U.S. PAT. OFF.)

## *Speed Up Your Production Too*

The whole world sorely needs every helpful effort.

This machinist is working from a Photostat print made direct from a pencil sketch.

Hours and often days are thus saved in putting work into and through the shop.

In the office, too, the Photostat is invaluable because it makes facsimile copies of blue prints, maps, charts, progress sheets, sales sheets, advertising layouts, etc.

Send for our booklet in which some of our customers tell in their own way how the Photostat is used both for standard and special work.

The Photostat is made by the Eastman Kodak Co., exclusively for the

## Photostat Corporation, Rochester, N.Y.

**Boston Chicago New York City Philadelphia San Francisco Washington**

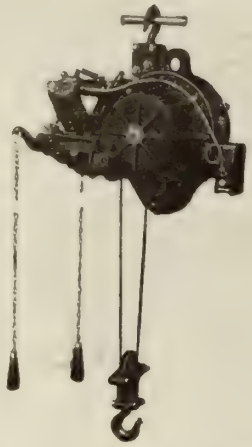
**EXECUTIVE OFFICE: PROVIDENCE, R. I.**

# PHOTOSTAT

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# WE HAVE TESTED THEM FOR YOU

PNEUMATIC MOTOR HOIST



*In sizes for lifting 1,000 to 6,000 lbs.*

Thor

## PNEUMATIC and ELECTRIC TOOLS

When you put THOR Tools on your work you are not "trying them out." Every minute mechanism in THORS is tried, tested, improved and perfected before it comes to you. All left for you is to decide, with the assistance of our expert mechanical department, the tool best adapted to your particular work. Hundreds of plants, knowing the reliability and tested merit of THORS, have adopted them as standard equipment.

**Send for detailed information or Service Engineer to call.**

## INDEPENDENT PNEUMATIC TOOL CO.

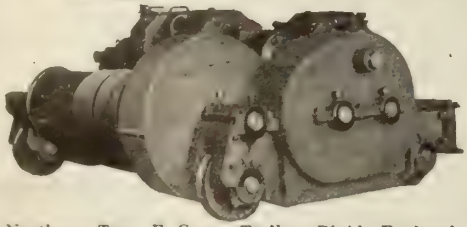
MONTREAL TORONTO 600 W. Jackson Blvd., Chicago VANCOUVER WINNIPEG

CANADIAN MADE CANADIAN MADE

# Electric and Hand Traveling Cranes



Type E—3-Motor Electric Traveling Crane, 2 Tons to 100 Tons.



Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada.

**We make a wide range of CRANE and HOIST designs. All sizes and capacities, 1 ton to 100 tons.**



Single Girder Electric Hoist Crane, Type D-158. 1 Ton to 10 Tons. Made also double girder design.

Made also for Hand Hoist or Air Hoist.

Get our prices and specifications before you buy.

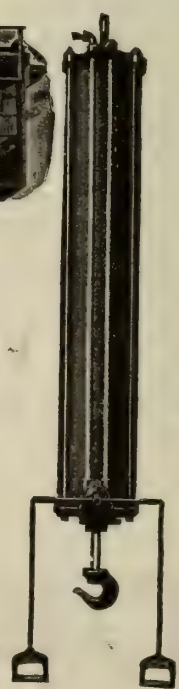
In asking prices, state SERVICE CAPACITY, SIZE OR SPAN POWER, and, if electric, KIND OF CURRENT.

Catalogs free.



Type D Electric Hoists—½ to 10 Tons.

Air Hoists, Trolleys and Tracks



Type No. 20 Air Hoists.

## Northern Crane Works, Limited

Walkerville, Ontario, Canada


*If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.*

Heavy Duty

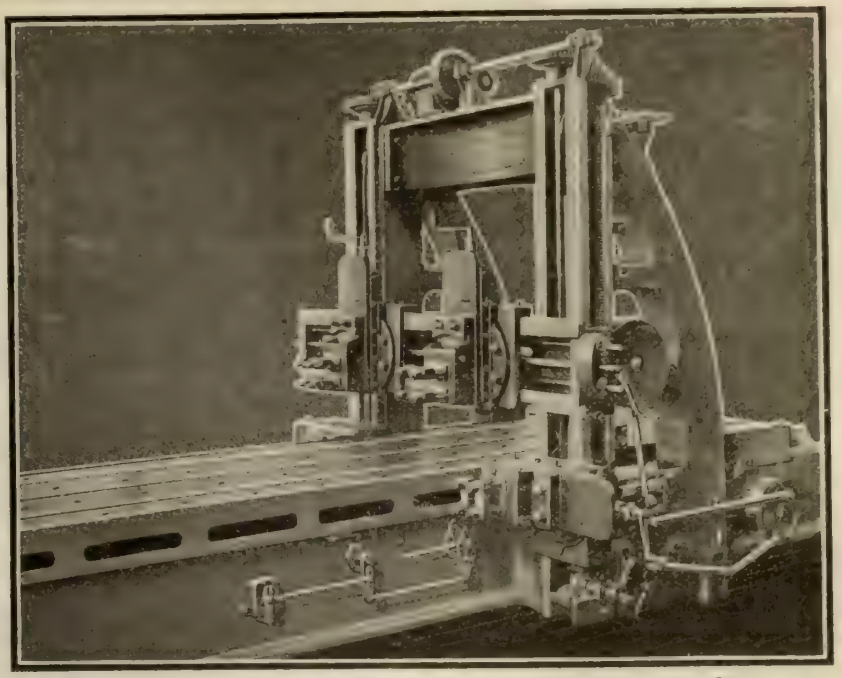
# PLANERS

**48" x 48" x 14' 0"**

No shop should make **production boasts** without an L. & P. Heavy Duty Planer on the job. The latest improved design embodies great accuracy.

***Either Two-Post or Openside Type***

All power feed. Belt or direct connected motor drive.



## L & P MANUFACTURING CO.
LIMITED
NIAGARA FALLS, ONTARIO

L. & P. Heavy Duty Planers are sturdy, finely finished machine tools. If you are interested in well-built tools investigate these Planers. We are prepared to ship direct from stock.

Electric and Oxy-Acetylene

# WELDED TUBING

***Also BUTT SEAM TUBING***

We have a thoroughly equipped plant for Welding by Electric and Oxy-Acetylene processes. Butt Seam Tubing is also one of our specialties. Tubing made hot or cold rolled finish.

***Our Work Includes Tubing for***

Bicycles, Bedsteads, Automobile Parts, Electric Fixtures, Gas Fixtures, etc. Round, Square, Rectangular and Special Shapes. Sizes 3/8 in. to 2 in. outside diameter, from 16 to 22 gauge. Also equipped for bending 16 gauge or lighter, any shape or radius.

Let us advise you of the kind of tubing that will best suit your requirements. Inquiries gladly answered.

**The Tube Company of Canada LIMITED**

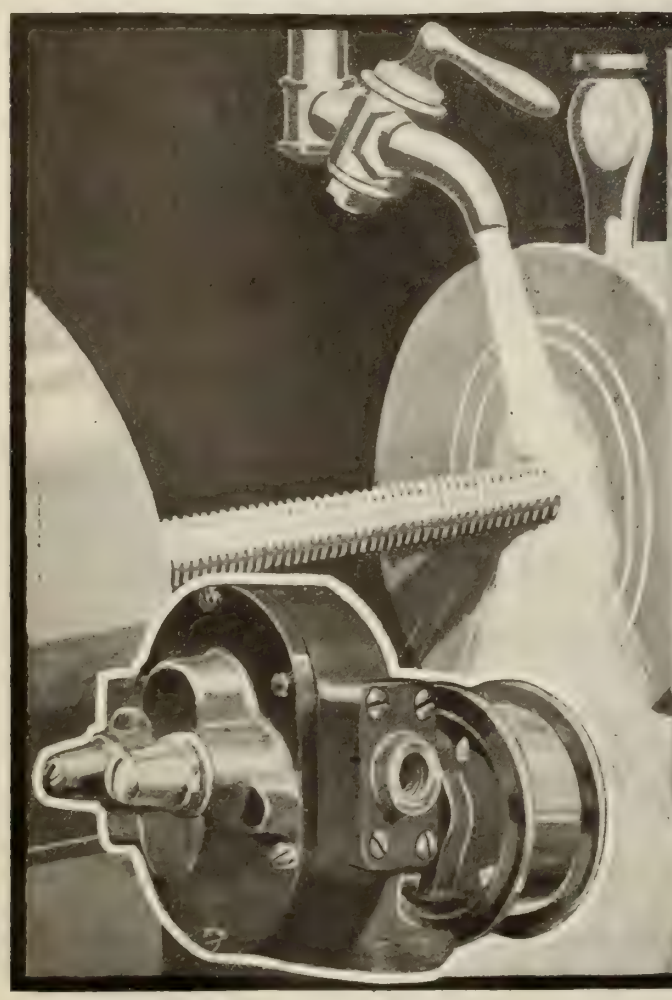
**233 Dufferin Street, TORONTO, Canada**

# W. ATKINS & CO LD Sheffield ENG

The
**HIGH SPEED STEELS**
*For superior cutting power:*
**"Double Waco" and "Waco Superior"**
**Carbon Tool Steels**
*For all Purposes.*
"Turtle Brand," unequalled for reliability.
MINERS' DRILL STEELS
Solid and Hollow.
All Sections.




Representative
MARSHALL SON & BUNNEY
39 Richmond St East
TORONTO



TRAHERN

## Better Threads

One of the vital necessities for cutting clean and accurate threads, is a steady stream of coolant kept flowing upon the chasers of the die head. The coolant gives longer life to the chasers, keeps them cool, and makes threading much easier.

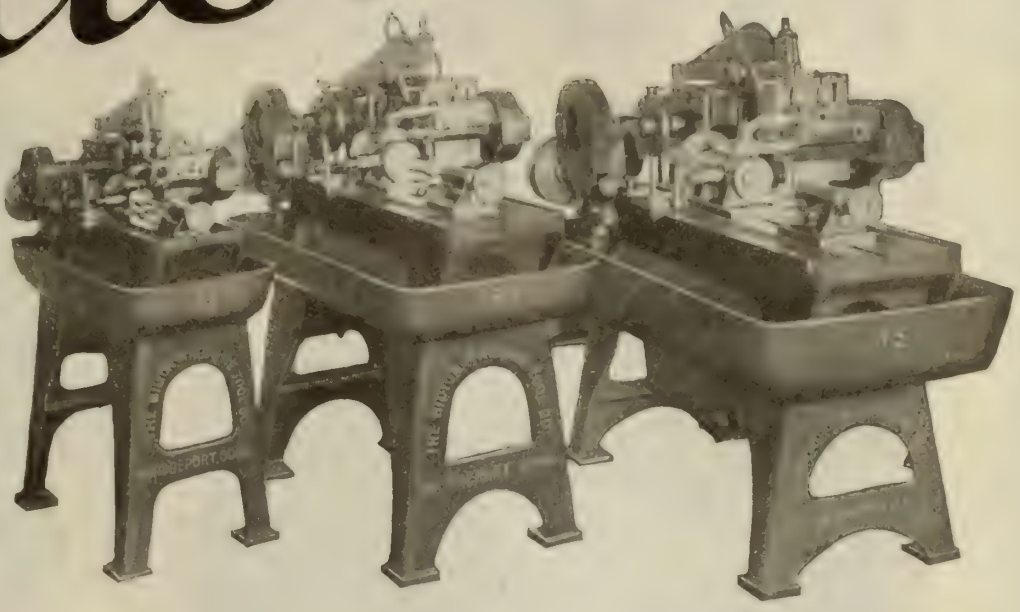
But a dependable circulating pump is necessary to assure a steady flow of coolant.

Trahern Rotary Geared Coolant Pumps are furnished as regular equipment on leading machine tools to-day. They throw heavy, forceful streams entirely free from pulsation. Supply can be shut off at discharge without stopping the pump, assuring the right quantity of coolant at the proper time. Will pump water, oil or compound. Operate at low speed, guaranteeing long life. If necessary will work against 100 lbs. pressure. When properly installed, guaranteed not to lose their prime.

For high quality threads, equip your machines with TRAHERN Pumps. Our catalog No. 44 explains in detail.

**TRAHERN PUMP DIVISION**
**Geo. D. Roper Corporation**
**ROCKFORD, ILL.**

# Bilton GEAR MILLERS



## Fully Automatic

Their adaptability is almost unlimited on small work—such as cutting spur, bevel, miter, angle gears, saws, ratchets, sprockets, cutters, knurls, taps, cylinders, form cutting, manufacturing, milling, etc.

A big time saver, as indexing takes place during return stroke of cutter — which is removing metal 90% of the time.

*Write us for Catalog* 30-6

***Over 500 leading manufacturers now use the Bilton for high production on accurate work***

**Bilton Machine Tool Co.** Housatonic Avenue **Bridgeport, Conn., U.S.A.**

Foreign Agents: Alfred Herbert, Ltd. Chas. Churchill & Co., Ltd.

# DOMINION GRINDING WHEELS




*The Same Quality for Less Money*




We know you have no use for wheels which will not stand up and do high-class work, even though they do cost you less to buy. You want **quality** at the lowest price. And that means Dominion Wheels!

Dominion Wheels are made of abrasives from our own factory, thus ensuring uniform grade and grain.

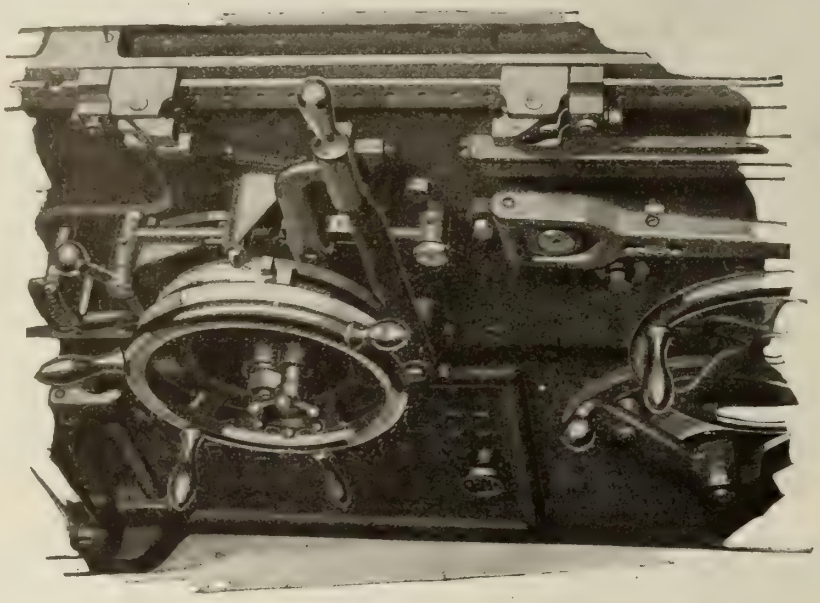
By purchasing Dominion Wheels you save duty and exchange. When the quality is right, is there any reason for sending your money out of the country?

**Dominion Abrasive Wheel Co. Ltd.**

Mimico, Ontario


*If interested tear out this page and place with letters to be answered.*

# MODERN
## Plain Grinding Machines



## ALL CONTROLS CENTERED ON FRONT

A "Modern" operator doesn't have to lean this way and that to control his machine. All controls are on front of machine within easy reach. This accomplishes three important things:

**1st—Avoids needless fatigue.**

**2nd—Permits closer attention to work.**

**3rd—Reduces number of spoils.**

Thus "Modern," with its centered controls benefits both operator and employer.

Let us send you our latest bulletin showing the other advantages of "Modern" construction. If you've a grinding problem "Modern" can likely solve it for you. Send your blueprints and specifications and our Service Department will get busy.

**MODERN TOOL CO. - - ERIE, PA.**

Main Office and Works: State and Peach Sts.

*CANADIAN AGENTS:*

**RUDEL-BELNAP MACHINERY CO., LIMITED**

**Toronto and Montreal**

**Foreign Representatives:** Yamatake Company, Tokyo, Japan; Leo. C. Steinle, 53 Victoria St., London, S. W., England; Glaenzer & Perreaud, 18 and 20 Faubourg du Temple, Paris, France; Rylander & Asplund, Stockholm, Sweden; C. Civita & Co., Milan, Italy; J. Lambercier & Co., Geneva and Zurich, Switzerland.

# This Mark On Belting

## *Means the End of Your Belt Troubles*



## D.K.McLaren's

### Genuine British Oak Tanned

## Leather Belting

Shows what a farce is the idea that adequate pulley grip can only be secured by extraordinary tension. It stands to reason that such tension plays particular havoc with the belting—strains shaftings and wears out bearing.

D. K. McLaren's Leather Belting renders you the service you ought to demand! It is amply flexible and as nearly stretchless as leather belting should be.

Compare the "hug" of a slightly slack D. K. McLaren's Belt with the extraordinary tension required to make other belts grip. This test will convince you as it is daily convincing others.

Back Leathers—Every inch of D. K. McLaren Belts represents Flawless Backs of the hides of the choicest steers.

British-Oak-Tanned—Every bit of the hide's natural strength is preserved in D. K. McLaren's Belts by the expert use of this famous process.

**D·K·McLAREN**
**LIMITED**

GENUINE OAK

HEAD OFFICE AND FACTORY:
351 ST. JAMES ST., MONTREAL, P.Q., CANADA

VANCOUVER, B.C. 334 Cordova West
TORONTO, ONT. 194 King St. West
ST. JOHN, N.B. 90 Germain St.

D. K. McLAREN, Limited,
Gentlemen,—Please put me in touch with some users of your belting.

Name .....
Address .....
Firm .....

*If interested tear out this page and place with letters to be answered.*

# Gear Cutting With the "IFS" Left Out

## The Gear Shaper Way

A production manufacturer knows that he will secure good gears IF he has an accurate cutter, an accurate machine and a machine working on the correct principle. The whole question of good gears is resolved in this one little word "IF."

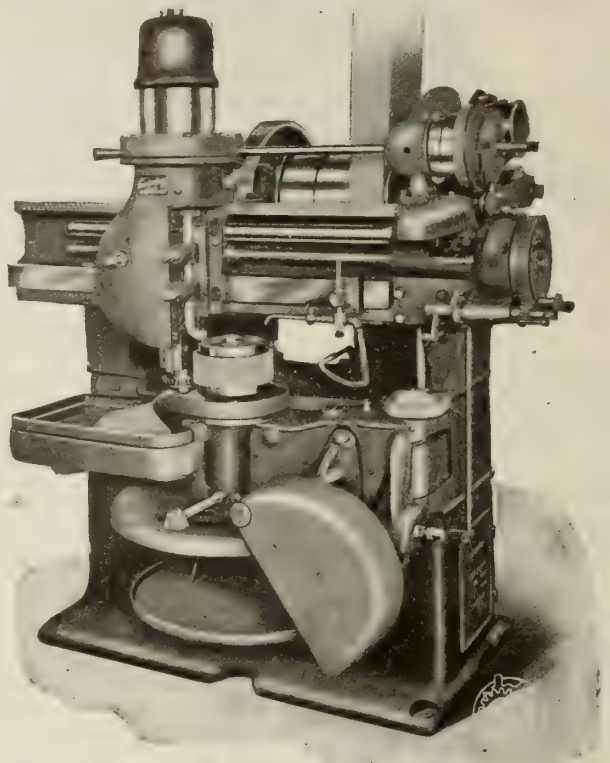
When the Gear Shaper was originally designed, the question of "IF" was taken into consideration and every possible means known to mechanical engineering was employed to eliminate the "IFS" from gear cutting.

That we have been successful in solving the problem is evidenced by the fact that each ensuing year sees a larger number of manufacturers adopting the Gear Shaper method.

How the Gear Shaper has accomplished this is clearly explained in our general catalog "Commercial Gear Cutting," which is a treatise on the subject of:—

Gear Cutting with the "IFS" Left Out.

**Send for your copy to-day.**

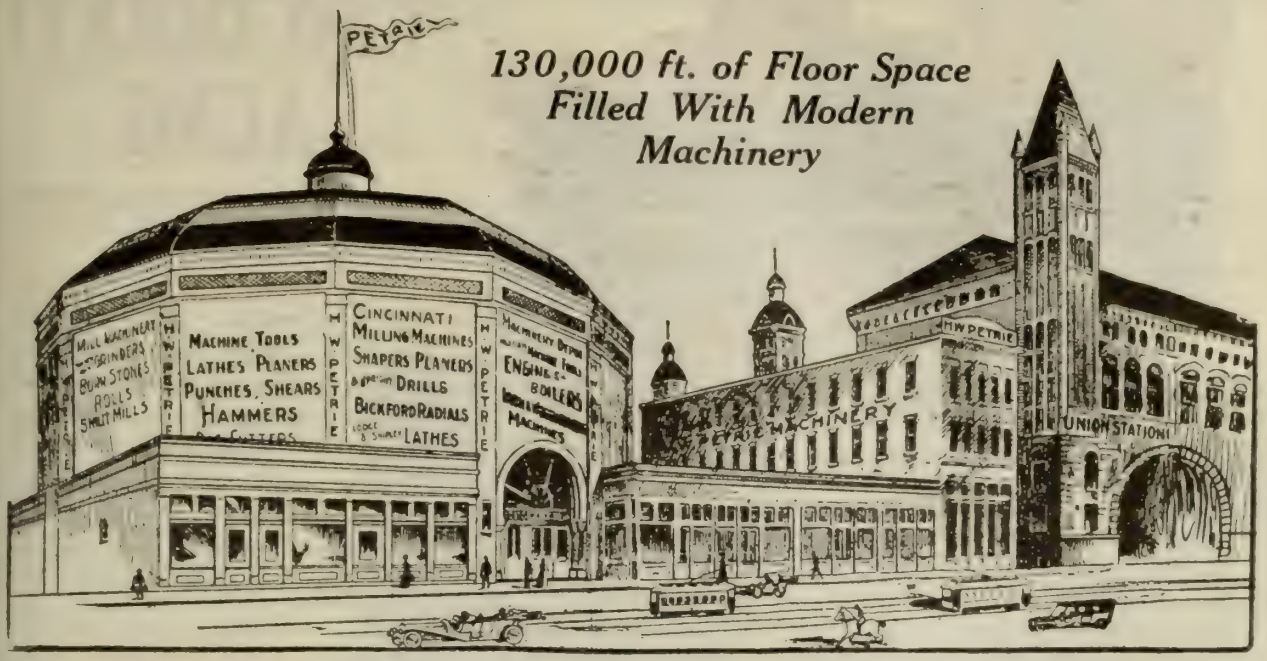


The Fellows Gear Shaper—the machine which has taken the "IFS" out of gear cutting.

# The Fellows Gear Shaper Company

## Springfield, Vermont, U.S.A.

FOREIGN AGENTS:—Alfred Herbert, Limited, Coventry, England; Societe Anonyme Alfred Herbert, Paris, France; Societa Anonima Italiana Alfred Herbert, Milan, Italy; Alfred Herbert, Limited, Yokohama, Japan; Societe Anonyme Alfred Herbert, Barcelona, Spain; Societe Anonyme Belge Alfred Herbert, Brussels, Belgium; Alfred Herbert (India), Limited, Calcutta, India.




*130,000 ft. of Floor Space Filled With Modern Machinery*

# PAY US A VISIT

## WHEN IN TORONTO

If you would like to see the largest exhibit of machine tools in Canada, pay a visit to our warehouse the next time you are in Toronto. No trouble to find our place. It is situated next door to the Union Station. Here we have 60,000 feet of floor space devoted to metal-working and woodworking machinery of all kinds, in addition to supplies and power transmission machinery.

Then there is our annex at the corner of Niagara and Bathurst Streets—70,000 feet of floor space and 40 acres of yards here, filled with machinery that meets all demands of Canadian shops. Our warehouse space thus totals 130,000 square feet, accommodating an immense line of tools—modern tools that are worthy of the attention of all careful buyers.

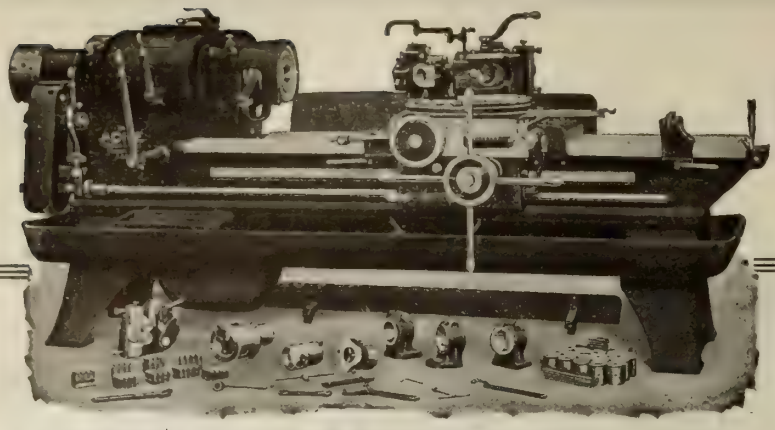
This invitation of course applies to Torontonians, too. Call on us at any time. You are always welcome.

## H. W. PETRIE, LIMITED

TORONTO and HAMILTON

# PETRIE

*If interested tear out this page and place with letters to be answered.*



# CINCINNATI ACME

## Convenience

Don't overlook this feature in considering the points of a machine tool; it's a factor of vital importance in securing volume production.

Look at this turret lathe for convenience! On it and all other Cincinnati Acmes, the levers and handles are directly in front of the operator.

The Cincinnati Acme stands for strength and precision as well as convenience. It is a sturdy, rigid machine, built for **accurate** speed. And it will do both bar and chuck work.

**The Cincinnati Acme line of machine tools includes Flat Turret Lathes, Screw Machines, Turret Lathes, Brass Working Machines, Universal Turret Lathes, and all accessories. Every machine is designed on the most modern principles. Write for catalog.**

## The Acme Machine Tool Company

**Cincinnati, Ohio, U.S.A.**

# Conservation of Oil

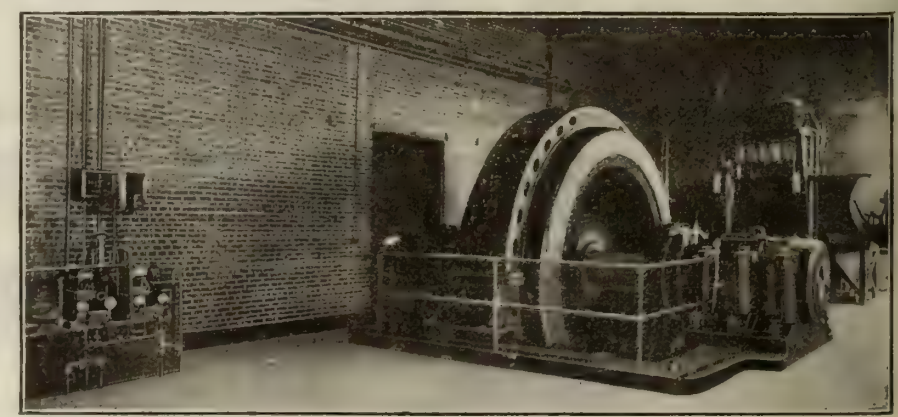
The consumption of mineral oil products is increasing faster than the production. Consequently engineers are beginning to realize how important and necessary it is to conserve these oils.

A Bowser Oil Filtration System will assist you in doing this.

By filtering oil with a Bowser system it can be used over and over again — or indefinitely. The installation of a Bowser Complete Oil Filtering and Calculating System generally results in a saving of over 50 per cent. on your oil bill.

The picture on the right shows a practical application of a Bowser 6-F Oil Filtering and Circulating System. It can be used with engines and other machinery where the filtration of dirty oil is essential.

*Write for our booklet on oil filtration.*



## S. F. Bowser Co., Ltd.

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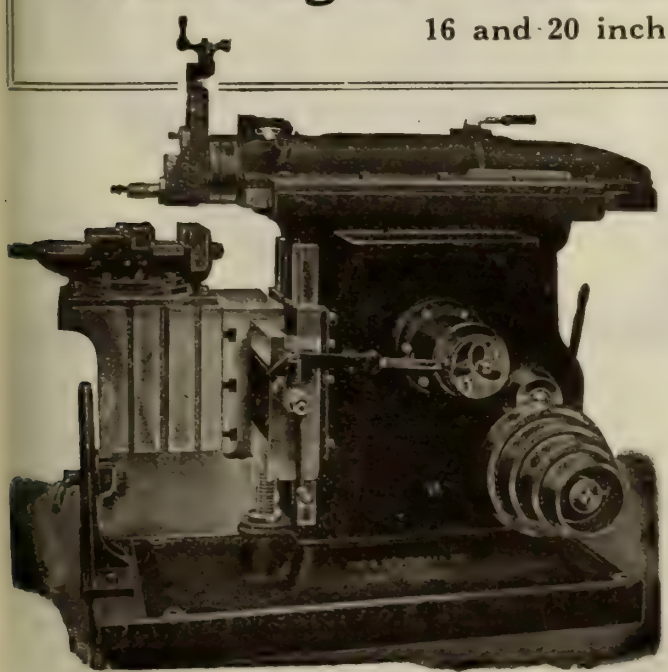
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The column is massive in construction, well braced and reinforced internally. Exceptional strength is also seen in the ram, which is semi-circular in form and of box type. It can be set forward by crank conveniently arranged.

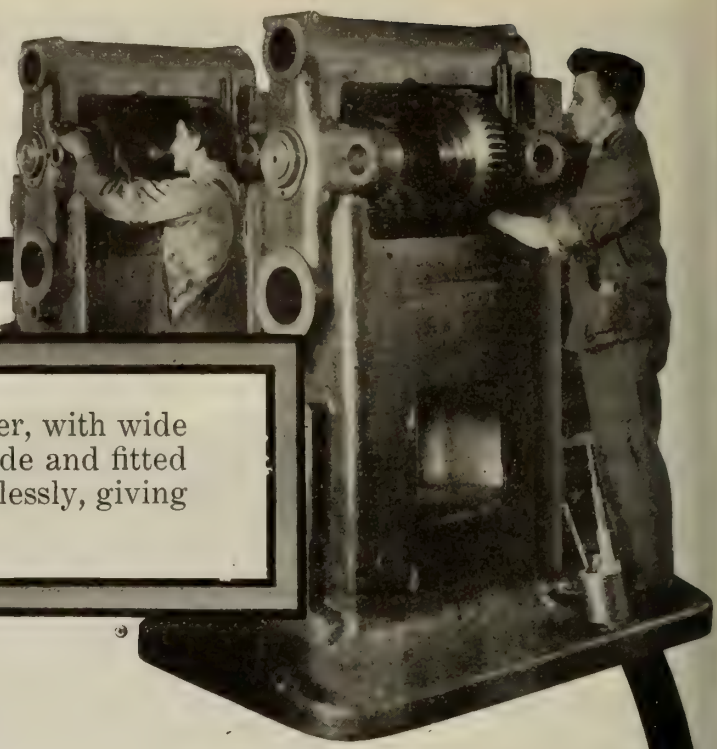
Slides are square, accurately fitted and with broad bearing surfaces.

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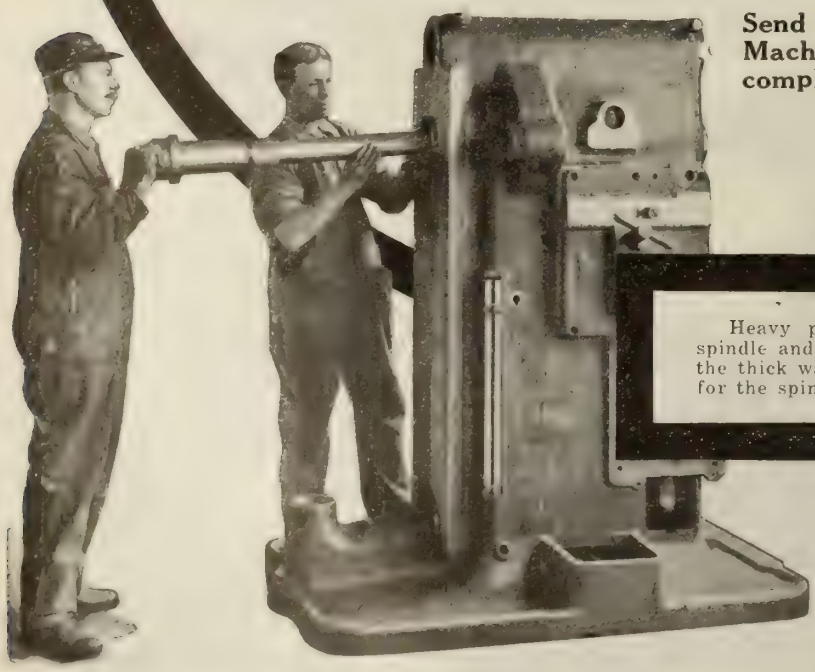
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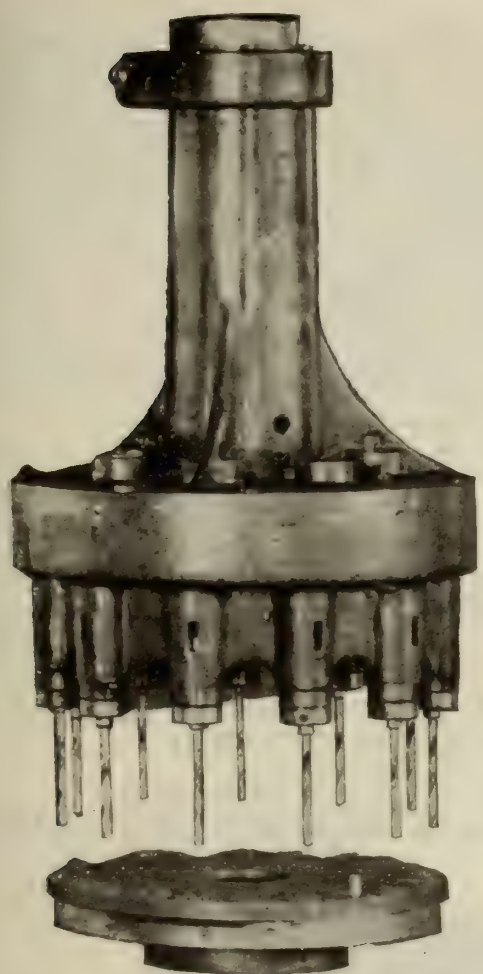
Heavy phosphor bronze boxes, scraped to fit the spindle and accurately aligned, are mounted directly in the thick walls of the column, providing a firm support for the spindle.

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One of these Heads applied to the drillers you are now using, regardless of make, will not only enable you to drill many holes for the present cost of one but also will save the time now lost in shifting jigs and raising and lowering the spindle.

Send blueprint or sketch showing number of holes to be drilled, sizes, and center distances.

26

*Send for the Hoefer Catalog*

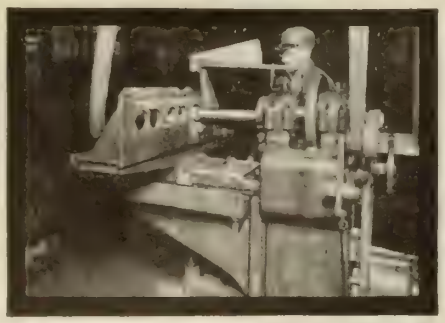
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# The Grinding Wheel *and* The Gasoline Engine

**For photographs and details we are indebted to the Buda Company, *Harvey, Illinois***



Grinding Cylinder Castings, Heald Machines. Wheels are Norton Crystolon, 24-J, 3½ in. x ¾ in. x 1¼ in. Limits are plus or minus .001 in.; stock removed .008 in. to .012 in.

It is remarkable that there are few parts of gasoline engines which are not ground—cylinders, pistons, connecting rod bushings, valve heads, push rods, crankshaft bearings, pins, camshafts, and many other parts depend largely on the grinding wheel industry for efficient production and accuracy.

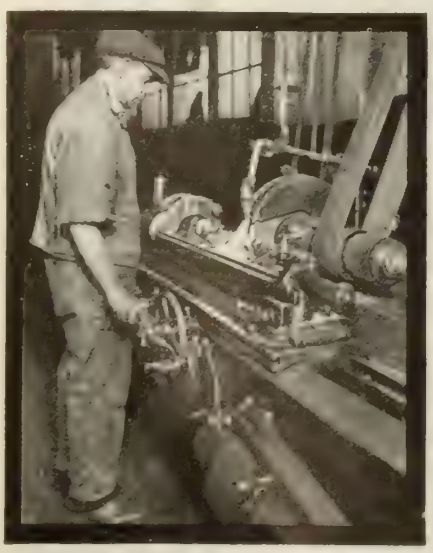
**CYLINDER GRINDING**—The proper grinding of the cylinder—which is the fundamental of the engine—determines the efficiency of the assembled machine. In the cuts shown, cylinders, cast four en bloc, are ground on Heald Cylinder Grinders, using Crystolon wheels 24-J —3½ in. x ¾ in. x 1¼ in. As the cylinders come from the Boring department, there is about .010 in. stock left on diameter for grinding, which is within .001 in. limits. Each machine completes twelve castings in an eight-hour day, a total of 48 cylinders.



Roughing Camshafts; Norton Machine; Norton Alundum Wheel, 24-Q 18 in. x 1¾ in. x 5 in. Camshafts are rough ground with Norton Alundum Wheels, 24-Q 18 in. x 1¾ in. x 5 in. and finish ground with a Norton Alundum 24-L 18 in. x 1¾ in. x 5 in. wheel.

**GRINDING CAMSHAFTS**—In grinding the seven different types of cams, three Norton machines equipped with Alundum No. 24-Q, 18 in. x 1¾ in. x 5 in. wheels are used for roughing, and three machines with 24 combination K, 18 in. x 1¾ in. x 5 in. wheels for finishing.

**CONNECTING ROD BUSHINGS**—Obtaining a perfect surface on the bronze connecting rod bushings, and bringing them down to size direct from the rough, is now done by grinding alone. This removes about 3-16 in. of stock, and production is 600 in eight hours, using Norton 24 Combination M, 20 in. x 4 in. x 12½ in. wheels.

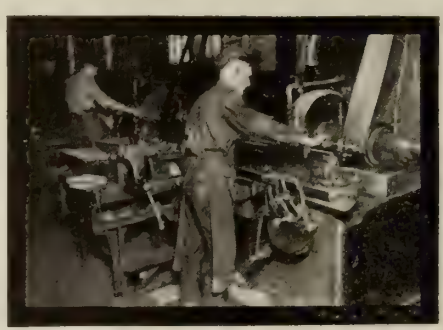


Finish Grinding, Camshafts, Norton Machine, Norton Alundum Wheel, 24 Combination L, 18 in. x 1¾ in. x 5 in.

## Norton Company of Canada, Limited
### HAMILTON, ONTARIO

**Electric Furnace Plants:**
Niagara Falls, N.Y.
Chippawa, Ontario, Canada

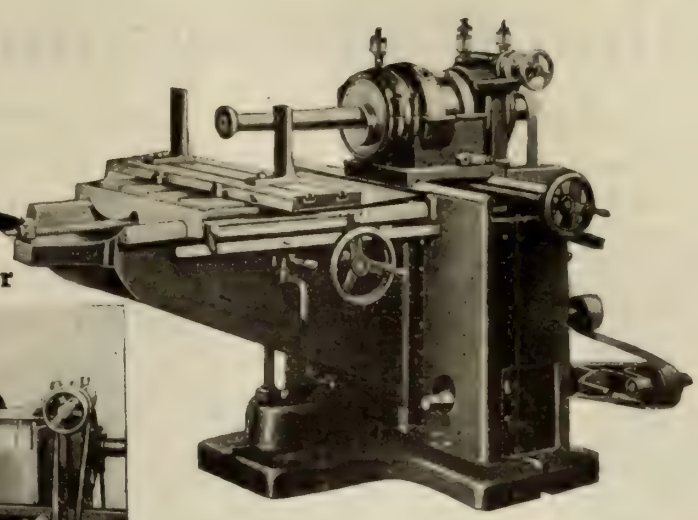
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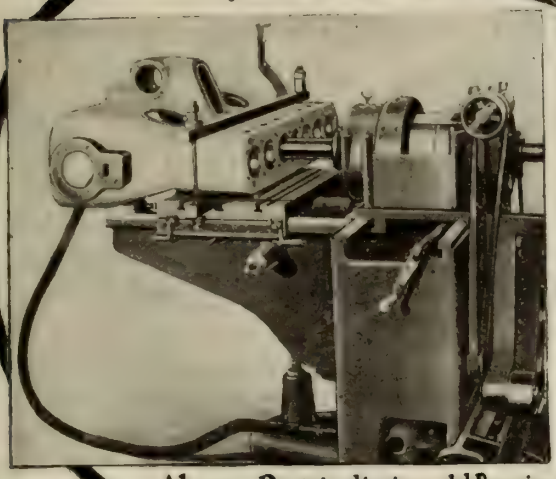
Grinding Connecting Rod Bushings, Norton Wheel 24 Combination M, 20 in. x 4 in. x 12½ in. These Bushings are Ground directly to size from the rough.

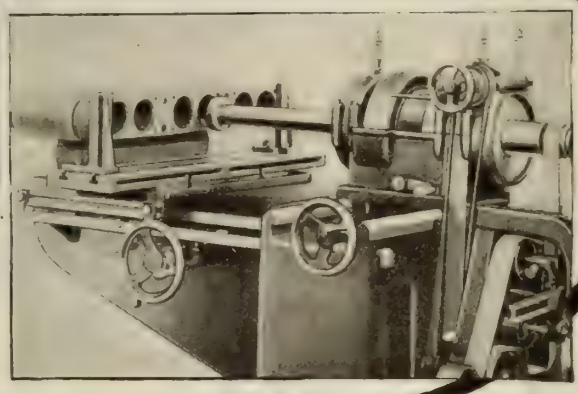
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Madison Cylinder Grinder





Above: Regrinding an old Premier.
At the Right: Regrinding a Buick-6 Cylinder

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## MADISON MACHINE TOOL COMPANY

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The special nature of the gum used in Dick's Balata Belting makes it less susceptible to climatic conditions. Because of its uniform quality of manufacture, it has been installed with absolute confidence for many years.

## Dick's Balata Belting




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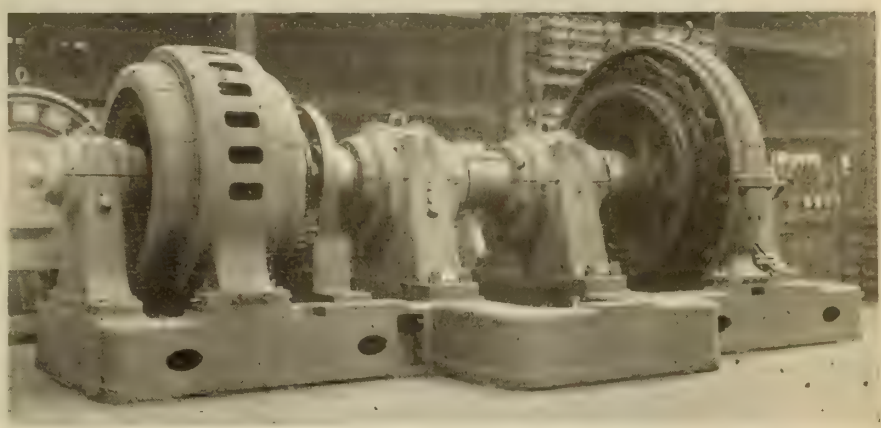
CANADIAN MACHINERY
AND
MANUFACTURING NEWS

VOL. XXV. No. 9 March 3, 1921

# New Universal Plate Mill

Technical Details — Construction Work—Electrical Equipment, and Various Other Features.

*By J. H. Moore*



THE FLYWHEEL MOTOR GENERATOR SET WITHOUT THE FLYWHEEL

THE universal plate mill just installed at the plant of the Dominion Foundries & Steel, Ltd., Hamilton, Ontario, will give Canada a mill of sufficient size to produce large plates, that heretofore have been imported through necessity. This mill, as already stated, is of the universal type and will roll universal plate from 7 inches to 41 inches, shear plate to 64 inches, and will roll both slabs and billets. At the present time all kinds of structural plates for bridges, buildings, cars, heavy pipe skelp, sheet bars, etc., are imported. These imports amount to hundreds of thousands of tons annually but the addition of this mill should help such work in our own country.

It is also intended to roll slabs and forging billets to furnish stocks for their own plow and jobbing mill, also their axle forge shop. These two departments have already been in operation for over two years. The new mill will also roll special forging billets or blooms, such as are used for locomotive, ship, and other heavy forgings. By removing the side rolls of the mill, sheared plates up to 64 inches can be rolled. It can also be equipped with blooming rolls for rolling billets, and a manipulator is installed to take care of this when used as a blooming mill.

At the close of the war this company found itself with a steel making capacity of over 12,000 tons per month; a large modern foundry; a heavy forge shop; a 22-inch bar mill; an axle shop, and a 26-inch jobbing mill. This latter mill was turning out soft center and solid plow steel, automobile frame steel, and jobbing plates, and it was realized that additional finishing capacity was absolutely necessary, not to speak of the need of equipment for the breaking down of the ingots for the existing finishing departments. After careful consideration, it was decided to install the plate mill about to be described.

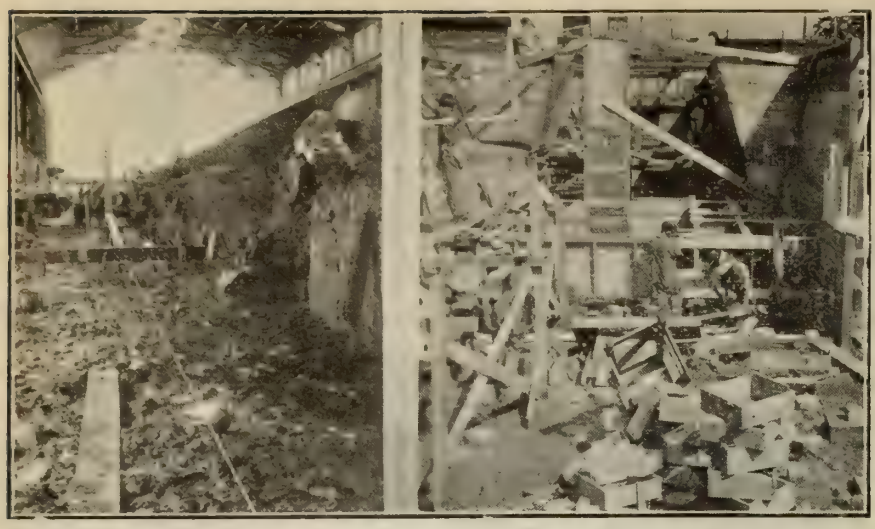
The mill itself is made by the Mackintosh & Hemphill Co., Pittsburgh, and is technically known as a 27-inch universal plate mill. The horizontal chilled iron rolls are 72 inches in length, with an extreme vertical lift of 20 inches. The vertical rolls both front and back are 18 inches in diameter, and have an opening range from 7 inches to 41 inches. The rolls are operated by hydraulic pull-backs, and the screw downs on the rolls are electrically operated. The main screw downs have two 60 h.p. compound wound motors in series, while for each set of side screws, there is a 40 h.p. motor of similar type.

The housings are cast steel of very rugged proportions, and many other principal parts on the mill are made from the same material. The pinions for both the horizontal and vertical roll drives are enclosed in oil type housings, and all these pinions have machine cut, helical teeth. The main screw down motors are mounted on the pinion housing cap, while the side screw motors are located in a pit at the side of the mill.

Provision is made for removing the side roll housings and inserting a short section of driven rolls both front and back, this allowing the rolling of shear plate up to 64 inches. This system of removing the side housings is also necessary when using as a blooming mill. The illustrations shown throughout the article are taken from various positions, and the details can be noted from the underlines.

### Construction Work

It is of course easily understood that an installation of this size entails considerable preliminary construction work. Without even attempting to enter the details of the work involved, let us skim over for a moment a few figures that will show conclusively the magnitude of the task. The main building in which this mill is located is approximately 500 feet long by 68 feet wide. The tables for the mill run the complete length of the building, and reinforced concrete foundations for all these tables, shear, etc., had to be laid. Then there were the foundations for the different power plant units. All this meant considerable work, for it was absolutely necessary to trench down until good solid ground was reached. The inserted panel tells its only story in this respect. The construction views depicted illustrate a little of the work entailed, but we are making no attempt to touch this work in detail. Enough to say that the foundations are laid 14 feet down underneath the mill and of course tunnels are provided to allow workmen to attend to bolting down, repairs, etc. The amount of concrete used is surprising. Over 10,000 cubic yards of solid concrete has been laid and over 1,000 bolts have been used, these ranging from 1½ inches diameter up to 3 inches. A very notable



THE PICTURE TO THE LEFT SHOWS THE DIGGING OF TRENCH FOR TABLES, WHILE THE OTHER VIEW IS THE PREPARATORY WORK ON FOUNDATIONS FOR PORTION OF ELECTRICAL EQUIPMENT.

performance in continuous concrete pouring was brought to our attention, and the quantity poured is well worth repeating. In 2½ days 1,153 cubic yards were poured, this of course being for 24-hour days.

### Electrical Equipment

The mill is direct connected to a 5,000 h.p. reversing motor of the compensating commutating pole type, and is specially designed to withstand the severe service encountered on reversing rolling mill work of this nature. The speed range of the motor is 120-0-120 r.p.m., and since the speed is quite slow during a considerable portion of the time, and the momentary current peaks are high, it has been designed for forced ventilation. A Buffalo Forge Co. fan is used, this equipment being placed in a lean-to at the side of the power house.

There is also a flywheel motor generator set, this consisting of a 2,000 h.p. wound rotor induction motor driving a 50,000 pound cast steel flywheel, and a special d.c. generator. This generator is also of the compensated commutating pole type and is designed to withstand the same peak load as the reversing motor.

The exciter set is of 3 piece construction, consisting of a 7½ K.W. exciter, and a 25 K.W. constant potential generator driven by a 50 h.p. induction motor. The magnetic control, main switch board, and air washing outfit are all located in the same building as the motor generator set.

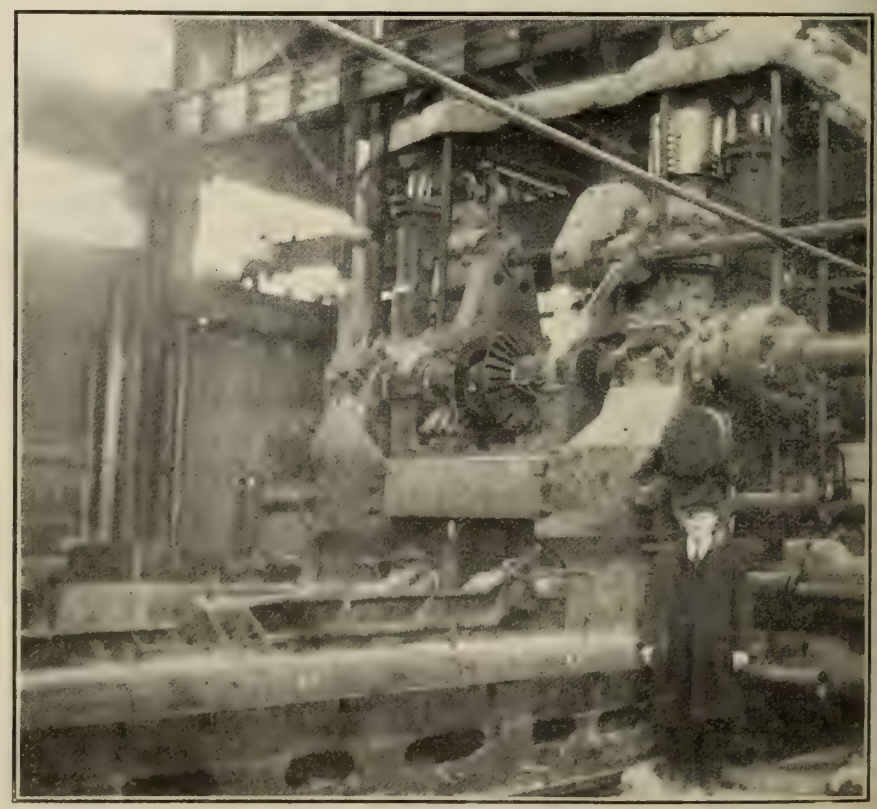
The switchboard and control apparatus is very interesting. The reversing motor is controlled automatically by magnetic switches. Adjustable relays control the rate of acceleration and retardation of the motor, so that it operates at a rate consistent with the reductions which are taken in the mill. The control is so interlocked that the motor always has full field when starting. Further increase in the speed, up to a maximum, takes place after the generator field has attained full strength.

The main switchboard controls the 2,000 h.p. A.C. motor, as well as the exciter and blower motors, and has mounted thereon the necessary meters for measuring the power of the different circuits. Two automatic oil circuit breakers are used between the power line and the primary of the 2,000 h.p. motor. One of these circuit breakers is for forward operation of the flywheel set, and the other breaker is for reversing the power to the set in order to make a quick stop when operating at full speed. This feature is included because it is sometimes desirable to bring the flywheel set to rest quickly, in case of trouble of any kind.

Between the D.C. generator and the reversing motor, an electrically operated high capacity automatic circuit breaker is used. The purpose of this circuit breaker is to interrupt the main D.C. circuit in case of very extreme overloads. The master switch is mounted in the operator's pulpit, and on an inclined panel in front of the operator is a D.C. ammeter and voltmeter for indicating the power transferred between the generator and reversing motor. This panel also has red and green lamps that indicate the position of the main circuit breaker.

The secondary of the 2,000 h.p. A.C. motor is controlled by means of an automatic liquid slip regulator. The position of the electrodes, and thus the amount of resistance inserted, is governed automatically by the torque motor, which in turn is actuated by means of a current transformer in the primary leads of the main motor. If the regulator is set for the average load on the motor during operation of the mill, it will take a constant input from the power circuit as long as the equipment is operating up to capacity. As peaks come on, the torque of the small motor is increased due to the greater current in the primary leads which raises the movable electrodes inserting more resistance in the secondary. This allows the motor to slow down, and shifts the peak to the flywheel. After the peak has been taken care of, the input to the main motor will be maintained until the set is brought up to approximately full speed.

The excitation for both generator and motor is supplied by the small exciter



GENERAL VIEW OF THE PLATE MILL. F. C. WALKER, THE SUPERINTENDENT, IS A BIG MAN—BUT SMALL IN COMPARISON WITH THE MILL.

set. The direction of the roll motor excitation is not changed during operation, but is varied to meet the conditions of load and speed requirements. The operation is as follows: With the flywheel set at full speed, and master controller in "off" position, the roll motor will not be in operation, since the generator has no field current. The motor now has full field and the generator field is gradually excited, bringing up the voltage across the motor armature which will cause the same to revolve in the direction indicated by master switch. Compounding of the reversing motor is accomplished by means of the series exciter, which is excited by the current flowing between the generator and the motor. In this way any variation in the load on the mill motor will vary its total field excitation, thus giving the effect of a compound motor without the disadvantage of reversing such heavy currents in the series winding, which would be required in machines of the usual type. Due to this system, compounding can be varied to suit the operating conditions without the necessity of shunting heavy currents.

The speed at which the roll motor runs is practically proportional to the impressed voltage, independent of load up to full field on both motor and generator. From here, the speed is increased by manipulating the field of the motor. During the pass, the load on the generator is often very much in excess of the average over the entire cycle, and the automatic slip regulator enables the flywheel to supply the difference between the average input to the set and the load on the generator during the peaks. A slip regulator automatically inserts resistance in the secondary of the induction motor when its primary current reaches the average value, so that the speed of the set is reduced, allowing the flywheel to give up a portion of its energy. When the load on the generator decreases below the average for which the regular is set, this operation is reversed, i.e., the difference between output of induction motor and input required by generator goes to bring the set up to maximum speed. By this system, the input to the set may be limited to practically a constant value, independent of peak loads which are several times the maximum load on the line.

The roll motor is rapidly brought to rest by regenerative braking if the voltage on the generator is lowered below that corresponding to the speed of the motor. In pumping back power into the set, a large portion of the accelerating energy is reclaimed, helping each time to increase the speed of the set and consequently the energy stored in the flywheel. A device for accomplishing rapid acceleration is incorporated so that when it is desired to speed up the operation the normal time for building up the generator voltage can be reduced.

The incoming power is 13,000 volts, 3 phase, 27 cycle, and is brought through an underground cable 1,500 feet from the main substation of the company. It is transformed down to 2,200 volts immediately at the mill power house.

The power for screw down and table D.C. motors is furnished by a motor generator set consisting of a 400 K.W. generator 220 V.D.C. connected to a 590 h.p. synchronous motor 2,200 V, 3 phase, 25 cycle. This also furnishes the power for driving the D.C. motors on all tables, plate leveller, manipulator, furnace pusher, shear depressing table, pinch rollers, etc. Provision is made for installing an additional motor generator set to duplicate this when required.

### Various Details

The billet shear used is of Mackintosh & Hemphill design, and was built by the Canadian Allis-Chalmers Co. The capacity of the shear is 10 feet by 10 feet square, and slabs up to 40 inches width can be cut. The stroke is 12 inches, the length of knife 48 inches, and the number of strokes 14 per minute. It is driven by a 125 h.p. induction motor and the clutch shifter is worked by a 9 h.p. D.C. mill motor with brake and limit switch. The shear gauge is also of M. & H. design, and is operated by a 9 h.p. D.C. motor.

The shear depressing table, back of the shear, is 23 feet long with 11 rolls 14 inches by 48 inches. It is driven by a 60 h.p. D.C. mill motor at a speed of

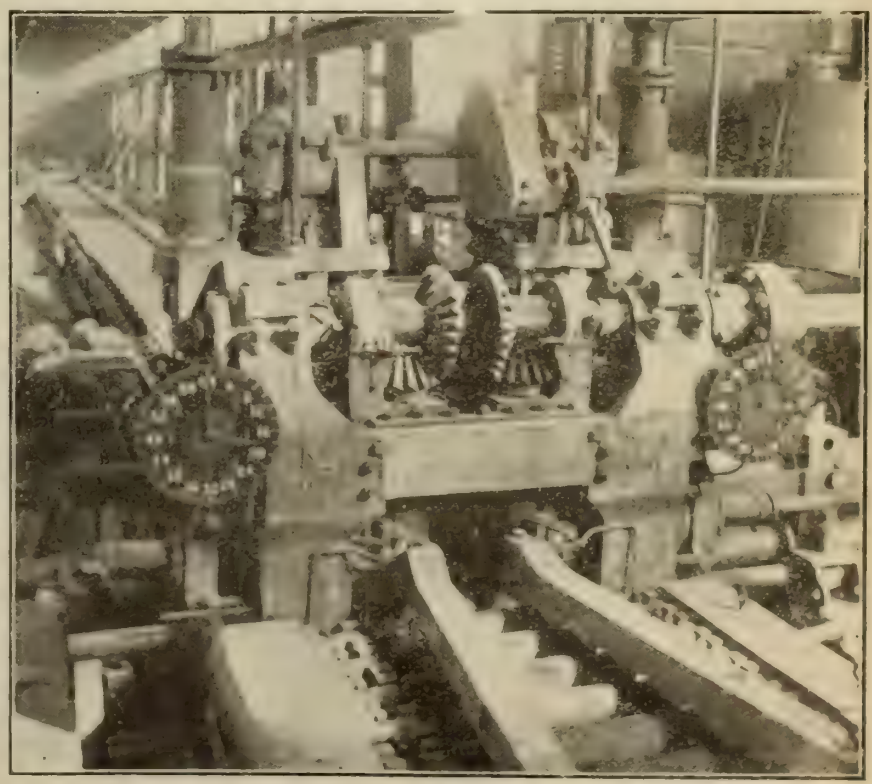
### *SOME VIBRATION*

*F. C. Walker, plate mill superintendent at the plant we are speaking of, tells a funny story about vibration. "You are, of course, well aware," he started off, "that a plate mill of any size is always subject to considerable vibration, but you have to actually experience the sensation before you have any conception as to its extent.*

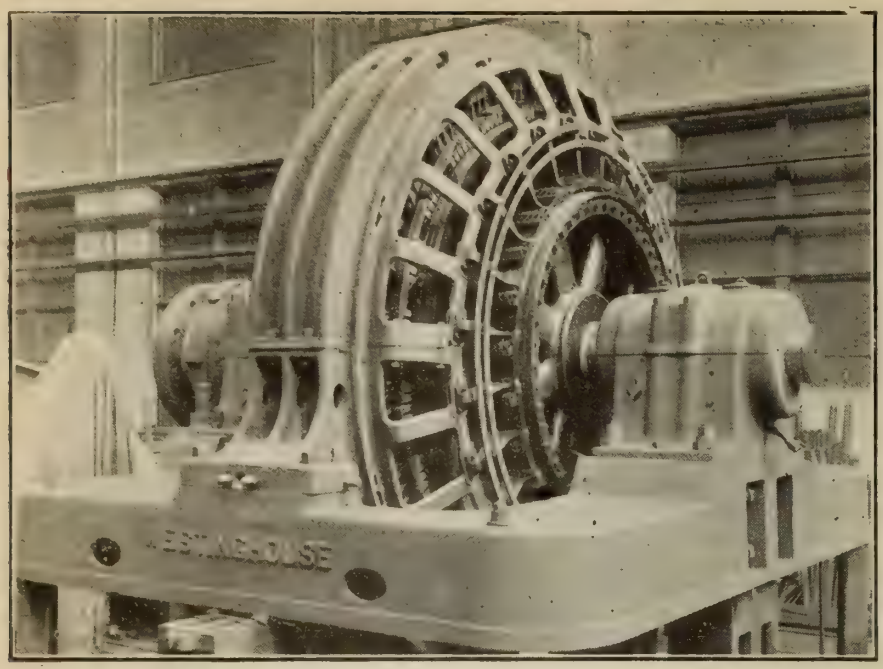
*"When you stand on the pulpit, or as some might term it, the control bridge, you feel the sway to a nicety. I remember on one occasion the foundations were none of the best, and the vibration and swing was worse than usual. It was like standing on the bridge of a ship during a rather nice swell.*

*"On reaching home that night I could still feel the sway, but the limit came when I actually woke up in the night to find myself grabbing the bed post firmly in order to keep myself from falling off the pulpit."*

*The little tale about vibration may seem to the uninitiated as exaggerated, but when we consider that the firm installing this plate mill at Hamilton saw fit to have a 14-ft. deep foundation of reinforced concrete, there must be something to the story. Below the concrete again there is placed considerable piling to a still further depth of 30 ft., this, of course, being to prevent sinking. Good, firm soil must be reached before the foundation proper is poured. In the old days these were of stone, not concrete, but were never as satisfactory as the modern method. Before a foundation is commenced, the ground is carefully drilled to ascertain its quality at different depths. Having this information at hand, they can proceed to drive their piling.*



CLOSE UP VIEW OF THE PLATE MILL.



THIS ILLUSTRATES THE 5,000 H.P. REVERSING MOTOR WHICH DRIVES THE MILL.

266 feet per minute. The shear run out table is 45 feet long with 27 rolls 14 inches by 48 inches and is driven by a 60 h.p. D.C. mill motor running at a speed of 266 feet per minute.

The punch rollers are located immediately back of the shear run out table and are 18 inches by 48 inches. These rollers are for delivering skelp, etc., to the piler, the intention being to cut skelp sheet, bar, etc., on the billet shear without going over the hot bed. The speed of rolls is 480 feet per minute.

The shear equipment consists of a cut-off and two side shears with an arrangement of castor beds to serve them. A 10-ton platform scale 5 feet wide and 50 feet long is also arranged for castors.

On account of the variety of products, a diversity of heating furnaces is necessary. A 32-foot continuous furnace with douhle electric charging pusher and delivery pusher places the ingot directly on to the approach table.

The mill tables, front and back, are 35 feet long, each having 20 rolls. The 13 rolls next to the mill are spaced 17 inches, while the balance are spaced 21 inches. All rolls are 14 inches diameter, 72 inches long. The maximum speed of table is 428 feet per minute. The case, and the table beams are made of cast steel and the roll bevel gears, as well as the drive gears, are machine cut cast steel, running enclosed in oil.

Each mill table is driven by two 80 h.p. mill reversing motors, connected in series. These motors have full magnetic plugging control, and are so arranged that the motors on the incoming table work at half speed, while the outgoing table works at full speed in either direction.

The two controllers are mechanically connected, and the operator uses only one handle to operate all four motors. This is accomplished on the first point of the master controller in either direction, and on the second point both tables run at full speed.

The approach table is driven by a 60 h.p. motor. The length of this table is 70 feet and it has 35 rolls spaced 18 inches centers in front of furnaces; while the balance are spaced at 21 inches and 30 inches centers, the latter distance being at the extreme end of table. The speed of this table is 350 feet per minute. There is also an extension to the table, this being 55 feet long, but with no rollers.

The run out and hot bed tables are each 145 feet long, the former having 58 rolls and the latter 61. These rolls are 14 inches diameter, 59 inches long and the center distance between the rolls is 30 inches. As on the other tables, the gears have machine cut teeth and run in oil. The speed of the rolls is 350 feet per minute. Each of these tables is driven by two 60 h.p. mill type motors connected in series.

A plate leveller is situated between the run out and hot bed tables, and this is a nine roll machine made by R. S. Newbold. The rolls are 10 inches diameter, 72 inches long and their speed is 158 feet per minute. Motor drive and screw down are of course provided. Extended shoe plates are provided to allow for removing leveller and inserting a dead roll when rolling slabs or billets.

A second continuous double skid furnace is installed alongside the first furnace, and is equipped with a hydraulic pusher. This will handle larger blooms and ingots up to 50 feet and the pusher will deliver material directly to the table. The capacity of both these furnaces is about 4,000 to 6,000 tons respectively.

It is the intention ultimately to make provision for four soaking pits, two to be installed later, but the first pits are four hole 6 feet by 9 feet with hydraulic operated covers. These pits are arranged for oil firing with provision for producer gas later. The soaking pit building is located immediately adjoining the furnace building, with the approach table through center, having two pits on each side.

The buildings in which these units are housed are of steel construction and provision is made for extending shipping room as required. The main building extends across the other buildings and is partitioned off from the power house.



PARTIAL VIEW OF TABLES AND MILL. NOTE—THE AUTOMATIC SWITCHES ARE IN THE GLASS-PROTECTED BUILDING TO THE LEFT OF THE TABLES.

The power house walls are reinforced concrete and glass with gypsum slab roof and concrete floor. The mill building and power house is served by a 40-ton crane, while other cranes in the plant are of 10-ton capacity.

With the exception of the mill and plate leveller, all the tables, shear pushers, punch roller, and accessory machinery was built in Canada. No doubt readers will remember our Jan. 8th issue in which we told of the work being done for this mill by the Dominion Steel Products Co., Brantford, Canada. The steel castings for the work performed in Canada were supplied by the Dominion Foundries & Steel, Ltd., from their own foundry.

The idea of producing as much as possible in Canada is to be commended, and here is how the work was distributed. The tables, including shear depressing and furnace pushers was made by the Dominion Steel Products, Brantford, Ontario, the shears by Canadian Allis-Chalmers, Toronto; manipulators by John Inglis, Toronto; buildings by Hamilton Bridge Works, Hamilton, Ont.; while the electrical equipment was supplied by the Canadian Westinghouse Co., Hamilton, and the Canadian General Electric Co., Peterboro, Ont.

A good feature of this installation is the railroad facilities provided. Three railway tracks serve the billet yard, shipping department and mill building, while a track runs right into the building at one point.

Briefly stated, the addition of this mill should mean much to Canadian business generally. Billets and blooms from 3 inches by 3 inches to 8 inches by 8 inches, slabs from 2 inches to 8 inches thick and from 6 inches to 40 inches wide are now available, while skelp of all sizes and weights 8 inches and wider can be made. Sheet bar (for sheets) of all sizes and weights can be produced, and universal plate from 7 inches to 41 inches of any thickness and length can be made. In addition to this list, sheared plate 66 inches wide, and of any thickness can be procured. The capacity of the mill being 150,000 tons per year will allow them to handle the demand easily. In fact, when in full swing this installation will be one of the largest steel finishing units in Canada.

# Increasing Production by means of Turret Lathe

## Possibilities of Such Machines Are Not Realized—Proper Planning of Operation Steps—Machining a Gear, a Clutch, and a Series of Collars—Making Tool Estimate Sheets, Also Time Study Sheets

By E. H. TURNER, Production Engineer for the Canadian Fairbanks-Morse Co., Ltd.

MANY shop men, and even executives are firmly of the opinion that it never pays to use a turret lathe unless you have a large quantity of similar shaped pieces to machine. This is an erroneous impression and the examples in the present article show clearly that in many cases a turret lathe can be used to advantage even on smaller quantities.

There are two reasons why manufacturers in general are not getting the production from turret lathes that they should. First they do not fully realize the possibilities of such lathes nor are they sufficiently familiar with the tools used. The second reason, is, to my mind, a question of the operator. The antipathy often shown by shop men to operate such machines to full capacity has caused many a one to exclaim, "Oh, you cannot increase production on that style of tool." This feeling can, I believe, be wiped out by offering additional wages for increased production, pointing out clearly to the workman that his increase depends on his efforts.

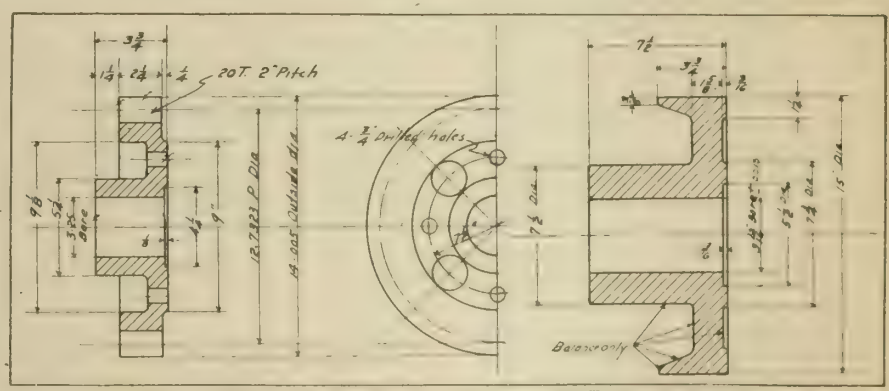


FIG. 1.—LEFT HAND VIEW. FIG. 6.—RIGHT HAND VIEW.

Proper planning of the operation steps is equally important. At all times make the tooling as simple yet efficient as possible. This will enable the operator to complete the work in the best possible time. To accomplish this requires a working knowledge of tool equipment, and such can be obtained in various ways; reading articles on the subject; by obtaining the information direct from the makers, or by practical experience in the shop.

In using pieces A, B and C for examples of work performed, it is intended to draw attention to the following points. First, these parts are taken from the

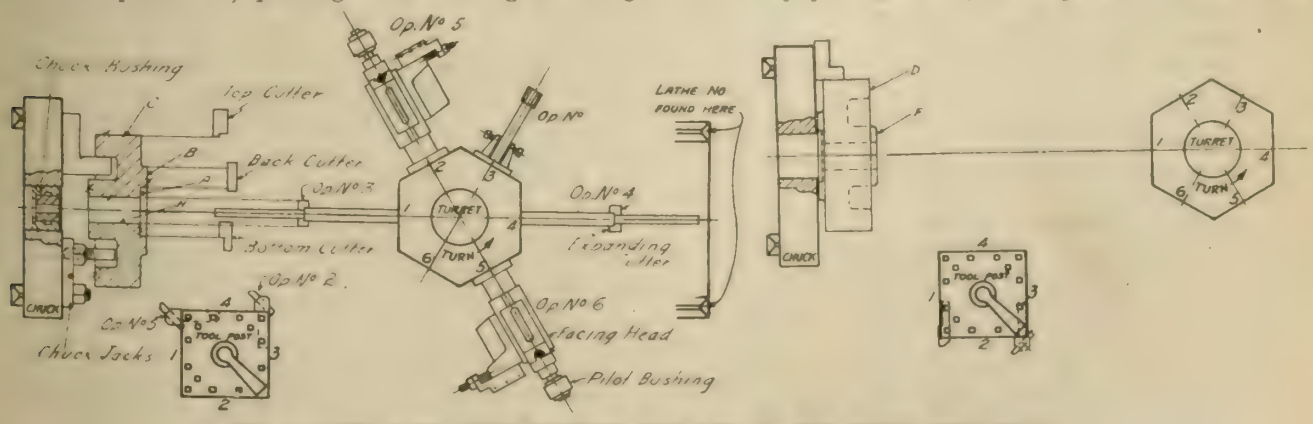



FIG. 2.—LEFT HAND VIEW SHOWING THE SET UP FOR FIRST OPERATION.
FIG. 3.—RIGHT HAND VIEW DEPICTS SECOND OPERATION SET UP.

**DETAIL OF TOOL ESTIMATE SHEET**

| *List No.* | *No. Req.* | *Tools Wanted* |
|---|---|---|
| CK-1 ..... | 3 | Standard Hard Jaws. |
| CK-52 ..... | 3 | Standard Chuck Jacks. |
| To make ..... | 3 | $\frac{5}{8}$ x $\frac{3}{4}$ Screws and Nuts for Chuck Jacks. |
| BB-20 ..... | 1 | Rough Bore Cutter, 3.235. |
| BB-21 ..... | 1 | Adjustable Cutter, 3.25. |
| BB-1 ..... | 2 | Standard Boring Bars, No. 5. |
| FH-1&3 ..... | 2 | Facing Heads with Top and Rear Tool Holders. |
| CK-54 ..... | 1 | Standard Chuck Bushing for No. 5 Bar. |
| To make ..... | 2 | Each of Flat Cutters for A, B, and C. |
| FH-65 ..... | 2 | Standard Pilot Bushing Arbours for Lubricated Bushing. |
| FH-64 ..... | 2 | C.I. Plain Bushings to Run in 3.25 Hole. |
| TP-42 ..... | 1 | Rt. Hd. Standard Tool Holder. |
| TP-43 ..... | 1 | Lt. Hd. Standard Tool Holder. |
| TP-48 & 49.... | 2 | $\frac{3}{4}$ x $\frac{3}{4}$ Tools for Tool Holders. |
| For Set-up No. 2— | | |
| CK-1 ..... | 3 | Standard Jaws. |
| TP-15 ..... | 1 | Lt. Hd. Roughing Tool. |
| TP-43 ..... | 1 | Lt. Hd. Tool Holder. |

FIG. 4.—AN EXAMPLE OF A TOOL ESTIMATE SHEET.

work of one plant, the machine shop of which is producing very creditable work, both large and small. It might be well to add that all the examples embodied in the article are taken from Canadian plants, and the first three, already referred to, were being made on engine lathes when I first saw them, although the equipment in this plant included a 21-inch turret lathe in good shape.

The second point I wish to emphasize is that similar parts, even if not identical with those shown, are common in many plants throughout Canada. It was for this reason that I picked on these simple examples, believing they would be of greater interest than if I were to show more complicated pieces.

The third point I wish to refer to is this. The tool set up for example A is quite sufficient for machining all the pieces shown, also other similar shaped parts, which of course we have not the time to deal with. All that is necessary is merely a change of boring bar cutters, flat cutters, and tool post tools. The above points will no doubt convince the skeptical that engine lathe work can often be profitably performed on the turret lathe, and that it is not always necessary to have large quantities of one piece to make the change a success.

At Fig. 1 is shown piece A in detail, while at Figs. 2 and 3 we have layout drawings of the first and second operations respectively. The piece as illustrated is a cast steel gear to be machined as shown by the finish marks. Much might be written at this point about the information left off shop drawings, such as type of finish desired, limits allowed, etc., but as this is a turret lathe article let us stick to the main subject. In this case all dimensions given in decimals are to be held within a plus of .005 inch, while the other dimensions are near enough to within 1-64 inch. Originally, these parts were put through the shop in lots of 5 or 6, but it was found easy to arrange for lots of 15 to 20. The layout shown was made for lots of 10.

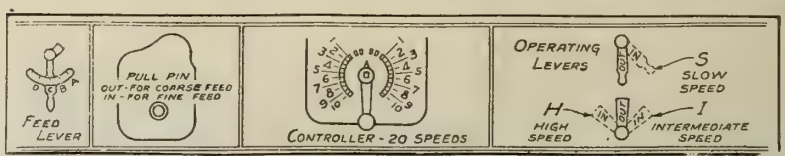
Let us refer to Fig. 2. The first essential in production is holding the work securely. Usually the largest diameter available should be held in the jaws. In this case the inside of the rim of gear affords ample holding surface and driving leverage for all cuts. The work is pressed against the chuck jacks and gripped on the inside of rim as shown on sketch.

Before placing work in position, the chuck bushing must be inserted. This consists of a cast iron outer bushing made an easy driving fit into the chuck plate. Inside of this outer bush is placed a hardened steel bushing having a hole to suitable size for the pilot on the boring bar. This hardened bush revolves in oil and is kept in place by a projection on the rear of the cast iron bushing, and a steel plate on the front end, this plate being held by three small screws. When the bar is in working position the hardened bushing remains stationary with the bar.

Next let us consider the tool post. Here is shown a right and left hand tool holder with the tools 4 and 3 in position. The order of operation No. 1 had best be told in steps. After chucking the work, using hard jaws, the faces of A and B are rough faced with the tool in tool post, side 3. Next the bore H is rough bored with bar at side 1 of the turret. After this the same hole is finish bored with the bar at side 4 of the turret. The fifth step is to start the tool on side 4 of tool post on face C of the work, following ¼ inch behind with the facing head at side 5 of the turret, this turning surface C, and facing surfaces B and A to semi-finished sizes. The last step in the first operation is to finish surfaces C, B and A with tools at side 2 of the turret.

It might be well to add that after face B is machined, the carriage stop was set so that the tool could be brought to the same position each time. The work is always measured from the chuck jaws out. This method of setting the stop likewise applies to the other positions where stops are necessary. It will be noticed that a reamer is shown at side 3 of the turret, but that no mention has been made of the same. The reamer is not used on this particular operation.

*The data contained in this article are taken from a Canadian plant, and are typical of almost any machine shop throughout the country. Tool planning is after all the big point to watch, for many a good machine tool is giving far from its possible service through poor tool layout.*




| Change Gear 32 Teeth | Controller at | Speeds | Spindle R.P.M. | Pull Pin | Feed | Min. Sec. |
|---|---|---|---|---|---|---|
| 1. Chuck ..... | .. | .. | .. | .... | ..... | 2:00 |
| 2. Rough A and B Tool Post No. 3 ..... | 5 | I | 24 | Out | D-1/32 | 4:00 |
| 3. Rough Bore H Turret No. 1 ..... | 7 | I | 55 | Out | D-1/32 | 2:30 |
| Above takes ¼ in. from bore. | | | | | | |
| 4. Finish Bore H Turret No. 4 ..... | 7 | I | 55 | Out | C-1/16 | 1:15 |
| 5. Rough C and semi-finish C, B and A Tool Post No. 4, Turret No. 2 ..... | 4 | S | 14 | Out | D-1/32 | 7:00 |
| 6. Finish C. B and A Turret No. 2 ..... | 4 | S | 14 | Out | C-1/16 | 3:40 |
| Operating Tools ..... | | | | | | 2:00 |
| Floor to Floor Time for Set-up No. 1 = ..... | | | | | | 22:25 |
| Set-up No. 2. | | | | | | |
| Chuck ..... | .. | .. | .. | .... | ..... | 2:00 |
| Face D and E ..... | 4 | S | 14 | Out | D-1/32 | 5:40 |
| Operating Tools ..... | .. | .. | .. | .... | ..... | 0:20 |
| Floor to Floor Time for Set-up No. 2 = ..... | | | | | | 8:00 |
| Total Floor to Floor Time— | | | | | | |
| 1st Operation ..... | | | | | | 22:25 |
| 2nd Operation ..... | | | | | | 8:00 |
| Complete ..... | | | | | | 30:25 |

FIG. 5.—AN EXAMPLE OF A TIME STUDY SHEET.

With the exception of a dual holder that could be placed in side 6 of the turret, and a holder for the tool post, this equipment is what is termed a standard set of tools for Gisholt lathes, and the layouts I am describing throughout this article are for this style machine. The set up used on this piece is adopted for all other work shown, the only difference being the changes in cutters and tools.

When work of this nature is planned it is customary to make out a list of tools as shown at Fig. 4. With a list of this kind all tools necessary can be placed at the machine ready for making the set up.

A short talk on the art of setting facing cutters would not be amiss. The quickest method is to use a finished piece, placing it over the pilot bushing and setting all finishing cutters on side 2 of turret first (see Fig. 2), then setting the cutters on facing head at side 5 of turret, allowing of course the correct amount of stock.

It is common practice on work of this nature to prepare study sheets as shown at Fig. 5. In this case the study was made before starting to make the set up, and is based on a cutting speed of 50 feet per minute. Such a list can, however, be made up when the set is being made, or it can be changed from time to time to meet any adverse condition that may arise, or to take advantage of a favorable one. The time sheet shown is for a 21-inch motor driven lathe with D.C. connection. This drive, to my mind, is the most convenient, as the controller has ten speeds in either direction for each position of the levers S, H and I. However, the same plan is adopted if A.C. drive or belt is used. These sheets give complete instructions to the operator. For example in step No. 2 we see that the controller has to be set at position 5, and that under the speed column we have to set lever I, giving us a speed of 24 r.p.m. The next column refers to the pull out pin at end of lathe, this pin controlling the fine and coarse feeds, out position for coarse and in for fine feeds. The next column denotes a letter as used, also the feed to be adopted. The last item gives the actual time of the step in the operation. Allowances for moving tools from one position to the other are made at the end of the time

*The author of this article is well qualified to speak on the subject, as he is constantly travelling around Eastern Canada giving advice on turret lathe tool planning. He has told Canadian Machinery that this service is free and that any firm desiring information can have the same upon request. Such correspondence should be addressed to him, care of Canadian Machinery Editorial Department.*

study, then all items are totalled, this giving the actual floor to floor time. In the case shown, the first operation takes 22.25 minutes, the second 8 minutes, therefore the complete time for the piece is approximately 30¼ minutes. As a general rule a separate set-up sheet is made for each operation, but for convenience we have shown both studies on the one sheet.

### Second Operation

Referring to Fig. 3, it will be seen that the only equipment necessary on the second operation is two tools in the tool post at positions 1 and 3. These tools could have been placed during the first operation if so desired as they do not in any way interfere with the others. The equipment on the turret can be left intact. Merely draw the turret out of the way and proceed as follows.

The work is held in the standard jaws, and the faces D and E are completed with the two tools at sides 1 and 3 of the tool post. To machine two of these gears in the regular way requires 3½ hours, but the ten pieces are machined by the turret method described in eight hours, or a time per piece of 48 minutes including all set-up time. This is by no means a record, but when you figure that in many cases two to four hours are often used up in machining even one of such pieces, it leads to the belief that record breaking is not essential if we can make an improvement in production time such as we have shown.

### The Second Example

The next example B illustrates a standard cast iron coupling that has to be machined all over. Machining for balance is marked clearly and such parts require only one cut. Other dimensions have to be held to plus .10 inch, except the bore which has limits as shown on the drawing at Fig. 6. Two operations are necessary to complete this piece and following is the sequence of steps.

Referring to Fig. 7 we see the tool layout for the first operation. The work is chucked in standard hard jaws, and the face E is faced to carriage stops by the tool in side 4 of tool post. The bore A is also started by the tool at side 1 of the turret, this being held to a turret stop. Next the surface K is turned by the tool in side 3 of the tool post. The face H is now machined by the tool in side 3 of tool post, also the face F. The surface G is next rough machined by tool in side 4 of the tool post. The surface G is now straightened by the tool in side 2 of tool post. It might be well to add that in withdrawing the boring bar the rapid traverse is used as soon as the turret trips.

As we have already gone into the system of making out a time study sheet we need not dwell on this at great length except to say that following are the times on the different steps. Chucking 2 minutes, face E 1 minute 20 seconds, turn K 4 minutes, face H 2 minutes 40 seconds, face F 30 seconds, rough G 3 minutes, straighten G by hand 1 minute, operating tools 2 minutes. This makes a total operation time of 16 minutes 40 seconds. It will be noted that no time is given for rough boring the hole A as this was performed while the other tools were working.

### Operation No. 2

Fig. 8 depicts the tooling used in the second operation on piece B. In this case the work is held by hard jaws and the piece is supported by chuck jacks. The surface B is rough machined to stops, the tool of side 4 of tool post being used. The bore A is next finished with box at side 4 of turret. The same hole is now reamed by reamer at side 3 of turret. The surface C is roughed to stop and E is merely cleaned up. D is next roughed with tool at side 3 of tool post. This is followed ¼ inch behind by tool at side 2 of turret, and surfaces C, D and B are semi-finished. The last step con-

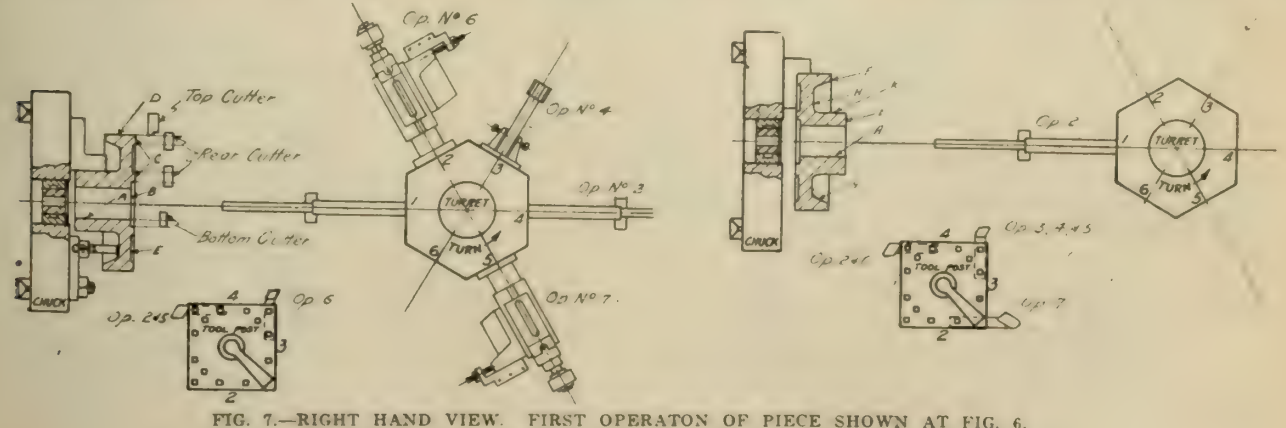



FIG. 7.—RIGHT HAND VIEW. FIRST OPERATON OF PIECE SHOWN AT FIG. 6.
FIG. 8.—LEFT HAND VIEW SHOWING SECOND OPERATION ON THE SAME PIECE.

sists of finishing the same surface mentioned with the facing tools at side 5 of the turret.

The time study for this operation follows. Chucking 2 minutes, rough B 25 seconds, finish bore A 1 minute 30 seconds, ream A 1 minute 30 seconds, rough C and clean E 3 minutes, rough D and semi-finish D, C and B 7 minutes 20 seconds, finish D, C and B 3 minutes 15 seconds. Total floor to floor time 20 minutes 40 seconds. This means that to complete the piece takes approximately 36 to 38 minutes, this including both operations. The best time on the former method employed was 2½ hours each, so that the saving is considerable.

### The Third Example

Example C at Fig. 9 illustrates a pair of standard cast iron saw collars. The face with a slight hollow near the bore must be true and square with the bore, and in this case the dimensions are not to close limits. Referring to Fig. 10 we see the tool layout sheet for this piece, and here is how the work is completed.

It will be noted that these collars are made from a casting long enough to make five or six pieces. To facilitate gripping the casting is made with a slight bevel as shown and is held in a pair of special jaws as shown. These jaws may be hard or soft as desired. The chuck bushing in this case is kept well to the front in order that the bar may be in as far as possible. Chips and dirt cannot injure such a bushing, if it is of standard design.

After chucking, the face B is machined by tool in side 4 of tool post. This, however, is for the first piece only. The hole A is bored and surface C is turned at side 1 of turret and side 4 of tool post. The bore A is now finished, and surface C by bar at side 4 of turret and tool at side 3 of tool post. The reamer at side 3 of turret now reams 3 inches into bore A. The face B is next faced to form by tool at side 2 of turret.

The piece is now parted at P by tool at side 2 of tool post. The eighth step is the reaming of other 3 inches into hole A by reamer at side 3 of turret. Face B is again formed and then the work is parted halfway down at P by tool at side 2 of tool post. E is next formed by tool at side 3 of tool post. The parting off is

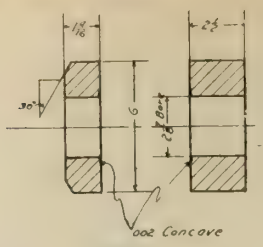


FIG. 9.

now completed by tool at side 2 of the tool post.

The time for the plain piece is about 9 minutes, while 11 minutes is approximately the time for the bevelled collar. There are a number of such collars of different sizes made at the plant I speak of, but the same equipment is easily adaptable to all. Many other examples of work even more complicated could be given, but sufficient has been said to emphasize the importance of studying the possibility of turret lathes.

To give readers an opportunity of making a layout for themselves, also a time study along the lines that the author has shown, we have prepared the examples D and E at Fig. 11. These pieces are at present produced on a 21-inch turret lathe, and it would be interesting to see comparative tool layout suggestions, showing these in a later issu with the present method employed. The preparation of such sheets would quicken the perception of the mechanic and Canadian Machinery will pay for all accepted material at regular space rates. Here would be the best method of submitting the material. Read the article carefully, cover the same points embodied in this work, make your layout sheets, give all possible data, then send it in to our office. After we have received a sufficient number of suggestions, we will publish the best of these, together with the present method of production.

## ERRATA

In our January 27th issue we published an article on the machining of monel metal castings. In this article we omitted giving credit to American Machinist, who were the first to publish the material. This was an oversight on our part; in fact, a footnote was prepared but was left out by mistake.

## ZINC SMELTING

Speaking on the spelter situation, Mr. H. M. Ridge in the "Journal of the Society of Chemical Industry" remarks that until conditions improve, the Old Country is dependent upon America for its supply. He points out that it will be some little time before either the British or Belgian works will be able to produce at full capacity. He states that no steps have yet been taken to make the country self-supporting, even although there are ample supplies to be had within the empire. He compares the various countries and remarks as follows:

"In the treatment of zinc concentrates no radically new methods have yet proved suitable. Electrolytic precipitation has been tried in a number of works in the country, but all of these have been shut down, including the Hoepfner process plant at Winnington, from which such a good product was obtained for several years. It is interesting to note that at the same time electrolysis has been adopted for the new plants in Tasmania, Canada, and at one place in the United States, but in each of these cheap power is available. The demand for high-grade zinc will be large in future, but it can now be obtained cheaply by new means which were worked out during the war. Much progress has been made with the electric-furnace reduction in Norway, Sweden, and France, and the troubles experienced in the condensation of the zinc vapor have been largely overcome, but here also cheap power is essential.

Charging the pots in the furnace probably used to be the most laborious work of the zinc smelter, and this has been overcome with the aid of charging machines. These are driven electrically, and are much more efficient than hand-charging, the pots being more uniformly charged and the charge denser. The duration of the manoeuvre is shortened by about two hours.

The more extensive use of machinery reduces the number of men, and at the same time makes the management more independent of the skilled workmen.

Before the war, 84½ per cent. of the total imports of South America came from European countries.

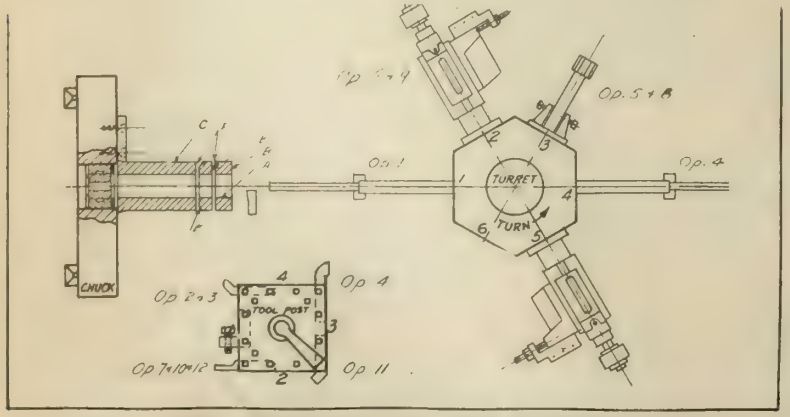
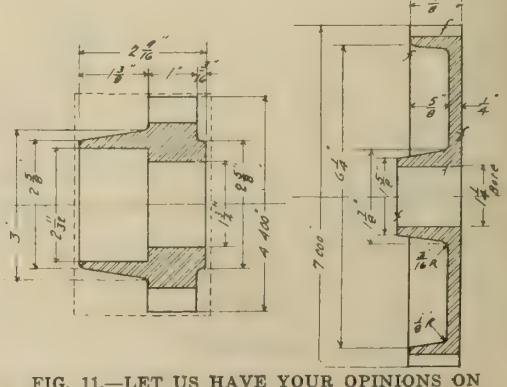


FIG. 10.—TOOL LAYOUT FOR CAST IRON COLLARS.


FIG. 11.—LET US HAVE YOUR OPINIONS ON HOW THESE PARTS SHOULD BE MACHINED.

# *Operation of Railroads Under War Conditions*

## Actual Experiences—Locomotives Used—Necessary Repairs Often Unobtainable—How Absence of Power Brakes on Cars Was Overcome

*By Capt. A. H. Kendall, M.C., O.C.
Master Mechanic C.P.R., Montreal

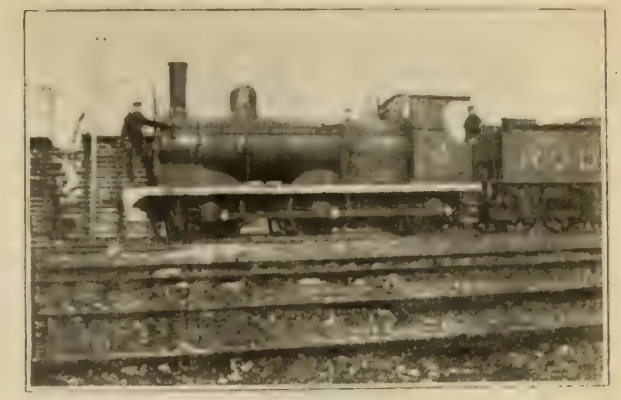


FIG. 2.—TYPE OF LOCOMOTIVE FIRST SUPPLIED

THE chief object of this article is to describe the actual experiences of a railway operating division under the severe and constantly changing conditions incidental to war manoeuvring. The original staff of the Canadian railway unit, for example, consisted of 3 officers and 266 men, and at the signing of the armistice this had increased to 17 officers and 1,567 other ranks, in addition to a large number of Chinese coolies and German prisoners, for the handling of coal, ashes, etc. Let me relate some of the engineering features in connection with the work of this unit.

"On arrival at Merris we found a railway yard of sixteen sidings, eight on each side of the main line, and a wye off the south yard. Off the south leg of the wye were three parallel sidings, two of them were 14 ft. centres and the third 20 ft. These three sidings were used as a locomotive depot, or locomotive despatch station. There were no shelters or other facilities available. Alongside these tracks was an irrigation ditch, with about two feet of water, full of vegetable matter, from which our water supply was obtained by means of Merryweather pumps. Merris was developed into a headquarters exchange and locomotive depot. Sub-depots were later established at Bailleul, Steenwerck, and Berguette. The latter station had previously been used by the Nord Railway as a divisional point, and it was, therefore, only necessary for the British army to improve the water and track facilities to meet their requirements.

"In developing the locomotive depot at Merris two 150 ft. concrete pits were put in at the end of the two sidings mentioned above. The sidings were extended, and over the pits we erected a sheet iron shelter, so that when necessary to make repairs at night lights could be used without being observed by hostile aircraft. Another shelter made of the same material was erected close by for use as a machine shop. A 50 kw. electric generator was obtained and used for supplying light for the depot; switches were placed so that all the exposed lights could be turned out during night raids.

"A washout pit was constructed. Engines were washed out every ten days and for this purpose a Merryweather pump, as shown in Fig. 1, was used. It may be said here that this little pump was one of the best friends of the railway men in France, for at times we were put to great inconvenience on account of failures to water supply. These pumps were made in two sizes of 5,000 and 10,000 gallons capacity per hour. In addition to the pumps in constant use we had several others in stock for use on the line in cases of emergency. Water tanks were erected, and kept filled by these pumps until such time as more permanent arrangements could be made. At Merris we later obtained a plentiful supply of very dirty water from the canal at Hazebrouck, five miles away. Oil burning pumps were installed at the canal and the water was forced through a ten-inch pipe line, which also had to be installed. At Merris a hole was dug in the ground and lined with canvas well tarred to hold a supply of 150,000 gallons, for use in case of emergency. This reservoir was filled to overflow from the tanks.

### Locomotives Used

"The locomotives supplied for work in this area varied in type, and the accompanying illustrations show the general dimensions of four of them. The 0-6-0 Midland railway engine, figures 2 and 3, was the type supplied when we first started operations. Of the fifteen engines of this type assigned to us several railways were presented—but the general design was similar. All these engines had slab frames and were inside connected. They had white metal bearings throughout and a spring boiler was used in the tender boxes and dope

*An abstract of a paper presented before the Canadian Railway Club in Montreal. The author was with the 58th Broad Gauge Operating Co., of the C. E. F.

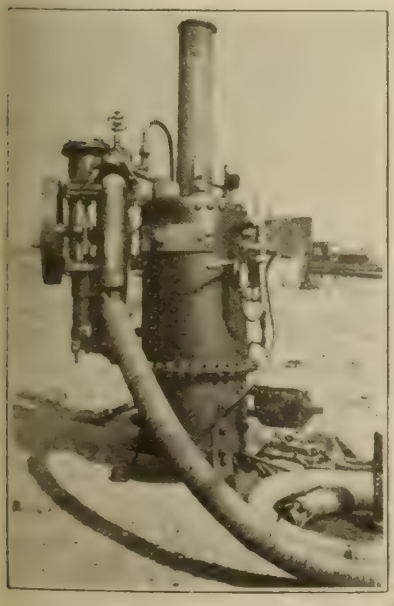


FIG. 1.—SHOWING STYLE OF PUMP USED.

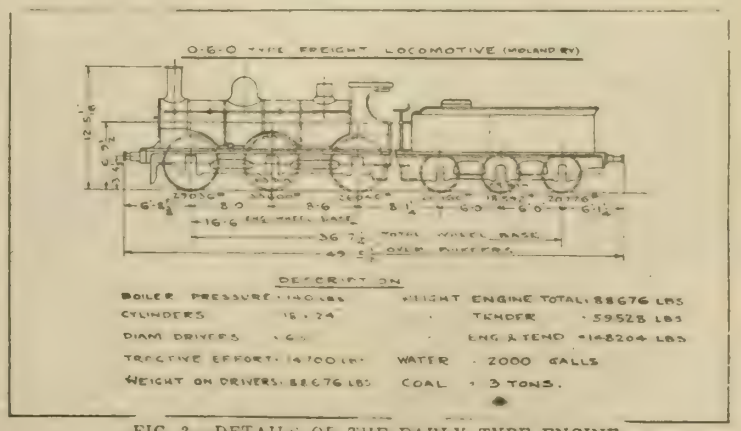



FIG. 3.—DETAILS OF THE EARLY TYPE ENGINE.

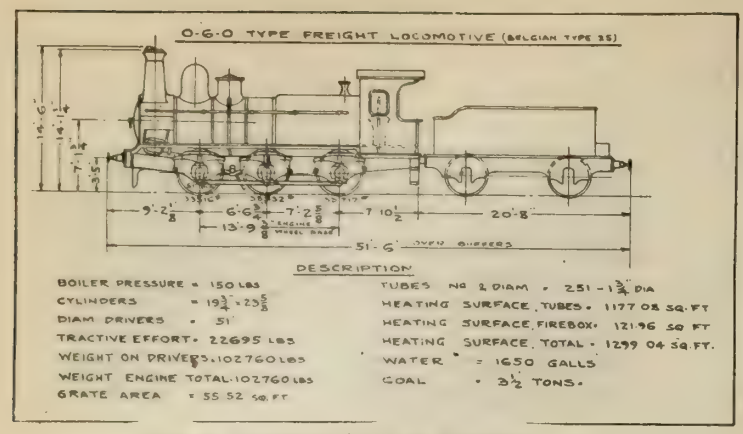



FIG. 4.—BELGIAN TYPE 25 ENGINE.



FIG. 5.—THE BALDWIN TYPE USED LATER

in the main boxes. Wool waste could not at times be procured and as a substitute we used hemp rope, stripped, bound in stacks, and stood on end. This was only a fair substitute, but it met requirements. The tubes and fire box sheets were mostly made of copper and when the boiler was kept clean they gave very little trouble. The chief maintenance repairs were driving boxes, side-rods and springs. Prepared white metal was kept in stock ready to be melted for all bearings. At times it was most difficult to obtain the necessary repair parts and we occasionally had to run engines with one or more springs missing, with the engine blocked up on hard wood. The springs on this type of engine were separately hung and readily adjusted by tightening or loosening the nuts on each hanger.

"The brake equipment was either steam or vacuum. We had, however, several Belgian engines, as illustrated in figure 4, with no braking power whatever on the engine and only hand brakes on the tender, the shoes of the latter being made of wood. Another Belgian engine in service was equipped with Westinghouse air brakes and this was used for personnel and ambulance trains. The 2-8-0 Baldwins, shown in figures 5 and 6, and Canadian built engines superseded the above mentioned classes of engines for handling through traffic. The 2-6-2 Baldwin engines, illustrated in figures 7 and 8, were used for short runs, and as they were delivered new the maintenance was not heavy. The engines were never killed except for boiler or grate repairs, but were kept constantly under steam for use on short notice. Where possible engines were double crewed, but when traffic was very heavy and men were scarce, all were pooled.

"As previously stated, Merris exchange yard consisted of sixteen sidings, which were 1,400 feet long. The chief control, or despatching station, was located here, and telephone communication established with all stations, the Nord Railway and the army signal systems. When a train left the despatching station, Boulogne for instance, Merris exchange was advised of the number, the consist, and the leaving time. Passing reports were also received from the reporting station on Nord lines. On arrival of the train at Merris the despatching station engine was taken off, sent to the locomotive depot, and made ready for the return trip. The crew was given eight hours rest, and when possible, a hot meal and 24 hours' rations before making the return trip. In the meantime the train was marshalled in the yard according to requirements.

"To overcome the absence of power brakes on cars, trains had to be made up with a brake van on each end, and with sufficient cars with hand brakes properly spaced throughout the train to provide the necessary braking power. A small white light was placed below the buffer beam on the front of the engine, and one red light on the rear of the train. The train crew consisted of a conductor and one or more brakemen, the former in the front van and the latter at the rear or on the braking cars. The engineer, not the conductor, was primarily responsible for the train.

"On Nord lines, trains were handled on the automatic system, and on the railroad operating divisions on the station block system. The latter were divided into sections, and at each station, hand, or at night, when possible, lamp signals were given to engineers in accordance with the prescribed rules. No engineer was permitted to proceed into a section until he was furnished with a train order, printed in French and English, indicating that the section was clear or occupied. In event of the section being occupied it was necessary for the engineer to proceed to "Caution" after signing the train order. The engineer's copy of the train order was handed by him or his fireman to the station master or blockman at the end of the section to which it referred. It was permissible to run all trains at "Caution," with the exception of ambulance trains, which were always handled on the absolute station block.

"When possible, trains were run at regularly spaced intervals throughout the 24 hours, but for obvious reasons traffic had to be suspended for a time, and then the trains unavoidably fleeted. Although traffic for the front was of the first importance, the shortage of equipment made it necessary to avoid delay to return empties as much as possible. Weekly census was taken of the waggons, and the compiled report was forwarded to the "Commission de Reseau du Chemin de Fer du Nord" at Paris, and a summary wired to R. O. D. headquarters.

"Traffic was usually heavier at night, particularly forward of exchange stations, and on account of shell holes, and other track breaks caused by bombs, the movement was somewhat slower than in the daytime. When these breaks in the track occurred telephone lines were usually torn down by the force of the explosion and communications cut with the stations beyond. The tracks were patrolled by track walkers, and gasoline track motors were used ahead of trains, when available. Notwithstanding all the precautions taken, however, an odd train on the block of an-

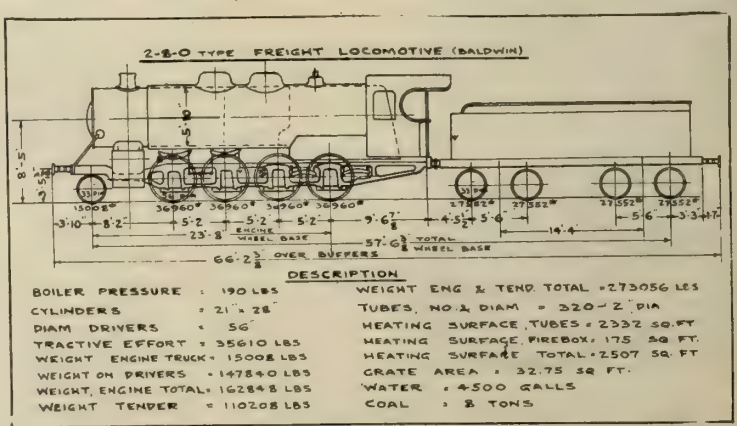



FIG. 6.—DETAILS OF THE BALDWIN FREIGHT LOCOMOTIVE.



FIG. 7.—THE TYPE OF ENGINE USED FOR SHORT RUNS.

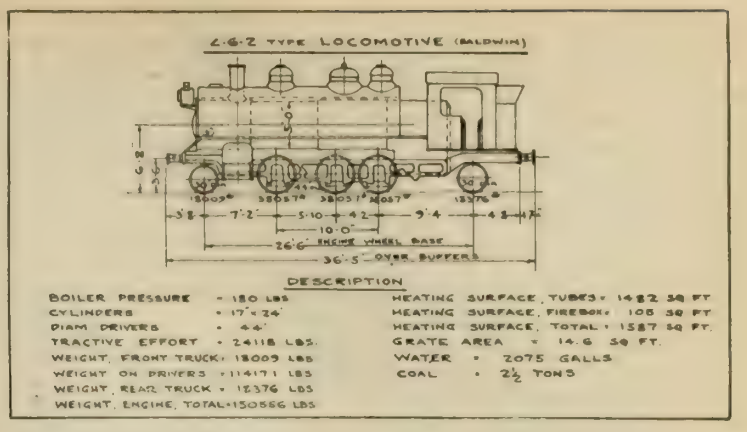



FIG. 8.—DETAILS OF SHORT RUN LOCOMOTIVE

ther train, which had passed safely, ould run into a shell hole without anyne being warned that the shell had nded. Engineers were sometimes required to take a train over new and unamiliar lines in the forward areas, vithout a pilot, and on which they would liscover heavy grades and sharp urves. On descending the locomotive would whistle for brakes and trust to luck to find their train still on the rails it the bottom. Some of the forward area grades were 2.5 per cent., and unless the trains were marshalled with sufficient brake vans the result was obvious. The absence of lights on switch stands at stations, etc., made operations all the more difficult. It was often necessary to divert traffic from one line to another on account of the tracks being badly blown up in places.

"In the extreme forward areas it was necessary to cover the cab with a large tarpaulin in order to baffle the light caused by opening the firebox door. In this service below Messines Ridge we had two engines equipped so that the exhaust could be turned back into the tender, so that during periods of inactivity on the front we were able to get trains of ammunition up closer with a minimum noise.

"Locomotives were also used to stand by railway mounted guns, and in this area we had as many as eight, ranging from 9.2 in. to 14 in. When the large guns went into action locomotives were used to spot them after each shot was fired, also to move the guns to alternative positions in the event of their location being discovered by the return fire of the enemy."

"When the advance on the Somme got under way we were advised by headquarters to get ready to move. We then went to the fourth army area and established headquarters at Chemin Vert; a British railway exchange yard just off the Amiens-St. Quentin-Nord main line at Weincourt. The advance in this area was, of course, very rapid, and upwards of 15,000 railway construction troops were used in this area to get the railways back into serviceable condition. Every rail had been put out of commission, bridges blown up, timber burned, deep fills mined and blown up, water systems destroyed, etc. Trains of supplies and ammunition were moved up the same day the rails were laid, even before the track had been lined or surfaced. It will therefore be understood that there were some derailments, but there were plenty of men and material available to do the rerailing. If the equipment was off the track very badly and we did not have time to handle it, the equipment was moved clear of the track and traffic handled as usual until we could get the wrecking cranes into service without causing much delay to traffic.

"Until the Somme River was reached great difficulty was experienced at Chemin Vert on account of the lack of water. We procured two tank trains and had to send them to Amiens daily to be filled with water. Deep wells were sunk, but the chalky formation of the soil, even when water was discovered, made it altogether unsuitable for use in locomotive boilers without first being given treatment. Pumps were later installed near Mericourt and a pipe line laid from the Somme River to Chemin Vert.

"On account of the rapid forward movement of the army it was necessary for us to send out additional detachments. The first one was sent to Omiecourt, near Chaulnes. The main local depot and exchange yard were built at Omiecourt, just off the Nord line. The line from Amiens to Chaulnes was left for operation by the Nord railway. The lines built by the railway troops in this area and taken over for operation by us, extended from Chaulnes through Peronne to St. Quentin, together with all British army lines in this area east of the line mentioned. Omiecourt, plan of which is shown in figure 9, was developed as the main locomotive and exchange depot in this area. The facilities at Omiecourt consisted of an incoming and an outgoing yard with ten 1,800 ft. sidings in one and 12 in the other, a coal ramp with a capacity of 1,000 tons, a concrete reserve water reservoir with a capacity of 25,000 gallons, and two ele-

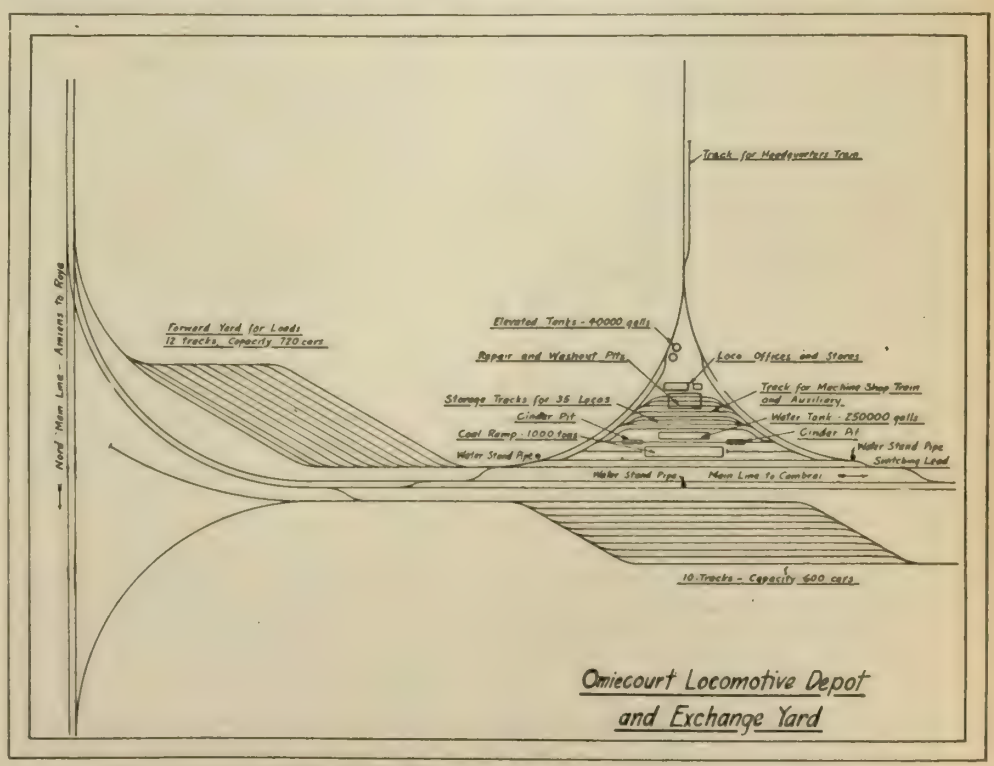



FIG. 9.—PLAN SHOWING THE DEPOT AND EXCHANGE YARD AT OMIECOURT

vated 20,000 gal. tanks; these latter tanks being filled by raising water from five deep wells. The locomotive depot was constructed so that 100 locomotives could be taken care of. The machine shop equipment was fitted up in large French steel brake vans and was readily transferred from one depot to another when required. The power was obtained from an electric generator run by gasoline engine. We also had a 35-ton steam crane, which was the largest one in use. The heaviest traffic was handled through this yard during the week ending October 3rd, 1919, this being made up of the following cars: troops and remounts, 2,490; supplies, ordnance, ammunition, and general traffic, 9,921; construction material, 884; ambulance 1,605; a total of 14,900 loaded cars.

"One of the drawbacks to the prompt handling of traffic in this area was the explosion of numerous delay action mines placed in embankments by the enemy when retreating. Although they had destroyed the steel and ties they had also mined nearly every fill of any size, as well as many junction points, diamond crossing locations and bridges. Even when bridges were blown by them other delay action mines were left to blow the new bridges, which they knew would inevitably be constructed. There were various types of mines, but they all had the acid timing arrangement. One of the biggest mines blew up the double main line near Marchelpot as late as January, 1919. Taking into consideration, however, the large number of mines placed, the unit was fortunate in only having had three locomotives wrecked through delay action mine explosions. At the signing of the armistice the unit had 101 locomotives in service. On the first of January following demobilization was started and this was completely carried out and the lines turned over to the Nord railway, and the Canadian railway unit entrained for the base on April 8th, 1919."

In the discussion that followed the reading of this paper some very interesting points were brought to light. Speaking on the class of men recruited for the R. O. D., Mr. Kendall said:—"We found that the men would have to apply themselves to all kinds of work, such as cooking, mending shoes, and various other incidental duties. For instance, we found that we had a road foreman of engines as chief cook. A chief clerk to a general superintendent was a call boy, but it was soon realized that the men who took up in the proper spirit the duties that were assigned to them at the start were the best men. We never had any complaints."

To illustrate the improved conditions resulting from the transportation problems being taken over by the R. O. D. we give the remarks of W. N. Dietrich, late C.S.M., 58th B.G., O.C.: "The most important section of the railway in the north of France for the use of the Allies was that connecting the sea ports of Calais and Boulogne with the cities of Bailleul and Armentieres. Before Capt. Kendall's arrival it had taken two days, or 48 hours, to handle shipments over the section. When he took it over and got things in working condition the trains were operated on a seven and a half hour schedule, and this was later reduced to seven hours, and notwithstanding the traffic was very dense, the total detentions for a week only amounted to a few minutes."

## GRAPHITE AS A LUBRICANT

All criticisms of graphite can be traced directly to its impurities. The impurities in lubricating graphite my be divided into two classes: those that have a positive abrasive effect and those that act neither as abrasives nor lubricants. Artificial graphite may be made very high in carbon, but since it is a by-product of the electric furnace process of making silicon carbide, it is likely to contain traces of this, which is very objectionable, as silicon carbide is one of the most abrasive substances known. In the natural graphites the objectionable impurity most commonly found is silica, or common sand. So says Brass World, which continues as follows:

The harmfulness of the impurities depends also on the size of the particles. If the size of the abrasive particles in a graphite is greater than the average thickness of oil film, their abrasive effect will be greatest in a bearing running under uniform pressure. On the other hand, in a reciprocating bearing under high duty, where the oil film is alternately broken and restored, all the different sizes or particles of the abrasive material may come into play, and it is in the latter class of bearing that pure graphite is most essential and that abrasive impurities are most harmful.

Among the many impurities in the natural graphite we find some that are not, by nature, abrasive, but are undesirable and injurious to bearings. To illustrate, let us take the particle of a so-called flake graphite, where we have alternating layers of mica and graphite held together in a manner capable of sustaining considerable compression. Let us imagine stoking an engine at night with a layer of these laminated particles between a heavy crankshaft and a babbitt or lead bronze bearing; the inevitable result will be "pockmarking" of the bearing surfaces. The effect on a reciprocating bearing would be equally undesirable; and it will be readily seen that the jamming effect produced in a ball bearing by the use of this graphite would be ruinous.

For lubrication, the graphite should be such as to permit an infinite divisibility while in contact with bearing surfaces. It should be uniformly fine enough to practically maintain suspension in the oil or grease, so as to permit of the application of the lubricant without undue difficulty due to settling, and it should be fine enough to enter properly betwee the bearing surfaces without clogging this will allow it to flow freely in the o film between the bearing surfaces. Fo all ordinary lubrication with the lighte grades of machinery oil, none of th graphite particles should be coarser tha 0.0003 inch; grades of graphite used wit greases or heavy oils would be satisfac tory if ground considerably coarser, ow ing to the correspondingly thicker oi film which exists with these lubricants.

## SMALL ELECTRIC FURNACE

A convenient laboratory electric furnace for temperatures up to 2,300 degrees Centigrade is described in a recent issue of "Chemical and Metallurgical Engineering." This furnace is of the granular coke-resistance type and uses 1-inch graphite electrodes, and 1¼-inch graphite crucible. The rods, supported by suitable sized pipe-fittings, pass through silocel brick, and continue to within 1½ inch of the crucible. Granulated coke is used to fill the space around the electrodes and crucible. The crucible is made by sawing off a length of graphite rod of desired diameter, and drilling out the centre in a lathe. The entire furnace is constructed of 9 in. by 4½ in. by 2½ in. silocel blocks, and is heated by an air-cooled, step-down 2.5kva. auto transformer. The primary is wound for 220 volts, having eight different taps for connections which give a voltage range of from 20.7 to 38 volts on the secondary.

This arrangement does not require the use of any outside resistance, as the current and temperature are controlled by means of the various contacts on the primary winding, and also by varying the pressure of the electrodes on the granulated coke between the electrodes and the crucible. The transformer is connected to the furnace electrodes with stranded copper cable. The corresponding amperes for the eight steps on the primary winding range from 65 to 120 amperes, or from 78 to 144 amperes, with 20 per cent. overload, which may be drawn for short intervals (20 to 30 minutes) without hurting the transformer. Temperatures as high as 2,200 degree to 2,300 degrees Centigrade have been obtained from the above, from a cold start, in 20 minutes.

## ERRATA

In the February 24th issue, page 35, we made the following statement: "A great advantage of ball bearings is the saving of power. The University of Wisconsin made a test some time ago which illustrated that **Roller Bearings** required the least amount of power."

It is self-evident that this was a typographical error, as what was intended was **Ball Bearings**, not roller bearings. We make this announcement so that readers will not get confused and will be able to follow intelligently the second portion of the article on ball bearings which will appear March 17.

# A New Method of Case-Hardening Steel

## Recent Development in the Carburizing of Steel—Greater Speed, Uniformity, and Depth Are Claimed—Factors Governing Case Hardening and Present Methods in Use

*By W. J. Merten, Metallurgical Engineer, Westinghouse Electric and Manufacturing Co.

IRON and low carbon steels absorb carbon from so-called carburizers very readily when in contact with these carbonaceous materials at temperatures above the upper critical point ($Ac_1$). The quantity of carbon absorbed depends upon:

1. The temperature or degree of heat above the $Ac_3$ point of the steel; or, in other words, the higher the temperature the faster and deeper the penetration of the carbon. This temperature is high enough to change the iron to gamma iron, which is capable of forming a solid solution with carbon or cementite. Beta and alpha iron do not absorb carbon to an appreciable extent.

2. The character of the carburizer is a very important factor in the successful conductance of case-hardening. Elementary carbon as such is only of secondary importance. Oxygen and nitrogen compounds, which are added or are naturally present in the so-called energizers that form carbonaceous compounds with solid carbon, are necessary to generate nascent gaseous carburizing mixtures of carbon monoxide and cyanogen gas (CO and CN). Flourishing industries are built up on the production of these carburizing materials and energizers.

3. The percentage of carbon present in the steel to be case-hardened has also a marked influence upon the affinity of the the material for more carbon up to saturation. More specifically, a low carbon steel absorbs faster than high carbon steel.

4. The presence of chromium, tungsten, or manganese accelerates the absorption of carbon since these elements form double carbides with iron. Nickel and silicon, however, retard the absorption. The fact that they form solid solutions with iron may be the cause for this retardation.

From the statement under paragraph (2), which states the necessity of nascent carbonaceous gas formation for penetration and absorption of carbon, it is readily conceivable that, if a properly heated piece of steel be brought into contact with pure nascent gas continuously generated in a separate unit or chamber and preferably under pressure, the conditions for case penetration would approach the ideal.* A process of this type is the one presented in this paper; but before giving the description a survey of the processes now in vogue with their disadvantages and deficiencies seems to be appropriate.

*Presented before the Pittsburgh Chapter, Heat-Treaters Research Society, Sept. 9, 1920.

### Present-Day Methods of Case-Hardening

First Method. The most general and commonly used method of case-hardening is conducted by packing steel parts in a metal box filled with carburizing materials, and then firing the tightly closed box and contents at a sufficient high temperature for a length of time adequate to give the desired depth of case. This process is quite simple and assures fair success if properly conducted in accordance with a prescribed procedure, experimentally determined to give certain definite results under definite and specific conditions. The disadvantages of the process are:

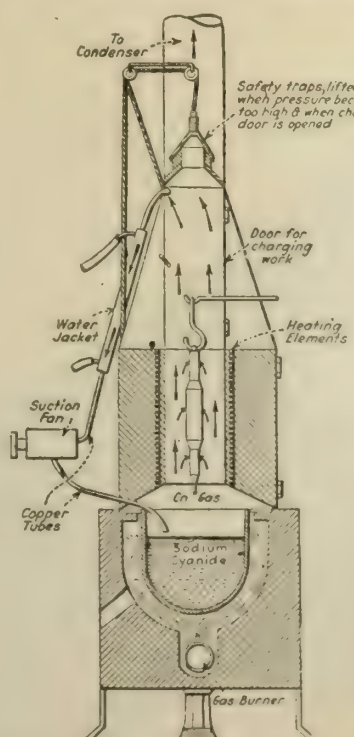
1. Uncertainty of obtaining the proper reaction within the closed box.

2. Difficulty in duplication of results as pre-determined, because of non-uniformity of carburizers.

3. Long time exposure of the steel to a heat not well controllable produces a questionable structural condition.

4. High cost of operation because of the inefficiency of the heating method, the cost of the boxes and the rapid deterioration of them by oxidation or scaling.

Second method. Another method of case-hardening is performed by immersing the steel article in a cyanide bath heated to about 860 deg. C. (1,580 deg. F.). This process is convenient and effective on small articles only and where the depth of the case required is not more than 0.005 in. to 0.015 in., or where mere surface hardening is wanted. This is a fast case-forming method, and from 10 to 15 minutes gives the desired depth. The outstanding disadvantage of this process is that no uniform case can be produced. The parts deep in the melted bath do not get the same penetration as the parts near the surface. The evolution of the cyanide gases at or near the surface favors the penetration, and it is hardly feasible to have pots with a large enough surface area to take care of the case-hardening work of an entire plant.




DETAIL OF REGENERATIVE CYANOGEN GAS CARBURIZING FURNACE.

Third method. The third method consists of dipping of a cherry red piece of steel or tool into a container of a powdered cyanide salt, such as potassium cyanide, sodium cyanide or ferro and ferri cyanides; or sprinkling the powdered salt of these cyanides on the red hot steel furnace and putting the steel back into the fire again. The case-hardening produced in this way is but a very superficial one, and resistance to excessive wear cannot be expected.

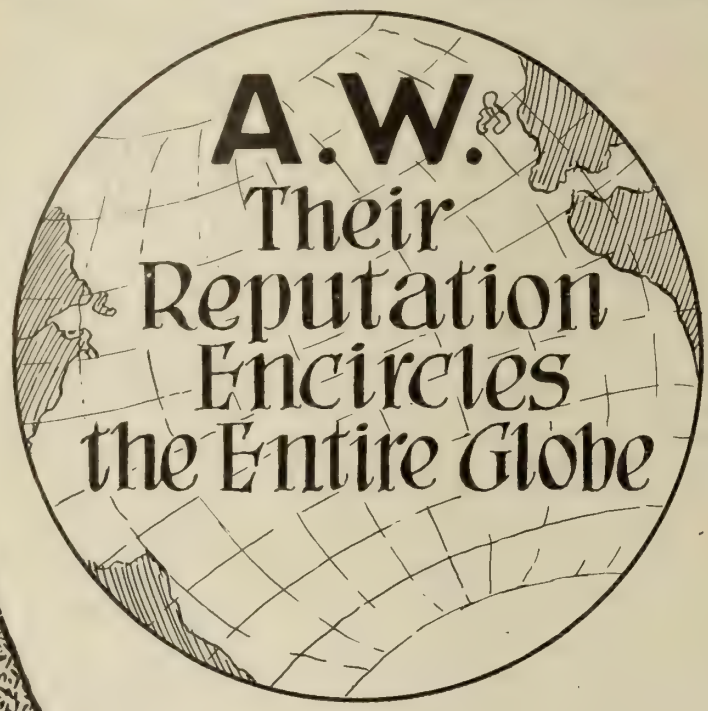
Fourth method. In the fourth method the carburizing gases are passed over a piece of steel heated in a retort. This process is applicable to parts that are intricate in design.

All these processes serve the needs of the different industries more or less satisfactorily. Box case-hardening is at best dirty, wasteful and unsatisfactory in a number of instances. Case cyaniding by firing in fused cyanide salt is inefficient, unreliable, dangerous and costly. Retort case-hardening with carbonaceous gases is a step in the right direction, but it leaves something to be desired on account of the selection of the carbonaceous gases and the method of application.

### Cyanogen Gas as a Carburizer

The process to be discussed next, although still in the experimental stage, owing to radical changes in the principle employed, appears to present opportunities for efficiency, preservation of the product, simplicity of operation, assurance of uniformity and duplication of results, speed of operation, reasonable cost, and wide range of utility. We may call this process a regenerated cyanogen gas case-hardening.

It has long been recognized that the most effective carburizing gas is cyanogen (CN), that by it a case can be produced more rapidly, with greater uniformity, and with deeper penetration




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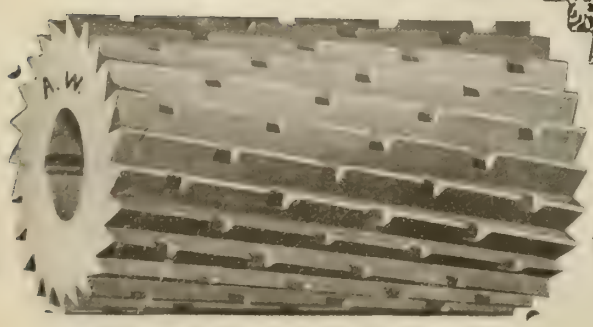
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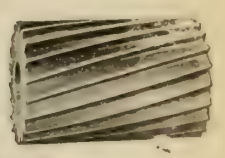
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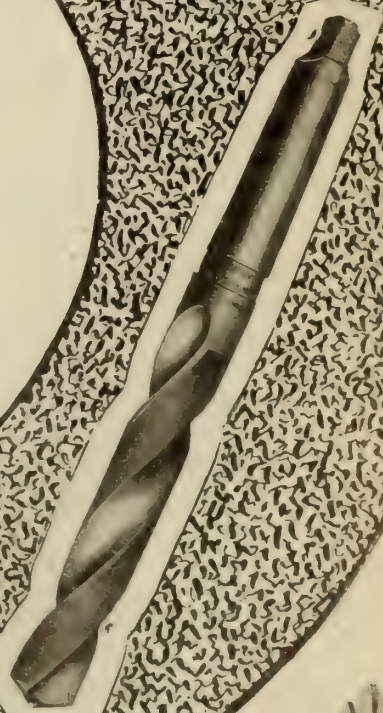
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Messrs. Armstrong Siddeley
Motor Cars, Coventry

Messrs. Rylands Ltd.
Wire Rope Manufacturers
Warrington

Messrs. Partington Iron & Steel Works
Manchester

Messrs. Pearson & Knowles Ltd.
Steel & Iron Manufacturers, Warrington



than one produced by carbon monoxide (CO); but the highly poisonous character of the substance has been a serious objection to its use, and the tendency is to wastefully lead the gas to the stack and out of harm's way, instead of controlling it to get maximum efficiency.

To case-harden steel and iron alloy articles in a stream of cyanogen gas evolved from a container filled with an alkali cyanide salt, heated by electrical energy or other means to accomplish vaporization or boiling of the salt, is the principle upon which the new process is based. The articles or materials to be processed are independently heated out of contact with the fused cyanide salt. The advantage of this will readily be appreciated on recalling the statements made regarding the fact that case-hardening is produced by contact with gaseous and not with solid carbon, and more especially with cyanogen gas. The depth of penetration is then only a function of the uniformity of the temperature of the article treated and the duration of treatment. Nascent cyanogen gas has a speed of penetration of four or five times that of carbon monoxide.

The furnace shown in the sketch embodies the regenerative principle, since the excess gases not absorbed by the steel are forced under pressure into the fused cyanide bath, are reheated, causing a vigorous stirring of the bath and a lively evolution of cyanogen gas. The gas is thus produced with more energy and in larger quantities, and it more vigorously attacks the surface of the steel, thus causing an accelerated and deeper penetration.

### Regenerative Type of Furnace

This regenerative type of furnace is a means of using the rather expensive salt economically, as the nitrogen gas on returning to the bath will combine with the sodium, and a carbon supply in some cheap form such as charcoal can be added to the liquid as required, thereby retaining the original amount of cyanide salt intact. It is, therefore, obvious that this process may compete with the present box or packing carburizing processes.

To prevent the poisonous gases, which are under pressure, it should be recalled, from escaping into the room, the suction fan is shut down before the charging door is opened, a bell ventilating device for inducing draft is arranged so as to open the bell when the fan stops and prior to opening the door. The speed of the pump or blower is to be regulated so as to cause the desired degree of circulation. Parts of the pump or suction fan wherever possible should be of non-ferrous metals, such as copper basic alloys or hard copper. Water cooling jackets or other protective methods are to be employed for the return flues containing hot gases, and the nozzle end of the flue must be of hard copper, monel metal or other non-ferrous alloy with a high melting point.

Sodium cyanide melts at 600 deg. C. (1,112 deg. F.) and boils at 800 deg. C. (1,472 deg. F.). The temperature of the pot must therefore be not less than 800 deg. C., and to effectively absorb the gas the steel is at a temperature above $AC_3$, or about 900 deg. C. (1,650 deg. F.).

The furnace illustrated in the sketch is designed especially for the processing of shafts, but a slight modification of the upper or steel heating chamber will adapt it to a variety of work. Grates of nichrome metal with knife-edge grate bars for supporting the work can be employed.

The advantages of this process are the following:

1. Temperature control is more perfect, since a pyrometer is inserted directly in the heating chamber;

2. It gives a finer, more uniform, and deeper case than any other process and requires less time, and is therefore cheaper;

3. It eliminates the use and storage of carburizers and carburizing boxes.

The efficiency of cyanogen gas for case hardening has never been fully appreciated, nor has it been fully obtained, since during previous tests the temperature was at or below the boiling point of sodium cyanogen (1,465 deg. F.), which is considerably below the $AC_2$ point of the steel. But, even in this unfavorable condition an exceptionally high speed of penetration has been noted by different writers on the subject.

It should be noted that, while some of the less important features of this process are still speculative in character because of the experimental stage of the development, the method is based upon well known principles and the conclusions have been drawn from a careful study of general case-hardening practice.

## SECURING PROPER LUBRICATION

Sluggish action of oil-rings leading to improper lubrication of motor bearings was cured by bevelling the sides of the rings of motors made in a large New Jersey factory after considerable searching for the reason for the trouble. On testing these motors, says Electrical World, it was noticed that the ring would creep along at a very slow speed, two or three revolutions a minute on a machine of several horse-power, instead of the regular speed of about thirty to fifty revolutions. Though all journals and rings were made in large numbers and as nearly alike as possible, this trouble appeared on only about one machine out of ten, and disappeared nearly every time a new ring of the same size and shape was put in. Sometimes, of course, it was due to the ring rubbing against some projection on the casting, but more often no apparent cause was found by the assembling department. At that time the oil-rings were cut from a rather heavy brass tube with straight sides, making the cross-section rectangular in shape, while the journals had a straight slot about twenty to twenty-five mils wider than the ring.

It was finally discovered that under certain conditions the ring would start with the machine and perhaps come up to normal speed, but soon work itself towards one side of the slot and slow down, hugging closer and closer until there was only a very thin film of oil between the ring and the flat part of the journal.

Therefore, in an attempt to prevent sticking, three rings were removed and their sides were slightly bevelled, when the trouble entirely disappeared. Since that time all oil-rings are bevelled either from the outside or from the inside, and there has been no sticking.

## PLAY SAFE

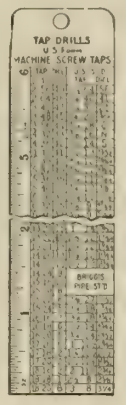
In climbing a ladder, do you ever pause to think "Am I safe"? Instead of pausing, partly up the ladder, why not investigate before you leave the ground? Watch the angle at which it rests. Seventy-five degrees has been found to give the greatest degree of safety, and to secure this angle all that is necessary is to place the foot of the ladder a distance approximating one-quarter of the length of the ladder away from the vertical. This angle will prevent undue straining of the ladder or slipping of the ladder feet when placed too flat and at the same time will give the feet of the workmen sufficient room when they are working near the top of the ladder. Another point that should not be forgotten is that portable ladders should be fitted with safety feet or points in order that a sure grip on the floor or ground may be secured.

## POWER FROM WASTE WOOD

The progress which has been made by British firms in the construction of suction gas plants for utilizing waste wood should be of special interest to this country, where there are still large quantities of wood available. These plants distil the wood and produce gas which is of excellent quality for use in gas engines. This method of utilization is said to be more economical for power producing purposes than burning under a boiler. A recent example of a large installation on these lines is afforded by a mine in a British Dominion, where four suction gas plants capable of yielding a total output of fourteen hundred horse-power have been installed. The fuel used is in the form of logs up to two feet long and a foot in diameter; and the gas is applied to the driving of four horizontal gas engines. Three of the engines drive electric generators and the fourth is coupled to an air compressor for operating pneumatic drills and hammers in the mine.

# Have You Tried This Contest Yet? If not--- Do so Now

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.




The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

## What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

Nine contestants solved the twelve questions in Feb. 10th issue correctly. This meant we had to use the elimination method once more. A visitor who was in our office was asked to pick on one of the papers, all of which were face downward. John McNaughton, Westville, N.S., was the lucky one, while the others who came so near the prize were: Mr. Baird, Windsor, Ont.; Albert Hepworth, Philadelphia; Geo. A. Todd Penetanguishene, Ont.; G. Overton, London, Ont.; W. Smith, New Liskeard, Ont.; W. S. Miners, Sarnia, Ont.; H. G. Zimmer, Waterloo, Ont.; and John A. Scarsbrook, Winnipeg, Man.

**CONTEST FOR MARCH 3RD ISSUE**

**Contestants are required to write us, stating to which advertisements we refer in this number.**

1—How to prevent weariness and discontent.
2—What one concern says you should consider if you want to increase production and quality.
3—Something that makes the engineer speak up.
4—Something that should be thrown away after a certain time.
5—How to get furnaces and fuel to suit your conditions.
6—Something that takes its power from an ordinary lamp socket.
7—How to handle work that requires heat, with a high degree of efficiency.
8—How to conserve oil.
9—How to secure volume production.
10—A good piece of advice in regard to money.
11—Something that costs little for upkeep.
12—Something worth considering and which will save you money.

**These are Correct Answers for List from February 10th Issue:**

1—L. S. Starrett Co.
2—The Carlyle Johnson Machine Co.
3—The Kearney & Trecker Co.
4—The J. G. Blount Co.
5—Thos. Firth & Sons, Ltd.
6—Murchey Machine & Tool Co.
7—Roelofson Machine & Tool Co., Ltd.
8—Cleveland Pneumatic Tool Co. of Canada, Ltd.
9—Geo. D. Roper Corporation.
10—The Bilton Machine Tool Co.
11—McKenzie Bros.
12—The Gisholt Machine Co.

## Closing Date for This Contest is March 24th.



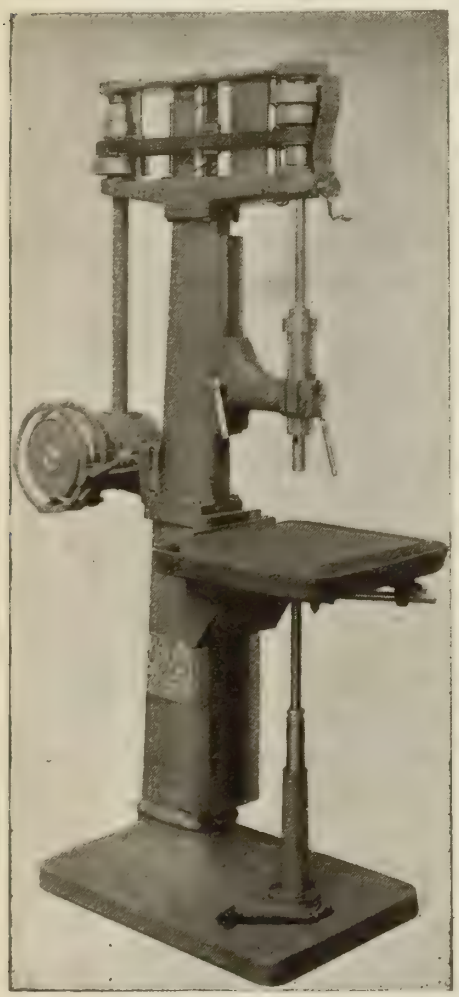
# DEVELOPMENTS IN SHOP EQUIPMENT



## BALL BEARING DRILLS

The Providence Engineering Corporation, Providence, R.I., have placed on the market the line of ball bearing drill presses formerly known as the Mason drilling machines. They are now to be known as the Pecorp machine.

These machines are equipped with ball bearings throughout, and range from the small bench type up to the heavier style shown in the illustration. The spindle is self-oiling, is made from tough spindle steel, and has a reservoir in the sleeve that contains sufficient oil to lubricate the spindle for a week. Various other features are included, and the complete range of speeds is said to be obtainable in less than two seconds. Unit construction of parts is followed out throughout the construction of the machine.



GENERAL VIEW OF BALL BEARING DRILL PRESS.

Various arrangements can be made on these machines. They can be made as a plain machine, a single speed purpose machine, and automatic power feeds can be arranged on any spindle alternating with built-in tapping attachments. Motor drive of both horizontal or vertical style can be supplied if required.

## NEW TAPER COLLAPSING TAP

The Alfred Herbert, Ltd., Coventry, England, have developed a new taper collapsing tap, and have the following to say upon the subject.

The problem of cutting internal taper threads in pipe couplings and similar work has always been a difficult one. Tapping with a solid taper is an unsatisfactory and primitive method of doing the work, as the whole length of the cutting edges is in operation at the same time, so that a very large amount of power is required to drive the work. Moreover, a number of lines are left in the work where the tap ceases cutting, which makes it difficult to get a good joint.

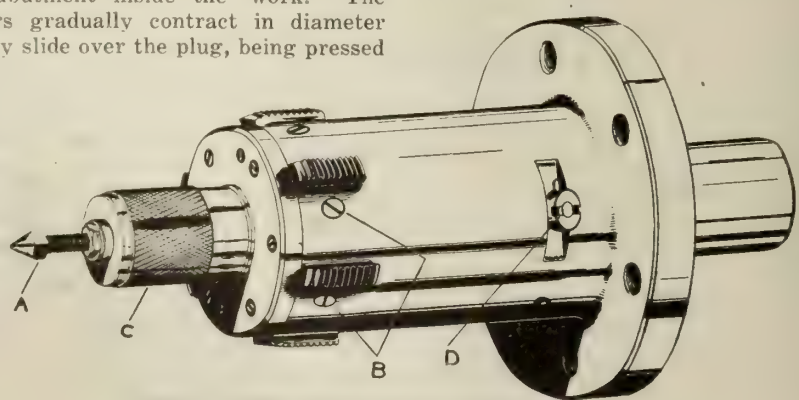
The chasers in this tap are supported on a taper plug, the front end of which projects through and is fitted with an adjustable screw A as shown in illustration. This, during tapping, is brought to rest by coming into contact with a suitable abutment inside the work. The chasers gradually contract in diameter as they slide over the plug, being pressed down on to the taper plug by compression spring B engaging pockets in the chasers, and retained by screws so that cutting takes place only on the cone or lead of the chasers, consequently no more power is required than when tapping parallel threads of the same dimensions.

By adjusting the screw A in or out the diameter of the thread can be adjusted within an appreciable range. At the end of the travel the chasers collapse an amount greater than the depth of the thread so that the tap can be withdrawn without reversing the work. By rotating the knurled sleeve C in the right-hand direction, the chasers are raised by a scroll, whereupon the plug shoots out into the starting position ready for the next piece.

In the illustration, the plug is shown at the right-hand end of the travel, i.e., with the chasers fully collapsed. Where a fine degree of accuracy is required a roughing and finishing attachment D can be supplied so that two cuts can be taken on the work without disturbing the adjustment. The design of this roughing and finishing attachment is similar to that used in the parallel type, style 'H Coventry collapsing tap.

The tap shown was made for taper pipe couplings 5 inches diameter for use on a screwing machine. It was, therefore, made with a flange to bolt to the screwing machine spindle. These taps can be made for taper threads 1½-inch gas and upwards, and are at present made to special order to suit the machine on which they are used, and for the work for which they are intended.

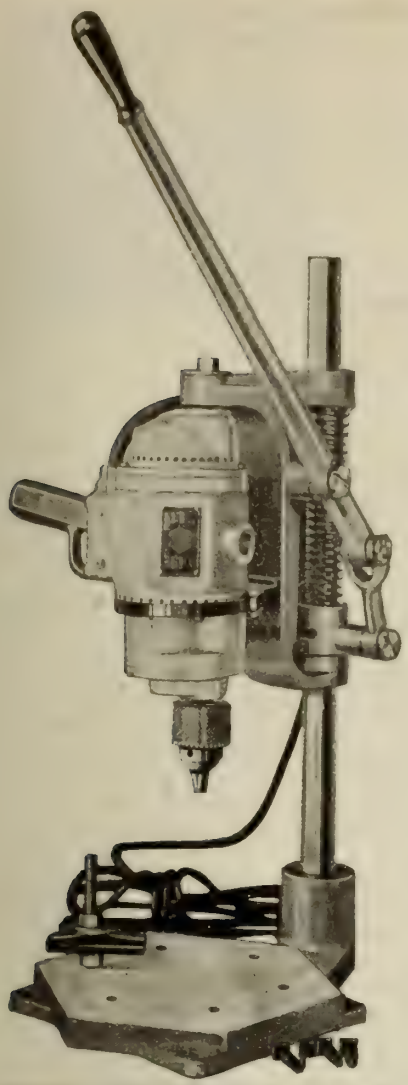
The Canadian office, 1-3 Jarvis Street, Toronto, are, of course, handling this tap in Canada.




DETAIL VIEW OF THE COLLAPSING TAP

## BENCH DRILLING STAND

The Black & Decker Mfg. Co., Baltimore, Md., have placed on the market a bench drilling stand as shown in the illustration. This takes ⅜ in., ½ in., 9-16 in., ⅝ in., and ⅞ in. B. & D. portable drills. The bracket carrying the drill can be raised or lowered on the vertical column and is secured in any position by means of a split collar and clamping screw. The drill may be



GENERAL VIEW OF BENCH DRILLING STAND

swung clear of the base, making it possible to use this stand for such work as applying ring gears to automobile axles, drilling in the ends of shafts, and other work too high to be drilled on the bench. The feed lever gives a feed ratio of 6 to 1.

This concern have also marketed a portable automatic tank outfit, operated by an electric compressor. This blowing outfit, as it is termed, is especially adapted to the blowing away of dust, lint, etc., from motors and machinery in general. It is, of course, used for other purposes such as inflating pneumatic tires, etc., but its chief interest to the machine tool trade is its cleaning qualities, in so far as machinery is concerned.

## CYLINDER GRINDING MACHINE

The Heald Machine Co., Worcester, Mass., have placed on the market a cylinder grinder known as their No. 55 style. This machine does away with speed boxes and other expensive units, replacing them with a drive from a single shaft on the rear of machine. It is also self contained, no countershaft being necessary. Naturally, this makes the machine less expensive.

The table is large enough to hold cylinder blocks of six cylinders without large overhang, even when grinding the end holes. The grinding spindle is carried on top of the column in a cylindrical, rotating head made up of two eccentric sleeves, this giving an adjustment to provide for grinding different sizes of holes. The spindle has two speeds, obtained by means of a two-step cone on the main drive shaft. The large, adjustable knee shown in illustration carries the main table, which slides back and forth in a line parallel to the spindle. The ways are protected from grit and dirt, and oil pockets with rolls are provided for continuous lubrication. The travel of the main table automatically reverses, adjustable dogs being provided to allow of controlling the limits of travel. Two speeds can be obtained by means of a knob placed at the front of the machine, and the cross-slide is provided with a hand feed screw fitted with a graduated dial.

The wheel spindle is hardened and ground, and runs in a solid, tapered bronze bearing at the wheel end, with a self-aligning ball bearing at the pulley end. It is fitted with interchangeable pulleys, to give different speeds to the grinding wheels, so that the proper speed for the size of wheel used can be obtained. The depth of cut is controlled by the feed mechanism on the right-hand end of the rotating head. It can be operated either by the knob for small adjustments, or by a small crank on the shaft below the knob when large adjustments are to be made, as when going from one size of hole to another.

Wheel spindles can be furnished to suit work of different types, the type depending upon the diameter and length of hole to be ground. Pump, tank, fan and diamond mounting can be furnished if required.

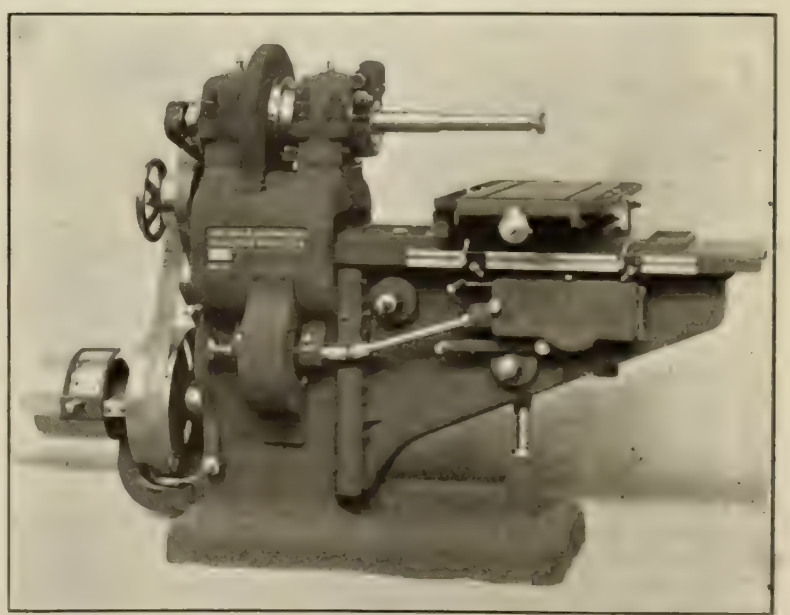
## AUTOMATIC LATHE

The Rockford Machine Tool Company, of Rockford, Ill., have added an automatic lathe to their line of machine tools. This machine is intended for the rapid production of duplicate parts, such as the turning of pulleys, pistons, gear blanks, etc., where various operations can be carried on simultaneously. It is designed along the lines of their heavy duty lathe and constructed to withstand the severest service. The headstock is cast integral with the bed so as to eliminate slippage. The front or turning head is carried on a 3-inch bar supported in both the front and the rear head. The carriage is supported on the outer end on a hardened way that can be shaped to give the work a taper, convex or concave surfaces. The back or facing head is carried on a bracket on the back of the machine. The movement of the back head is obtained by means of a cam drum operated by rack and pinion. Cams of any desired shape may be mounted on this drum. The machine is supplied with an oil pump for supplying lubricant to the work and cutting tools. The machine can be supplied with a belt or motor drive.

## K. T. TOOLS

The Knanel Tool Works, Rock Island, Ill., have placed on the market their line of tools. These include their adjustable taper caliper and high-speed parallel clamps. The caliper is fitted with a lock which sets the members to any taper desired and allows for duplication. They range from No. 1 to No. 10 B. & S. taper shanks.

The clamps are made of steel throughout and are heat treated to secure proper strength. They are claimed to be absolutely parallel and are said to grip powerfully.



GENERAL VIEW OF THE GRINDER.



# WHAT OUR READERS THINK AND DO



## MAKING TIME ON A SQUARE THREAD CUTTING JOB

By D. A. Hampson

A SHOP that manufactures (manufactures, not makes) square threaded lead screws and screws for jacks and other such purposes has adopted the accompanying fixtures as their standard practice in threading. Precision screws are not turned out, though all of their screws must pass a test with a twelve-inch steel rule—and the commercial accuracy of the product is so high that the rejections from faulty lead are practically nil.

All the threading lathes in the shop are equipped with the same tools, i.e., there are two sizes of cross slide castings—one for larger and one for smaller screws—and each of these sizes takes the cutter blades of a certain range of widths. This standardizing of tools keeps down the initial expense and minimizes the cost of repairs.

Reference to the drawing shows the customary cross slide bearing a tool block on its upper face. Then there is a rear casting A that fits the cross slide ways and is adjusted to any desired position before tightening the gib screws. In addition to this latter fastening, two bolts B are supplied. This makes a rigid fixture, one well calculated to stand the lifting action of the rear cut. Casting A is planed to receive a slide S, having square ways and a slot on top for the tool, or cutter.

The rod R, adjustable from the front of the lathe, joins the carriage with the link at the rear of A—and it is the function of this link to move the rear tool into the blank screw just as the front tool is moved in for a cut by the operator's turning the crank handle, the movements of both tools taking place at the same time and being of equal amount. At the end of the cut, when one tool is withdrawn for reversal or whatever other means is followed for returning the carriage, the other tool backs out clear of the work as well.

This outfit turns a "mean job" into the production class. The two cuts balance and so avoid that curse of square threading—a buckling screw—which occurs in spite of the rests used. With this rig, no rests are required and two cuts are made at once; it is hard to say whether more time is saved by setting up or in actual cutting. Flooded lubrication is employed.

### Turning a Twelve-inch Crank Shaft

Nothing remarkable disclosed by that heading. The shaft, however, weighed three tons and was not removed from its bearings. Up at the cold storage plant, their oldest ice machine had had a loose balance wheel for years; finally it got so bad they couldn't keep a key in it and arrangements were made to exchange the wheel for a new one—but we were asked to turn the shaft to remove the irregularity caused by years of pounding—turn it straight and send a snap gauge of its diameter to the engine builder.

We had a 20″ planer whose cross-rail was easily detached and this we planned to use for turning. The cross rail would bridge the flywheel pit easily and could be secured near enough to the worn shaft to leave the tool rigid; two brackets to support the cross rail were cast and these were fastened by having a lug on each bracket extend over the caps of adjacent main bearings. When drilled and held down by these main bearing bolts, our rig was complete.

Twelve hours were consumed at the plant—and we had eighteen inches of good straight shaft to show for it. As against any other method, the cost of this was less than the trucking charges for moving the shaft if it was taken out. The scheme of using a planer head for a portable tool is an old one with engine men, but it is always new to others in the craft.

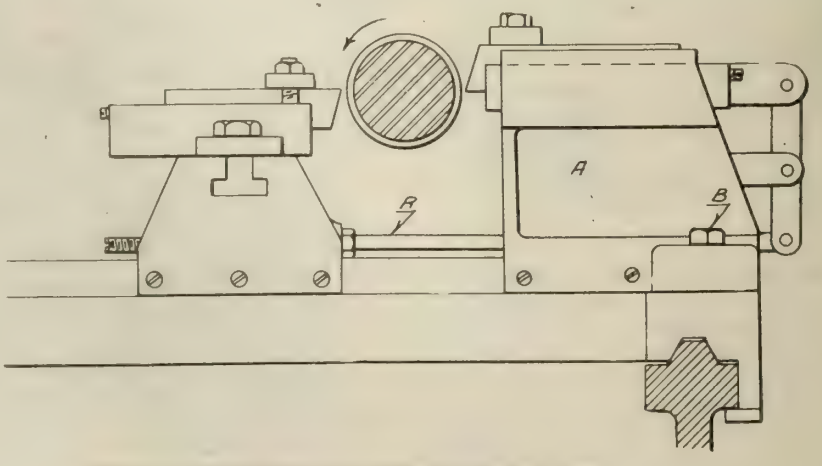
## REDUCING COSTS IN HIGH SPEED TOOL SERVICE IN MACHINE SHOPS

By P. Dyson

During twenty years' practical experience as a mechanical engineer, a great deal of which time has been spent in machine shops both in Great Britain and Canada, I have often been led to wonder, when seeing expensive and still good machines scrapped, and still more costly machines bought to replace them, how comparatively few shops there are that know the comparative production of each machine as judged by actual working. In other words, whether the heavy costs of installing new machinery are always justified when contrasted with the production given by the machines scrapped. To me it seems as if the new machine is set to work, an operator found for it, and there it ends as far as comparisons go with former production.

The object of this short article is to point out, after careful observation, one of the causes of a machine not coming up to expectations on an output basis. I am referring more particularly to the method of supplying high speed tools to the machinists. I will try to illustrate more clearly what I mean by relating what proved to be a very interesting experience some little time ago.

I was employed in the machine shop of the locomotive works of one of the largest railways in Great Britain. A large proportion of the machines had recently been scrapped and replaced by the finest products of British and American machine tool makers and the shop superintendent was determined that the




THIS ILLUSTRATES THE THREAD-CUTTING IDEA.

service of high speed tools to the machinists must be worthy of the machines on which they were to be used. He also decided that no machine should be stopped through a machinist going to the toolsmith or grinding wheel with his tools, and at the same time decided to take away existing grindstones and emery wheels from the shop.

It was given to me to institute a new system of supply which would give satisfaction to masters and men alike. I set out by making myself familiar with the class of work done in all the lathes and on the turning and boring mills, slotters, planers, shapers, autos and borers through out the shop. I next made it my business to get hold of all the available high speed steel in the shop and it was amazing to see the huge pile I collected in the form of broken and damaged tools which were lying in cupboards and under machines. My new toolroom consisted of a high speed furnace together with high pressure blower and pyrometer, whale oil tank, and water tank. The grinding plant consisted of two Lumsden oscillating tool grinders each with a Norton conical grinding wheel and one ordinary disc grinder with table inclined at 6 degrees and racks containing an aperture for every one of the above mentioned machines.

The tools were standardized and a chart drawn out giving the cutting and clearance angles of every tool. Some of the tools were forged, while with others, it was found advantageous to grind them into shape. The rough grinding was done dry on one machine. They were then hardened and re-ground wet on the other machine and the radius finished off on the disc grinder, the inclined table at 6 degrees giving the necessary front clearance angle. Tools were then placed in the aperture in the rack which was labelled with the number and name of the machine to which they belonged and when the system got into full swing it was found possible for every machinist to have a good set of tools by him and at the same time have at least one duplicate set in his aperture in the toolroom rack.

When a machinist had tools that required regrinding he sent them to the toolroom and duplicates were given to the messenger. The others were attended to by the men on the Lumsden grinders and replaced in the rack.

This system was found to be economical and highly satisfactory. The tool steel was worked out to very small proportions. When a 1½-inch square section tool had become too short for use it would be drawn down to a smaller section, and then a smaller section again, and would eventually finish its career by being used up ¼-inch square section for turning copper fire-box stays in an automatic machine. This does not damage the steel in any way, it only requires care on the part of the blacksmith that he does not put it under the hammer at too low a heat.

During the time I was engaged in collecting the old style tools from the machinists it was very amusing to hear the remarks from some of the older hands. One man who had turned piston-rods for the past twenty-five years declared that nobody could grind a tool to do that job except himself. His principal tool was a right-hand sliding tool and when he was first given one of the new products of the Lumsden grinder he put it down with the remark, "No good." However, the last I heard of him was that he had increased his production of piston rods.

From my experience in Canada, I am convinced that the above method could be adopted with great advantage in a number of machine shops over here and I have been led to relate the above experience in the hope that it may help towards this end. That the workmen would gladly co-operate goes without saying, for they know full well that increased production is better for everyone concerned.

## SPECIAL LAMP

The supremacy of the carbon arc lamp in the projector field is being challenged by a special bulb lamp invented by a British firm in which the light is supplied by an electric arc between two small beads of tungsten. An intense point of light is thus obtained. Larger lamps are made with a square plate of tungsten (about half a square inch in area) which becomes white all over and produces a light of as much as four thousand candlepower. Smaller sizes give five hundred and one thousand candle power. For cinema projectors and many other purposes these new lamps are said to have many advantages over the old-fashioned carbon arc. They can be run off any electrical circuit, whether continuous or alternating.

## CIRCULAR SLIDE RULE

In order to assist engineers to calculate the size of pulleys and width of belts for transmission problems, a British firm has developed a circular slide rule by which all the details required can be ascertained with rapidity and accuracy.

In the German city of Hamburg a taxi may be called by dropping a coin into a slot machine. If this idea were in force here we might run out of coppers, judging from the amount of taxis flying around.

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# CANADIAN MACHINERY
## AND MANUFACTURING NEWS

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## The Need of Information

SEVERAL strikes are pending, others have taken place, and it looks as though much of the metal working world would be involved in troubles over the readjustment of wages to meet changed and changing conditions.

It is hard to ask a man to meet a reduction in wages and it is hard for a man to accept a cut. As soon as he comes into higher wages the chances are that the standard of living in the home comes up to a higher level. There may be a few homes where this would not hold good, but in the majority of cases it would work out that way.

When it comes to the point where readjustment has to be made, there is only one way of taking the keen edge off of a wage reduction and that is by being able to show to an employee that there have been corresponding reductions in the prices of things he must purchase.

The trouble is that this information is hard to secure. The figures used by the Labor Department at Ottawa are not practicable enough. They do not meet the needs of every community. In this country we have no organization that is going into this work as thoroughly as the Industrial Conference Board in United States, the findings of which can be accepted as readily by an employer as by an employee.

In order to deal justly with this condition, there is need right now in Canada for a statistical organization doing work on the plan followed by such firms as the International Harvester at Hamilton. When they desire information as to how much it costs a family of five to live, they work it out in actual every-day practice, making the purchases from the average stores and under average conditions. It has been found possible in this way to arrive at something that will be satisfactory to all concerned, because the men in the shop know it is right and the management have faith in the results.

Many a firm is faced right now with the necessity of making a reduction of wages because present conditions do not warrant the old rate. They will likely make a direct cut of so much all around and the chances are that the amount will be arrived at by trying to figure out how much they can afford or how much they think the men will stand.

We need better organization along these lines in Canada.

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The composite market average is a quick way to get an idea of prices. This represents the average of fourteen iron and steel products. Over a period of seven years they stand: To-day, $47.10; February 16, 1921, $48.36; January, 1921, $51.73; November, 1920, $63.75; February, 1920, $65.63; February, 1914, $23.52. If you want to know at once how things stand as compared to a year ago, there it is $47.10 as against $65.63, or a drop of $18.53.

## Apprentice and Superintendent

THE superintendent of a large shop signed an order for added equipment a few days ago. He had not been interviewed by any machine tool salesman. He knew exactly what he wanted and he knew the firm he was going to place the business with. But let this man tell his own story:

"Years ago as an apprentice I learned to love machine tools and one of the happiest moments of my life was when, on odd days, I could get inside a machine tool showroom and spend hours going over the new designs that were coming out. One day I was in a certain city and went in one of the showrooms to have one of my treats. A salesman came along and asked what I wanted. Upon telling him he informed me that it was a salesroom and not a showroom. I didn't go home, but went to another place, hoping for better luck. I had not gone very far into that place when I was met by a different sort of salesman. He showed me around and we had a good time together. He made me feel at home and he told me certain things about new lines that impressed me. I was not a superintendent then—simply an apprentice."

There is not a salesman in the business who cannot benefit by that incident. The idea of impressing an apprentice and winning the buying power of a superintendent may not impress you very much, but it is none the less a fact.

It does not require the outlay of much courtesy and attention to make a friend. Being courteous to a non-buying apprentice and winning a superintendent with big purchasing powers is a real, worth-while piece of business.

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Price tendencies were down this week in several steel markets. The law of supply and demand is at work and greater than that is the desire of a good many steel merchants to clear out their stock. There was more steel held in the country than was generally believed. In a rising market such as prevailed for about a year and a half, terminating six months ago, it is easy to sell, and about nine out of every ten buyers do things they wouldn't do in normal times. The liquidation of high-cost stocks is very advisable, even if accomplished at a loss.

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There is a marked difference in the coal market now as compared with conditions six months ago. Coal Age this week uses such words as "marking time," "demoralized," "standstill," "glutted," in describing conditions, especially in the soft coal trade. This condition developed very rapidly following the falling off in industry—so quickly, in fact, that one is led to wonder if some of the stories of coal shortage, when demand is good, can stand on all fours.

# Pouring 50 Tons in Less Than 3 Minutes

"WELL, it looks as though it was all over and all right." Such was the modest acknowledgment of our congratulations to the superintendent of the foundry at the Allis-Chalmers Co., Toronto, a few days ago.

Our time-piece had just told us that it had taken exactly fifteen seconds less than three minutes to pour fifty tons of iron into the biggest casting ever made in Canada. That is, one ton went in every three seconds, or pretty close to it. And this casting forms the base for the biggest dynamo ever made in the world. So you can see that in this Dominion of ours, in spite of its lean streaks and its agitators, and those who claim we shouldn't do anything but grow grain here, there are firms forging ahead and doing some worth-while big things.

Making a casting that size is like excavating for a fair-sized house. A glance at the photo on this page will give some idea of the size of the mold. The layman thinks of the molder as ramming away with some sand and cores, all on a fairly small scale. He seldom stops to think that he is called upon to build the place in which 50 tons of hot iron are going to be poured at the rate of about 20 tons per minute—that there must be reinforcements and bindings and safety margins to take care of all the pressure that tremendous weight is going to exert—that the gas that is going to come into existence must be let out and burned.



THIS SHOWS THE SIZE OF THE MOLD, SETTING CORES, ETC. IT IS 26 FEET ACROSS AND SOME 80 FEET AROUND.

And just to make sure that everything was going to stay just as planned, "Jimmy" Craig, the superintendent of the foundry, had piled an extra hundred tons of weights on top just to make sure that nothing went through the roof. The placing of that added weight was simply a precautionary measure. The fact that it was sitting on top of that heap may have had quite a bit to do with said heap behaving itself, for as Mr. Sedgwick, the general superintendent of the plant, explained, "There is really no way to know definitely how much resistance is required to play safe on a job of that size."

There were, for instance, some eighteen bolts 2¼" across and 6' 3" long, holding top and bottom. These were all turned down tight and in themselves out to stand a strain of 300 tons each or 5,400 tons in all. The breaking strain would easily be five or six times as much as the safe working strength.

### It Was Well Done

A person can hardly help admiring anything that is well done. A greenhorn could have gone into the Allis-Chalmers foundry last Friday afternoon and after watching the final preparation for the pouring of that casting and the completion of the work, he would have seen one thing standing out all over the place, viz., organization. There was nothing left to chance. They were not wondering at the last minute if this thing or that had been done. All HAD been done.

One ladle was good for some 30 or 35 tons of metal. There's something mightily impressive in the way the men who live up near the roof in the cranes run their 'bus up and down the shop and drop those ladles where they are wanted almost to the inch. The iron was taken out in ten-ton lots—poured and covered with charcoal to keep out the air. Then in an hour or so the cupola was ready to belch out another allotment of ten tons. And so it took a good five hours' blowing and puffing for those two ladles, one with 30 and another 20 tons to be ready for the last act in making the base for the dynamo that is going to be sent across to the Chippawa power development.

### They Take No Chances

But hold a minute. They're not taking any chances. We climbed the winding staircase to where the cupola was being stuffed—stuffed to the neck on this occasion after those two ladles were filled. Pig, scrap and charcoal was the diet for the day and the chalk marks on the stack indicated the number of helpings of each that had been dished to the big stove that day. "We're not taking chances to-day," said the cupola foreman, "it's no use for the sake of a few tons to risk running short. And so it was that the extra 10 tons was spouted out and the work started on pouring.

Every man Jack of them knew what to do. No person yelled—no person was excited, nor was there any evidence of that abundant "Now all together boys" meddler. It was so still that I heard someone across the shop say, "There she goes" when the first iron hit the pouring basin. Pouring was done from opposite ends, the iron running around in a ditch, with many holes.

Pretty soon the gas started to blow where it had been lit. "She's starting to fill up now," remarked one old foundry man, "and she's all right, too. It's queer how we get used to work like that. I mind not long ago pouring one in Buffalo. It was the first one of that size, some forty or fifty tons. They had the ambulance and fire brigade all tuned up for the occasion. But nothing happened. But believe me, we always feel a bit better when we see a baby like that poured and done for."

Walking the eighty feet around the outside of that mold a few minutes after it was poured, when its stomach and liver and everything else was grumbling and pouring out smoke, gas and heat, one would hardly stop to think about the cooling-off process. In fact it would be very easy to imagine, as the gas was blazing away at the top and forcing its way out of the ground two or three feet distant from the base, and with that mass left in the ditch on top, that it would never get cool again. But even as we squinted at a respectable distance, the superintendent had given orders to start tearing the house down by midnight. That hundred tons excess baggage that was camping on the neck of that iron baby was taken off. Then a certain number of bindings, bolts and strapping had to

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# MARKET DEVELOPMENTS



## More Readjustments are Made in Prices

### Local Dealers Give a Lower Figure on Sheets and Plate—Orders For Bar Mill Material Are Eagerly Sought—What Pittsburgh Has to Say About Prices and Conditions

SOME of the warehouses in the steel business continue to mark down prices. Sheets came down farther this week and are at a point they have not touched in the last two or three years. Still the price cutting has not improved the sale and very few are moving. One firm placed an order for well over a car of bar iron this week for stock purposes, believing that the price and service they secured on the order were good enough to warrant them taking on the material. Some reinforcing bars are being sold and other work is under way that will call for a good tonnage of this sort. Dealers all over are out to sell now, in an effort to get their stocks cleared out.

Many stories are heard in the street as to how long the U.S. Steel Corporation will stand by and see the independent operators cut away at their prices and stop the flow of business to their mills. One report says that so many of the large agricultural implement makers have taken on stock at present prices that should the Corporation come along with a cut now it would seriously involve these interests.

Some of the largest makers of machine tools have come along with announcements during the week of reductions in their selling schedule. These vary from 15 to 20 per cent. There is no thought that the new price will stimulate buying, but it is simply an effort of the builders to try and line up with other reductions. Long years of experience have taught the machine tool market that price reductions do not make sales. Machine tools are bought for a purpose and not because they are cheap.

The scrap metal markets are dull yet. Dealers have too much copper on hand, some of the yards being badly clogged with this metal. Any prices quoted now are more or less nominal. Yards as a general thing are not carrying much heavy melting and stove plate and it would not take much added activity to make this class of material much in demand at better prices than are going now. Dealers claim it does not pay to collect and sort this at present values. There is no money being made in the scrap metal business just now and it is probably a fact that the majority of the yards are losing every day they keep open for business.

## MONTREAL BUYERS ARE STILL IN THE MOOD TO BUY FOR ACTUAL NEED

Special to CANADIAN MACHINERY.

MONTREAL, March 3.—When are we to have a return of that confidence in business that insures a steady movement of all lines of commodities? Upon this question hinges the duration of the present period of trade depression. The solution of the trade problem is—to buy. So long as buying is restricted or even curtailed, just so long will dullness prevail. Every line of industry is more or less affected by the non-buying attitude, a factor that tends to unemployment and underproduction, and consequently high prices. The metal situation is the key to all other activities; therefore, it is essential that this market be stabilized before a return to normal can be attained. Reports from every quarter point to the continued attitude of conservative buying.

### Steel Dull and Unsettled

Steel conditions in this district reflect the unsettlement that prevails both in this market and that existing in the States. Dealers here state that they do not know where they are at. This is the result of the action of many mills, particularly those on the independent list in the States, of quoting prices considerably below the market, and as one dealer remarked: "They are not justified in taking such a stand, as these prices are very often much below what it costs to produce the material." However, it seems to be a question of "getting the orders" and if lower prices will effect this, then quote it. This may seem like a reasonable attitude, but it has the tendency to augment the uncertainty that has pervaded the market for many weeks past. "Consumers are not buying," said the dealer, "except for actual needs. If a suggestion is made that material will probably be needed for spring and summer requirements, the reply is invariably along the lines of 'the future will take care of itself.' Railroad buying is almost exclusively for repair work; material for new construction is practically nil. Shipyards are taking very little. Orders for single plates are now more common than tonnage placements."

Despite the continued dullness, however, there is still the old optimism that improvement will come soon. True, there appears little to substantiate such claims, but this belief of better business is an encouraging factor. A steel dealer here stated that more orders were received last Saturday than on any previous day for several weeks, and the greater number were of the urgent variety. "Our experience," he stated, "confirms us in the belief that very many consumers in every line of activity are carrying on with as small a surplus as possible, covering only when necessity requires, content even to hold up production while waiting on delivery. This attitude is one that prevents a speedy return to normal business, but at the same time proves that the needs of industry are such that business would be rapidly accelerated should anything like normal activity be resumed on short notice." The movement of boiler tubes, while light, is quite active when compared to the sales of other lines. There has been a recent reduction on tubes, these declines averaging about 5 per cent., the greatest reductions being on the lap-welded tubes; 1 3-4 inch l.w. are now $27.50, and 4 inch are $55.50. Two

inch seamless are quoted at $29.25, a decline on previous prices of 5 3-4 cents per foot. Sheets and plates are very quiet, with prices unsteady.

### Dealers Seek Information

"Well," said one scrap dealer, "the present is a trying period, and one requires to have considerable faith to keep his office open. We are now carrying on business at a loss and anticipate this condition for some time to come. None the less, our expectations are for a gradual return to greater activity. Sufficient trading is maintained to keep us interested, but receipts are low—very low. We are pretty well stocked, but are reluctant to seek a market at prices that would mean a heavy loss to us. We are not seeking material for the same reason. Until the market is more active we will assume a passive attitude. The prices quoted may as well stand as they are, although weakness may develop."

## A FEW STOCK ORDERS PLACED

**Buyers Believe Present is a Good Time to Place Business—Some Prices Down.**

TORONTO.—There is some evidence here and there of business coming in for machine tool houses, for iron and steel merchants, but it is still pretty well scattered, and buying is done only after very close scrutiny. One dealer expressed a view that probably sums up the ideas of a good many in the business: "The present market is making more hard buyers than ever existed before. They seem to know that we want business, and that we are inclined to get right down on the mat and pull off the best terms possible. It is spreading, too. We have firms on our books whose business we have simply received as a matter of course for years. Only this week we got a letter from them asking for quotations on several items that in the ordinary course of trading they would have turned over to us without a thought about the price they would be paying."

Prices remain pretty much where they have been in the machine tool market. The belief seems to be held that there will be no move to put machine tools any place near the pre-war price. Some of them have not gone up as far as others. One warehouse was showing a shaper this week and the question arose regarding the comparative price of that machine to-day compared with pre-war times, when the dealer stated: "It used to sell at the factory for $405, but to-day the price, with exchange and 27½ per cent. duty added, makes the tool worth about $1,200."

This same dealer held that it was not desirable that prices should come down to old figures—in fact, he held that it was impossible.

Small tools are being sold in pretty much the same way. Orders are quite numerous, but they are small, although one hears of a few orders being placed for stock by some of the larger users. This market has also felt the work of the man who wishes to cancel his order. One firm had a number of special drills made, and they were of such shape and design that were they to go back to the maker they would have to remain on his shelves waiting for some other queer demand to come along and take them out, the chances very much inclined to them remaining indefinitely. Failure to cancel the order has cost the dealer his chances of getting any more business from that source.

Prices remain the same on all lines of small tools, and the indications seem to point to them remaining there for some little time to come, although there is a willingness on the part of some of the offices to pare a little on a good-sized order. The National Railroads have some specifications out yet that have not been placed.

### The Steel Market

Whether the dealers admit the fact or not, there is a merry little war going on now when any fair-sized order is let loose in the steel market. Dealers are anxious to get cleared out of stock. They feel that they are going to buy to better advantage later on—in fact, they can buy now much better than they could a few months ago. So if a chance comes along to make a good hole in the stock they are carrying they are going to cut their earnings pretty close in order to make the hole in the stock.

There is a certain amount of material going out now for building operations, although it is a little early to sell much reinforcing steel. Some Government work has been allotted and bars were required for that. Other large work is under way, and some pretty good-sized tonnage is certain to result.

The warehouse generally relies on the small machine shop to send in a certain amount of business in bars, but just now this trade is not coming in, and orders are short to that extent.

Tube prices in this district remain where they have stood for some months back. In fact, tubes are still at the same price they were a year ago.

### Placing a Stock Order

That thing most rare for a long time past has started to show up in the market again, viz., the good old stock order. Yes, he is in our midst, but is a little wobbly yet. Still, it is regarded as a good omen that he is venturing out. One firm that has a good-sized machine for doing its own work bought a large car lot during the week, and took the material home at a pretty close price. It's a buyer's market all right, and some of the buyers are beginning to take notice of the fact that this situation is not going to do them much good unless they go ahead and take advantage of it.

Sheets are very quiet now. They have been marked down again to keep them lined up with other classes. Black 28 are quoted at 6.50, and that is probably the lowest price since the last days of 1917. There was no warehouse price that could be counted on absolutely in 1918-19, while for the most part during 1920 it was a case of buy where you can get served and find out about the price afterward.

Plate is moving out decidedly slowly. One mining company came in a short time ago with an order that put at least one warehouse all right as far as its stock is concerned.

At another office the report was that inquiries were improving, if anything, and that several car lots were being

## POINTS IN WEEK'S MARKETING NOTES

**Reductions were made this week in the prices of sheets and plate in Toronto warehouses. Sheets are at a lower price now than they have been since early in 1917.**

**Several of the large makers of machine tools have sent out announcements of reductions in their selling schedules. These will amount to between 15 and 20 per cent.**

**One large order for bars was placed this week for stock. The buyer in this case decided that the price he received, together with the good delivery, warranted him in laying in his requirements out of the present market.**

**The scrap metal market continues about the same as it has been for the past five or six months. There is every reason to believe that dealers are quite correct when they claim they are losing money every day they are in business on the present market.**

**There are not very large supplies of heavy milling steel for stove plate in any of the scrap yards now, and there should be a pretty fair demand for these later on. Dealers claim that it does not pay them to collect and sort this class of material at present prices.**

**Small tool dealers report only a fair amount of business coming in, and this is made up largely of small orders.**

**Pittsburgh reports that the United States Steel Corporation is now operating at about 65 per cent. capacity, and that next week will see this figure still lower.**

placed. There was, in the opinion of this office, a better buying tendency than there has been since the first of the year.

**The Scrap Metal Trouble**

There's very little joy to be found in the scrap metal market this week, or any week for a long time past. "The longer we keep open the more we lose," was the view of one pessimist this morning, but one never expects to find much visible joy in the scrap metal market. The copper surplus in United States markets continues to increase. A week or so ago the producers got a loan of $40,000,000, placing as security against that 400,000,000 pounds of copper. "Electrolytic is quoted this morning," remarked a dealer, "at 12.75, but I know very well that it can be bought for 12.50 if one were to get out and buy. The market has got out of the hands of the producers, or the dealers, or the buyers themselves, for that matter. It is any person's affair just now, and there does not seem to be any step that would stabilize it."

There is a fair demand for heavy melting and stove plate, but the price is so low, claim the yards, that it would not pay them to have men collect and sort it. Yards are for the most part pretty well cleaned out of iron and steel. Were they as barren of coppers they would be in much better shape than carrying, as they are, large stocks of this metal.

## MORE CHANGES IN TOOL PRICES

**Some of the Big Makers Are Out Now With Cuts of From 15 To 20 Per Cent.**

Special to CANADIAN MACHINERY.

NEW YORK, March 3.—The meeting of the National Machine Tool Builders' Association in Cleveland last week was devoted mostly to a discussion of the cost of doing business in the industry. The executive committee of the association presented a uniform cost finding method, which has been devised by a firm of accountants, Scovell, Wellington & Co., Boston, Mass., after careful investigation throughout the trade.

The machine-tool trade is of the opinion that interesting developments in the price situation may be expected shortly. At the Cleveland meeting it was announced that two of the leading machine-tool builders, the Brown & Sharpe Manufacturing Co. and the Cincinnati Milling Machine Co. had reduced prices 15 per cent. Reduced prices are now in effect on nearly all well-known makes of grinders, shapers, engine lathes and precision lathes. In some instances manufacturers have not formally reduced their prices, but in competition have met the cuts of their competitors.

Developments in the market so far as business is concerned are very meager. Domestic business is almost at a standstill, although occasional orders for single machines are being placed. In foreign trade the principal buying is from Japan and India.

## A BIG BUYER IN THE MARKET MIGHT SET A NEW LOW PRICE

Special to CANADIAN MACHINERY.

PITTSBURG, March 3.—The finished steel market continues stagnant. There is scarcely any inquiry and thus the mills cannot get much business and do not even have much opportunity to endeavor to get business by making further price cuts. The position of most independent mills is that they would gladly quote lower prices than have yet been named if thereby they could secure reasonable sized orders and by the term they do not mean really large orders, but rather orders for say 1,000 tons at a time in the heavy rolled products and even less in the lighter materials, like sheets.

Declines in prices in the week have been small. Plates, which were quotable a week ago at about 2.25c as minimum, against the Industrial Board and Steel Corporation price of 2.65c, have been quoted at 2.10c, and the producing interest which quotes this price will not say how small a tonnage need be offered to induce it to quote it, while intimating that on a really large inquiry a still lower figure would be named. Shapes are quotable at 2.25c, the same as a week ago, the old price having been 2.45c, but the lack of a lower price on shapes seems to be due simply to there having been no inquiry to bring out a lower quotation. Bars were quotable a week ago at 2.00c, the old figure having been 2.35c, and may still be quoted generally at 2.00c, though it is known that in some special cases 1.95c and even 1.90c has been quoted, while in some quarters it is believed 1.85c could be done if there were the right sort of inquiry.

In sheets there are definitely lower prices. Blue annealed sheets are still quotable at 3.20c against the Industrial Board price of 3.55c, but the 3.20c is practically nominal, awaiting inquiry, and the heavy gauges can be bought at much less, as they could be bought at a plate mill price, say at 2.10c plus an extra for their being under ¼-inch thick. Black sheets can easily be done at 4.10c, against 4.15c quoted a week ago, and an Industrial Board price of 4.35c, while it is believed 4.00c could be done and perhaps shaded a trifle on a really good order. Galvanized sheets have been quoted even in small lots at 5.25c against 5.35c a week ago and an Industrial Board price of 5.70c.

Standard steel pipe seems still to present a firm front, so far as the mills are concerned, but it is reported that some jobbers, particularly in the East, are offering to sell at mill prices. Tin plate likewise has not been shaded. These two are the only lines that remain at Industrial Board prices.

The Steel Corporation has made no reductions, but adheres rigidly to the Industrial Board prices, just as it did all through the period when the independents were readily securing much higher prices.

**Buyers Apathetic**

The record of prices and price declines, however, is of little significance and of no particular interest. As to market conditions it does not matter what prices chance to be quotable, as there is no market in the sense of there being activity. It would make very little difference in the year's earnings of producers or consumers whether the material now being sold were at $10 a ton higher or $10 a ton lower than the prices that are just now quotable as the market.

Buyers are taking no interest in prices. There is nothing like a deadlock. Buyers are not waiting for lower prices, nor have they any particular prices in mind, at which they would be disposed to buy.

The really interesting feature of the situation is the relation between the Steel Corporation and the independents, which was referred to at some length in last letter. The independents evidently wanted to force the Steel Corporation to reduce wages, but the corporation refuses to take action. The independents did not, presumably, wish to force the corporation to reduce its prices, though obviously the corporation must eventually do so. Apparently they did wish to curtail the flow of steel from the Steel Corporation to its customers, as the existence of this steel, much of it going into stocks, would tend to detract from the quantity the independents would be able to sell later.

Last Friday a circumstantial report emanated from Youngstown to the effect that the Steel Corporation was to have a meeting that day and the next of the sales managers of the subsidiary companies, to consider making price reductions. The newspaper reports quoted officials of the Steel Corporation in Youngstown without giving names, also a prominent independent steel official, name also not mentioned, all commenting on this meeting, yet there was no meeting. The sales managers who would constitute the meeting were to be found at their desks in Pittsburg both days. The presumption is the report was conceived by independent steel men rather than by newspaper men. From various circumstances it is plain that the steel industry is not entering an era of good feeling between the various producers.

**Operations**

The Steel Corporation could not logically reduce its prices when it still had a high operating rate, based on old orders, but the cutting by independents has caused many customers of the corporation to instruct that shipments be curtailed or discontinued, and the cor-

poration operations are decreasing rapidly. They were about 75 per cent. of capacity week before last, against about 92 per cent. in the first fortnight of the year, and last week they probably did not average over 65 per cent. This week will naturally show a still lower rate, and so on. The decline paves the way for the corporation to reduce its prices, and, of course, the corporation will reduce wages when it reduces prices or soon afterwards.

Practically everywhere it is admitted that the independents are operating at under 25 per cent., and one observer with good facilities for ascertaining the facts estimates that the rate is under 20 per cent. In other words, the independents are not running as well as when they started to cut prices, although they might be no better off if they had not cut prices. The one noteworthy result of the price cutting is the great decrease in the Steel Corporation's operations.

Foundry pig iron has quietly slid off a dollar a ton, $27, valley, being now the accepted market price, Bessemer remaining at $27 and basic at $25. These prices are more or less nominal, and certainly they are not supported by any buying to speak of. The prices are much below the cost of production, based on the cost of the large quantities of ore the furnaces have, purchased at last season's prices, and recent prices for coke. It appears now that the pig iron price will make the ore and coke prices, rather than the other way, and of course furnaces have to absorb the loss on the ore already bought. There is no interest in coke as to actual purchases, and little interest as to the future, the point about coke being that eventually the Steel Corporation will no doubt reduce wages all around, including wages in the Connellsville region, and then the other operators in the region can reduce also. When the new wage scale is in force it will be possible to figure how cheaply coke can be sold. The market is nominal just now, with spot furnace at $4.50 and contracts at $5.00. Some operators ask more, of course, but even those with the lowest prices do not effect sales. Spot foundry coke is quotable at $5.50 to $6.50, depending on brand, all prices being per net ton, f.o.b. Connellsville ovens.

## Pig Iron Market

The general tendency in the pig iron market is still downward. Some rumors of very low prices have not been confirmed, but their influence has had a depressing effect on the market. The reduction last week in the Pittsburg district of standard basic iron to $25 by a merchant interest has not resulted in any appreciable increase in demand. One company in this district has disposed of some off basic at $24.50, furnace, part of the tonnage going to a Homestead melter, the price in this case being equal to about $24 valley furnace basis. Basic is being quoted at $25, and No. 2 foundry at $27.

Chicago reports that business has been very light during the past week. Although it is possible that better prices can be obtained no orders have appeared to bring out such quotations. Delivered at consumers' yards—southern foundry, sil., 1.75 to 2.25, is being quoted at $34.17, and basic at $28 to $29.

The Birmingham iron market seems to have steadied itself since the establishment of the $27.50 level, and none lower had been heard from up to the close of the week. One furnace interest booked about 1,500 tons of iron during the week at $27.50 to $30, much of the $30 business being acceptance on quotations previously made. The leading interest continues to ignore the general market. Although the indications have been brighter, indications seem to point to a stronger effort to hammer the market down to $25.

The volume of business on the books and in prospect in the Buffalo district is so small that it has been remarked by one sales manager that he has not seen such stagnation in the iron trade in 30 years. Increased business was expected on account of the heavy inquiry two weeks ago, but this has not been realized. Reports are current of furnace iron sold at less than $30, but verification is lacking. No. 2 plain, 1.75 to 2.25 silicon, is quoted at $28 to $30, and basic, nominal, at $30.

On the St. Louis market foundries are doing a little work and are taking an occasional carload, but this is about all the business being carried on.

The market at Cleveland shows little life. Lake furnace prices on foundry iron have declined $1 a ton to $28, at which several small lot sales have been made. An inquiry has been made for 1,000 tons of foundry iron for prompt shipment by the American Radiator Co., for its Detroit and Titusville, Pa., plants, also an inquiry for 1,000 tons for second quarter, but it is understood the latter inquiry was sent out to obtain prices for use in quoting on castings. There is a considerable amount of resale foundry iron in the market and it is being offered from $1 to $2 a ton below the prices asked by furnaces.

The New York market is still extremely dull, with indications of further weakening. A sale was made of 1,000 tons of foundry grades last week at a price that is understood to be equivalent to about $27 eastern Pennsylvania for No. 2 plain, and less than $25, Buffalo, but no sales of Buffalo are reported at less than $28.

That buyers are a little more confident as regards the present quotations on the Philadelphia market is shown by a few more sales of 500 and 1,000 ton lots. One eastern furnace took a 1,000 ton order for February-March shipment at $29, base furnace, and a 500 ton order at the same price for the same delivery.

## Scrap Metal Market

The scrap metal market is still lifeless and prices continue to show weakness, though dealers believe the bottom has been reached.

Chicago reports that if the market could be any duller than it has been for some time past, that is the condition during the past week. Except for tonnages bought to apply on unfilled contracts for the Gary plant, dealers have practically no outlet for their material, and shipments to that destination have been almost enough to cover its requirements. As a result dealers are again accumulating scrap in their yards. Quotations on many grades have been lowered 50 cents to $1 per ton during the past few days. Heavy melting steel remains at $15 to $15.50. Railroad offerings are not as plentiful as has been the case.

Owing to the necessity for small dealers to raise cash, an increasing number of sales of scrap were made during the week on the Boston market. The larger dealers, without exception, are buying all tonnage that appears at concessions. The foundry demand in New England continues slack. No. 1 machinery sold during the week at $23 delivered. The price of railroad wrought, based on several recent sales, has advanced from $15 to $15.50.

The heavy snowfalls in New York have brought operations in the New York district to almost a standstill. Prices have been unchanged, although some weakness is reflected in cast scrap, of which there seems to be an unusually large supply at this time.

At Philadelphia dealers are inclined to refuse bids on large tonnages of scrap offered at the current prices. A couple of mills inquired for heavy melting steel at $14 and $14.50, but were told that large lots could not be had at these prices. However, it is not certain whether or not the mills would have bought even if they could at these prices. Small lots of heavy steel continue to sell at $14.50 delivered.

On the Pittsburg market No. 1 cupola cast is quoted at $22 to $23. Some demand is current for heavy breakable cast, but there seems to be a considerable shortage. Recent small sales of cast iron borings and shovel turnings have been made around $12.50. Prices have been reduced as follows: Cast iron borings, from $12 to $13 to $11.50 and $12.50: shovel turnings, from $12 and $13 to $12 and $12.50.

Buffalo reports an extremely dull market. Mills figure that the bottom has not been reached, but indications point that it has, and many dealers are speculating on this. It is believed that few dealers would care to sell large tonnages at $15.

The market for scrap continues quiet at St. Louis.

# SELECTED MARKET QUOTATIONS

**Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.**

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $26 00 |
| Lake Superior, charcoal, Chicago | 40 50 |
| Standard low phos., Philadelphia | 41 50 |
| Bessemer, Pittsburgh | 28 96 |
| Basic, Valley furnace | 26 00 |
| Toronto price:— | |
| Silicon, 2.25% to 2.75% | 39 25 |

## IRON AND STEEL

| Per lb. to Large Buyers | Cents |
|---|---|
| Iron bars, base, Toronto | $ 4 50 |
| Steel bars, base, Toronto | 4 50 |
| Iron bars, base, Montreal | 4 25 |
| Steel bars, base, Montreal | 4 25 |
| Reinforcing bars, base | 4 50 |
| Steel hoops | 6 00 |
| Tire steel | 5 00 |
| Spring steel | 8 00 |
| Band steel, No. 10 gauge and 3-16 in. base | 5 50 |
| Chequered floor plate 3-16 aud heavier | 7 50 |
| Bessemer rails, heavy, at mill | 2 35 |
| Steel bars, Pittsburgh | 3 00-4 00 |
| Tank plates, Pittsburgh | 3 50 |
| Structural shapes, Pittsburgh | 2 45 |
| Steel hoops, Pittsburgh | 3 05 |
| F.O.B., Toronto Warehouse | |
| Small shapes | 4 50 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 3 48 |
| Structural shapes | 3 58 |
| Plates | 3 78 |
| Small shapes under 3-in. | 3 48 |

## FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

| | C.L. | L.C.L. |
|---|---|---|
| Montreal | 58½ | 73 |
| St. John, N.B. | 84½ | 106½ |
| Halifax | 86 | 108 |
| Toronto | 38 | 54 |
| Guelph | 38 | 54 |
| London | 38 | 54 |
| Windsor | 35 | 50½ |

## METALS

| | Gross. Montreal | Toronto |
|---|---|---|
| Lake copper | $18 50 | $17 50 |
| Electric copper | 18 00 | 17 50 |
| Castings, copper | 17 75 | 18 00 |
| Tin | 39 00 | 40 00 |
| Spelter | 7 75 | 7 50 |
| Lead | 6 75 | 7 50 |
| Antimony | 8 00 | 8 25 |
| Aluminum | 34 50 | 30 00 |

Prices per 100 lbs.

## PLATES

| | | |
|---|---|---|
| Plates, 3-16 in. | $5 25 | $5 25 |
| Plates, ¼ up | 4 75 | 4 75 |

## PIPE—WROUGHT

**Standard Buttweld Pipe**

Per 100 Ft.

| | Steel Blk. | Steel Galv. | Gen. Wrought Iron Blk. | Gen. Wrought Iron Galv. |
|---|---|---|---|---|
| ⅛ | $ 6 50 | $ 8 50 | $..... | $..... |
| ¼ | 5 31 | 7 41 | 5 91 | 8 01 |
| ⅜ | 5 31 | 7 41 | 5 91 | 8 01 |
| ½ | 7 10 | 8 63 | 7 95 | 9 48 |
| ¾ | 8 80 | 10 87 | 9 95 | 12 02 |
| 1 | 13 01 | 16 07 | 14 71 | 17 77 |
| 1¼ | 17 60 | 21 74 | 19 90 | 24 04 |
| 1½ | 21 04 | 25 99 | 23 79 | 27 84 |
| 2 | 28 31 | 34 97 | 32 01 | 38 67 |
| 2½ | 44 75 | 55 28 | .... | .... |
| 3 | 58 52 | 72 29 | .... | .... |
| 3½ | 74 06 | 90 62 | .... | .... |
| 4 | 87 75 | 107 37 | .... | .... |

**Standard Lapweld Pipe**

Per 100 Ft.

| | Steel Blk. | Steel Galv. | Gen. Wrought Iron Blk. | Gen. Wrought Iron Galv. |
|---|---|---|---|---|
| 2 | $32 01 | $ 38 67 | $35 71 | $42 37 |
| 2½ | 48 26 | 58 79 | 54 11 | 64 64 |
| 3 | 63 11 | 76 88 | 70 76 | 84 53 |
| 3½ | 75 90 | 92 46 | 85 10 | 101 66 |
| 4 | 89 93 | 107 55 | 100 83 | 120 45 |
| 4½ | 1 05 | 1 29 | 1 30 | 1 54 |
| 5 | 1 22 | 1 50 | 1 52 | 1 80 |
| 6 | 1 58 | 1 95 | 1 97 | 2 33 |
| 7 | 2 06 | 2 53 | 2 53 | 3 01 |
| 8L | 2 16 | 2 66 | 2 66 | 3 16 |
| 8 | 2 49 | 3 07 | 3 07 | 3 64 |
| 9 | 2 98 | 3 67 | 3 67 | 4 36 |
| 10L | 2 77 | 3 41 | 3 41 | 4 05 |
| 10 | 3 56 | 4 39 | 4 39 | 5 21 |

Prices—Ontario, Quebec and Maritime Provinces

## WROUGHT NIPPLES

4-in. and under, 50 per cent.
4½-in. and larger, 40 per cent.
4-in. and under, running thread, 20%.
Standard couplings, 4-in. and under, 20%
Dd., 4½-in. and larger, net.

## OLD MATERIAL

Dealers' Average Buying Prices

| | Per 100 Pounds. Montreal | Toronto |
|---|---|---|
| Copper, light | $10 50 | $ 9 00 |
| Copper, crucible | 13 00 | 11 00 |
| Copper, heavy | 12 00 | 11 00 |
| Copper wire | 12 00 | 11 00 |
| No. 1 machine composition | 13 00 | 9 75 |
| New brass cuttings | 7 00 | 8 00 |
| Red brass turnings | 8 00 | 8 00 |
| Yellow brass turnings | 7 00 | 6 00 |
| Light brass | 5 00 | 5 00 |
| Medium brass | 6 50 | 6 00 |
| Scrap zinc | 5 00 | 4 00 |
| Heavy lead | 4 50 | 4 00 |
| Tea lead | 2 50 | 2 00 |
| Aluminum | 15 00 | 10 00 |

| | Per Ton | Gross |
|---|---|---|
| Boiler plate | $11 00 | $12 00 |
| Heavy melting steel | 15 00 | 14 00 |
| Axles (wrought iron) | 25 00 | 20 00 |
| Rails (scrap) | 15 00 | 14 00 |
| Malleable scrap | 20 00 | 20 00 |
| No. 1 machine cast iron | 30 00 | 25 00 |
| Pipe, wrought | 8 50 | 8 00 |
| Car wheel | 30 00 | 25 00 |
| Steel axles | 20 00 | 18 00 |
| Mach. shop turnings | 8 00 | 6 00 |
| Stove plate | 23 00 | 20 00 |
| Cast boring | 8 00 | 7 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent |
|---|---|
| Carriage bolts, 7-16 and up | Net list |
| Carriage bolts, ⅜" and less | 15 |
| Coach and lag screws | —20 |
| Stove bolts | 55 |
| Wrought washers | —25 |
| Elevator bolts | Net |
| Machine bolts, 7-16 and over | —5 |
| Machine bolts, ⅜-in. and less | —30 |
| Blank bolts | Net |
| Bolt ends | —5 |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | +25 |
| Machine screws, fl. and rd. hd., brass | Net |
| Machine screws, o. and fil. hd., brass | Net |
| Nuts, square, blank | +25 add $2 00 |
| Nuts, square, tapped | add 2 25 |
| Nuts, hex., blank | add 2 25 |
| Nuts, hex., tapped | add 2 75 |
| Copper rivets and burrs, list less | 27½ |
| Burrs only, list plus | 10 |
| Iron rivets and burrs | 37½ and 5 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, bright | 67½ |
| Wood screws, flat, brass | 55 |
| Wood screws, O. & R., brass | 55½ |
| Wood screws, flat, bronze | 50 |
| Wood screws, O. & R., bronze | 47½ |

## MILLED PRODUCTS

(Prices on unbroken packages)

| | Per Cent |
|---|---|
| Set screws | Less 40% |
| Square and hexagon head cap screws | Less 30% |
| Round head cap screws | Plus 10% |
| Fillister head cap screws | Less 10% |
| Flat head cap screws | Net list |
| Button head cap screws | Plus 10% |
| Studs | Less 20% |
| Semi-finished nuts up to and including 1-in. | Less 35% |
| Semi-finished nuts 1⅛ to 1½" | Less 30% |
| Semi-finished nuts 1⅝ to 2 in. | Net list |
| Coupling bolts | Plus 10% |
| Taper pins | Less 40% |
| Planer bolts without fillet | Plus 40% |
| Planer bolts with fillet | Pus 50% |
| Patch bolts | Plus 80% |
| Hollow set screws | Plus 20% |
| Thumb screws | Less 35% |
| Thumb nuts | Less 65% |

## BILLETS

F.O.B. Pittsburgh.

| | Per gross ton |
|---|---|
| Bessemer billets | $43 50 |
| Open-hearth billets | 43 50 |
| O.H. sheet bars | 47 00 |
| Forging billets | 48 50 |
| Wire rods | 57 00 |

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails, base | $5 10 |
| Cut nails, base | 5 75 |
| Miscellaneous wire nails | 50% |

## ROPE AND PACKING

| | |
|---|---|
| Plumbers' oakum, per lb. | 0 10¼ |
| Packing, square braided | 0 38 |
| Packing, No. 1 Italian | 0 44 |
| Packing, No. 2 Italian | 0 36 |
| Pure Manila rope | 0 26 |
| British Manila rope | 0 20 |
| New Zealand hemp | 0 20 |

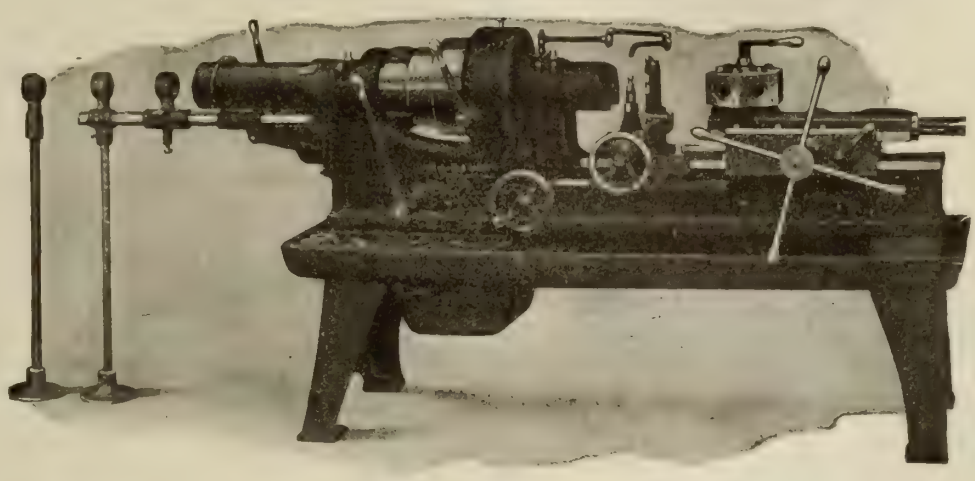
## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | Net |

# Warner & Swasey Screw Machines

For large output and close limits—If you are figuring on screw machine work you can depend on W. & S. machines being right for the job.

**We can supply you from stock immediately.**



## The A. R. Williams Machinery Company, Limited

ST. JOHN, N.B.
WINNIPEG, VANCOUVER

*If It's Machinery—Write "Williams"*

64 Front Street West
TORONTO


# GERMAN GOODS ARE FINDING THEIR WAY TO CANADIAN MARKET

The menace to Canadian industry from Germany appears to be not only real, but immediate, according to the Canadian Reconstruction Association, and while Germany is making a moan about her ruined industries, she is at the same time trying by every means in her power to regain the position in the world's trade she occupied before she plunged the world into war. The United States Department of Commerce has reports from Argentina showing how the Teuton is underselling American firms, a concrete instance being in the respective quotations for 10,000 car wheels. In Mexico, German manufacturers are offering hardware at 25 per cent. lower than U.S. firms. The low exchange situation, to some extent, explains the matter, but high exchange countries like Canada and the United States are menaced by countries whose currency is greatly depreciated in international trade.

**Perfect Industrial Machine**

In a recent statement, a British government official said that "Germany is still a perfect industrial machine, running at low speed, it is true, but undamaged as yet in its vital parts, and would respond readily to any stimulus. The Guaranty Trust Company, of New York, which has just issued an analysis of "German plans to extend foreign trade," written by the assistant manager of its international trade department, quotes this statement:

"German exports for the first five months of 1920 were valued at 23,688,000 marks as compared with 10,057,000 marks for the entire year of 1919. For the eleven months ending November, 1920, the United States imported from Germany imports valued at $84,000,000, as compared with $10,608,141 for the entire year of 1919."

German imports into Canada for the eight months period ended November 30, 1920, were valued at $725,322, as compared with a value of $11,862 for the corresponding period of 1919.

German salesmen in great numbers are at work in all parts of the world offering low prices and long credits, with quicker deliveries than their rivals. Before the end of last year English warehouses were filled with German toys, which, with the exception of dolls, were generally at about the same price as toys of British manufacture.

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American railroads are said to need 12,000,000 tons of rails to restore them to pre-war condition. This tonnage, representing a deficit, must be supplied over and above the normal consumption.

# STEEL EXPERT DIES AFTER OPERATION

**C. E. Duncan, General Superintendent of Algoma, Was Sick Only a Few Days**

Sault Ste. Marie, Ont.—C. E. Duncan, general superintendent of the Algoma Steel Corporation, died here following an operation for appendicitis. He had been ill only a few days. Mr. Duncan was forty-eight years of age and was born in Chattanooga, Tenn. He learned the steel business in the Homestead works of the Carnegie Steel Corporation, where he mastered every branch of the trade. Throughout Canada and the United States he became recognized as an authority. He first joined the Algoma Steel Corporation in 1909 as general superintendent and worked in that capacity until 1915 when he entered the service of the United States Government as adviser in large plants. When the late David Kyle died here last spring Mr. Duncan succeeded him as general superintendent of the Soo mills. Mr. Duncan's death is deeply regretted by his business associates, for his death means the loss of an exceptionally brilliant and successful steel man. The remains will be taken to Johnstown, Penn., for interment.

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | $ 0 27½ |
| Solder, guaranteed | 0 29½ |
| Soldering coppers, lb. | 0 62½ |
| White lead, pure, cwt. | 17 00 |
| Red dry lead, 100-lb. kegs, per cwt. | 15 00 |
| Gasoline, per gal., bulk | 0 42 |
| Pure turp., single bbls., gal. | 1 20 |
| Linseed oil, raw, single bbls. | 1 00 |
| Linseed oil, boiled, single bbls. | 1 03 |
| Wood alcohol, per gal. | 2 75 |
| Whiting, plain, per 100 lbs. | 3 00 |

### CARBON DRILLS AND REAMERS

| | |
|---|---|
| S.S. drills, wire size | 40 and 5 |
| Can. carbon cutters, plus | 10 |
| Standard drills, all sizes | 40 and 5 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 and 5 |
| Bit stock | 50 |
| Ratchet drills | 10 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 50 |
| Sleeves | 50 |
| Taper pin reamers | 25 off |
| Drills and countersinks | Net |
| Bridge reamers, carbon | 50 |
| Centre reamers | 5 |
| Chucking reamers | Net |
| Hand reamers | 10 |
| High speed drills, list net to plus | 20 |
| Can. high speed cutters, net to plus | 10 |
| American | plus 40 |

### COLD ROLLED STEEL

[At Warehouse]

| | |
|---|---|
| Rounds and squares | $7.00 base |
| Hexagons and flats | 7.00 base |

### IRON PIPE FITTINGS

| | Black | Galv. |
|---|---|---|
| Class A | 60 | 75 |
| Class B | 26 | 36 |
| Class C | 17 | 26 |

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 7 30 | $ 6 50 |
| Sheets, blue ann., No. 10 | 6 25 | 6 00 |
| Canada plates, dull, 52 sheets | 13 00 | 13 00 |
| Can. plates, all bright | 14 00 | ..... |
| Apollo brand, 10¾ oz., galvanized | .... | ..... |
| Queen's Head, 28 B.W.G. | 12 50 | ..... |
| Fleur-de-Lis, 28 B.W.G. | 11 50 | .... |
| Gorbal's Best, No. 28 | .... | ..... |
| Colborne Crown, No. 28. | .... | ..... |
| Premier, No. 28, U.S. | 10 00 | 9 00 |
| Premier, 10¾-oz. | 10 50 | 9 40 |
| Zinc sheets | 15 50 | 20 00 |

### PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13; 5-16, $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

### ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13; 5-16 in., $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

**Prices per 100 lbs.**

### FILES AND RASPS

| | Per Cent. |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 32½ |
| Black Diamond | 27½ |
| J. Barton Smith, Eagle | 50 |
| McClennand, Globe | 50 |
| Delta Files | 20 |
| Disston | 40 |
| Whitman & Barnes | 50 |
| Great Western-American | 50 |
| Kearney & Foot, Arcade | 50 |

### BOILER TUBES

| Size | Seamless | Lapweld |
|---|---|---|
| 1 in. | $26 00 | $..... |
| 1¼ in. | 27 25 | ..... |
| 1½ in. | 26 25 | 29 50 |
| 1¾ in. | 29 75 | 27 00 |
| 2 in. | 29 25 | 25 50 |
| 2¼ in. | 33 00 | 28 50 |
| 2½ in. | 44 75 | 31 50 |
| 3 in. | 49 25 | 40 00 |
| 3¼ in. | ..... | 48 50 |
| 3½ in. | 63 50 | 43 50 |
| 4 in. | 85 00 | 55 50 |

Prices per 100 ft., Montreal and Toronto

### OILS AND COMPOUNDS

| | |
|---|---|
| Castor oil, per lb. | — |
| Royalite, per gal., bulk | 28 |
| Palacine | 31 |
| Machine oil, per gal. | 58 |
| Black oil, per gal. | 27 |
| Cylinder oil, Capital | 1.01 |
| Petroleum fuel oil, bbls., net | 11.2 |

### BELTING—No. 1 OAK TANNED

| | |
|---|---|
| Extra heavy, single and double | 15% |
| Standard | 15 and 10% |
| Cut leather lacing, No. 1 | 2 00 |
| Leather in side | 2 40 3 00 |

### TAPES

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES

| | |
|---|---|
| Polishing wheels, felt | $4 50 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, Turkish | 8¾ |
| Pumice, ground | 06 |
| Emery glue | 30 |
| Tripoli composition | 9½ |
| Crocus composition | 12 |
| Emery composition | 11 |
| Rouge, silver | 64 |
| Rouge, powder, nickel | 38 |

**Prices per lb.**

### ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | 8½ |
| Grits, 80 and finer | 6 |

### BRASS—Warehouse Price

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 30 |
| Brass sheets, 24 gauge and heavier, base | 38 |
| Brass tubing, seamless | 42 |
| Copper tubing, seamless | 44 |

### WASTE

| | | | |
|---|---|---|---|
| XXX Extra | .21 | Atlas | .19 |
| Peerless | .22 | X Empire | .15 |
| Grand | .21½ | Ideal | .18 |
| Superior | .21½ | X Press | .13½ |
| X L C R | .16½ | | |

**Colored**

| | | | |
|---|---|---|---|
| Lion | .13½ | Popular | .10½ |
| Standard | .12 | Keen | 9 |
| No. 1 | .14 | | |

**Wool Packing**

| | | | |
|---|---|---|---|
| Arrow | .35 | Anvil | .22 |
| Axle | .28 | Anchor | .17 |

**Washed Wipers**

| | | | |
|---|---|---|---|
| Select White | .20 | Dark colored | .09 |
| Mixed colored | .10 | | |

**This list subject to trade discount for quantity.**

### RUBBER BELTING

| | | | |
|---|---|---|---|
| Standard | 10% | Best grades | 15% |

### ANODES

| | |
|---|---|
| Nickel | .55 to .60 |
| Copper | .38 to .40 |
| Tin | .70 to .70 |
| Zinc | .16 to .17 |

**Prices per lb.**

### COPPER PRODUCTS

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | $32 00 | $34 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 34 00 | 38 00 |
| Copper sheet, tinned, 14 x 60, 14 oz. | 40 00 | 42 00 |
| Copper sheet, planished, 16 oz. base | 46 00 | 48 00 |
| Braziers', in sheets, 6 x 4 base | 38 00 | 41 00 |

### LEAD SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $10 50 | $14 50 |
| Sheets, 3½ lbs. sq. ft. | 10 25 | 14 00 |
| Sheets, 4 to 6 lbs. sq. ft. | 10 00 | 13 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS

| | |
|---|---|
| Acid, boracic | $ .25 |
| Acid, hydrochloric | .03¾ |
| Acid, nitric | .10¼ |
| Acid, sulphuric | .03¾ |
| Ammonia, aqua | .20 |
| Ammonium, carbonate | .23 |
| Ammonium, chloride | .22 |
| Ammonium, hydrosulphuret | .75 |
| Ammonium sulphate | .30 |
| Arsenic, white | .18 |
| Copper, carbonate, annhy. | .35 |
| Copper, sulphate | .10 |
| Cobalt, sulphate | .20 |
| Iron perchloride | .62 |
| Lead acetate | .30 |
| Nickel ammonium sulphate | 16½ |
| Nickel carbonate | .30 |
| Nickel sulphate | .17½ |
| Potassium sulphide (substitute) | .40 |
| Silver Chloride (per oz.) | 1.15 |
| Silver nitrate (per oz.) | 1.10 |
| Sodium bisulphate | .13 |
| Sodium carbonate crystals | .04 |
| Sodium cyanide, 127-130% | .39 |
| Sodium hyposulphite per 100 lb. | 6.50 |
| Sodium phosphate | .15 |
| Tin chloride | .80 |
| Zinc chloride, C.P. | .30 |
| Zinc sulphate | .08 |

**Prices per lb. unless otherwise stated**

# GEOMETRIC

## Adjustable Collapsing Taps

Have overcome all the expense and annoyance of tapping screw threads with a solid tap.

Anyone doing thread tapping knows what backing out a solid tap each time means. It usually means low production, poor threads, and worn-out taps. The mechanism of the Geometric Taps takes care of adjustment to correct diameter each time a thread is tapped; it collapses the chasers automatically, leaving a thread clean cut and perfect.

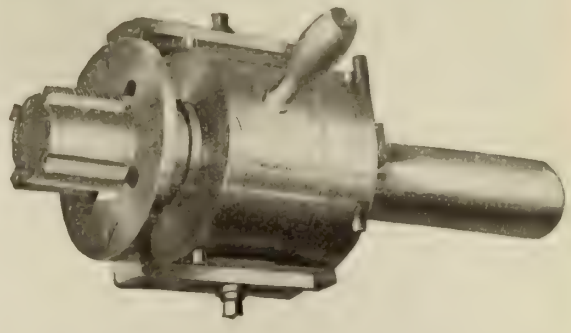
The chasers are readily reground, and when finally used up, are renewed at comparatively small cost, leaving the tap as efficient as when new.

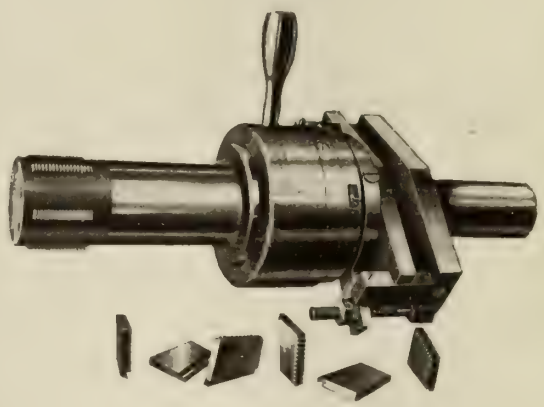
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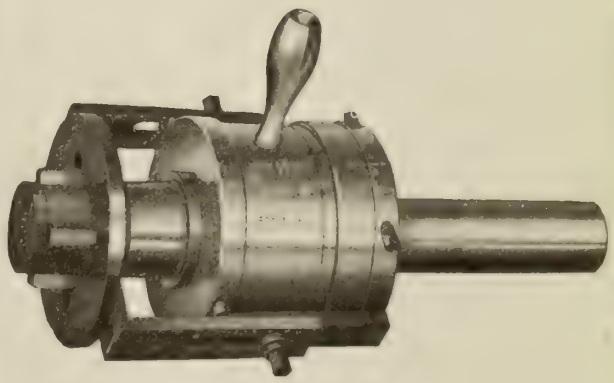
The manufacturers of the Geometric line of Collapsing Taps and Self-opening Die Heads are justly proud of the distinction which is theirs:—

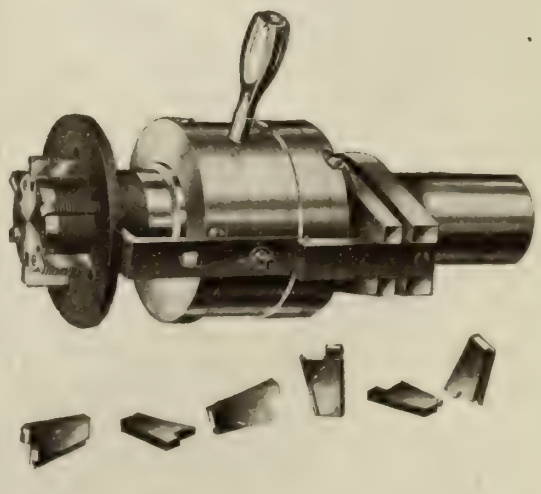
**The Originators**
**and the**
**Largest and Best Known Manufacturers**
**of**
**Automatic Threading Tools**

***For cutting all classes of screw threads, internal and external, of any diameter and form***









## The Geometric Tool Company

**New Haven, Conn., U.S.A.**

CANADIAN AGENTS:

**Williams & Wilson, Ltd., Montreal; The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B., and Halifax, N.S.; Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.**

# Machine Tool Builders Meet at Cleveland

## Matter of Costs Gone Into at Great Length—By Interchanging Ideas and Experiences the Going Can be Made Safer For All —Prices Likely to Decline

THE National Machine Tool Builders' Association, although at first announcing their next meeting at Atlantic City in May, held an important gathering in this city last week, extending over several days. E. F. DeBrul, the new general manager of the association, planned the gathering, considering there was sufficient of importance to discuss and bring before the members without waiting for the May meeting. Judging from the nature of the subjects before the meeting it was deemed advisable to bring the matter of costs, scientifically studied, to the attention of the members before they embarked upon a selling program based on altered prices.

The fact that the members of the association saw the wisdom of the move was well set forth in the attendance at the meeting. The notices were only sent out on February 7, and even on such short notice there was an attendance of 165 members, which sets a high mark for any similar gathering. All sessions were held at the Cleveland Hotel, and nearly all behind closed doors, only members being admitted. There were several reasons for this. The gathering was for the benefit of the members, and it was felt that by allowing none others to attend the sessions would be held more to topics of common interest. The closed sessions were also counted on to draw forth more frank discussion, and this was what the meeting desired above all else. E. F. DeBrul, general manager of the association, and C. Wood Walter, of the Cincinnati Milling Machine Co., formed the press committee.

Practically all sessions on Thursday were taken up with the one matter of "Cost." Mr. Scovell gave the report and findings of the investigation of the Scovell-Wellington Co., cost accounting experts. These covered a very wide range and from them recommendations were made to the association. Following up the same idea, the question of "Overhead" will be taken up at the next meeting in Atlantic City. The afternoon session listened to an address by F. A. Geier on "What Constitutes the Fundamentally Sound Finances for the Machine Tool Business." One point brought out here was that very little outside capital ever found its way to the machine tool business, on account of the big risk and the low returns that had been made in many firms.

J. B. Doan, of the American Tool Works, also gave a talk on the present business situation. To E. J. Kearney, of the Kearney & Trecker Co., was given the very delicate topic of discussing the "Running of a Machine Tool Business in a Period of Depression," in which he went extensively into matters of finance connected with the business.

### Some Pleasing Events

Two presentations were made by the members of the National Tool Builders' Association during the day. A handsome silver service was presented to the retiring general manager, Charles Hildreth, the presentation being made by W. A. Viall. In the afternoon some of the members went out to the home of George Merryweather, of Motch & Merryweather Machinery Co. During the war Mr. Merryweather was one of Uncle Sam's dollar-a-year men, acting in the capacity of a purchaser of machine tools for war purposes, and the members felt that they should show their appreciation of the services rendered by one of their number. The expression took the form of furniture for a well-appointed den. A banquet was held in the evening.

### The Work of the Association

Friday morning was taken up largely by Mr. DeBrul in discussing the activities of the association. He outlined at length some of the things he considered should be included in the work for the coming year. Charts and graphs, indicating the trend of business activity, supply and demand and the law of averages were gone into minutely. The value of interchanging ideas, statistical information, and other like matter was referred to very directly. The speaker pointed out that years ago the early navigator could run his vessel around in the waters where he was well acquainted. He could make his own little chart for his own little route, but he had to stay right there, and every time he ventured out it became for him a big adventure. But now every rock and channel had been charted through the interchanging of ideas and information, and a captain can sail in strange waters with perfect safety. The only thing necessary is that he shall be able to rightly interpret the charts.

Mr. DuBrul believed that if he were supplied with figures for the next fifteen years it would be possible to compile business charts, which, by taking lessons from the laws of averages, over-stocking, over-production, and therefore cancellations, could do much to correct the resulting evils from these conditions. The present conditions came as the result of ignoring certain well-known laws, and by following the crazy system—if it could be called a system at all. He believed in supplying even the customers with copies of these charts, so that they could more intelligently carry on their business. The course of iron through the year was referred to. At the start all was booming, with stacks working to capacity and sales away up on the percentage chart. And so they drifted on down through the year, but all of them ended up in the dumps in December with sales next to nil. By the use of charts, stocks could be liquidated, thus steadying the market at the most necessary time.

The matter of prices was mentioned several times, but no concerted action will be taken, nor would it be possible to move in this direction, as such action would bring the association within the phase of the law dealing with price-fixing. Members were rather reticent in mentioning this matter, but enough could be gathered to leave the impression fairly well fixed that a movement downward is going to take place, in order to conform with the present prices of other commodities. None of the members believed that such a move would tend to increase sales in the least, most of those with whom your correspondent discussed the situation holding that machine tools were bought because the buyers wanted them for some particular purpose, and not because they were down in price.

### Conditions Abroad

At the Saturday sessions H. B. Krant, of Ryerson & Sons, Chicago, who has made several trips to Europe during and since the war, and who has just recently returned, gave a talk on conditions as he had found them, with special reference to their application to the machine tool field. He discussed conditions in England, France, Germany, Norway, Sweden, Poland, Italy, Greece, Russia, and ended up with Roumania. Although conditions were much better now than they had been in those countries, the speaker was of the opinion that there was not much hope for a good market in those counties for some time to come. Exhausted credits and rates of exchange were all against the U.S. selling in Europe.

In the closing meeting Mr. DuBrul also dealt with the need for more education, this service to be rendered by the association. Special reference was made to the method of cancellation that was becoming far too common in business. These losses were largely caused by over-production, and over-buying, due to not having proper statistics and a correct knowledge of the consuming power of the buyer.

The Atlantic City meeting of the National Machine Tool Builders will be held as originally planned.

# ATKINS

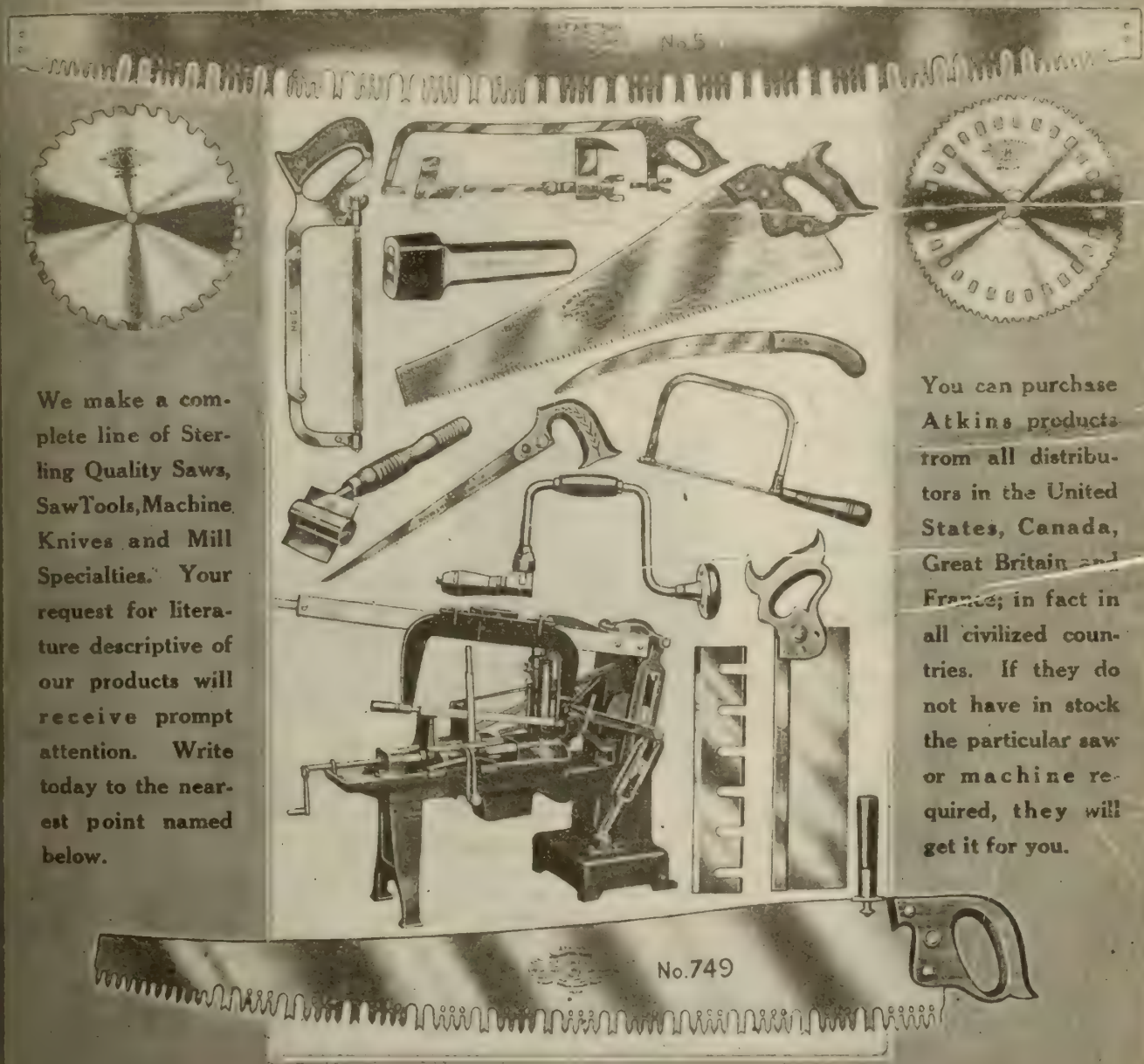
STERLING QUALITY

SAWS and TOOLS

A Perfect Saw for every Purpose

"Finest on Earth"

"Finest on Earth"




We make a complete line of Sterling Quality Saws, SawTools, Machine Knives and Mill Specialties. Your request for literature descriptive of our products will receive prompt attention. Write today to the nearest point named below.

You can purchase Atkins products from all distributors in the United States, Canada, Great Britain and France; in fact in all civilized countries. If they do not have in stock the particular saw or machine required, they will get it for you.

*If you have difficulty in obtaining Atkins Saws and other products through your regular service, write*

## E. C. Atkins & Company

Established 1857

*Canadian Factory:* HAMILTON, ONTARIO

*Branch:* VANCOUVER, B. C.



# INDUSTRIAL NEWS

## NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES



## WILL CORPORATION REDUCE PRICES?

**Considerable Speculation Going On As To Why This Move Is Not Taken**

Is the United States Steel Corporation likely to reduce its price in order to meet the price slashing that is going on among the independent producers? Judge Gary says prices will stand, but there is a growing feeling that prices are not going to stand very long. There are all sorts of rumors in the steel markets as to why the Corporation adheres to its schedule of March 21, 1919.

One of the most likely seems to be that some of the largest customers of the Corporation have taken on large tonnages at present prices, with a view to using them for carrying out certain manufacturing programmes. Whether this would refer to agricultural interests especially is not certain, but it would seem reasonable to suppose that it would. The fear is expressed that were a lower price brought out—and it would need to be appreciably lower to keep pace with the cutting of the independents—it would cause considerable financial embarrassment to some of these large customers. It would, in fact, more or less cut the ground out from under their feet.

Of course there are well defined limits in Canada to which prices can be cut, before coming under the operation of the dumping clause. A United States firm must sell its product in Canada within 5 per cent. of the reasonable market price in the United States. Of course it can go as much higher as it wishes, but just now the tendency is to get down instead of up. The Steel Corporation capacity of operation continues to get less each week. One very good authority says that they are not running much over 65 per cent. of their capacity now, while the independents are down to around the 20 per cent. mark. The cutting of prices has not resulted in new business being brought into the market.

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A reduction in wages was made by the Nova Scotia Steel and Coal Co. at the Sydney Mines plant. About three hundred men were affected by the decrease, which is said to have been necessary in order to keep as many men employed as possible.

## TECHNICAL MAN JOINS SALES FORCE

**F. J. McCarty Now In Charge of Morrow Company Business In Montreal**

The John Morrow Screw & Nut Co. have opened their own warehouse and office in Montreal at 489 St. Paul Street West. It is interesting to note that once more the technically trained man is coming into his own in the field of selling, for F. J. McCarty, A.S.M.E., now in charge of the Montreal office, has come up through the mechanical end of the business.

It is easy to say that it hardly pays to learn a trade now, but just go and ask



F. J. McCARTHY, A.S.M.E.

Mr. McCarty if his technical training is of any use in the selling business. He will soon tell you that it is. Mr. McCarty graduated from the Springfield Technical School in 1904, and then went into practical work in the tool room of the National Needle Company, Springfield, where he finished. We next find him in the experimental and automatic department of the Singer Manufacturing Company. Later he was promoted to the designing of new tools and machinery. Then with the Standard Oil Co. as chief draftsman and designer. Mr. McCarty's first acquaintance with Canada was on the sales force of the Standard Oil Co. In 1910 he joined the Tait-Jones Company, Pittsburg, but still worked on the Canadian field, and during this time was admitted as a member of the A.S.M.E.

In 1915 Mr. McCarty went with the Rudel-Belnap people, at the Montreal office, specializing on heavy machinery, special equipment, and drills. At the first of the present year he went with the John Morrow Co. as eastern representative and manager of the Montreal office.

Mr. McCarty has always been a student of mechanical affairs. So far as Canadian Machinery can learn, he has never had the peculiar sensation of being "fired," lives in Montreal and is bone dry, works hard, expects results, and gets them.

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## DECREASE SHOWN IN NET INCOME

**Annual Meeting of Canada Foundries and Forgings Held At Brockville**

The annual meeting of Canada Foundries and Forgings, Ltd., was held at Brockville on February 22, and several changes were made in the personnel of the directorate, among which are several new names. A heavy decrease in net income in 1920 was shown in the statement submitted to the shareholders. After allowing the usual deductions, including bond interest and other miscellaneous expenses, but before the payment of 7 per cent. dividends on the preferred stock, there remained a balance of $90,861. The balance available for application to preferred dividend requirement was equivalent to approximately 8.6 on the $960,000 of senior securities of the company outstanding. After disbursing the full year's dividends on the preferred there remained the amount of $15,053 to apply on the common, or equal to about 1½ per cent. against 10.7 in 1919, some 40 per cent. in 1918 and 54 in 1917.

Among the changes in the executive of the enterprise is noted the return of W. M. Weir, as president, succeeding T. J. Dillon, whose resignation was announced a short time ago. Mr. Weir retired from the position of president last year, but remained on the board. The board now stands as follows: Wm. M. Weir, president; Hon. George P. Graham, vice-president; Hon. W. J. Shaughnessy, Montreal; Lt.-Col. C. M. Monserrat, Ottawa; W. T. Sampson, Gananoque; Lt Col. C. W. McLean, W. D. Robb and B. F. Conway, Montreal; James Arnold, general manager, Brockville; and J. H. Briggs, Brockville, the latter being also secretary-treasurer.

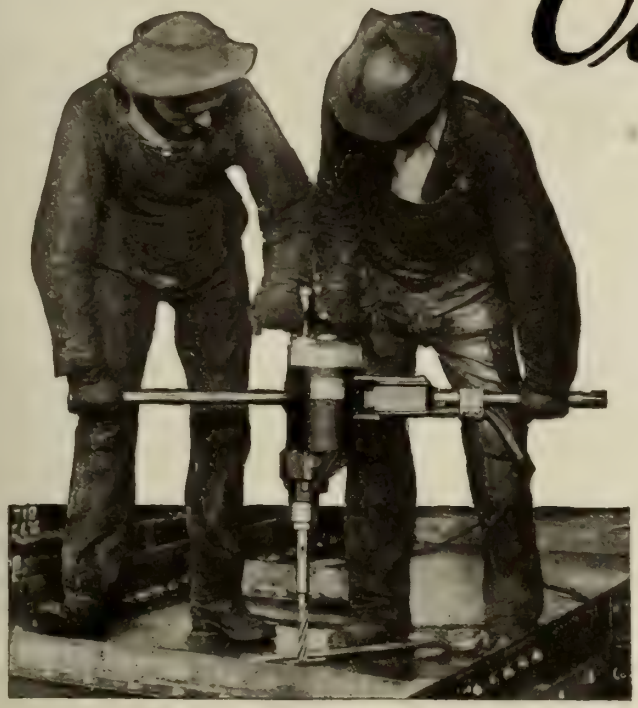
# Aikenhead's

A Manufacturer, in offering his products, must choose a worthy representative—else his products lose prestige.

Aikenhead's is Canadian Headquarters of many of the world's largest manufacturers of fine tools.

Two well-known samples are shown below.

## Van Dorn ELECTRIC TOOLS

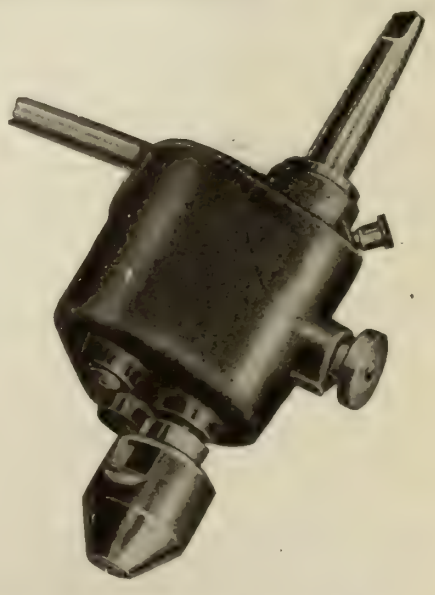


Van Dorn Electric Drills make neat, clean holes 50 per cent. faster than the best pneumatic drills.

For 15 years Van Dorn Electric Drills have been the recognized standard by which all portable electric drills are judged. They are both fool and trouble proof. Such quality insures continuous service on your work.

**Buy them at Aikenhead's.**

## WAHLSTROM'S Tapping Attachment



Why stick to the old slow and expensive practice of Hand Tapping when you can do the same work in one-tenth the time with a Wahlstrom Automatic Tapping Attachment? It imitates the simple to-and-fro motion of hand-tapping and will tap holes as squarely as they could be drilled. For tapping in soft materials the oscillating motion can be changed to a continuous revolution.

Made in two sizes. No. 1 takes taps of all sizes from 5.40 to 1-2 inch standard. No. 2 takes taps from 1-4 inch to 3-4 inch. **Buy them at Aikenhead's.**

## Aikenhead Hardware, Limited

**17 Temperance Street, Toronto, Ont.**


*If interested tear out this page and place with letters to be answered.*

# FEAR MERGER MAY INTERFERE WITH DEVELOPMENT IN PICTOU

THE resignation of Felix Notebaert as general manager of the Acadia Coal Co., Ltd., has called for some criticism in the east, and there are those who see in it a letting up of certain developments that are much desired, especially in Pictou County.

In a recent issue the Evening News of New Glasgow said:

"* * * * The proposed British Empire Steel merger was never particularly popular in Pictou County. The general feeling was that Nova Scotia could work out its own salvation and that it could best do so by big developments in its native county.

"In a word, the public believed that with Mr. D. H. McDougall at the helm the future of Trenton and New Glasgow was assured, that with Mr. Notebaert as his lieutenant at the collieries the future of Stellarton, Westville and Thorburn was also assured, and that what has been done heretofore was only an earnest of what the future had in store for us.

"That Mr. D. H. McDougall will grapple with the situation and straighten matters out is generally hoped. The public have confidence alike in his ability and in his sagacity. He has handled other situations just as trying and come out on top. What the people of Pictou County now want and expectantly look to him for is (1) no entangling alliance which would imply that the identity of Scotia would be lost, (2) a policy of expansion at Trenton, and (3) continued and accelerated expansion of the Acadia collieries with Mr. Notebaert as general manager for many years to come.

"Mr. Notebaert, we may say in conclusion, may have an idea that the people of Pictou County would rather have a "native son" or a man of English descent in charge of the Acadia collieries. There was a time when that feeling did exist, there was a time when we thought so and said so, but by sheer force of his personality, by his splendid record, particularly as a mining expert, and by his fair treatment of his employees, Mr. Notebaert has not only worn down adverse sentiment, but he has also won a place in public esteem so marked that the consensus of opinion is that he cannot be replaced, and that he must not be allowed to go if there is any way under Heaven of preventing it."

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**Start to Work.**—A number of the employees of the Hercules Rubber Co., Ltd., Brampton, Ont., commenced work on Monday. Mr. Fairty, the manager, is hopeful that the full staff will be taken on in the course of a couple of weeks. Orders for spring delivery continue to come in and prospects for the coming season are bright.

### BROKEN HILL PLANT CLOSED

A cablegram from Melbourne, Australia, reports that the New Castle Steel Works of the Broken Hill Proprietar, Co., Ltd., has been closed on account of the strikes at the mines of the company. The New Castle Steel Works employs about 5,000 men. During the year ending May 31, 1920, the company produced 296,000 tons of pig iron from two furnaces with a combined capacity of 1,000 tons daily. An additional furnace of 500 tons daily capacity has since been added and preparations are under way for the installation of a fourth blast furnace.

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# MR. J. N. TALLMAN DIES IN HAMILTON

**President of the Tallman Brass and Metal Co., and Was in Business For Quarter Century**

Joseph Nelson Tallman, well-known brass manufacturer and president of the Tallman Brass and Metal, Ltd., Hamilton, died at St. Joseph's Hospital. Mr. Tallman had been ailing for some time past but the news of his death will come as a shock to a wide circle of friends. He was born in Hamilton on North John street 73 years ago and had been a resident here practically all his life. He was a member of the First Methodist Church and held the office of trustee and member of the quarterly board of the church for a number of years. He was one of the oldest members of the A.O.F. and Chosen Friends, but during the last few years did not take an active part in these organizations. In 1896 Mr. Tallman purchased the brass business on North Wellington street from William Hunter and since that time has enlarged the plant, which is now situated at the corner of Sanford avenue and Wilson street.

In business circles deceased was well known and he took a very active and prominent part in the management of his firm until his last illness. He is survived by his widow, two sons, William and A. H., of Hamilton; three daughters, Mrs. W. B. Anstey and Mrs. R. Hill, of Hamilton; and Miss Alma, at home; one brother, Walter H., of Penetang, and three sisters, Mrs. L. Bowron, of Hamilton, Mrs. C. Duff, of Ancaster, and Mrs. D. Woon, of Toronto.

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### POURING 50 TONS

Continued from page 87

be let loose, some of the brickwork taken out. That fifty-ton mass was going to cool off, and it had to have a chance to contract evenly—otherwise, in plain talk, something might bust. And so little by little things will be stripped and taken away until that hundred thousand-pound chunk is ready to be heaved out of its pit and travel off with the rest of the trinkets that go with it to make up the world's largest dynamo. Some of these trinkets have been finished. One of them was sitting on a flat car, but how that car was going to get out of the door was more than I could tell, unless they took a bite out of the wall.

But the iron men talk in tons up at that shop just now. This piece is forty tons, that one seventeen, another a mere trifle like thirty or so. Finished, it will be around 300 tons.

It's a real man's job turning out such work as is being done at the Allis-Chalmers shop just now.

# CALLS IT BUSINESS IMMORALITY

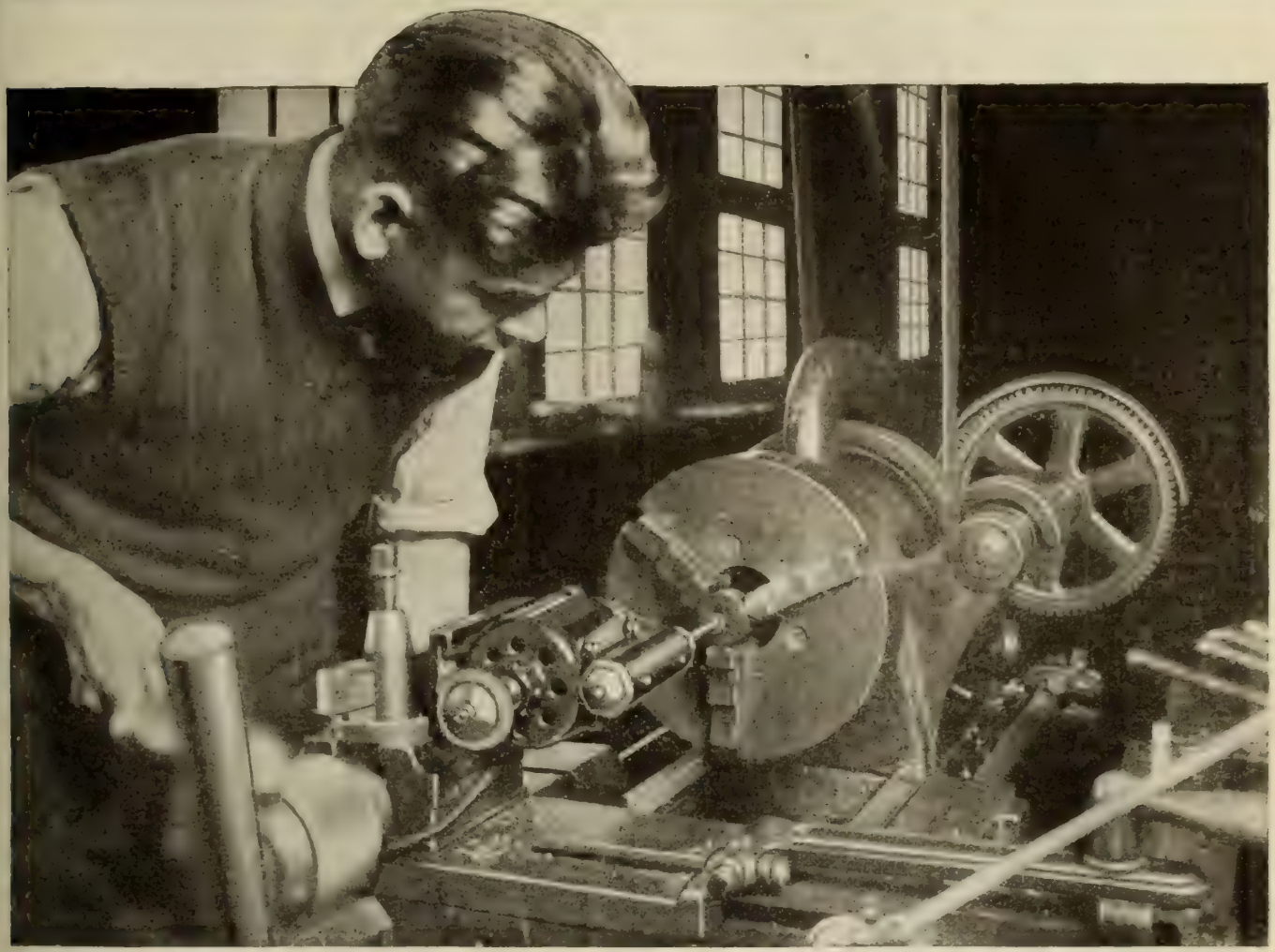
By CHARLES PIEZ, President Link-Belt Co., Chicago

ONE of the discouraging, if not alarming, symptons attending the present business depression is the attitude of the merchants, dealers and jobbers on the subject of cancelling orders. While a sudden and severe reduction in demand may warrant a distributor in holding up or cancelling an order, there is absolutely no justification for the position taken by many distributors that they can cancel or reduce orders without incurring any obligation.

If manufacturers are going to permit distributors to escape responsibility for losses involved in cancellations, then they will encourage overpurchases in the future, with the loss and derangement to business which such overpurchases and consequent cancellations involve.

It is only when a merchant, dealer or jobber realizes the responsibility he is under when he places an order, that he will investigate conditions before he buys, and base his order on an intelligent estimate of the demand.

The widespread feeling that orders can be cancelled with impunity must be cured by a more vigorous and definite insistence on accountability for losses involved; for it is essential to the continued soundness of our business structure that this piece of business immorality be permanently stamped out.



# Grinding Diameters on Ring Gages to Close Limits

In the Terry Turbine Company of Hartford, Conn., Dumore Grinders are used on jobs where accuracy is of the utmost importance.

The job shown here is a special Gage—diameter .750-in. with plus or minus limits of .0002 in. Because the Dumore grinds to extremely close limits it is just the tool for work of this character. Besides, the ease with which it can be set up for service wherever necessary gives it an advantage over other methods of handling many kinds of work.

Dumore Grinders can be used anywhere, taking their power from the nearest lamp socket; extremely simple and durable, they offer an economical method for accurately finishing work without changing the setting.

See the Dumore at work. Ask a man who uses one. Or have your dealer give you a demonstration.

## Wisconsin Electric Company

**2933 Sixteenth Street - Racine, Wisconsin**

# DUMORE HIGH SPEED GRINDERS

*If interested tear out this page and place with letters to be answered.*

## B. C. PAYS BOUNTY FOR PIG IRON NOW

**On Finished Iron From B. C. One Company Will Get $3 Per Ton**

Victoria.—To encourage the establishment of the iron and steel industry in British Columbia, the Provincial Government has entered into an agreement with the Coast Range Steel, Limited, whereby the Government promises to pay bounties not exceeding $3 per long ton on pig iron manufactured from ore mined in the province. The agreement sets forth that British capitalists are prepared to invest the necessary capital, "not exceeding £10,000,000," in the establishment of the industry. Engineers are now investigating the resources to ascertain if conditions are suitable for the establishment of the industry.

## NEW PRICES NAMED BY READING CO.

Reading, Pa.—At the annual election of officers and directors of the Reading Iron Company, one of the largest independents in the East, prices were substantially cut, effective March 1. The company operates nine plants here, at Columbia, Pottstown, Birdsboro' and Danville.

The company announced a reduction of from $8 to $10 a ton in the selling price of tubular products. The price of cut nails and bar iron was reduced several weeks ago. These reductions are made with the hope that they will bring in orders sufficient to run the plants at a better rate of production. Orders received during the last two months were the lowest in the history of the company, and unless orders are received the outlook is not bright.

## GOING AHEAD TO LOCATE COAL

Reports of provincial analysts and other kinds of geologists have not cooled the ardor of those who believe there is coal around Shelburne, Dufferin County.

A while ago investigations were made, and as a result a very discouraging report was made to the effect that the chances of finding coal in such surroundings were nothing at all.

The sequel comes in this announcement in the Official Gazette:

Two million dollars is the authorized capital of the Chamberlain Coal and Oil Development Co., Ltd., which has been granted letters patent and will have its head office in the village of Shelburne.

The new company under its charter is authorized (a) To acquire, own, lease, prospect for, open, explore, develop, work, improve, maintain and manage mines and mineral lands and deposits; and (b) to take, acquire and hold as consideration for ores, metals or minerals, including oil and gas, sold or otherwise disposed of, shares, debentures or other securities and to sell and otherwise dispose of the same; with a capital of two million dollars, divided into two million shares of one dollar each; its head office at the village of Shelburne, in the county of Dufferin.

## ENGINEERING

**New Company.**—The Canadian Toledo Scales Co., Ltd., has been incorporated with head office at Windsor and capital stock of $350,000 to carry on the business heretofore carried on in Canada by the Toledo Scale Co. of Toledo, Ohio, and to carry on the business of mechanical engineers and dealers in and manufacturers and operators of plants, engines and other machinery, including scales and weighing and testing machines of all kinds.

**Want Guarantee.**—The National Shipbuilding Company, of Goderich, which was organized in 1917 to build trawlers to the order of the British Admiralty for use in the North Sea, are asking the town council of Goderich to guarantee a bond issue that has been created on the property and assets of the company. The organization is perfecting and manufacturing a flax-pulling machine of the Vessot model, on which the patent rights are held both in Canada and abroad. Marine engines and boilers were made for the Imperial Munitions Board, t French government and the Unit States Emergency Fleet Corporatic Before the shipbuilding industry beg to subside, the National Shipbuilding C turned its attention to the manufactu of the flax-pulling machine. In aski the municipality to guarantee the bo issue, the company points to its reco including wage payments aggregati $400,000 for three years and nine mont ending December, 1920.

A large British factory, which w erected during the war chiefly for t production of "dope" or varnish for aer plane purposes, is turning its attentic to the application of these and oth products as peace time products. It h been found that this aeroplane dop makes an excellent insulating varni for electrical machinery. Further, pap strips drawn through the solution b come impregnated with it and are the suitable for winding on copper wires t make "paper-insulated" cables for tel phone and electric power purposes. A tificial silk, which can be braided on t wires instead of the natural silk, is als produced; and still another possible lir of development is in the molding of ele trical connections in celluloid, which ha a very high electrical resistance and non-flammable even when exposed t the heat of a fierce flame. All thes products are "synthetic"; that is to sa they are built up by chemical processe from simple constituents.




Adapted from "N.Y. Evening Post."

**HE DOESN'T GET THE ATTENTION HE USED TO.**

# MORROW!

## It Means So Much to You to Say "MORROW'S" When Ordering Drills





*TAKE NO OTHER---*
*MORE HOLES*

Please Note Our New Montreal Address is :
**John Morrow Screw and Nut Co., Limited**
489 St. Paul Street West
MONTREAL, QUE.
*Telephone :* Main 8418

Set and Cap Screws, Semi-Nuts, Engine Studs
P-H and IMPERIAL FILES
*Nothing Better*

WORKS AT
# INGERSOLL

*If interested tear out this page and place with letters to be answered.*

**Upon the Health of your employees depend your profit and production**



**Throw out the germ-laden Drinking Cup!**

**Give your men a clean drink**

**PURO** SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)



Allows just the proper amount of cool, clear fresh water to come through the bubbler. No splashing, overflowing, no loss. "Puro" regulates itself. "Puro" saves 35% on water bills, too. You can attach it in a few minutes. Tell us how many men, how many departments and we'll tell you how much the cost will be.

**Puro Sanitary Drinking Fountain Co.**

*Canadian Agents:*

**McKENZIE BROS.**

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Holds over 850 lbs. 22 inches from center of swivel block. This means heavier cuts and more production. Over 2000 satisfied users all over the world.

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MANUFACTURERS REQUIRING MACHINERY can with advantage obtain speedy delivery, through our Surplus Plant and Machinery Dept., constituted some years ago for the handling of Surplus Plant, of Boiler Works, Ship Yards, Engineering Works, etc. New or Good Used Plant as required. Please send enquiries. Pillatt & Co., Ltd., Stapleford Iron Works, Nr. Nottingham, England.



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*Consulting and Designing* — Tools, Jigs, Fixtures and Special Machinery. Let us shoulder your problems.

17 MAIN ST. EAST, HAMILTON


## TRADE GOSSIP

A sheet metal shop will be built by E. Batisti, 140 McEwan Ave., Windsor, Ont.

The Board of Control is contemplating the erection of a garage on Lombard St., Toronto.

The Transparent Rubber Co., on Danforth Ave., Toronto, will rebuild their factory which was recently destroyed by fire.

A new industry has opened a factory at Selkirk, Man., and is known as the Canadian Insulation Company. The head office is in Winnipeg.

Ellis-McIntyre Motors Ltd., Hamilton, Ont., has been incorporated with a capital stock of $150,000 to manufacture automobiles, trucks, tractors, etc.

The Monarch Industries, Ltd., Beamsville, Ont., has been incorporated with capital stock of $300,000, to manufacture registers, carburetors, motors, etc.

Plans are being prepared by Downing and Kayll, architects, 525 Seymour St., Vancouver, for the erection of a hotel to cost $1,500,000 for an Eastern syndicate.

J. M. Schneider & Son, 63 Courtland Ave. E., Kitchener, Ont., are building a garage costing $10,000. W. H. E. Schmalz, architect, Frederick Street, is preparing the plans.

A new firm, known as the Drifting Sand Filters, Ltd., has been recently incorporated with head office at Toronto. Filters such as those installed at Toronto Island will be manufactured. Mr. E. L. Cousins, manager of the Toronto Harbor Commission, is the president.

It has been stated that tenders will be called shortly for alterations and addition to building at an estimated cost of $40,000 for L. R. Steel Co., Ltd., Royal Bank Building, Toronto. The architects are Gardiner and Mercer, 718 Granville St., Vancouver.

Plans are being prepared and bids will be called in the near future for airplane hangars and a machine shop to cost $75,000 for the Dominion Government Militia Department, Ottawa, Ont., to be erected at Vancouver, B. C. Major McLaurin, Hotel Vancouver, Vancouver, B.C., is superintendent of Jericho Station.

The Westinghouse Electric and Mfg. Co., East Pittsburg, has announced a wage adjustment, effective March 1, which cuts the present pay of workmen approximately 15 per cent. The announcement, made by H. P. Davis, vice-president in charge of operations, states that the cut is due to competitive market conditions, the decline in prices and the decrease in volume of business.

---

The death occurred on February 26 of G. R. Baker, 615 Huron St., Toronto, who for many years had been a member of the engineering firm of Westman and Baker. He was an active member of the Lakes Association of Muskoka, and commodore of the Toronto Canoe Club.

## PERSONAL

Joseph Pearce, Brockville, Ont., has retired after forty-eight years of service as locomotive engineer on the Grand Trunk Railway. His period of service dates from the time of wood burners which he fired on the old Brockville and Ottawa Railway. Since 1875 he has been with the G. T. R. in freight service between Brockville and Montreal.

A Welland despatch says: It is announced that T. J. Dillon has resigned from his position as president, general manager and director of Canada Foundries & Forgings, Limited, with plants at Brockville and Welland, which over a period of years under his management has been built up into one of the strongest Canadian manufacturing institutions, with an enviable reputation and records for earnings. Mr. Dillon is well known amongst the manufacturers in this country as one of the leading steel men. He will interest himself vigorously in manufacturing different lines of steel products in Welland and the Niagara district. "I am going to operate right around Welland," said Mr. Dillon, "and help to make this a bigger and better city to live in."

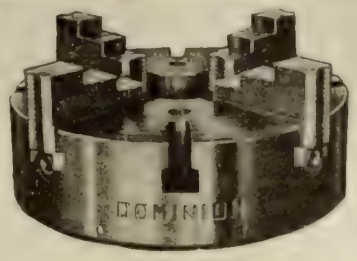
## MACHINE SHOP PRACTICE

A rather interesting book, entitled "Elementary Machine Shop Practice," has been issued by the D. Van Nostrand Co., 8 Warren St., New York. This is really a text book presenting the elements of the machinist's trade, and the author, James A. Pratt, who is a mechanical engineer, is also director of the Williamson School of Mechanical Trades. The price of the book is $2.50 and it is well illustrated throughout, in fact there are over 200 illustrations.

Briefly, here are the contents in chapters: Bench and Bench Work; Supplies and Miscellaneous Tools; Hardening and Tempering; Machine Adjustments; General Tools; Lathe Tools; Lathe Backrest, Follow Rest, Compound Rest, and Eccentric Turning on Lathe.

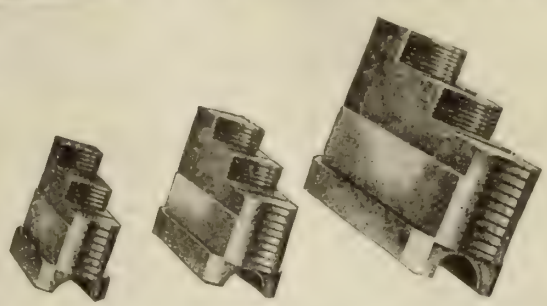
Drill press, shaper, slotter, grinder, and miller work; also problems in gearing. Planer work, machine shop calculations and machine glossary, including tables, etc., etc.

At the end of each chapter is a number of questions which the reader should be able to answer for his own peace of mind, if he has been intelligently reading the contents. This is a good idea, for it has the tendency of making the reader be careful in his perusal. There are many existent who believe a short reading of a technical book should make them more efficient immediately. This is not so, for to get the most out of any book, especially a technical book, you must not only read, but study the contents. Taken in all, this book should interest the budding mechanic who is anxious to get on.

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BUILT FOR HEAVY DUTY



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WIRE SPRINGS OF ALL KINDS

Machine Springs, Valve Springs, Automobile Cushion Springs, etc., of a quality that defies competition. Tell us your requirements. Send sample or specification for price.

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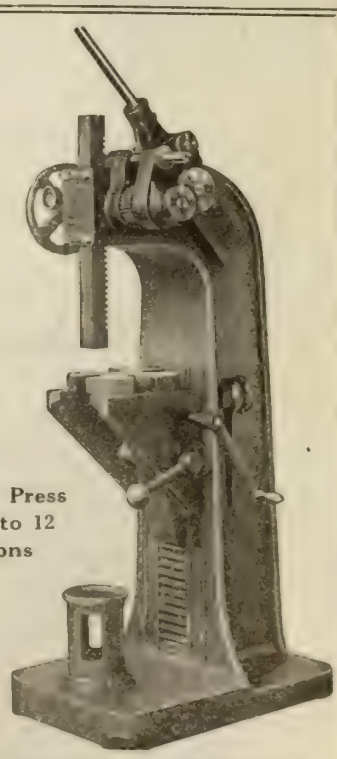
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TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (ctfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

## FOR SALE

FOR SALE — COMPLETE EQUIPMENT FOR the manufacture of Bench and Machine Vises, including patterns, jigs, templates, special tools, etc. Going out of the manufacturing business on account of ill health. Bargain for quick sale. This is a production proposition, specially suitable for plant with foundry and wishing to add profitable additional line with well established connection. Apply Box No. 756, Canadian Machinery.

BOILER FOR SALE — CAPACITY 150 H.P., horizontal tube size 72" x 16 feet long, working pressure 110 lbs. steam. Government inspection certificate. Apply The Steel Company of Canada, Limited, Canada Works, Hamilton, Ont.

### FOR SALE

Perfected rotary engine valve, simple design, free from defects common in rotary valves. Patented Feb. 20, 1917. Can be inspected at and purchased from H. W. Petrie Limited, Toronto.

### FOR SALE

Enclosed liquid fuel combustion apparatus capable of generating intense heat in pipes and confined passages for heating parts of internal combustion engines and for other uses; spark ignited; blower operated. Patented April 3, 1917. Can be inspected at and for sale by H. W. Petrie, Limited, Toronto.

### Re-Built Machinery For Sale

1—24" x 12' Canada Machinery Lathe.
2—22" x 10' Davis Lathes.
1—21" x 10' London Lathe
1—20" x 8' C.M.C. Lathes.
1—18" x 8' Mueller Lathe.
1—18" x 8' London Lathe.
3—18" x 8' C.M.C. Lathes.
1—16" x 6' McDougall Lathe.
1—14" x 8' London Lathe.
1—14" x 6' Flather Lathe.
2—No. 1 Racine Hack Saws
4—20" McDougall Drills.
1—22" Barnes Drill.
1—28" Barnes Drill.
1—D-1 H.D. Colburn Drill.
2—No 24 H.D. Foote-Burt Drills.
1—16" C.M.C. Shaper.
1—24" Rockford Shaper.
2—2" x 26" Pratt & Whitney Turrets.
1—10" x 52" Plain Landis Grinder.

**Specifications and prices sent upon request.**

**Yeates Machinery, London**

**Hale St., London, Ont.**

## HELP WANTED

WANTED AS ASSISTANT EDITOR, ON group of technical papers, live-wire mechanical engineer. Qualifications required are: Age, under 45; good education; certain amount of practical experience; ability to express ideas on paper; good mixer and aggressive worker. Splendid opportunity for the right man. State full particulars in first letter, mentioning present salary. Box 152, Canadian Machinery.

## POSITIONS WANTED

YOUNG MAN, MARRIED, 35 YEARS, AMERIcan, technical and metallurgical training, tool room foreman, superintendent or manager. Position where opportunity assured. Combined shop and office experience. Box 65, Canadian Machinery, 128 Bleury St., Montreal. (c9m)

I WILL BE IN A POSITION WITHIN TWO weeks to accept charge of a drop forge, or machinery blacksmithing plant. Can design all types of bending and forming dies, and have had 30 years' experience in this class of work. Box 753, Canadian Machinery.

MECHANICAL ENGINEER WITH 16 YEARS' experience in mechanical shops and drawing offices, executive for the last 7 years, and 2 years' selling experience, is looking for responsible position with good manufacturing concern. Familiar with building construction, plant maintenance, fire protection, and efficiency principles. Age 35. Box 754, Canadian Machinery. (c9m)

### Modern Marine Machinery

Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

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Light and Medium-Bench and Floor Repetition Castings: Capacity 15 tons per day.
Expert Metal and Wood Pattern Work. Our advice and estimates will save you money.
Semi-finishing operations on Lathe or Grill on Castings supplied if required.
ASK US.

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### REGO WELDING *and* CUTTING APPARATUS

Oxygen, Acetylene, and a complete line of Welding and Cutting Supplies.

**Carter Welding Co. of Toronto, Limited**

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WANTED—NEW AND RE-MANUFACTURE gas and gasoline engines, boilers, saw-mi machinery, planing mill and sash and door fa tory machinery. New and manufactured iro and wood-working machinery. Electric motor dynamos, direct connected steam operated gener tors, portable electric tools. Builders' hoists, el vators. Box 739F, Canadian Machinery.

IF YOU HAVE IRON-WORKING OR WOOI working machines for sale, or idle machir shop equipment, call or write Canada's large dealers in new and used machinery. H. V Petrie Limited, Toronto, Ont. (cfm

ONE SINGLE STAND 9 x 18 ROLL IN GOO condition; one receiving separator, capaci about 1,000 bushels per hour. Crane Bros., 81 Ferry St., Niagara Falls, Ont.

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Advertisements under this heading will be inserted once free of charge. Readers are invited to use this department when in need of equipment. Replies may be sent to box number, care of Canadian Machinery, if desired.

### MACHINE WORK WANTED

We are equipped to handle all kinds of general or special machine work. All operations in our plant are done under the most careful supervision and we can satisfy you as to price. Always available for consultation.

**PERFECT MACHINE COMPANY, GALT**

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**One 14" x 9" x 12" CANADIAN INGERSOLL-RAND two-stage Intercooled Air Compressor, capacity 400 cubic feet per minute at 220 r.p.m. 100-lb. pressure, complete with 75 h.p. motor and 3' x 9' air receiver. In excellent condition. Price $1,250.**

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## JOBBERS and DEALERS
### Engineering Supplies

There is absolutely no reason for paying exchange on your purchases of asbestos packings, gaskets and tape. We manufacture a line that is equal to any imported article and sold to jobbers at a price that allows a good margin of profit with protection. If you are not handling our line you are working at a disadvantage. Write us for set of samples, circulars and prices.

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Tiger Superheat
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## THIS WEEK'S SPECIALS

*Equipment That Pays For Itself in Service*

**2 26′ x 12′ C.M.C. Lathes, 3 step cone, D.B.G., Q.C.G., compound rest and hollow spindle with extra tool post turrets and quick return, now under belt.**

**No reasonable offer refused.**

You do not need to wait for falling prices—you are the judge and jury.

If you need machines as badly as I need the money, it is time for you to come in.

***Our motto is to supply our patrons with tools of first grade quality at low prices.***

**R. S. HOLLY**
SUITE 502 KENT BUILDING PHONE ADEL. 3147
TORONTO, ONTARIO

## Buy the Brand Your Work Requires

# ELK FIRE BRICK

Are made in a great variety of mixtures and chemical compositions, and when you order a certain brand of **Elk** you may be sure that it is the one brand to give you the best results. We never recommend a high-priced brick if a lower-priced brand will give equal service.

### OUR BRANDS

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| "Elkco" | "St. Marys" | "Elk Dust" |
| "Elkco" Special | "Keystone" | "Keystone Dust" |
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It is time to make the acquaintance of ELK quality and reliability. Large stocks from our warehouses at Hamilton are now available.

**Elk Fire Brick Company of Canada Limited**
Sun Life Building, HAMILTON, ONTARIO

*STOCK SHIPMENTS*

# AUTO BODY SHEETS

**18 Ga. 38″ x 96″ Regular — Oiled**
**20 Ga. 30″ x 96″ Regular — Oiled**
**22 Ga. 30″ x 96″ Deep Drawing— Oiled**
**23 Ga. 30″ x 96″ D. D. Silver Finish.**

## COLD ROLLED STRIP STEEL

**BLACK AND GALVANIZED SHEETS; BRASS AND COPPER SHEETS, RODS, TUBES; FLEXIBLE STEEL STEAM HOSE; COLD FINISHED STEEL BARS; TIN PLATE.**

***We Solicit Your Enquiries***
***Lists Sent on Application***

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237 Dufferin St., TORONTO, Canada

# Classified Opportunities


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### If You Want Machine Equipment, Send Us Your Enquiries

**We have one of the largest stocks of new and used metal and woodworking machines in Canada.**
**Many machines only very slightly used and all absolutely guaranteed.**
**A few machines from our Toronto stock at exceptionally attractive prices are:**

**LATHES**

1—30" x 12' "Blaisdell" (used).
1—30" x 14' "Niles-Bement-Pond" (used).
1—26" x 14' "Niles-Bement-Pond" (used).
1—24" x 10' "Milwaukee" (new).
1—18" x 8' "Rae" (new).
1—16" x 6' "Reed" (used).
1—12" x 8' "LeBlond" Tool Room (used).
1—8" "Rivett" Cabinet Type, full attachments (used).
1—7" "Cataract" Precision (new).

**GAP LATHES**

1—38" x 54" x 12' Bertram (used).
1—22" x 40" x 16' McDougall (used).
1—21" x 30" x 7' South Bend (used)
1—20" x 38" x 12' C.M.C. (used).

**TURRET LATHES**

No. 4 Millhollands, capacity 1¾" (used).
Several Oliver & Davis Turrets, various capacities (used).

**SHAPERS**

1—16" "MacKenzie" B.G. Crank Shaper, (new).
1—16" "Rae" B.G. Crank Shaper (slightly used).
1—24" "McGregor-Gurley" B.G. Crank Shaper (used).

**PLANERS**

1—42" x 42" x 20' Putnam, 1 head (used).
1—30" x 30" x 10' Pond, 1 head (used).
1—24" x 24" x 6' Powell, 1 head (new).

**MILLING MACHINES**

1—Briggs High Duty Type "A" 22" Traverse (new).
1—Briggs High Duty Type "B" 42" Traverse (new).
1—Whitney Hand Miller, 18" x 6" table (used).

**DRILLS**

2—10" Burke Sensitive (Bench type) (new)
1—15" Barnes (used).
20" "Sibley," "Champions," "Rockwell" and "Silver" (new) and (used).
1—36" C.M.C. Heavy Duty (used).
1—3-spindle 20" Silver Gang Drill (used).
1—4-spindle W. & R. Sensitive (used).

**BORING MACHINES**

1—66" Bement-Niles Vertical, 2 heads, 24" under rail (used).
1—Universal No. 2½ Horizontal Table, 42" x 22" (used).
1—Bullard "New Era" Vertical Turret, 36", complete equipment (new).

**POWER HACK SAWS**

1—No. 10 Racine 8" x 8" Cap. (new).
1—No. 7 Watkins 9" Cap., 18" Blade (used).
1—6" x 6" Racine (used).

**AIR COMPRESSORS**

1—12" x 12" Bury, Class "L," Belt driven (used).
1—8½ x 8" Sullivan, Class W.G.-3, Belt driven (used).
1—8 x 10 x 8 Bury, Steam driven (used).
1—3" x 1½" x 3 American Steam Pump Co., motor driven (used).

**MISCELLANEOUS**

1—Brown-Boggs No. 200, Power Press (new).
1—Lennox Rotary Bevel Shear, 1" Cap. (new).
1—"High Speed" Hammer, No. 3A (used).
1—Beaudry Champion Power Hammer, No. 9 (used).
1—"Grant" Riveting Machine, No. 80A (used).
1—"Grant" Riveting Machine, No. 80B (new).
1—Arbor Press, No. 4 "Greenerd" (new).

**GRINDING MACHINES**

1—Landis No. 4 Universal (used).
1—Landis Plain, self-contained, 36" x 12" (used).
1—Norton Plain, No. 434 (used).
1—Fitchburg Cylindrical 8" x 36" (new).
Several Tool and Cutter Grinders (new) and (used). "Globe," "Stevens," "LeBlond" and "Cincinnati."

**GARLOCK-WALKER MACHINERY CO., LIMITED**

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CANADIAN MACHINERY wants a representative in every town and city where there is a metal working plant or large machine shop.

We require first of all the ability to demonstrate to mechanics the value of reading technical journals in general and CANADIAN MACHINERY in particular, and to secure their subscriptions.

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**Canadian Machinery and Manufacturing News**

**143 University Ave. Toronto, Ont.**

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We shall also be pleased to quote for shipments direct from Birmingham, shipping in two weeks' time.

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## In
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| Pumps—all kinds | Dado Machines | |
| Precision Machinery | Safety Devices | |

**THESE ARE ONLY A FEW OF THE MANY ITEMS WE HANDLE**

*Let us quote on your requirements*

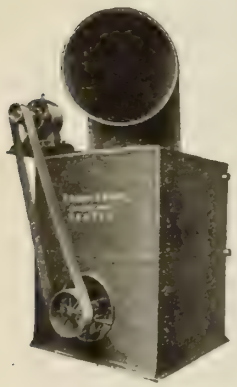
## THE CHARLES A. STRELINGER CO.
## OF CANADA, LIMITED

126 Ferry Street Windsor, Ontario

*If interested tear out this page and place with letters to be answered.*



# That Single Heater, With No Outside Pipes or Ducts, Keeps Our Whole Factory Warm"



"We've got all that open space out there—had all sorts of trouble keeping it warm. Naturally, I was a little bit skeptical until the Skinner Bros. salesman told me he would put in his heater on an absolute guarantee to keep all of the factory warm, all of the time—that if it failed we could return it and get back every dollar we paid. I told him to put it in. That was five years ago—since then we haven't had a bit of trouble—temperature is always right around 70 and we hardly ever run the heater more than three or four hours a day."

### Simple in Principle

The Skinner Bros. (Baetz Patent) Heater is an individual enclosed unit, with a series of steam coils compactly mounted above a powerful fan wheel. Cold air near the floor level, or from outside, is drawn into the heater by the fan, forced up and around the coils, and, after being heated, is gently distributed through the outlet hoods into the open building space. Uses live or exhaust steam—where steam is not available, we supply our direct-fired type, which burns coal, coke or wood.

The heater is portable—requires no special foundation—installation cost is 15% to 50% lower than any other type—operating cost is equally low.

Find out more about this heater. If you wish, we will send you names of users so you can make your own investigations.

### MECHANICAL DETAILS

**Built as an individual enclosed unit with a series of pipe coils compactly mounted above a fan wheel, and heated by exhaust or live steam. Cold air near the floor level is drawn into the heater by the fan, impelled upward and around the coils, and, after being heated, distributed through outlet hoods to every part of the open building space.**

**Large illustration at top shows direct fired type D-F, fired with coal, coke or wood.**

## SKINNER BROS. MFG. COMPANY, Inc.

**1438 S. Vandeventer Avenue, St. Louis, Mo.**

New York, 1706 Flatiron Bldg.; Indianapolis, 330 Occidental Bldg.; Boston, 449 Little Bldg.; Minneapolis, 806 Metropolitan Life Bldg.; Buffalo, 706 Morgan Bldg.

# Skinner Bros.
## Baetz Patent HEATING SYSTEM

**Skinner Bros. Mfg. Co., Inc.,**
**1438 S. Vandeventer Ave., St. Louis, Mo.**

Please send complete details on Skinner Bros. (Baetz Patent) Heaters to

Firm Name .....

Address .....

For what purpose building used .....

Can you use steam? .....

# Canadian Machinery BUYERS DIRECTORY

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**Abrasive Discs**
Norton Co. of Can., Ltd., Hamilton, Ont.
Oakey & Sons, Ltd., John London S E., Eng.
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Abrasive Materials**
Dom. Abrasive Wheel Co., Ltd., Milnico, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.
Wausau Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Acetylene, Dissolved**
L'Air Liquide Society, Toronto, Ont.

**Accumulators, Hydraulic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Air Lifts**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hewden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Air Purifiers and Coolers**
Sturtevant Co., B. F., Boston, Mass.

**Analyses, Chemical**
Toronto Testing Laboratory, Toronto, Ont.

**Angle Bars**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Anvils**
Alkenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Columbia Helve Division, Cleveland, O.
Peter Ltd., H. W., Toronto, Ont.

**Arbors**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Cleveland Twist Drill Co., Cleveland, O.
Lang Smith Machine Co., Hamilton, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
James Mfg Co., Hartford, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Pratt & Whitney Co., of Canada, Ltd., Dundas Ont.
Skinner Chuck Co., New Britain, Conn.

**Axles, Car**
Dom. Foundries & Steel, Hamilton, Ont.

**Babbitt Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
Macmillan Metal Co., Montreal, Que.
Parkman Brass & Metal Co., Hamilton, Ont.

**Balls, Brass, Bronze and Steel**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian SKF Co., Toronto, Ont.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

**Barrels, Tumbling**
Baird Machine Co., Bridgeport, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Bars, Boring**
Armstrong Bros. Tool Co., Chicago, Ill.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Madison Mfg. Co., Muskegon, Mich.

**Bars, Boring, Portable**
Underwood Corp., H. B., Philadelphia, Pa.

**Bars, Bronze Cored**
Moore & Son, Thos., Montreal, Que.
Parkman Brass & Metal Co., Hamilton, Ont.

**Bars, Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Bars, Steel**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Pilot Steel & Tool Co., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.

**Bearings, Ball**
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Railway Roller Bearing Co., Syracuse, N.Y.

**Bearings, Bronze**
Tallman Brass & Metal Co., Hamilton, Ont.
Railway Roller Bearing Co., Syracuse, N.Y.

**Bearings, Die-Cast**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Tallman Brass & Metal Co., Hamilton, Ont.

**Bearings, Journal**
Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Bearings, Roller**
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

**Belt Cement**
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

**Belt Clamps**
Graton & Knight Mfg. Co., Worcester, Mass.

**Belt Dressings and Fillers**
Alkenhead Hardware Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.

**Belt Fasteners**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Belt Lacing**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

**Belt Lacing, Steel**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing, Hinged**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing, Flexible Steel**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing Machines**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
McLaren Belting Co., J. C., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Belt Joiners, Conveyor**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Tools**
Graton & Knight Mfg. Co., Worcester, Mass.

**Belting, Chain**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Belting, Fabric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
McLaren Belting Co., J. C., Montreal, Que.
Sumner & Co., New York City

**Belting, Leather**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Smith Belting Co., Toronto, Ont.
Sumner & Co., New York City.
Tullis & Son, Ltd., John, Glasgow, Scot

**Belting, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.
Quaker City Rubber Co., Philadelphia, Pa.

**Belts, Abrasive**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.

**Bench Countershaft Standards**
Ford-Smith Machine Co., Hamilton, Ont

**Benches, Work**
Alkenhead Hardware Ltd., Toronto, Ont.

**Bending Machines, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bertrams Ltd., Edinburgh, Scotland.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Bins, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Blocks**
Ford Chain Block Co., Philadelphia, Pa.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Chain (See Hoists, Hand)**
Alkenhead Hardware Ltd., Toronto, Ont.
Ford Chain Block Co., Philadelphia, Pa.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Die**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Blocks, Pillow**
Can. Link-Belt Co., Toronto, Ont.

**Blowers**
Can. Blower & Forge Co., Ltd., Kitchener.
General Combustion Co. of Can., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Bolt and Nut Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Bolt and Nut Machinery, Automatic**
National Acme Co., Cleveland, Ohio.

**Bolts and Nuts**
London Bolt & Hinge Works, London, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Petrie, Ltd., H. W., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Bolt Threading Die Heads**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa

**Boosters**
Sturtevant Co., B. F., Boston, Mass.

**Boring and Turning Mills, Vertical**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.

**Boring, Drilling and Milling Machines, Horizontal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa.

**Boring, Drilling and Milling Mach., Vertical**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Boring Heads**
Alkenhead Hardware Ltd., Toronto, Ont.

**Boring Tools**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Gisholt Machine Co., Madison, Wis.

**Brakes, Magnetic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Brass**
Brown's Copper & Brass Rolling Mills Ltd., Toronto, Ont.

**Bricks, Fire**
Elk Firebrick Co. of Can., Ltd., Hamilton, Ont.

**Bridges**
Hamilton Bridge Works Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

**Broaching Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont

**Bronze**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Bronze, Phosphor**
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.

**Bucket Carriers, Pivoted**
Can. Link-Belt Co., Toronto, Ont.

**Buffing or Polishing Machines (See Polishing and Buffing Machines)**
Blount Co., J. G., Everett, Mass.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.

**Bulldozers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Burners, Oil and Gas**
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

**Bushings**
Fisher Motor Co., Ltd., Orillia, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Cabinets, Oil**
S. F. Bowser & Co., Ltd., Toronto, Ont.

**Calipers**
Brown & Sharpe Mfg. Co., Providence, R.I.
Starrett Co., L. S., Athol, Mass

**Cams**
Canada Foundries & Forgings Co., Welland, Ont.

**Can-Making Machinery (See Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

# BUYERS' DIRECTORY

**Cars, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Castings, Aluminum**
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Brass and Bronze**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Copper**
Can. Hanson & Van Winkle Co., Toronto, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Marine**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Castings, Die Molded**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Ferro-Alloy**
Can. Steel Foundries, Montreal, Que.

**Castings, Iron**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Hyd. Press**
Can. Steel Foundries, Montreal, Que.

**Castings, Monel Metal**
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

**Castings, Naval Bronze**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Nichrome**
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Nickel**
Can. Hanson & Van Winkle Co., Toronto, Ont.

**Castings, Semi-Steel**
Davidson Mfg. Co., Thos., Montreal, Que.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

**Castings, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Sweetland Crucible Steel Co. of Can., Ltd., Windsor, Ont.

**Cements, Iron**
Smooth-On Mfg. Co., Jersey City, N.J.

**Centering Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gardner-Walker Mchy. Co., Toronto, Ont.

**Chains (See Sprockets and Chains)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chains, Driving**
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chasers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chemists**
Toronto Testing Laboratory, Toronto, Ont.

**Chucking Machines**
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Chucks, Drill**
Jacobs Mfg. Co., Hartford, Conn.

**Chucks, Drill and Tap**
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Lathe**
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Magnetic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**
Columbia Hdwe. Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

**Cleaners, Metal, Waste, General**
Oakley Chemical Co., New York, N.Y.

**Clocks, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Clutches, Friction**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**
Can. Link-Belt Co., Toronto, Ont.

**Collars, Shaft or Set**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

**Collets**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Heudey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compressors, Air**
Curtis Pneumatic Machinery Co., St. Louis, Mo.

**Compressors, Air and Gas**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**
Ford-Smith Machine Co., Hamilton, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Conveyor Belt Joiners**
Flexible Steel Lacing Co., Chicago, Ill.

**Copper**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Cored Bronze Bars**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Cotter Pins**
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Counterbores**
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Countershafts**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Couplers, Car and Locomotive**
Can. Steel Foundries, Montreal, Que.

**Couplings, Flexible**
Holden Co., Ltd., Montreal, Que.

**Couplings, Rigid**
Bernard Industrial Co., A., Fortierville, Que.

**Couplings, Shaft**
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

**Cranes, Electric**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.

**Cranes, Hand (See Hoists, Hand)**
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

**Cranes, Locomotive**
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Cranes, Traveling**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Crank Pin Turning Machines**
Gardner-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia, Pa.

**Cutters, Flue**
Holden Co., Ltd., Montreal, Que.

**Cutters, Gear**
Armstrong-Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Milling**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Milling Machine Co., Cleveland.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.

**Cutters, Stay Bolt**
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Thread**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.

**Cutting-Off Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Cutting-Off Machines, Pipe (See Pipe Cutting and Threading Machines)**
Landis Machine Co., Inc., Waynesboro, Pa.
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Cutting-Off Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Pilot Steel & Tool Co., Montreal, Que.

**Cutting Oil Filters (See Oil Filtering Systems)**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Cataract Refining Co., Toronto, Ont.

**Cutting, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

**Cutting, Oxy-Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Dealers, Machinery (See Searchlight Section)**
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Deckle Straps**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Diamonds, Black and Rough**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond, Carbon and Bortz**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Desmond-Stephan Co., Hamilton, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Wheel Trueing Tool Co., Detroit, Mich.

**Diamond Crossings**
Can. Steel Foundries, Montreal, Que.

**Die-Castings**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Dies, Pipe-Threading**
Jones & Lamson Machine Co., Springfield, Vt.

**Die Sinking Machines, Automatic**
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

**Die Sinkers**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Screw and Thread Cutting**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

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IN CANADA

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6000 Tons

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stamped with our trade-mark mean fittings made with iron of high tensile strength — proper proportions and correct tappings.

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St. John, N.B.—H. G. ROGERS, 147 Prince William St.
Winnipeg—HARRY F. MOULDEN, Confederation Life Building
Vancouver, B.C.—CYRIL AMES, Wilton Block
Montreal and Toronto—From Head Office, Guelph, Ont.

# Sweeney and Reginald

SWEENEY the quick-footed, quick-thinking, rugged iron worker and Reginald the pride of the parlor are off—where's your money?



And yet you employ "Reginalds" to do your high speed reaming—pretty pedigreed reamers, expensive and brittle as a match—when high speed reamers with all the burly strength and speed of *"Sweeney"* are yours for the asking.

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Peerless High Speed Reamers are the "Sweeney's" of reamerdom—tough, gluttons for punishment, yet high speed from tip to toe. Peerless bodies are of a special tough alloy chosen especially to withstand shocks and tortional strains.

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*We Invite You to Try to Stump "Peerless"*
*With the Toughest Job in Your Shop.*

**The Cleveland Twist Drill Co.**

CLEVELAND NEW YORK CHICAGO

Agents for Europe, Cleveland Twist Drill Co., (Great Britain) Ltd.
36-37 Upper Thames St., London, E. C. 4.



# BUYERS' DIRECTORY

**Dies, Forging**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

**Dies, Hammer**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Self-Opening, Adjustable**
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Dies, Threading-Opening**
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Disc Cement**
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Dividing Heads**
Ackworthie, Ltd., John, Birmingham, Eng.
Dickow, Fred. C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Dogs, Lathe and Milling Machine**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drafting Boards and Tables**
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Drafting Materials**
American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Dressers, Grinding Wheel**
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Drill Holders**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drill Rods**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Drill Speeders**
Canada Machinery Corp., Galt, Ont.

**Drilling Machine Heads**
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

**Drilling Machines, Automatic**
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind

**Drilling Machines, Bench**
Beacon Engineering Co., Tipton, England.
Can Blower & Forge Co., Ltd., Kitchener.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Electric and Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Gang**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drilling Machines, Heavy Duty**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Multiple Spindle**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

**Drilling Machines, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Drilling Machines, Portable**
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Radial**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Drilling Machines, Sensitive**
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Turret**
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

**Drilling Machines, Vertical**
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill
Rockford Lathe & Drill Co., Rockford, Ill
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng.
Wanzer Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Drills, Center**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drills, High Speed Twist**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Drills, Twist and Flat**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.

**Dust Handling Equipment**
Can. Blower & Forge Co., Ltd., Kitchener.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Electrical Instruments**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Electrical Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O.

**Elevating Trucks (See Trucks)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Elevators and Conveyors**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Emery Wheels (See Grinding Wheels)**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Engines, Capstan**
Kennedy & Sons, Wm., Owen Sound, Ont

**Engineers, Mechanical**
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.

**Expanders, Tube**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Eyeglasses, Safety (See Goggles, Safety)**
Prest-O-Lite Co. of Can., Toronto, Ont.
Willson Goggles, Inc., Reading, Pa.

**Fans, Electric**
Can Blower & Forge Co., Ltd., Kitchener.
Northern Electric Co., Montreal, Que
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Exhaust**
Can. Blower & Forge Co., Ltd., Kitchener.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Sturtevant Co., B. F., Boston, Mass.

**Fans, Ventilating**
Can Blower & Forge Co., Ltd., Kitchener.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Sturtevant Co., B. F., Boston, Mass.

**Fibre**
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**File Handles**
Ingersoll File Co., Ltd., Ingersoll, Ont.

**Files and Rasps**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Filing Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Filler, Iron (See Cements, Iron)**
Smooth Mfg. Co., Jersey City, N.J.

**Fire Extinguishers**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Fittings, Pipe**
International Malleable Iron Co., Guelph, Ont.

**Flexible Shafts**
Aikenhead Hardware Ltd., Toronto, Ont.

**Flux, Galvanizing**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Fluxes, Welding**
L'Air Liquide Society, Toronto, Ont.

**Forging Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.

**Forgings, Drop**
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd., Toronto, Ont.

**Forgings, Hammer**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Foundry Equipment**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Foundry Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Frogs, Spring or Rigid**
Can. Steel Foundries, Montreal, Que.

**Fuel Oil Burning System**
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Heat Treating Coal**
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Oil and Gas**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bellevue Industrial Furnace Co., Detroit.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces and Ovens, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd Hiram, Walkerville, Ont.

**Furnaces, Tempering and Annealing**
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furniture, Machine Shop**
Garlock-Walker Mchy. Co., Toronto, Ont.

**Gages, Comparator**
Jones & Lamson Machine Co., Springfield, Vt.
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont.
Perdue, W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass.

**Gages, Measuring (See Tool Work)**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont
Starrett Co., L. S., Athol, Mass.

**Gages, Recording**
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.

# BUYERS' DIRECTORY

**Gages, Snap, Thread and Cylindrical**
Ackworthie, Ltd., John, Birmingham, Eng
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Standard**
Armstrong Whitworth Co. of Can., Lt Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis.
Johansson Inc., C. E., Windsor, Ont

**Gages, Thread**
Ackworthie, Ltd., John, Birmingham, Eng
Greenfield Tap & Die Corp., Galt, Ont
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Garnet, Emery and Flint Paper and Cloth**
Ritchey Supply Co., Toronto, Ont.

**Gas, Coal Compressed**
L'Air Liquide Society, Toronto, Ont

**Gas, Compressed**
Prest-O-Lite Co. of Can., Toronto, Ont

**Gaskets**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

**Gear Blanks**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario
Philadelphia Gear Works, Philadelphia, Pa.

**Gear-Cutting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

**Gear Testing Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Gears, Cast**
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

**Gears, Cut**
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hamilton Gear & Machine Co., Toronto, Ontario.
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Gears, Dressed**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Gears, Forged**
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Gears, Herringbone**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

**Gears, Machine Moulded**
Can. Steel Foundries, Montreal, Que

**Gears, Rawhide (See Gears, Cut)**
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear, Silent Chain**
Gardner & Son, Robt., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Can. Link-Belt Co., Ltd., Toronto, Can.
Hans Renold of Canada, Ltd., Montreal, Quebec.

**Gears, Worm**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.

**Generators, Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Generators, Electric**
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Goggles, Safety**
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

**Grab Buckets**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Grease Cups, Pressed Steel and Brass**
Can. Winkley Co., Ltd., Windsor, Ont.

**Greases, Lubricating**
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

**Grinding Discs**
Ritchey Supply Co., Toronto, Ont.

**Grinding Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Grinding Machines, Abrasive Belt**
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Automatic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Bench**
Aikenhead Hardware Ltd., Toronto, Ont.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Grinding Machines, Center**
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines Chaser**
Jones & Lamson Machine Co., Springfield, Vt.

**Grinding Machines, Cutter and Reamer**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Cylindrical**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Die**
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

**Grinding Machines, Disc**
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Drill**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Face**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Floor and Tool**
Beacon Engineering Co., Tipton, England.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Grinding Machines, Internal**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Portable**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Power Oscillating Tool**
Herbert Ltd., Alfred, Toronto, Ont.

**Grinding Machines, Ring Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Snagging**
Blount Co., J. G., Everett, Mass.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Surface**
Garlock-Walker Mchy. Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machinery, Tool Post**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Universal**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.

**Grinding Wheels**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Guards, Machinery and Window**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Guards, Electric Lamp**
Flexible Steel Lacing Co., Chicago, Ill.

**Gun-Barrel Machinery**
Steinle Turret Machine Co., Madison, Wis.

**Hack Saws, Power**
Ackworthie, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Hamilton, Canada.
Garlock-Walker Mchy. Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hammers, Chipping**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hammers, Drop**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

**Hammers, Electric**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Hammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Hammers, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hammers, Riveting**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hangers, Shafting**
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Terry & Co., John C., Birmingham, Eng.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hardening, Case-Hardening and Tempering**
Hamilton Gear & Machine Co., Toronto, Ont.

**Hardness Testing Apparatus**
Shore Instrument Co., Jamaica, N.Y.

**Heating**
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.

**Hobbing Machines**
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hobs**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Hoists, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

**Hoists, Hand**
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Hoists, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Holders-On, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Hose, Industrial**
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Hose, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Foamite Firefoam Co., Hamilton, Ont.

**Hydraulic Leather**
Graton & Knight Mfg. Co., Worcester, Mass.

**Hydraulic Machinery**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.

**Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Index Centers**
Dickow, Fred. C., Machinery Co., Chicago, Ill.

**Igniters, Gas Engine**
Canada Foundries & Forgings Co., Welland, Ont.

**Indicators, Speed and Test**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.

**Insulation**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Jacks, Hydraulic**
Norton, A. O., Boston, Mass.

**Jacks, Planer**
Armstrong Bros. Tool Co., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que.
Crescent Machine Co., Ltd., Montreal, Q.

# BUYERS' DIRECTORY

**Jigs and Fixtures (See Tool Work)**
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Keyseating Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg Co., Muskegon, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Keys, Machine**
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

**Knives, Machine**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Oliver Machy Co., Grand Rapids, Mich.
Simonds Canada Saw Co., Montreal, Que.

**Knurl Holders**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lacing Leather**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

**Lamps, Electric**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**Lathe Attachments**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.

**Lathe Pans, Portable**
Canada Machinery Corp., Galt, Ont.

**Lathe Tools**
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

**Lathes, Automatic and Semi-Automatic**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Bench**
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lathes, Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
McDougall Co., Ltd., R., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Engine**
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Sidney Machine Tool Co., Sidney, Ohio
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Walker Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Extension and Gap**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Lathes, Heavy Duty Projectile Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blaskill Wire Machy Co., Ltd., Montreal
Sidney Machine Tool Co., Sidney, Ohio.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio.
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Polishing (See Polishing and Buffing Machines)**
Ford-Smith Machine Co., Hamilton, Ont

**Lathes, Relieving**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Lathe, Universal Hand**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Lathes, Screw-Cutting**
Jones & Lamson Machine Co., Springfield, Vt.

**Lathe, Speed and Hand**
Blount Co., J. G., Everett, Mass.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich

**Lathes, Spinning**
Terry & Co., John C., Birmingham, Eng.

**Lathes, Threading**
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

**Lathes, Vertical Turret**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

**Lathes, Wood Turning**
Blount Co., J. G., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Lead Pipe**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Lighting Fixtures**
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

**Linoleum Mill Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Liquid Air Plants**
L'Air Liquide Society, Toronto, Ont.

**Lockers, Clothes**
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

**Lubricants**
Cateract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Lubricating Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Machinists' Small Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Manganese Steel**
Can. Steel Foundries, Montreal, Que

**Mandrels, Expanding**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Mandrels, Solid**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Measuring Machines**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Metals, Alloy**
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Tallman Brass & Metal, Ltd., Hamilton, Ontario.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Metalite Cloth**
Ritchey Supply Co., Toronto, Ont.

**Micrometer Calipers**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Milling Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Milling Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Milling Machines, Automatic**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Bench**
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Hand**
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

**Milling Machines, Horizontal and Planer Type**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal Q
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Milling Machines, Plain**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill
Terry & Co., John C., Birmingham, Eng

**Milling Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Milling Machines, Universal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Cincinnati Milling Machine Co., Cincinnati, Ohio
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Milling Machines, Vertical**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

**Monel Metal**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Motors, Electric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Moulded Rubber Goods**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Nail Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Nails and Staples**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Nickel, Bars, Sheets, Wire, Etc.**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Nickel Plating Outfits**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Nickel Silver**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Nitrogen**
L'Air Liquide Society, Toronto, Ont.

**Nut Tappers (See Bolt and Nut Machinery)**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

**Nuts, Finished and Semi-finished**
Galt Machine Screw Co., Galt, Ont.

**Nuts, S.A.E., Plain and Castellated**
Galt Machine Screw Co., Galt, Ont.

**Oil Filtering and Storage Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oil Storage Engineers**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oils**
Canadian Oil Companies, Ltd., Toronto, Ont
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Hole Covers**
Can. Winkley Co., Ltd., Windsor, Ont.

**Oils, Soluble**
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oxygen**
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont
L'Air Liquide Society, Toronto, Ont.

**Oxy-Acetylene Apparatus**
L'Air Liquide Society, Toronto, Ont.

**Packing, Hydraulic**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass
Guildford & Sons, Ltd., Halifax, N.S.

**Packing, Steam**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

**Paper Mill Conveyors**
Bertrams Ltd., Edinburgh, Scotland.

**Patents**
Fetherstonhaugh & Co., Ottawa, Ont
Marion & Marion, Montreal, Que

**Pans, Wet and Dry**
Frost Mfg. Co., Chicago, Ill.

**Pattern-Shop Machinery (See Woodworking Machinery)**
Canada Machinery Corp., Galt, Ont
Oliver Machinery Co., Grand Rapids, Mich.

**Patterns, Wood and Metal**
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Wraggis Pattern Works, Galt, Ont.

**Penstocks, Steel**
MacKinnon Steel Co., Sherbrooke, Que.

# BUYERS' DIRECTORY

**Phosphor Tin**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Photographic Duplicating Machines**
Commercial Camera Co., Providence, R.I.

**Pig Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Bending Machines**
American Pipe Bending Machine Co., Boston, Mass
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

**Pipe Couplings**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Cutting and Threading Machines**
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., B., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**
Landis Machine Co., Inc., Waynesboro, Pa.

**Pipe Fitters' Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa.

**Piston-Ring Machines**
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Planers, Parallels**
L. & P. Mfg. Co., Niagara Falls, Ont.

**Planing Machines**
Bertram & Son Co., Ltd., The John Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Planing Machines, Rotary**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Pneumatic Tools**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Blount Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Pots, Steel**
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont

**Pressed Steel Parts**
Ackworthie, Ltd., John, Birmingham, Eng
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Presses, Drop and Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Foot and Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

**Presses, Forcing**
Atlas Press Co., Kalamazoo, Mich.
Stewart & Co., Duncan, Glasgow, Scot.

**Presses, Hydraulic**
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

**Presses, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Protractors**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Propellers**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Pulleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal and Fibre**
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Pulp and Paper Mill Equipment**
MacKinnon Steel Co., Sherbrooke, Que.

**Pumps, Automobile Tire**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Pumps, Barrel and Boiler-feed**
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coalant**
Trahern Pump Co., Rockford, Ill.

**Pumps, Geared and Hand**
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

**Pumps, Lubricant and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., B., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener
Jardine & Co., A. B., Hespeler, Ont.

**Punches, Power**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

**Punching Machines, Horizontal**
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Racks, Cut**
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**
Holden Co., Ltd., Montreal, Que.

**Reamer Holders**
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

**Reamers, Expanding**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Reamers, Solid**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Reamers, Taper**
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Recorders, Temperature**
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Recorders, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Rheostats**
Northern Electric Co., Montreal, Que.

**Resistance Materials**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Respirators**
Willson Goggles, Inc., Reading, Pa.

**Rivets**
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Rivet Heaters**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.

**Riveting Machines**
Bilton Machine Co., Bridgeport, Conn.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**
Stewart & Co., Duncan, Glasgow, Scot.

**Rolls (Rubber Covered)**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rudder Frames, Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Rubber Goods, Mechanical**
Quaker City Rubber Co., Philadelphia, Pa.

**Rules, Steel**
Chesterman & Co., Ltd., J., Sheffield, Eng.

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R.I

**Rust Preventatives**
Oakley Chemical Co., New York, N.Y.

**Sand Equipment**
Can. Link-Belt Co., Toronto, Ont.

**Sand Mills**
Frost Mfg. Co., Chicago, Ill.

**Sanding Machinery**
Oliver Machy. Co., Grand Rapids, Mich.

**Sand Rammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Saw Frames and Blades, Hack**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Sawing Machines, Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Sawing Machines, Power Hack**
Ackworthie, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Saw Sharpening Machines**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saw Tables, Universal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Hot and Cold**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Saws, High Speed Steel**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Metal Band**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saws, Metal, Power**
Clemson Bros., Inc., Hamilton, Ont.

**Saws, Metal Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

**Saws, Milling**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Saws, Screw Slotting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Swing Cut-off**
Oliver Machinery Co., Grand Rapids, Mich.

**Scales**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal, Q.

**Screens**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Screw Driving Machine**
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Screw Extractors**
Cleveland Twist Drill Co., Cleveland, O.

**Screw Machine Work**
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
Tallman Brass & Metal Co., Hamilton, Ont.

# BUYERS' DIRECTORY

**Screw Machinery, Wood and Lag**
Cook Co., Asa S., Hartford, Conn.

**Screw Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Screw Machines, Automatic**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

**Screw Machines, Plain or Hand**
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio.

**Screw Plates**
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

**Screws, Cap and Set**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Screws, Machine**
Barnes Co., Wallace, Bristol, Conn.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Screws, Safety Set**
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Second-Hand Machinery**
**(See Searchlight Section)**
Petrie Ltd., H. W., Toronto, Ont.

**Separators, Moisture and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Separators, Oil and Waste**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Shafting**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Shapes, Cold-Drawn Special Steel**
Union Drawn Steel Co., Hamilton, Ont.

**Shaping Machines**
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Rocleson Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Walcott Lathe Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Shapers, Wood**
Oliver Machinery Co., Grand Rapids, Mich.

**Shears, Hand**
Can. Blower & Forge Co., Ltd., Kitchener.

**Shears, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y.
Stuart & Co., Duncan, Glasgow, Scot.
Toledo Machine & Tool Co., Toledo, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.

**Shearing Machines, Angle, Iron Bar and Gate**
Bertrams Ltd., Edinburgh, Scotland.

**Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio.

**Sheets, Nickel, Resist, Alloy**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Sheets, Nickel, Monel and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Side Frames, Locomotive**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Slotting Attachments**
Ford Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

**Slotting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

**Solders**
British Smelting & Refining Co., Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Canada.

**Snap Flasks**
Oliver Machy. Co., Grand Rapids, Mich.

**Special Machinery and Tools**
Brown Engineering Corp., Ltd., Toronto
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Spectacles, Industrial**
Willson Goggles, Inc., Reading, Pa.

**Springs**
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

**Spring-making Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Sprockets and Chains**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glasco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Squares**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Stamping, Metal**
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Stamps, Steel**
Diamond Saw & Stamping Works, Buffalo, N.Y.

**Stairways, Wrought Iron**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Steam Specialties**
Crane Ltd., Montreal, Que.

**Steel Plate**
Dom. Foundries & Steel, Hamilton, Ont.

**Steels, Tool**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel Blooms and Billets**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steel, Cold-Rolled Strip**
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.

**Steel Castings**
Dom. Foundries & Steel, Hamilton, Ont.

**Steel Forgings**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Steel, Shafting and Free Cutting Screw**
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

**Steel, Sheet**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

**Steel, Tanks**
Can. John Wood Mfg. Co., Toronto, Ont.

**Steel, Stainless**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel Wire Rods**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steels, Alloy, Open Hearth and Electric**
United Alloy Steel Corp., Canton, Ohio.

**Steels, Alloy and Carbon**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

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Pilot Steel & Tool Co., Montreal, Que.
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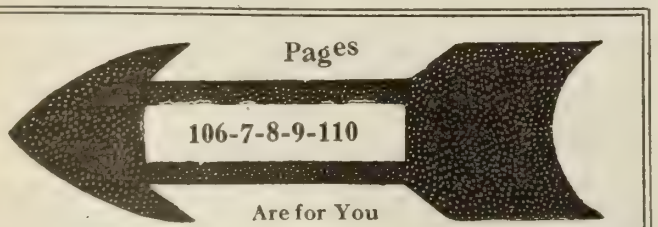
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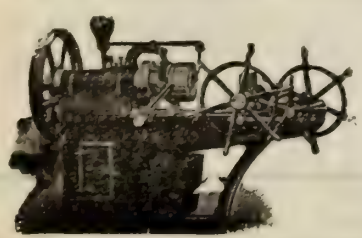
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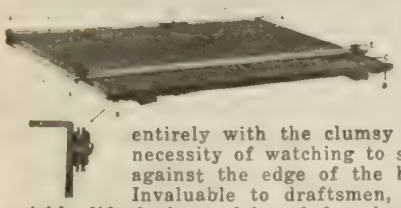
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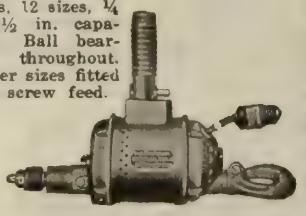
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We make complete line of Portable Electric Drills and Grinders for all purposes. Especially built to withstand hard usage. For all currents and voltages. Catalog?

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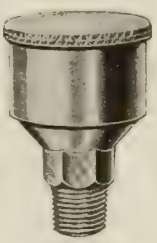


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Complete Line of Oilers, Oil Cups, Brass Dowel Pins and Pressed Steel and Brass Grease Cups All Types

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Limited
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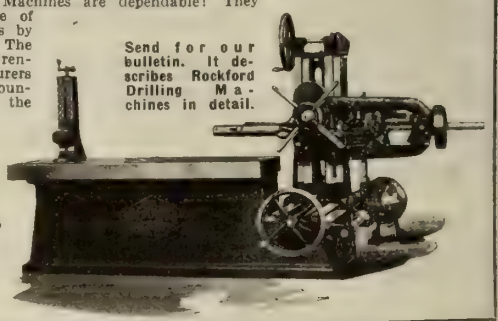


PLAIN

## ROCKFORD DRILLING MACHINES

Note the lateral and vertical adjustment of this Rockford Drilling Machine. It operates anywhere on a surface 18" high by 36" wide! Rockford Drilling Machines are dependable! They are carefully made of the finest materials by skilled workmen. The service they are rendering manufacturers throughout the country proves that the design is right.

Send for our bulletin. It describes Rockford Drilling Machines in detail.



**The Rockford Drilling Machine Company**
**Rockford, Ill., U.S.A.**

Canadian Agents: Rudel-Belnap Machinery Co., Toronto and Montreal.

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FOR ALL TYPES OF BELTS

Leather, Canvas, Balata, Cotton, etc.

Preserves the Belts, prevents slipping, jumping, stretching and fraying.

Ensures highest efficiency in transmission of power.

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614 Drummond Bldg. - MONTREAL

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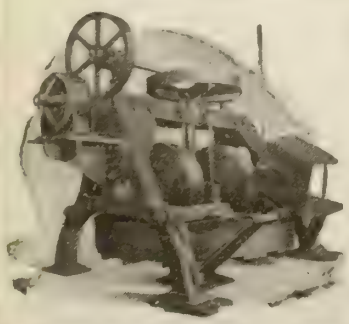
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*If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.*

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**Standardized Series**

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*Tanned by us for belting use*

*The Correct Belt for Every Drive*

Flat and Round Belting, Leather Packings, Gaskets, Washers, Lace Leathers, Belt Dressings and Cements. Protective Aprons and Hard Leathers.

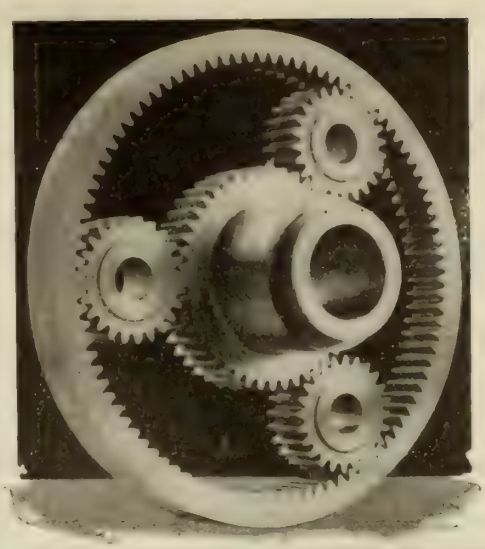
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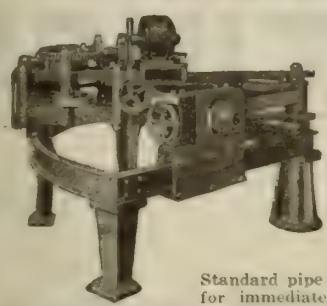


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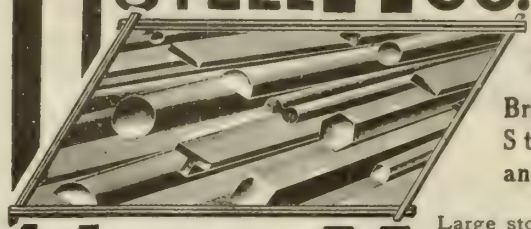
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Standard pipe bends 1" to 6" pipe in stock for immediate delivery.

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Large stock of all sizes.

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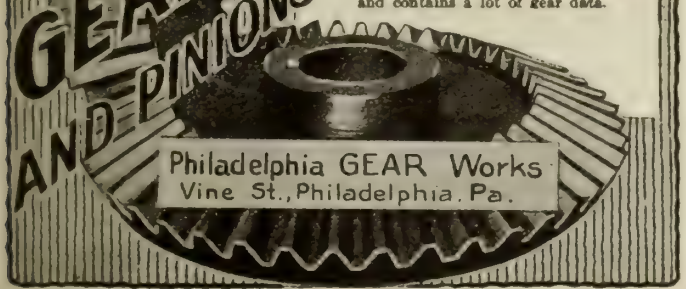
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Special facilities for Keyseating up to 6 in. diameter.

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Wheels Equipped With Hyatt Flexible Roller Bearings.


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If you are, look on page 81.



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**36" Fallows Gear Shaper**

indicates the complete and modern equipment throughout our Gear Department. Send your custom work to us.

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Made for use in Automatic Machines, Turret Lathes, Boring Mills, etc. Pays for itself very quickly out of the money it saves in the tool room.



Cuts absolutely straight holes of any size from 1¼" up to 5" diameter. Adjustable to .00025". Made in 45 sizes for all requirements. Write for prices and literature.

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Made by the Acid Electric process up to fifteen tons. Castings made by this process are free from blow holes, easy to machine, and superior in every way to ordinary Steel Castings.

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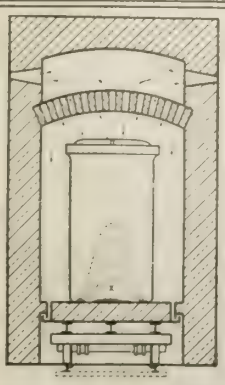
Our service brings to your desk interesting news collected from the newspapers, relating to your business.

Often you plan your affairs on market conditions and new developments, but you could plan much better with full information before you from the whole of Canada and United States.

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**Canadian Press Clipping Service, 143-153 University Ave., Toronto**





Irregular heating of high charge in car furnace, showing tendency to overheat at the top and information of cold zone (X) at bottom, due to comparatively cold hearth.

## Uses and Limitations OF Car Type and Car-and-Ball Type Furnaces

**are clearly defined in Bulletin 222-T**

W. S. ROCKWELL CO. INDUSTRIAL ESTABLISHED 1888 FURNACES NEW YORK

Typical installations are shown to illustrate—

The applicability of car type and car-and-ball type furnaces to the heat-treatment of material that cannot be advantageously handled in other types of furnces.

Factors governing selection of the type (car or car-and-ball) best suited to individual manufacturing requirements.

Difference in design of each type.

Influence of unequal cooling on the quality of finished product.

In brief, this bulletin is a discussion of principles which will appeal to those interested in furnace design, loading and handling methods, heat generation and utilization, etc.

***Write for Bulletin 222-T to Canadian Representative.***

**W. S. ROCKWELL COMPANY**
*Furnace Engineers and Contractors*
50 Church St. (Hudson Terminal Bldg.), New York
*"Furnace and Fuel to Suit Conditions"*
*Canadian Representative:* R. J. McLean, 604 Southam Bldg., Montreal, P.Q.

# A Stirring Instalment of Heming's Famous Story

ARTHUR HEMING continues his remarkable story of Canada's Northland in March 1 MACLEAN'S MAGAZINE. In "Wild Animals and Men" he tells how he and Oo-Koo-hoo tracked and trapped wolverine, lynx, and other wild animals, and tells fascinating stories of battles of wits between the hunters and the hunted. The wiles of the Indians and half-breeds are pitted against the amazing, almost superhuman craftiness of the animals—and sometimes the denizens of the forest wilds outwit their human antagonists.

## Fun at Opening of Parliament

J. K. Munro sat in his seat in the Press Gallery, Monday, February 14, when Parliament opened, and looked down with the good-natured tolerance and contempt of an iconoclast and a satirist at the proceedings. The members invariably amuse "J. K."; it takes a really big man to elicit more than scant praise from his sophisticated pen. His March 1 article is entitled: "Funny, as the Owl is Funny."

## Other Big Features and Fiction

**"Canada's Fur Future,"** by Agnes C. Laut. Telling what a potential gold mine Canada has in her fur industry, properly conserved and exploited.

**"Goldwin Smith,"** by James Mavor, Ph.D. The personal side of the "Sage of the Grange," the man who was tutor to King Edward VII, before coming to Canada.

**"More Political Memoirs,"** by Col. George H. Ham. Further stories of the "Solons of the Eighties," and Ottawa 30 or 40 years ago.

**"Pawned,"** by Frank L. Packard. The story of a triple regeneration—in this instalment John Bruce declares his love for the "Pawnshop Girl."

**"The Man Who Knew Too Much: The Bottomless Well,"** by Gilbert K. Chesterton. This Near-Eastern well and a revolving bookcase figure in a baffling murder story, handled by England's master of fiction.

**"The Lady at His Door,"** by Barker Shelton. A girl takes a law course, graduates—but that doesn't mean clients. But she gets a partner—and for life.

**"The Millionth Chance,"** by Henry Holt. An Adventurous sea story, with a girl skipper and a man who won her respect—and even her love.

## Review of Reviews

**Split Among the Socialists—** Joseph Gollomb

**New Wonder City—** Agnes C. Laut

**Where Humanity Started—** New York "Times"

**World's Worst Failure?—** Harold Trowbridge Pulsifer

**Birth Control and War—** Harold C. Cox

**A Pugilistic Apollo—** Heywood Broun

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# MACLEAN'S

"CANADA'S NATIONAL MAGAZINE"




*Name of Hardware Merchant and further details, supplied upon request*

# The Answer is—He Didn't!

THE crowd was drawn by a hardware firm in an Ontario town of 700 population. This crowd of over 1,000 people represents customers of the store, drawn from miles around, to attend the picnic given by this firm to its customers. Surely this is evidence of the close relationship between this hardware firm and its customers.

The close relationship between retailer and customer in this instance is typical of conditions existing in hundreds of Canadian towns, villages and cities.

The average hardware merchant (particularly in the smaller cities and towns) has been established for many years. He has a big business connection built up through years of efficient service to his customers. He is well rated, and a desirable man with whom to do business. He influences the buying habits of the people in his community, and in over 90% of the sales made, he is the deciding factor.

*"Which one do you recommend?"* is a question asked thousands of times each day in the hardware stores of Canada.

If you can get the effort and enthusiasm of the retail hardware merchants and their clerks, plus their window and interior displays and local advertising behind your goods, you will have secured the co-operation of one of the greatest available selling forces.

**HARDWARE AND METAL is paid for, and read, by all the wholesale hardware buyers of Canada, and over 90% of the retailers from coast to coast. They are the men who control the sale of your products to the hardware consumers. HARDWARE AND METAL can put your story before, practically, the entire Canadian hardware trade. One of our representatives would be glad to give further details.**

**(Only hardware paper in Canada with membership in the Audit Bureau of Circulations).**

## HARDWARE & METAL

*Canada's National Hardware Weekly since 1888*

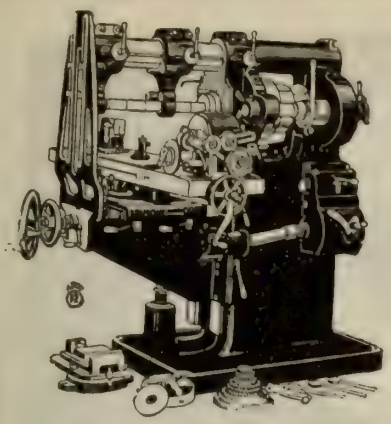
**143-153 University Avenue - - Toronto, Canada**

*Published every Saturday since 1888. The only weekly hardware paper in Canada, and the only hardware paper in Canada that gives you a circulation statement audited by the Audit Bureau of Circulations*

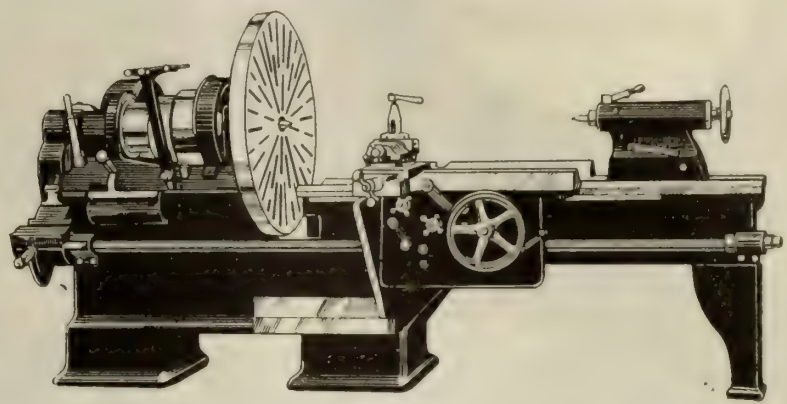
**Montreal Branch; Southam Building** **Winnipeg Branch, Union Trust Building**

# Machine Shop and Pattern Shop Equipment

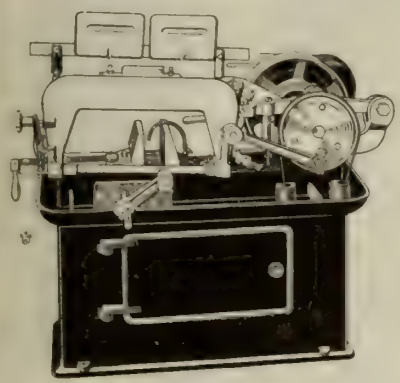
## NEW AND USED



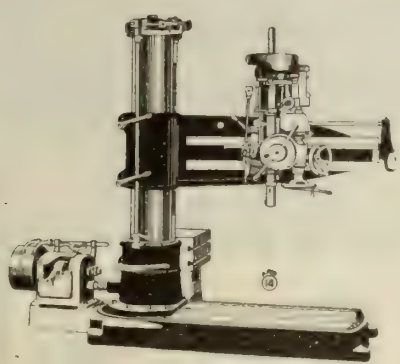
LeBlond No. 2 Universal Miller



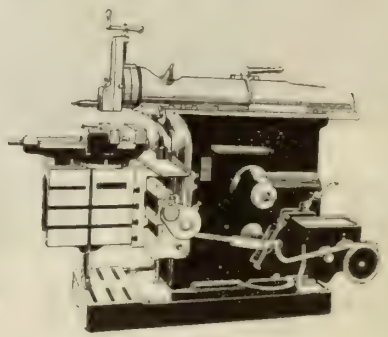
Gap Lathe



6 x 6 High Speed Hack Saw



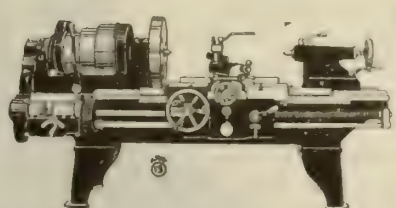
4 ft. Fosdick Radial Drill



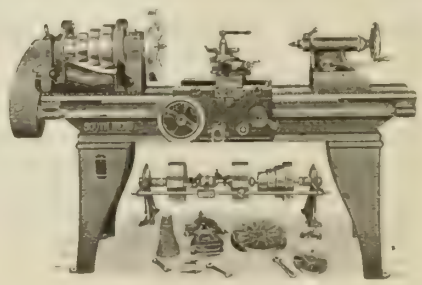
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4 in. Pipe Machine



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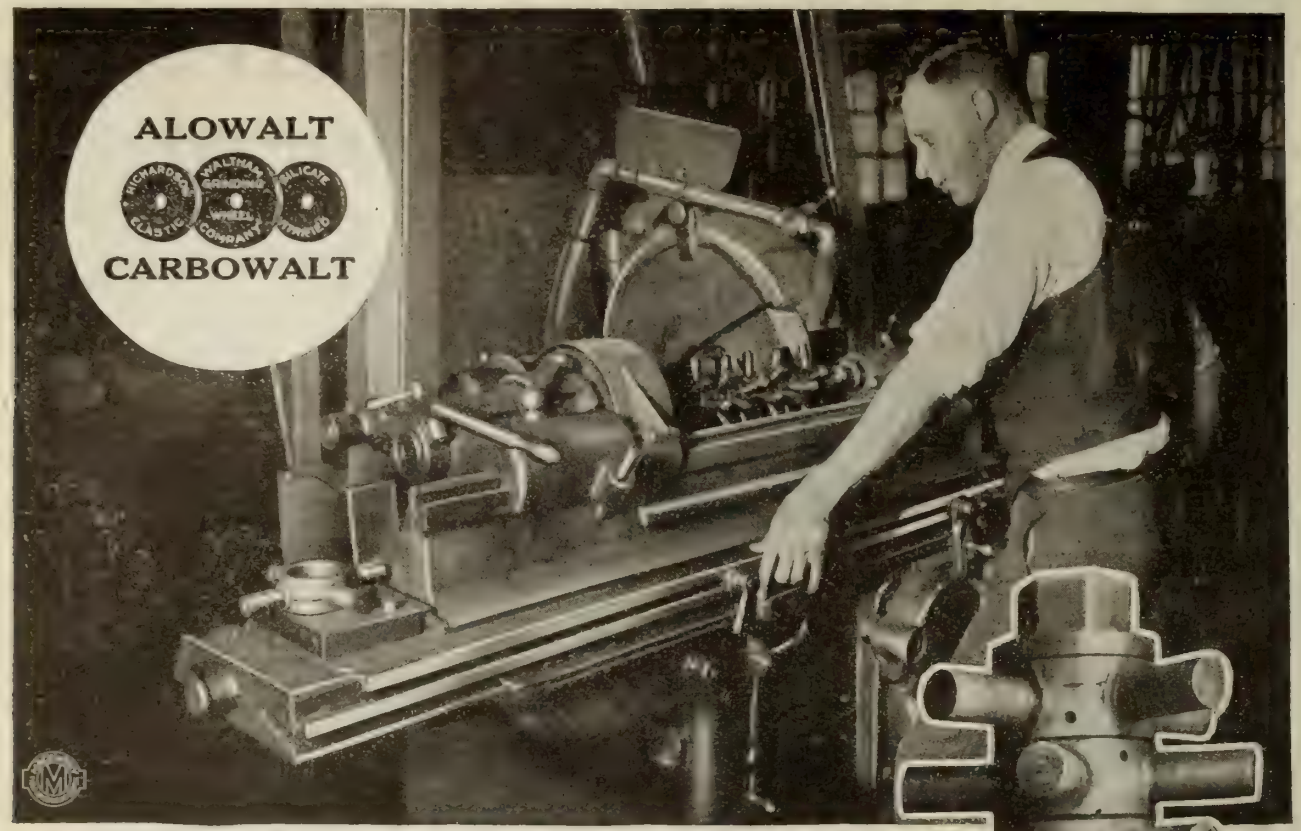
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# WALTHAM

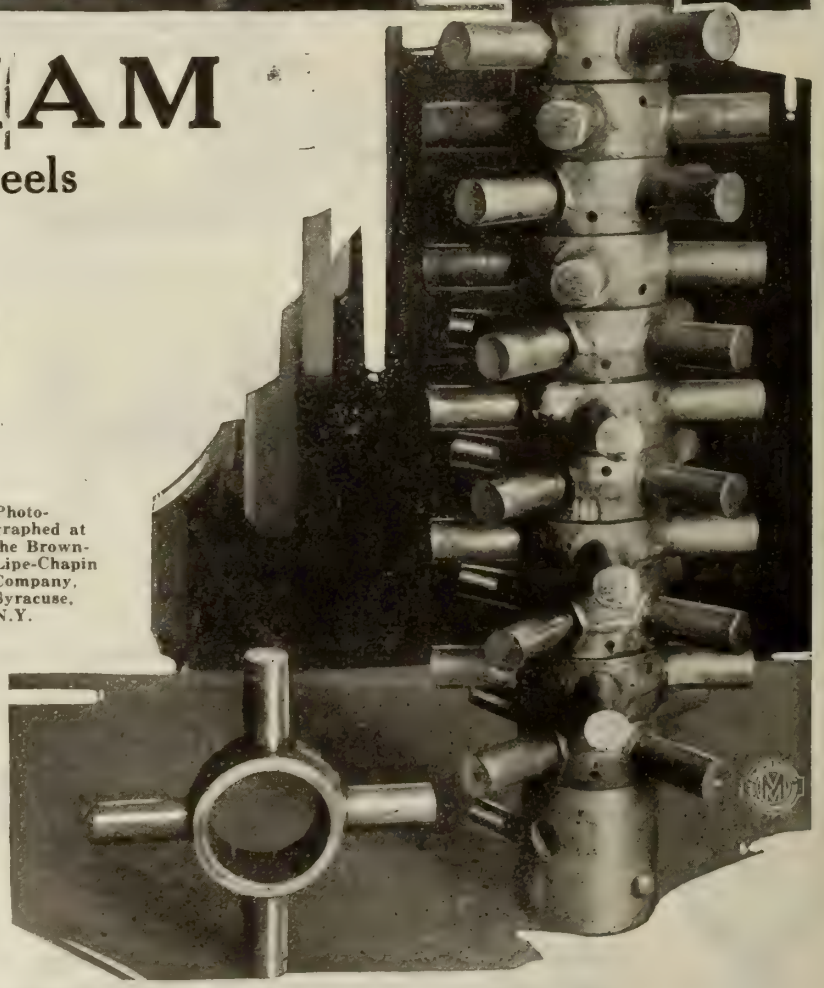
## Alowalt Grinding Wheels

### *Best to Break Through the Case on These Forgings*

The parts are case hardened forgings for 6″ differential gear cross arms. These are mounted on an arbor and set up as for cylinder grinding (see photograph), a method of handling the work that makes severe demands on the wheel. Arms are ¾″ in diameter and about 1-16″ of stock is removed.

After many tests a Waltham No. 346L. Special Alowalt Grinding Wheel 18″ diameter, 2″ face, was selected for this job and is now used exclusively. Production averages 90 per hour.

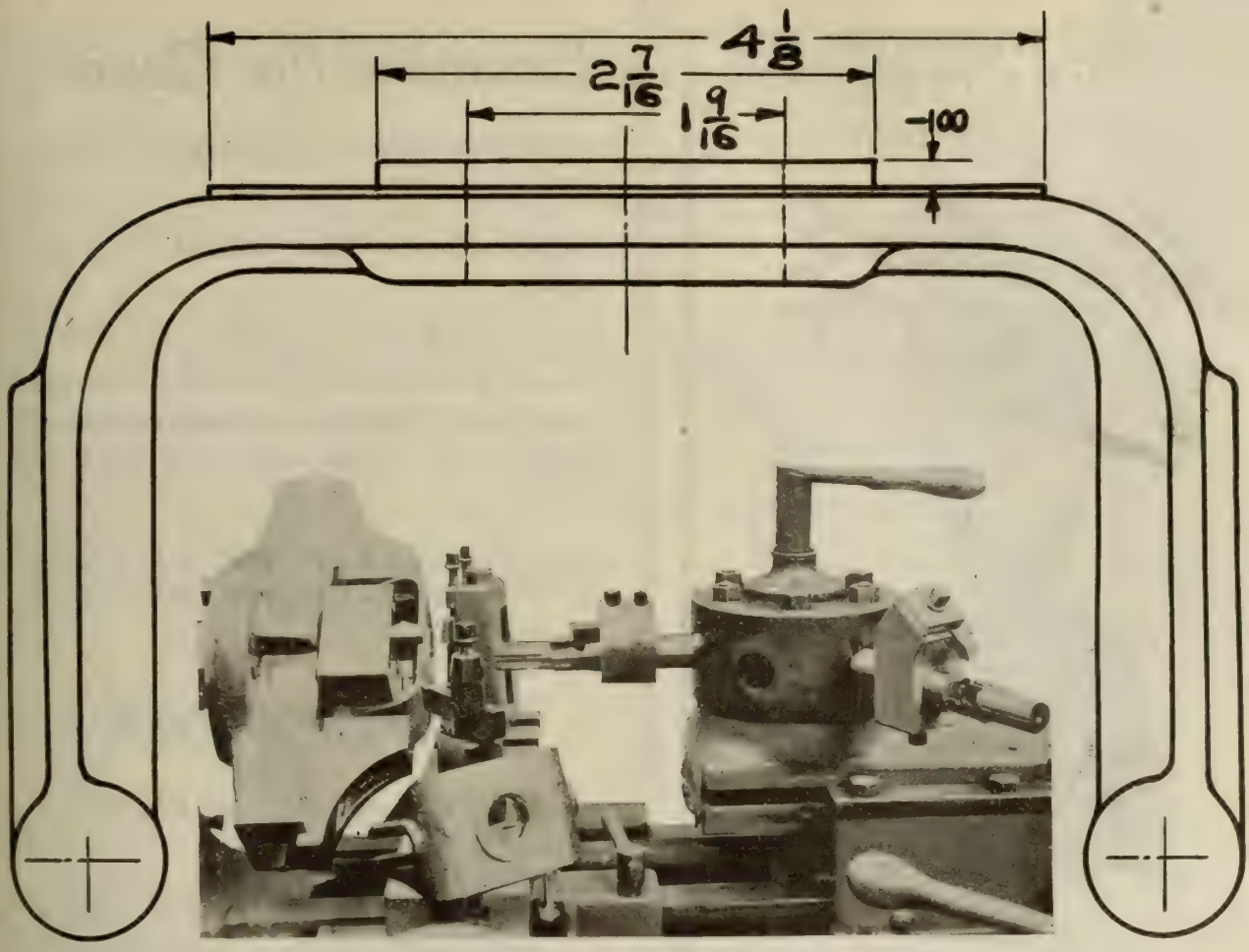
There's a Waltham for every job, no matter how tough or how delicate. Put your grinding problem up to us. We're here to help.



Photographed at the Brown-Lipe-Chapin Company, Syracuse, N.Y.

**Waltham Grinding Wheel Co.**
**of Canada, Limited**
**Brantford, Ontario**

*Eastern Representative:* **Standard Machinery & Supplies Ltd., Montreal, Que.**




W & S 16" Geared Friction Head Turret Lathe tooled to finish Torque Arm Brackets

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**We've had forty years' experience making and tooling turret lathes to satisfy unusual demands. Draw on our experience and be ready for the business increases which are bound to come soon.**

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Brossard-Mopin & Company, Saigon, Singapore, Haiphong.

*If interested tear out this page and place with letters to be answered.*

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OF BELTING
KEEP IN MIND THAT

*The back of the Ox*




is the part where the fibre of the hide is tightest and unaffected by the action of breathing, therefore the most suitable to produce a dead straight and practically stretchless belt.

**Tullis**
LEATHER BELTING
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is made entirely from this portion of the hide.

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A properly alloyed babbitt has a perfectly uniform grain.

Break a bar of the babbitt you are using—

If you find the grain irregular—if it shows a mixture of fine and coarse particles—if it shows a separation of layers—one dark and one light in color—

then you may know that it is poorly alloyed—and that you can get far better wear from

*Lionroyal*

produced by the STANLEY PROCESS of alloying.

Lionroyal is clean—uniform—dense grained—and durable.

It is copper-hardened and tin-toughened. Bearings lined with it carry the load evenly—every inch of bearing surface equally durable.

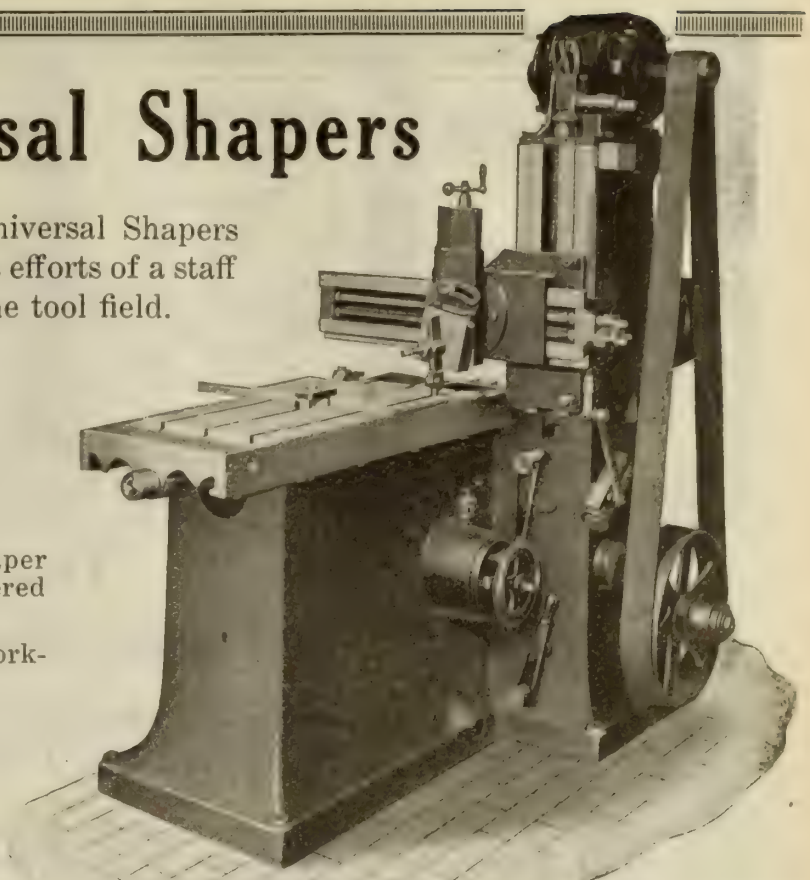
It has no hard spots of copper or antimony, because the hard elements are thoroughly and uniformly amalgamated with the tough elements. This fact bespeaks steady service and long wear.

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BRITISH SMELTING COMPANY & REFINING LIMITED
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Into the design and construction of Universal Shapers have gone the united knowledge and best efforts of a staff of specialists in the tool, jig and machine tool field.



## *Consider these features—*

It planes parallel in the heaviest cuts.

It planes accurately—horizontally as well as vertically.

It handles efficiently a wide range of shaper and planer jobs—particularly those considered awkward by **both** these machines.

Operator can reach all adjustments from working position.

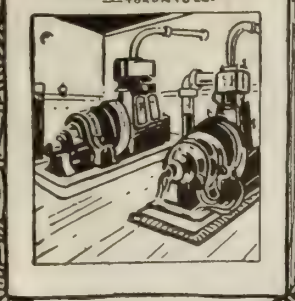
**Have you full particulars?**

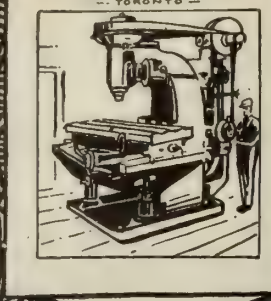
**Universal Machine & Tool Company**

**Canton, Ohio, U.S.A.**

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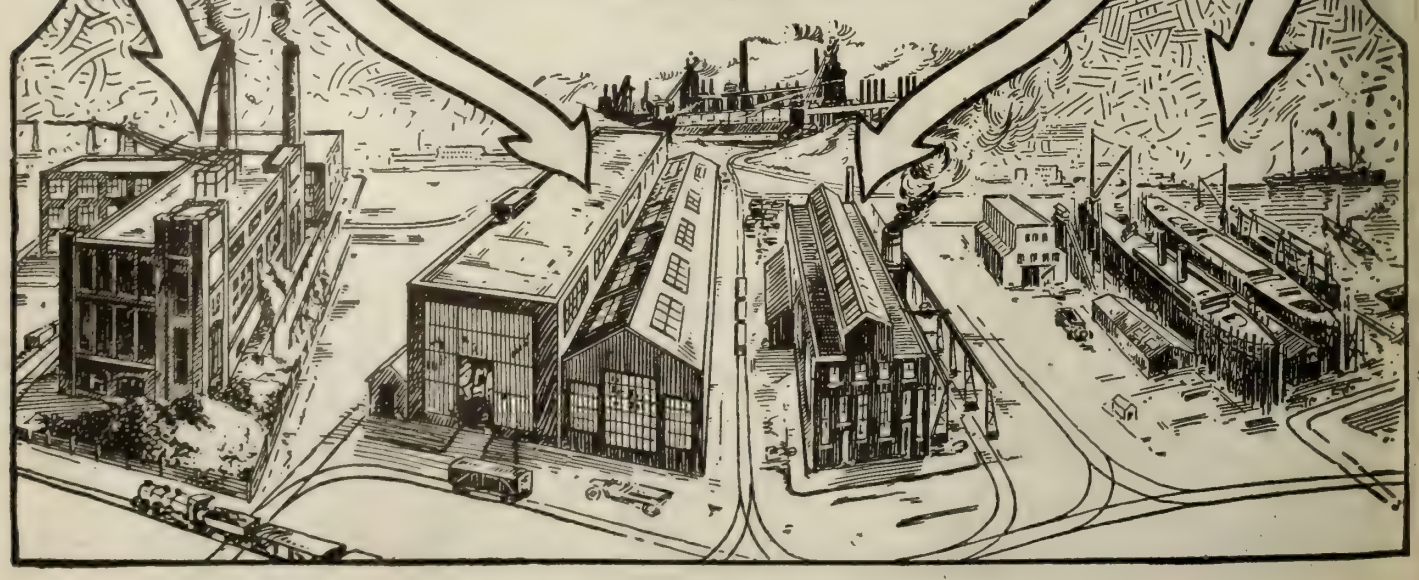
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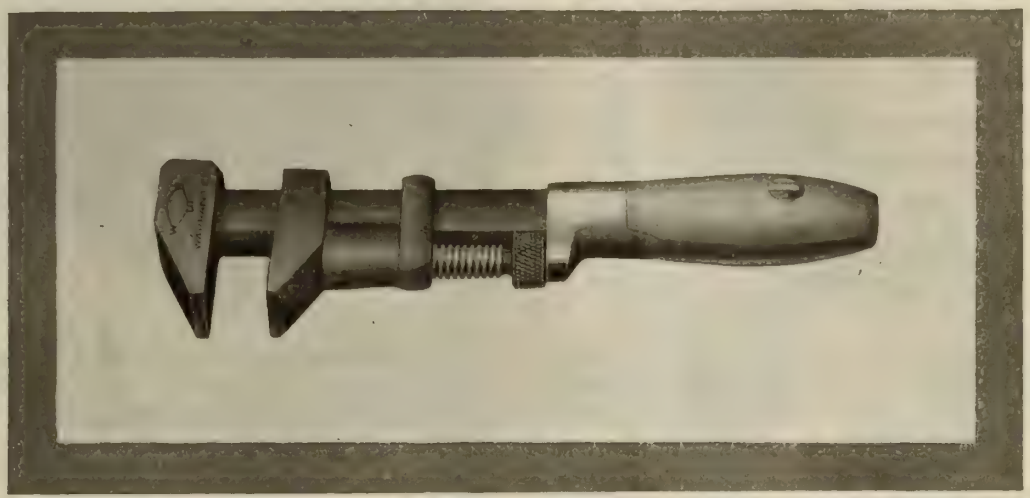
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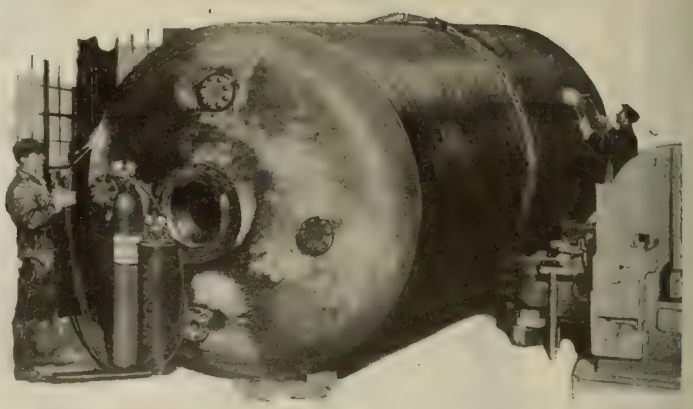
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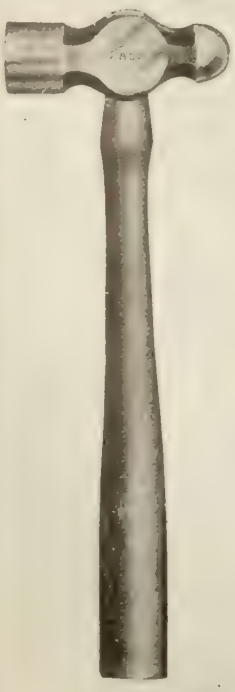
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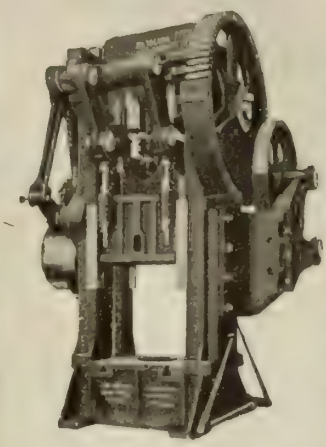
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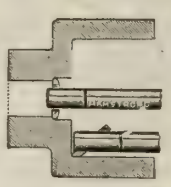
Require no forging or tempering and very little grinding. They are always ready for use, are very stiff and will bore close up to a shoulder or bottom.

1=12

One Armstrong Boring Tool will take the place of a dozen forged boring tools.



| No. | Size Shank Inches | Diam. Bar Inch | Size Cutter Inch Sq. |
|---|---|---|---|
| 00B | 5-16x 3-4 | 1-2 | 3-16 |
| 8 | 3-8 x 7-8 | 9-16 | 3-16 |
| 9 | 1-2x1 1-8 | 3-4 | 1-4 |
| 10 | 5-8x1 3-8 | 15-16 | 5-16 |
| 11 | 3-4x1 5-8 | 1 1-8 | 3-8 |
| 12 | 7-8x1 3-4 | 1 5-1 6 | 7-16 |
| 13 | 1 x2 | 1 1-2 | 1-2 |

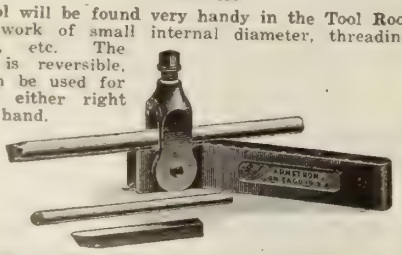


This cut shows Double-Ended Cutter roughing out cored hole; also angle cutter boring and facing end.

## Armstrong Boring Tool Holder

**Patented**

This tool will be found very handy in the Tool Room or in boring work of small internal diameter, threading, brass turning, etc. The holder is reversible, and can be used for turning either right or left hand.



| No. | Size of Shank Inches | Size of Bars Furnished Diam. Inches | Size of Square Cutter Inches |
|---|---|---|---|
| 15 | 3-8 x 3-4 | 1-8 and 1-4 | 1-4 |
| 16 | 1-2 x 1 | 3-16 and 5-16 | 5-16 |
| 17 | 5-8 x 1 1-4 | 1-4 and 3-8 | 3-8 |
| 18 | 3-4 x 1 1-2 | 5-16 and 7-16 | 7-16 |

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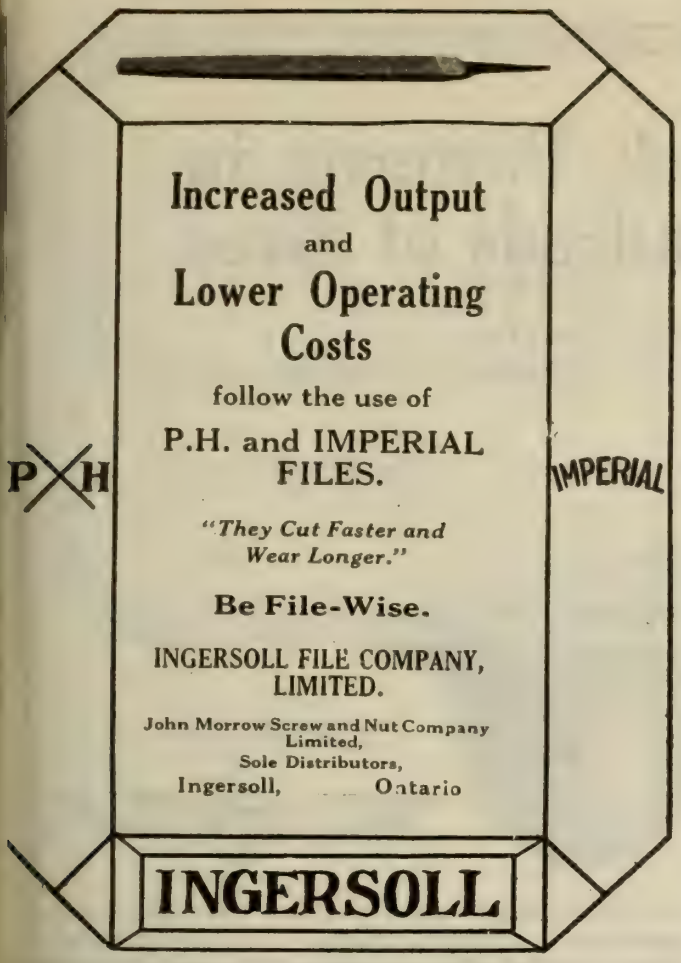
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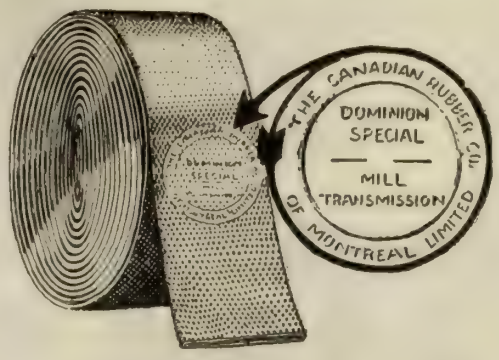
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**Steam:** "Indestructible," "Rockproof," "Para."

**Water:** "Indestructible," "Para," "Kushion Kover," "Star."

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**Garden:** "Canadian," "Dominion," "Star."

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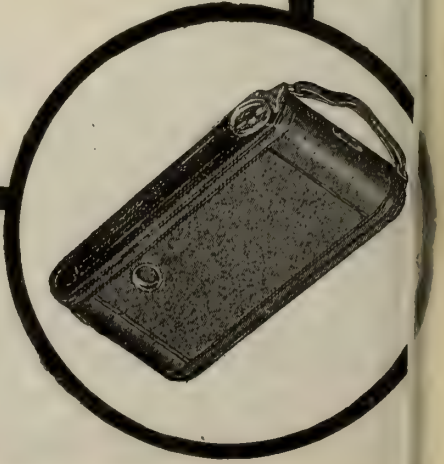
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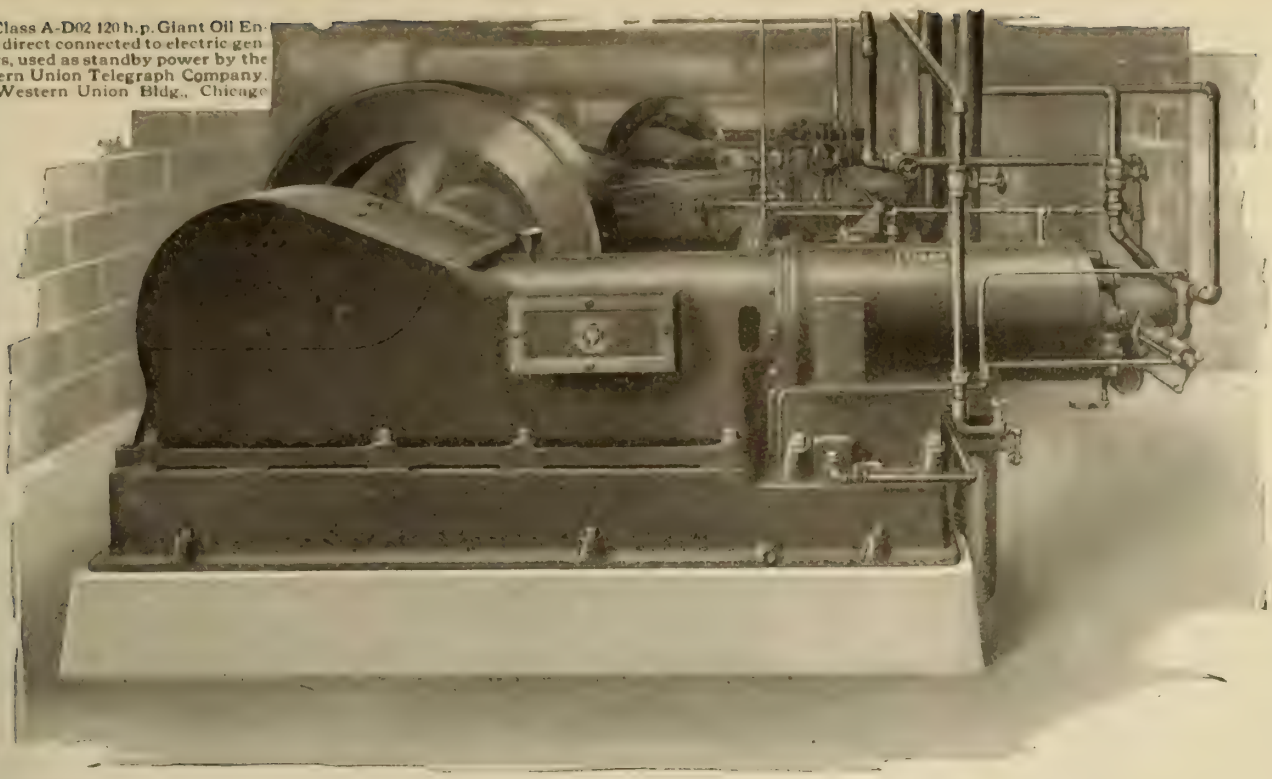
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# HENDEY SHAPER

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Two Class A-D02 120 h.p. Giant Oil Engines, direct connected to electric generators, used as standby power by the Western Union Telegraph Company, new Western Union Bldg., Chicago

# *Why Giant Oil Engines have a cross-head*

THE Giant cross-head and the efficient lubrication system which it makes possible, *double engine life.*

Giant cross-head construction conforms to high-grade steam engine design. It prevents side pressure against the cylinder walls. It obviates uneven cylinder wear, worn pistons, loss of compression and consequent hard-starting. It reduces friction to a minimum. It provides easy accessibility to all moving parts by permitting the use of readily removable frame covers. It permits compressing the charging pressure in the cylinder proper, and not in the crank case where leakage is almost unavoidable. It allows the crank end of the cylinder to be closed, thus providing for full *automatic splash lubricating system.*

The Giant system of lubrication is *positive-oiling, continuous in circulation, entirely automatic.* It saves time and saves oil.

Longer life and lower power costs invariably result from these and other Giant features that prove the worth of Giant Engines on a cost-per-year basis.

How much can Giant Oil Engines reduce *your* power bills? Engineering counsel, extended without obligation, is available to assist you in answering this important question. Giant Engines are built in single and duplex types, capacities 12 to 200 h. p. Ask for Bulletin 389.

*Sales Representatives*

## The Holden Company, Limited

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EN 41 - H

BOYER PNEUMATIC HAMMERS · LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS
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GIANT OIL AND GAS ENGINES ROCK DRILLS · COAL DRILLS

CANADIAN CP PNEUMATIC

# GIANT ENGINES

*Dependable Power at Less Cost Per Hour*

C.M.C.

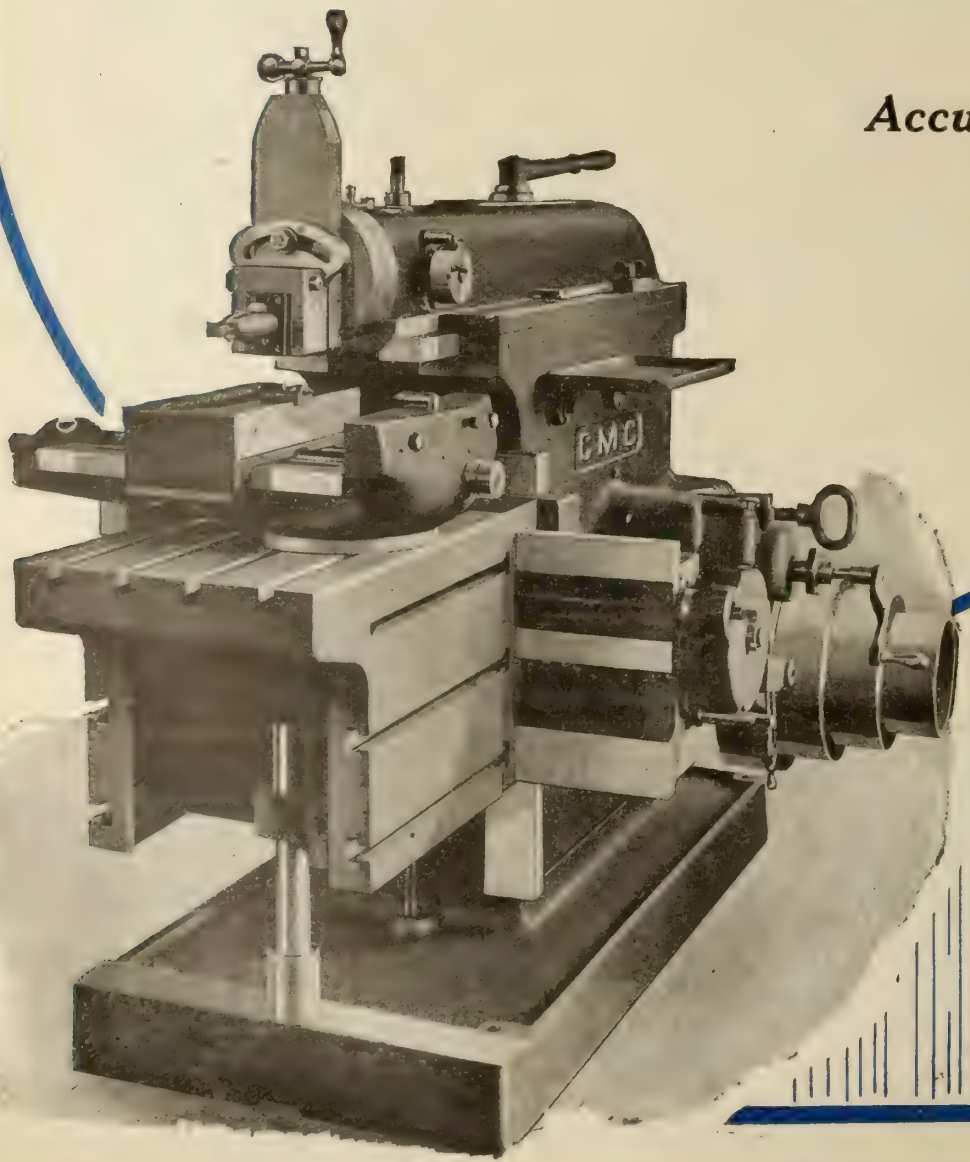
# 26" x 30" Crank Shaper

is distinctive. Its mechanism is simple but effective. Within easy reach of the operator's right hand is the down feed to head, automatic cross feed, handle for changing the length of stroke, the speed changes, and always in sight is the constant-reading stroke indicator showing at all times the stroke the machine is set for, whether in operation or not.

**Write us for special bulletin and prices.**

CANADA MACHINERY CORPORATION
LIMITED
GALT, ONTARIO

*Accuracy*
*Production*



# CANADIAN MACHINERY AND MANUFACTURING NEWS

Vol. XXV., No. 10 | Published by the MacLean Publishing Company, Limited, Toronto | March 10, 1921 | $4.00 a Year Subscription Price


| READ AND PASS TO | check | See Page | READ AND PASS TO | check | See Page | READ AND PASS TO | check | See Page |
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Canadian machinists recognize the name of Starrett as a guarantee of quality and superiority in tools, tapes and hacksaws.

THE L. S. STARRETT CO., Athol, Mass.

*The World's Greatest Toolmakers. Manufacturers of Hack Saws Unexcelled.*

42-158

STARRETT TOOLS

STARRETT HACK SAWS CUT QUICKER LAST LONGER

Starrett Tools

# STAYBOLT TAPS



## The Better the Man, the More He Appreciates Them—

Not only good when new, but heat treated and seasoned to maintain this goodness. Can be ground on face of cutting edge without affecting their size. That's why you'll find Pratt and Whitney Stay Bolt Taps on the job long after cheaper, "just as good" tools are buried in the scrap pile.

Threads accurately and cleanly cut, with the least expenditure of time and effort, are other reasons why these better Taps are favorites in the shop.

If you've used them before, you know just how good they are. If you haven't, send us your first order—we know you'll be back for more. They're carried in stock in our sales rooms in all large cities.

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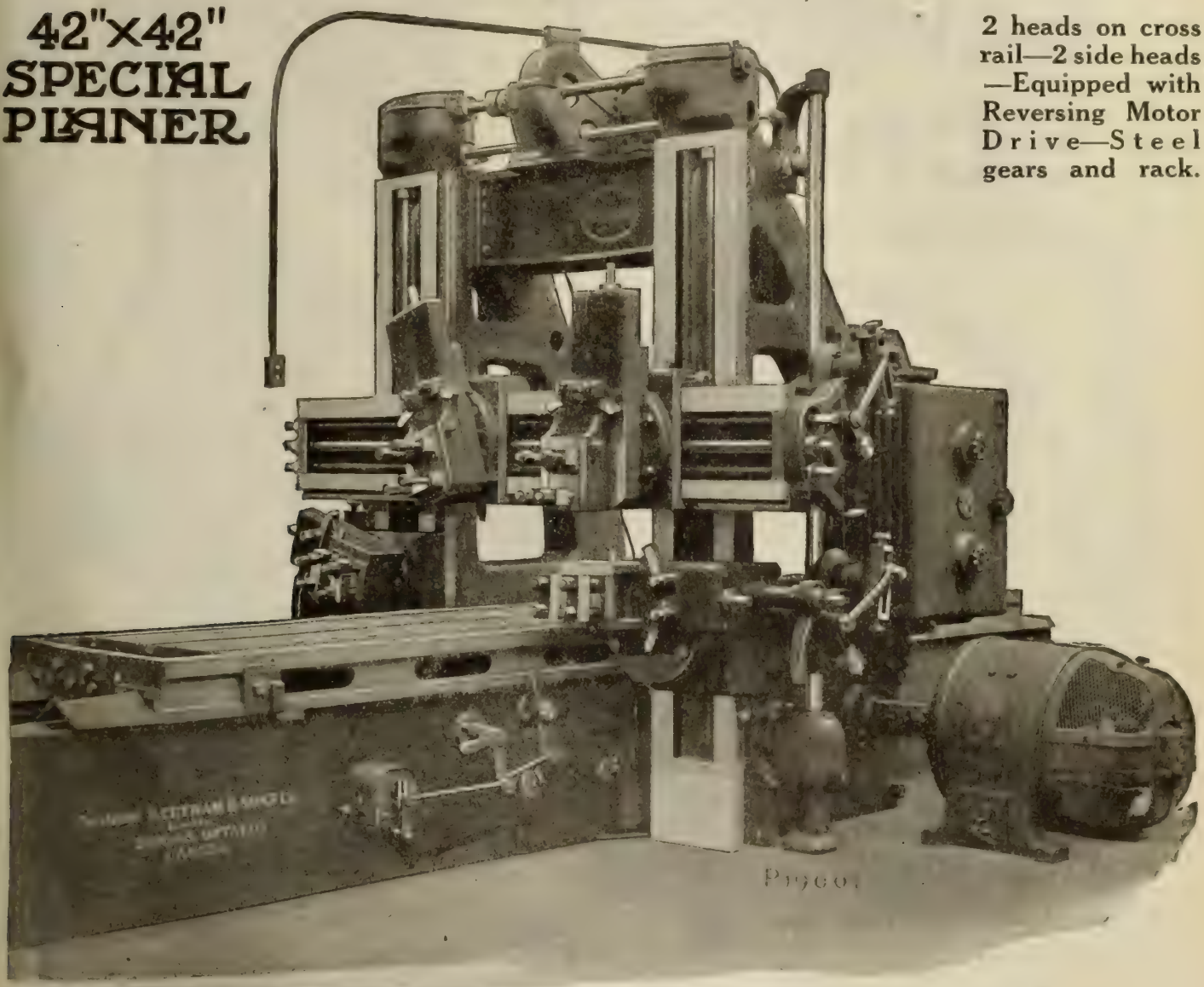
PRATT AND WHITNEY

# The BERTRAM Page

## MACHINE TOOLS

**42"x42" SPECIAL PLANER**

2 heads on cross rail—2 side heads —Equipped with Reversing Motor Drive—Steel gears and rack.



## The John Bertram & Sons Co., Limited

DUNDAS. ONTARIO. CANADA.

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# NAMCO

## U.S. STANDARD CAP AND SET SCREWS



**STANDARD**

V. & U.S.S. Semi-finished Nuts
V., U.S.S. & S.A.E. Cap Screws
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**SPECIAL**

Screw machine product up to 2¼" diam.—to specifications
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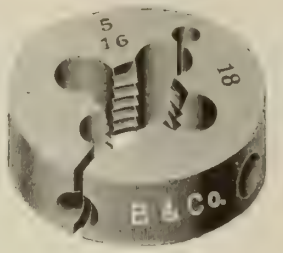
De Courcelles G.T.R.R.

# Butterfield

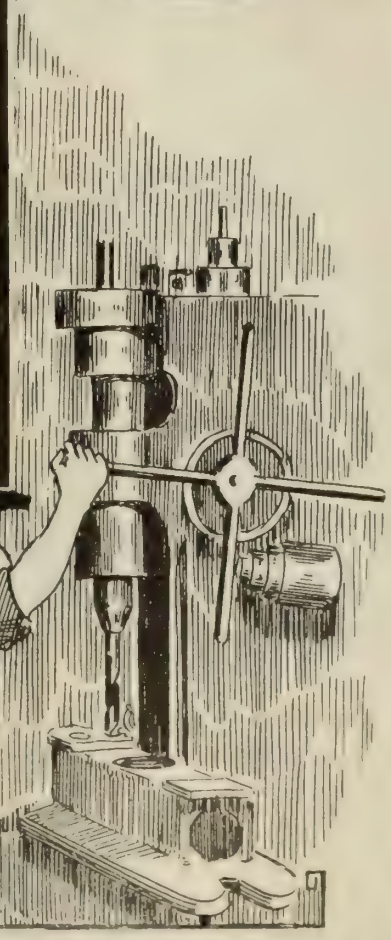
## Tools that Assure Maximum Production

IN the big shops and the small shops you will find **Butterfield** Taps, Dies, Drills, Reamers and Milling Cutters in use. These shops know what cutting-tool perfection means, for **Butterfield** tools possess the strength that enables them to stand up under continuous hard usage—they retain their keen cutting edge.

**A trial will prove their quality.**











*"The Tools You Buy Again"*

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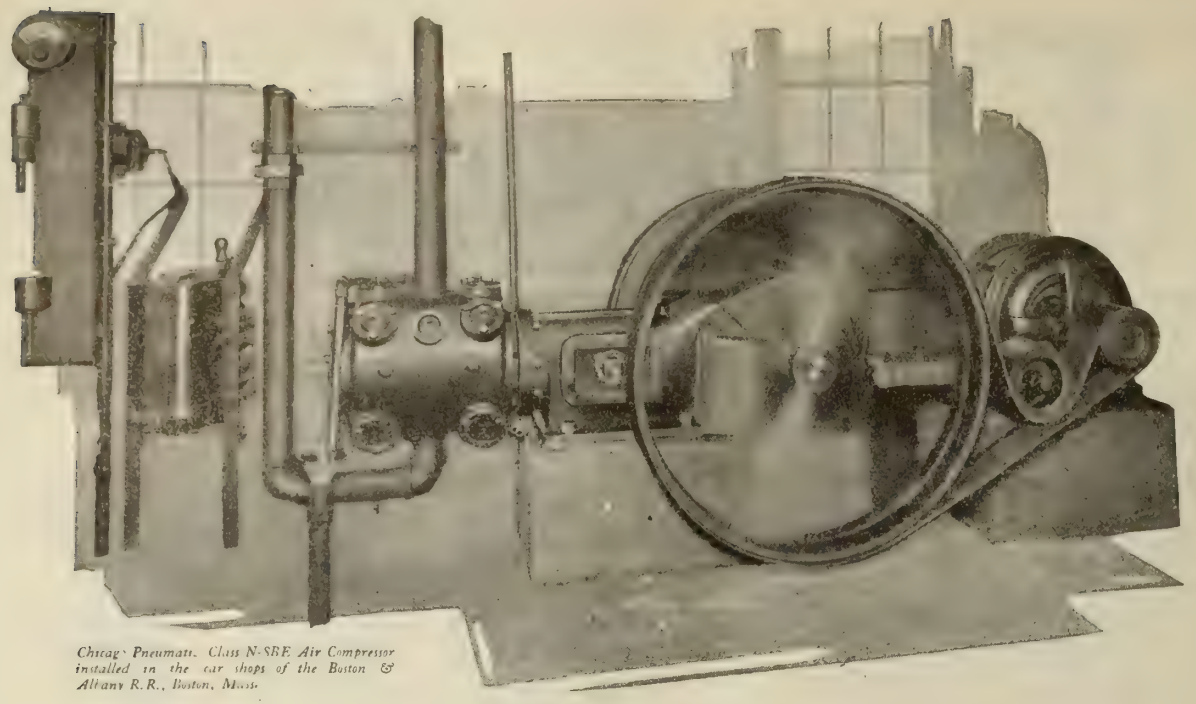
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*Chicago Pneumatic Class N-SBE Air Compressor installed in the car shops of the Boston & Albany R.R., Boston, Mass.*

# *Where dependability counts big!*

THE user of air power in moderate quantities—particularly with but one unit—needs *real* compressor dependability. In such plants an enforced shutdown means 100% air output loss.

In reality this Chicago Pneumatic Short-Belt Motor-Driven Air Compressor is a large Chicago Pneumatic "under a reducing glass."

It embodies such advanced features as: Simplate flat-disc indestructible valves, exceptionally large bearing surfaces, totally enclosed frame construction, automatic lubrication throughout, automatic regulation, insuring ideal operating economy under variable load demands.

This compact type unit is available in capacities from 69 to 1197 cubic feet per minute, for any form of drive.

Prompt delivery. Ask for Bulletin 418.

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BOYER PNEUMATIC HAMMERS -- LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS
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**CHICAGO PNEUMATIC**

*The Compressor with the Simplate Valve*

*If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.*

# BALL-BEARING DRILLS

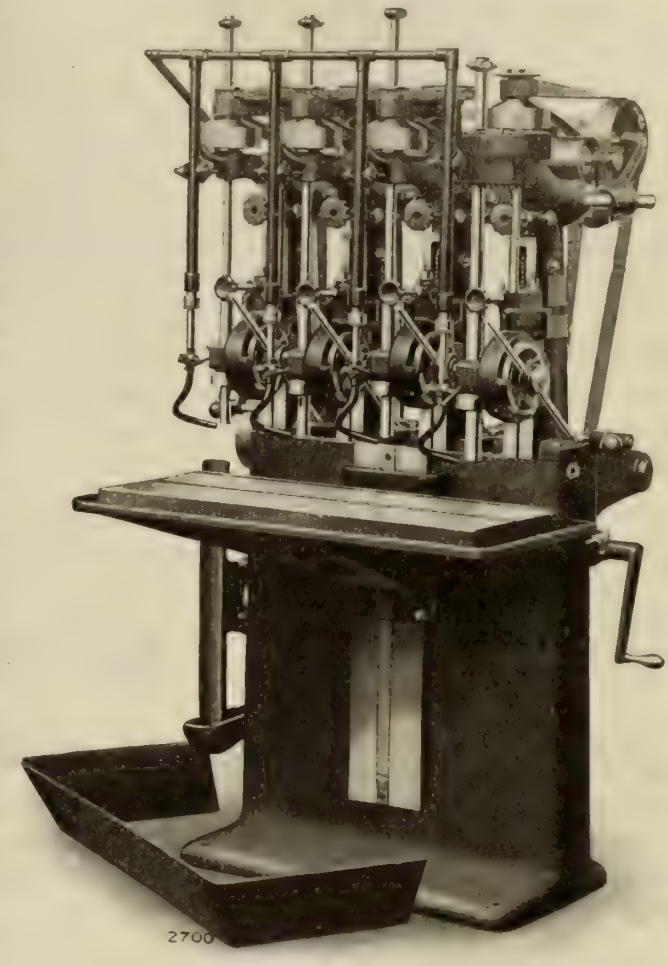
THE chief direction in which the modern ball-bearing drill excels the old type of so-called sensitive drill may be briefly indicated by three words: Output, Convenience, and Durability.

To obtain the highest excellence in these three directions, every element and part of the machine has had to receive close attention both in design and in manufacture.

The design of our Ball Bearing Drills is the result of exhaustive experiments and a long experience in the manufacture of drilling machines. The patent self-acting feed is a valuable aid to increased output. The operator has only to start the drill, the feed does the rest. This relieves the operator of all tedious work in pulling the feed lever.

The materials used in the construction of these Drills are submitted to chemical and physical tests in our own laboratory to ensure a high standard being maintained.

The factory at Edgwick, where the Ball Bearing Drills are made, is equipped with the most up-to-date appliances for the production of interchangeable parts.




The extensive use of jigs and special tools, together with a rigid system of detail inspection, ensures accurate workmanship.

Machines are made with one, two, three and four spindles with hand feed plain, auto feed plain, or auto feed geared spindles in any combination.

A copy of our new booklet, Rapid Drilling, will be sent post free to anyone interested.

*Delivery from Stock.*

## ALFRED HERBERT, LTD.

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Turret Lathes, Engine Lathes, Horizontal Boring Machines, Boring Mills, Planing Machines, Slotting Machines, Shaping Machines, Profiling Machines, Grinding Machines, Sawing Machines, Precision Machines, Chucks, Die Heads, Tool Room Equipment, Foundry Equipment, Drills, Milling Cutters and Small Tools.

*If interested tear out this page and place with letters to be answered.*

# What Would You Think of a Manufacturer—

—who wrote to you with a lead pencil—"We are saving much money because we do not use typewriters and telephones"? You might well wonder whether his merchandise was as much out of date as his business methods.

You know that modern time and labor saving appliances are not added expenses, but that they have superseded slower and more costly processes.

The concern which uses your business paper to tell you its business story is simply using a modern piece of selling machinery to make it easier for you to buy intelligently with the least waste of your time and theirs.

For the right kind of advertising shortens the distance between human minds just as certainly as the railroad shortens the distance between places. It is still possible to walk from New York to Chicago, and it is still possible for a business to get along without advertising, BUT—

—bear in mind that the seller who does not advertise does NOT save the cost of advertising, for it costs more to do the work of advertising by other means. Consistent advertisers are progressive merchandisers, and it pays to do business with them.

**You are invited to consult us freely about Business Papers or Business Paper Advertising.**

## THE ASSOCIATED BUSINESS PAPERS INC.

*The International Association of Trade and Technical Papers*

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*Canada's Dependable Machinery and Supply House*




130,000 Square Feet of Floor Space Filled With Up-to-Date Machinery.

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From time to time we have some excellent opportunities in slightly used machine tools. These tools are warranted to give satisfactory service and they can be secured at very low prices. You are urged to let us know the class of tool you need. Included in the list are: Arbor Presses, Bolt Cutters, Boring Mills, Drills, Grinders, Lathes, Milling Machines, Shapers, Planers, Punches and a variety of other machine tools. Enquiries promptly answered.

## H. W. PETRIE LIMITED

**TORONTO and HAMILTON**

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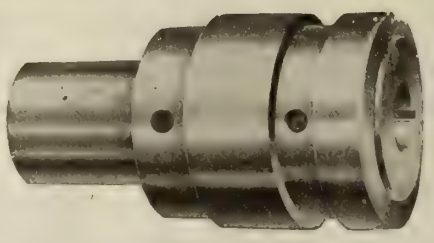
# THE JOHNSON FRICTION CLUTCH

## IF YOU BUILD MACHINERY

you are anxious to put into your product every refinement which will add to its efficiency—which will make it serve your customer longer and more satisfactorily.

One of the most important features of any machine is its clutches. No single item adds more to machine performance than a good clutch, and nothing can be a greater source of annoyance than a poor one.

Play safe and equip with Johnson Clutches.



*Write for our Yellow Catalog and Booklet "Clutches as Applied to Machine Building"*

## IF YOU USE MACHINERY

you are looking for the machine with the highest rate of production, the smallest amount of lost time, and the longest life. In all probability you will find that machine equipped with a Johnson Clutch, for the Johnson Clutch not only gives best service, but adds greatly to the convenience and speed of operation.

Look for it on the machine you buy, and to be consistent equip your plant transmission in the same way.

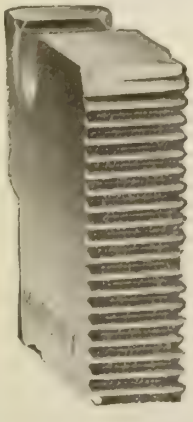
CANADIAN AGENTS:
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**THE CARLYLE JOHNSON MACHINE CO.** MANCHESTER, CONN.

*Talk About Saving Time and Labor—*

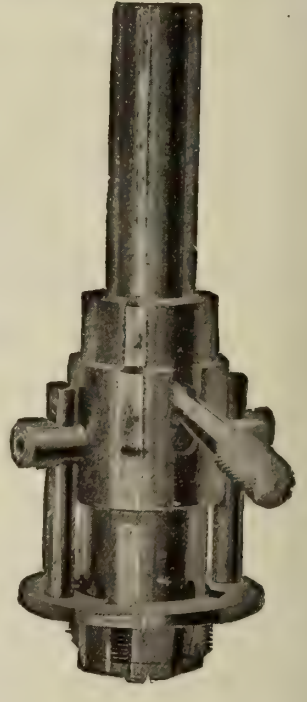
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will boost your production fifty per cent. and at the same time turn out better and more economical work than ordinary tools.



Murchey Tools are built for long, hard service. The fine materials and workmanship, their extremely simple design and rugged construction, enable clean, accurate threading under all conditions.

**If you would experience a new kind of tap and die satisfaction send for a trial order of Murchey Taps and Dies.**



## Murchey Machine & Tool Company

**75 Porter Street, Detroit, Mich.**

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- Complete Intersections

This list is merely an indication

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Transportation Building, Montreal

## WE CAN SUPPLY

# STEEL PLATE

—IN—

**Universal Edge** - up to 40 in. wide

**Sheared Edge** - up to 60 in. wide

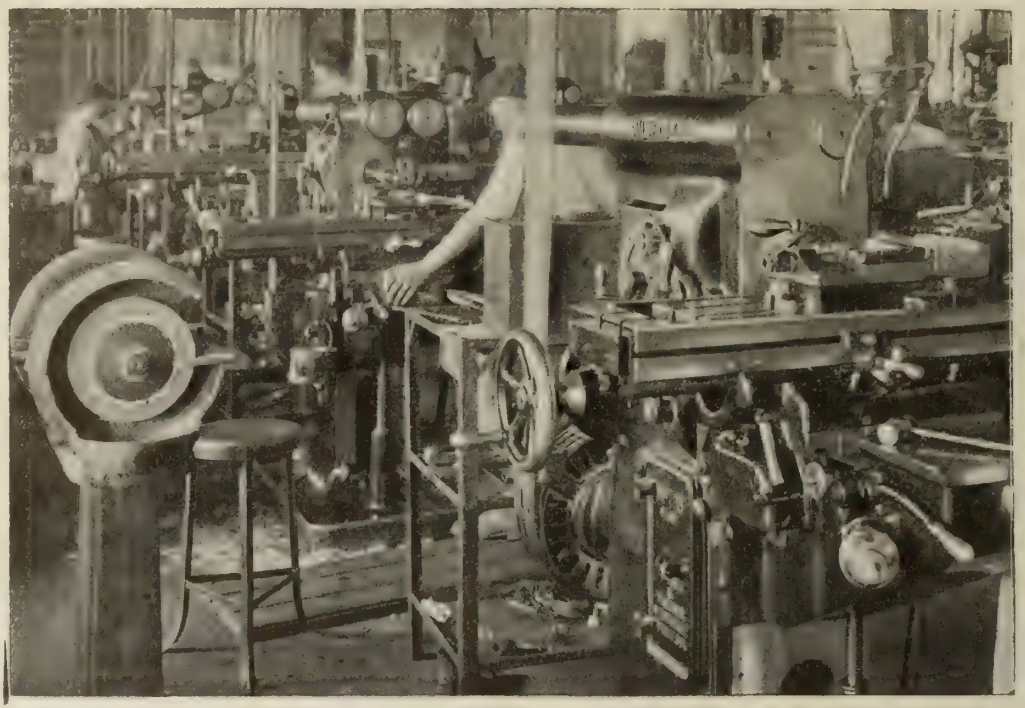
**Any Thickness** **Any Lengths**

*Send Us Your Enquiries.*

## Dominion Foundries & Steel, Limited
HAMILTON, ONTARIO

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# MILWAUKEE MILLING MACHINES



A Battery of "Milwaukees" on accurate tool work in the plant of the Continental Tool Works, Detroit.

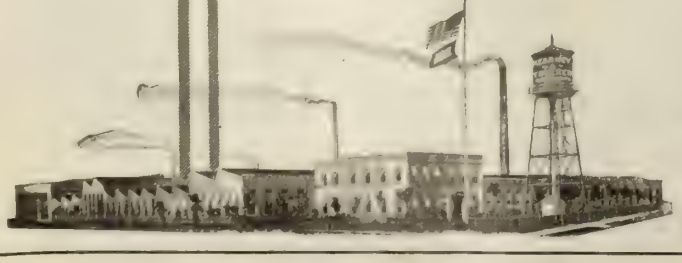
## Everywhere, In Shops That Insist On The BEST

YOU'LL find Milwaukee Milling Machines fast friends of shops that install nothing but the highest class equipment.

Positive alignment of the arbor is provided by the Double Overarm, consisting of two steel bars accurately parallel with the spindle.

The Automatic Flooded Lubrication System lubricates all bearings and gears in the column, feed box and pulley bracket. Each machine also possesses an Automatic Cutter Lubricating System which functions only when the spindle revolves or cutter lubricant may be shut off. All levers and handles are conveniently located to assist in ease of operation, making them popular with operators.

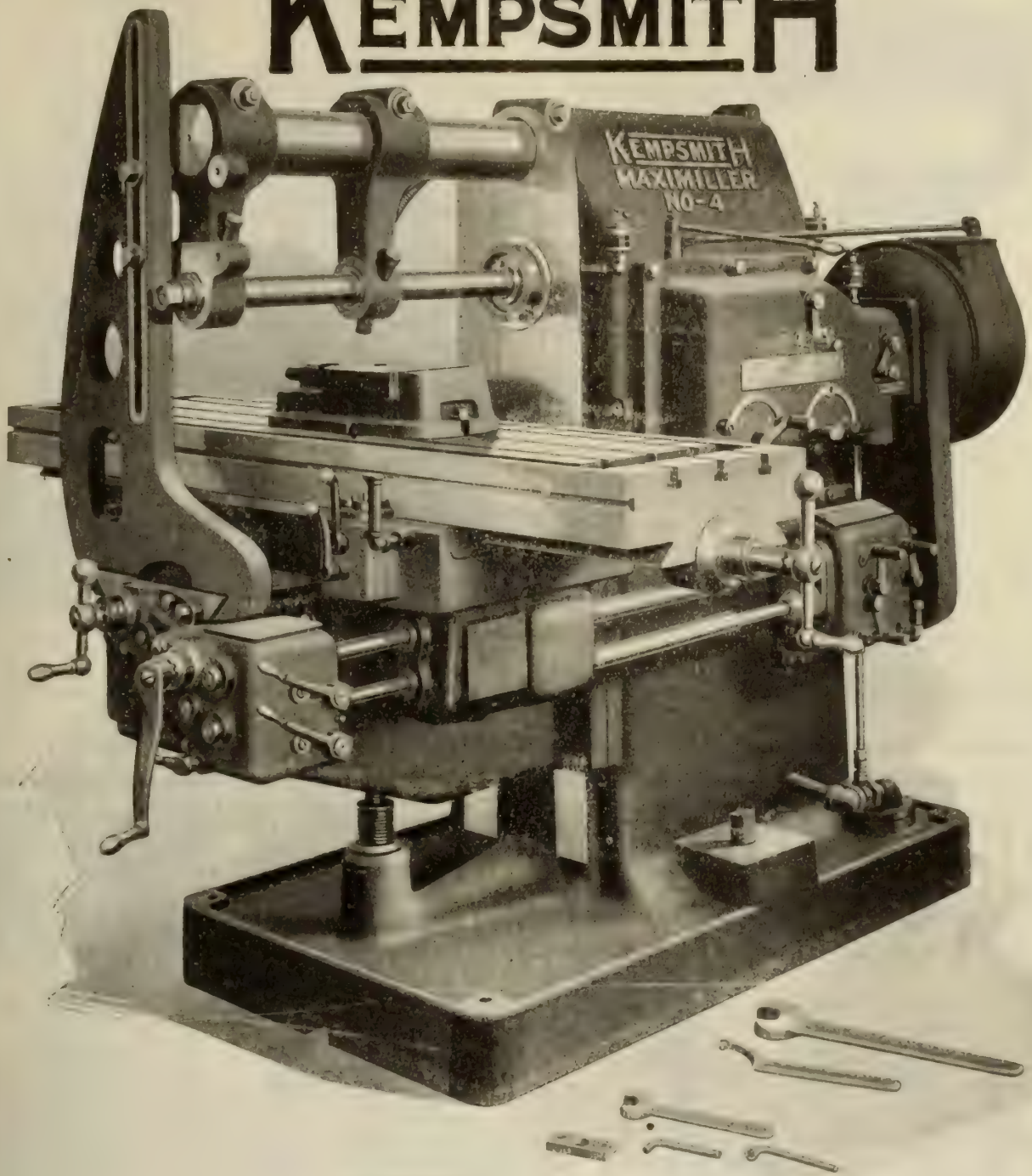
These are a few of the features representative of "Milwaukee" engineer's forethought in superior design and construction. For complete facts get our catalogue.



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# KEMPSMITH




**KEMPSMITH No. 4 Plain Maximiller**

A veritable maximum in milling machines embracing all Kempsmith patented features, permitting a maximum in production and efficiency. Write for particulars as to this machine.

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CANADIAN DEALERS:—The Geo. F. Foss Machinery & Supply Co., Limited, 305 St. James St., Montreal, Canada; General Supply Co., 38 Toronto St., Toronto, Canada.


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## CLEVELAND "FOUNDRY" CHIPPERS

*Are Dust-Proof* *Easy To Hold* *Easy To Control*

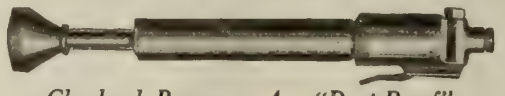
**A Remarkable Tool for Fast Chipping**

Made in "Seventeen" sizes with "Open" or "Enclosed" handles—
Outside or Inside Latch.

## CLEVELAND FOUNDRY RAMMERS

**For Floor - Flask - Bench or Core Work**

Run Fast
Hit Hard



Have No
Vibration

*Cleveland Rammers Are "Dust-Proof"*



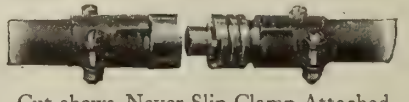
*They cost less for "Up-Keep" than any Rammer made.*

## BOWES AIR HOSE COUPLINGS
*AND*
## CLECO PRESSURE-SEATED AIR VALVES

*"Are Standard Equipment Everywhere"*



Style P.O.



Cut shows Never-Slip Clamp Attached.
Write for Bulletins Nos. 44-48



Style A.

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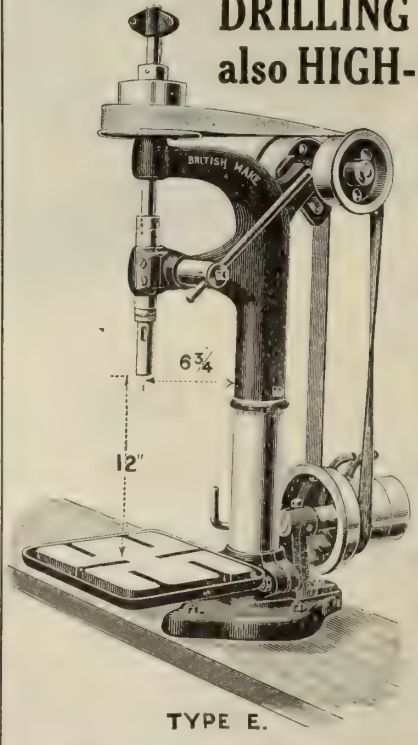
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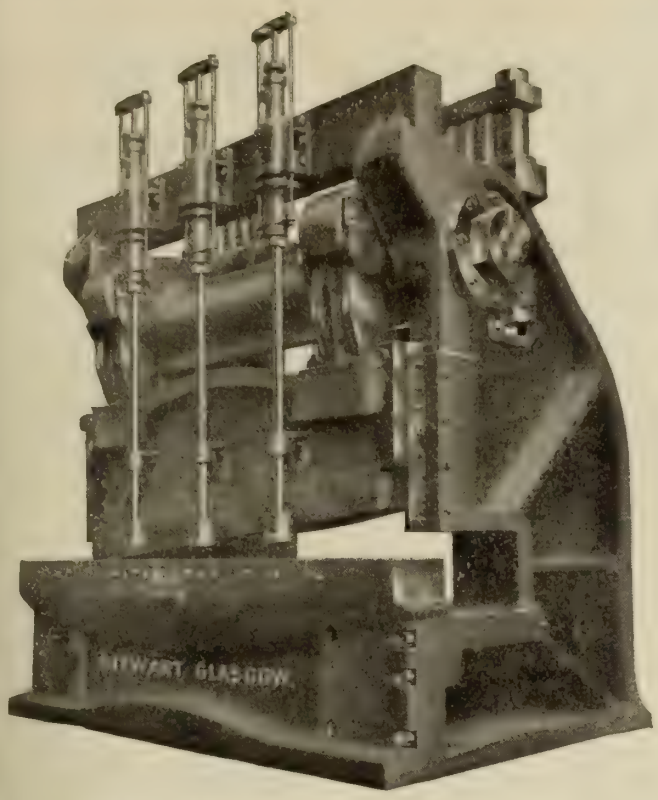
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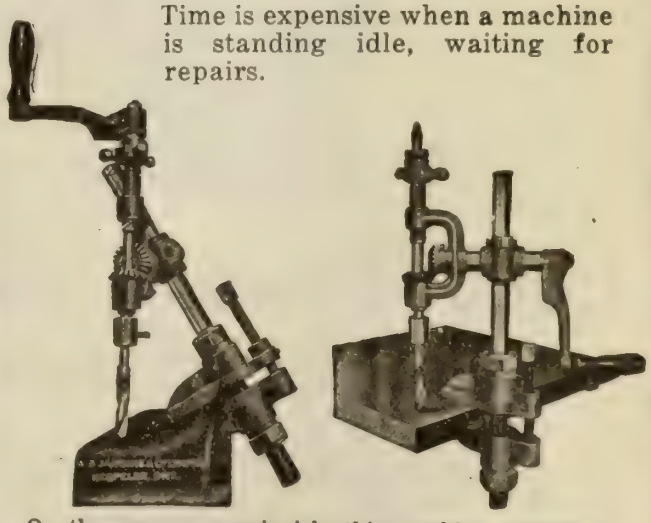
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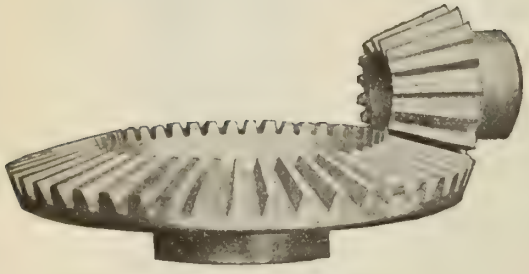
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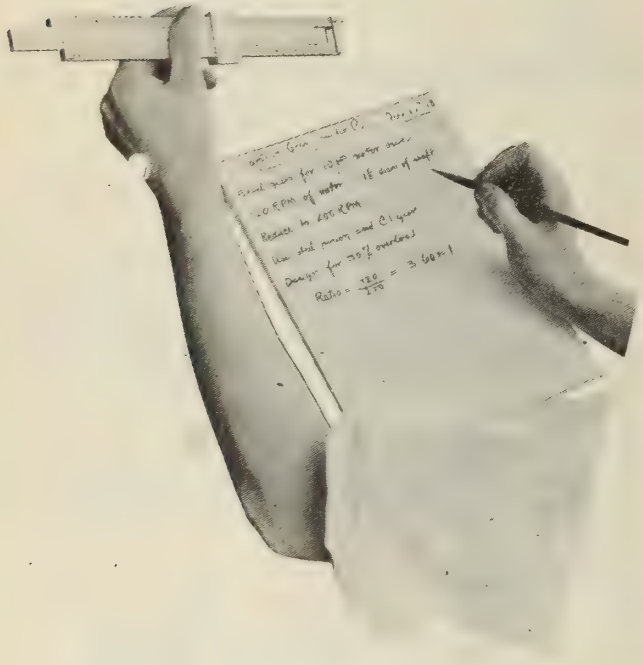
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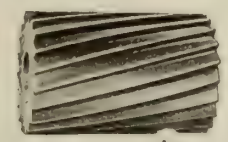
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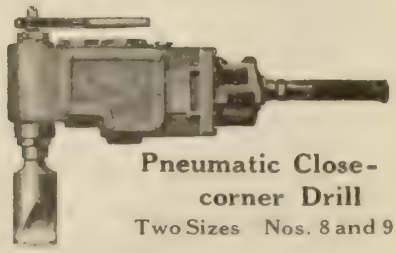
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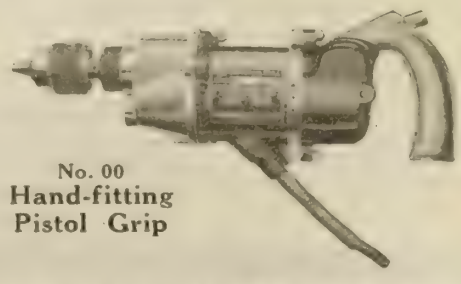
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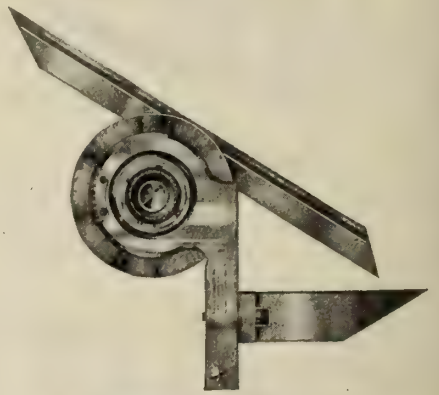
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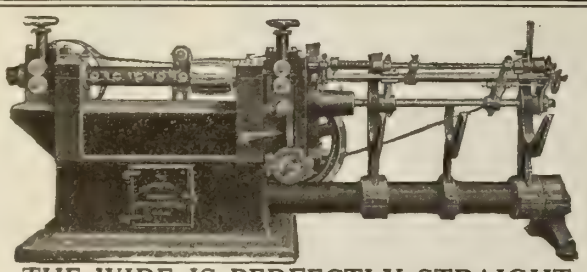
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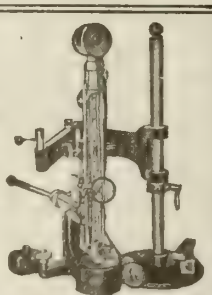


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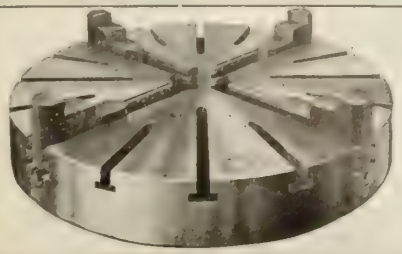
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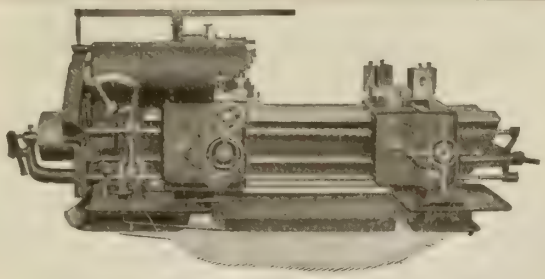
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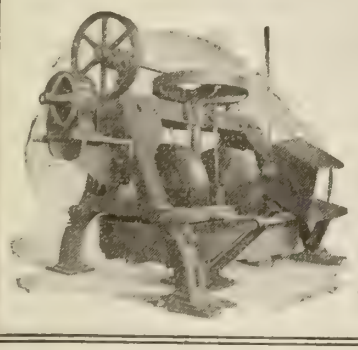
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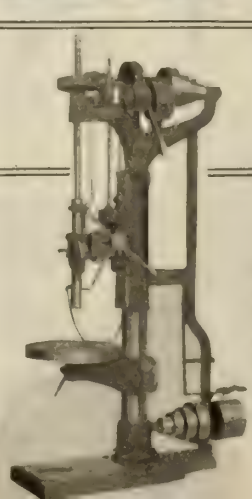
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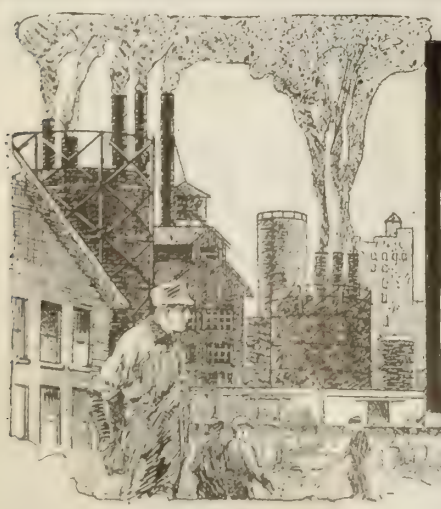



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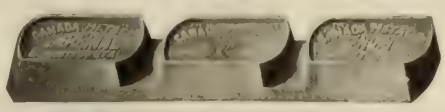
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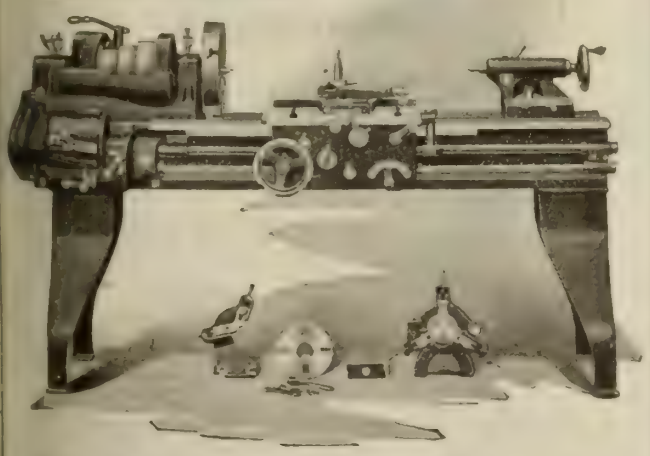
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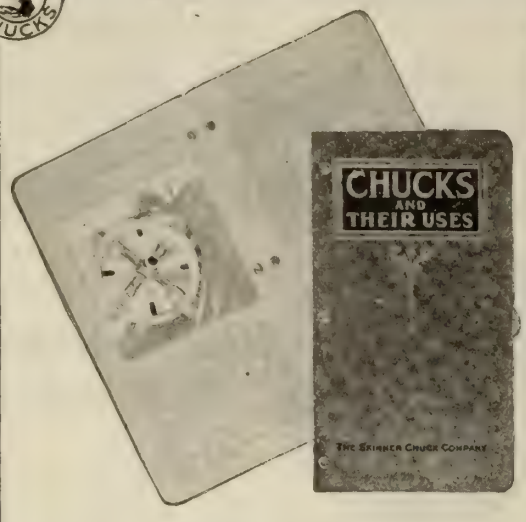
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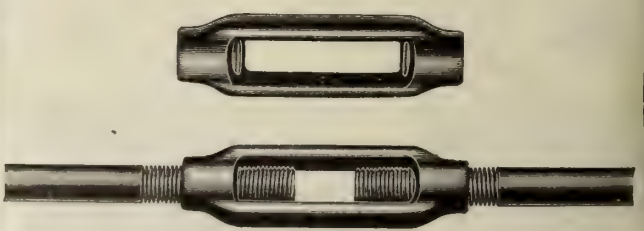
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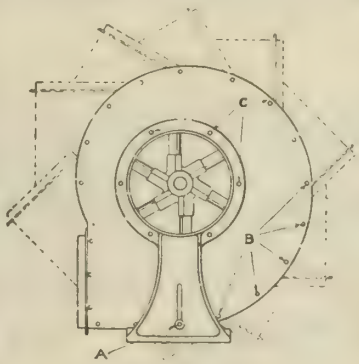
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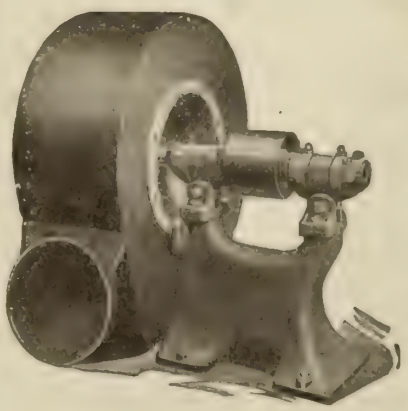
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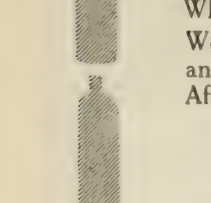
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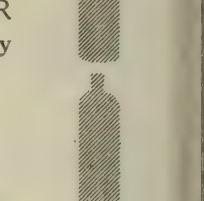
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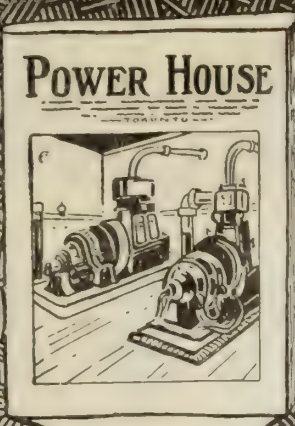
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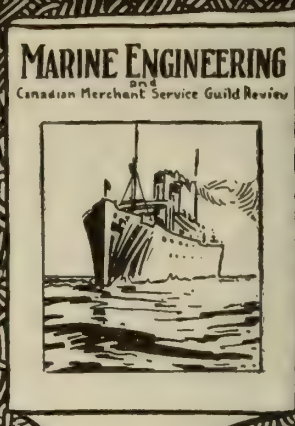
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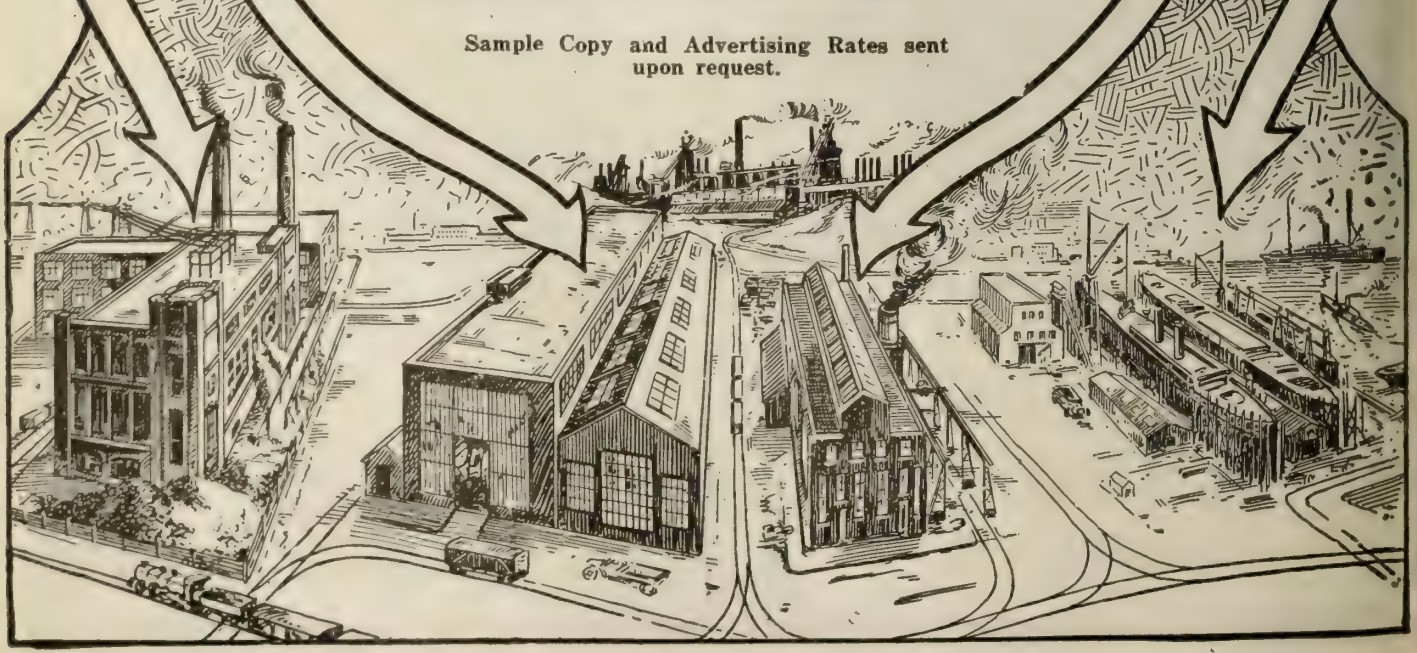
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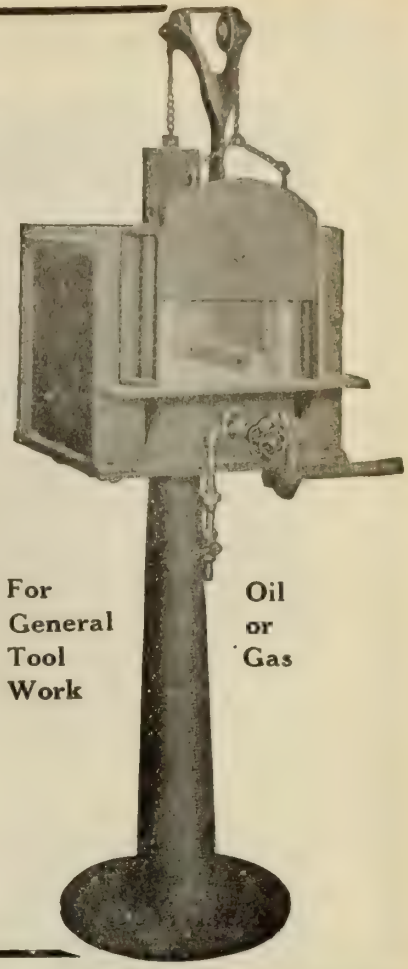
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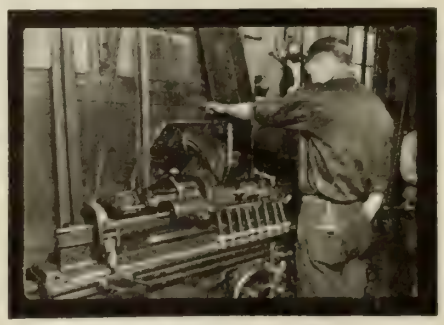
**CRANKSHAFT PINS**—6636-0 Alundum wheels are used in both roughing and finishing operations on crankpins, removing .090 in. of stock in roughing, leaving .010 in. to finish. The finish grinding is done to a .001 in. limit

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Grinding Push Rod Shanks, Norton Wheels, 24 Combination M, 20 in. x 4 in. x 12½ in.

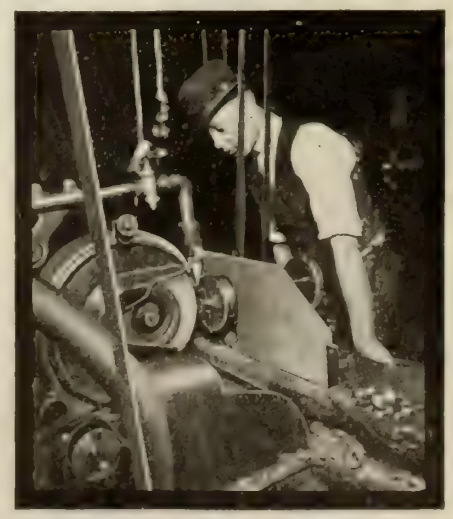
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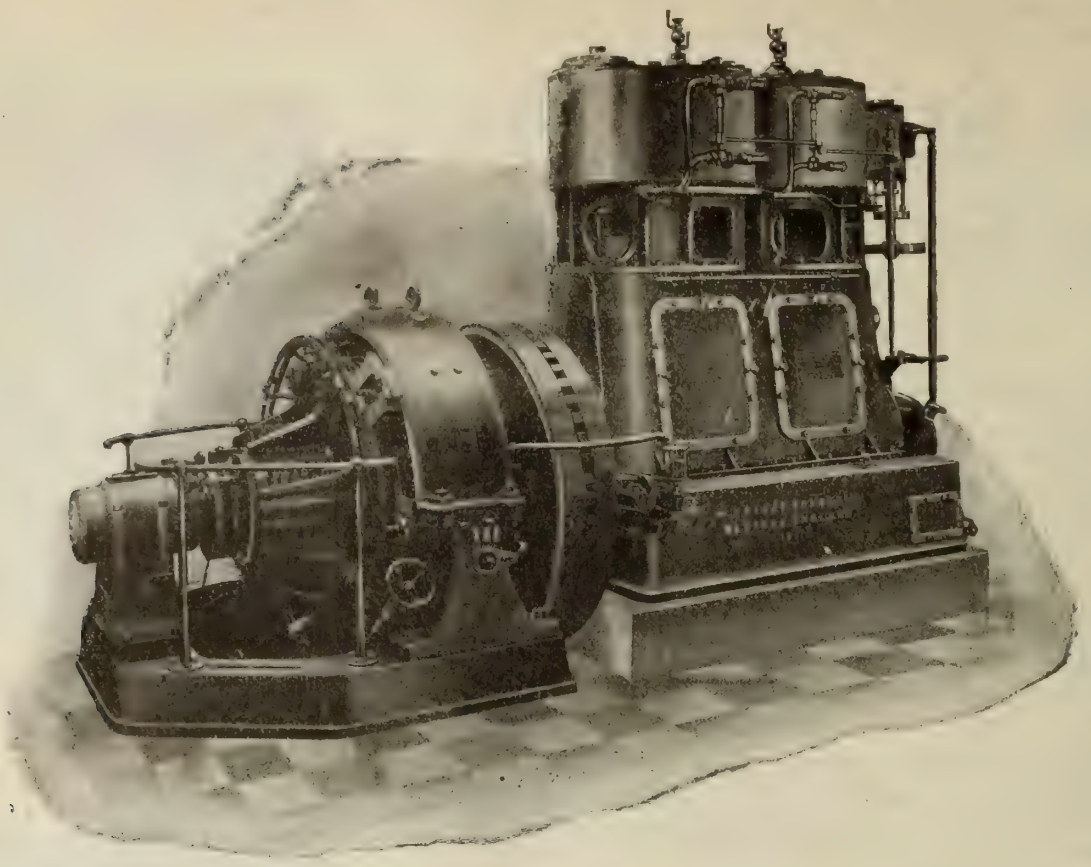


Finish Grinding Valve Heads, Norton Machine, Norton Alundum Wheel, 24-M, 20 in. x 2 in. x 12½ in.



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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

VOL. XXV. No. 10 March 10, 1921

# *Milling Practice*

## Efficient Milling Means Increased Production—Varied Examples, Including Use of Attachments and Special Fixtures.

*By J. H. Moore*

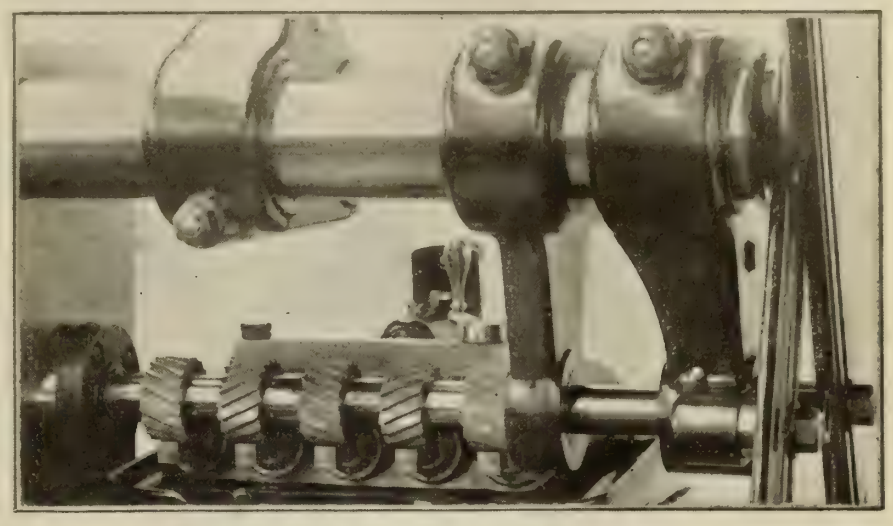


FIG. 5—MILLING SQUARE PUNCHES IN SERIES OF FIVE.

THE field of usefulness for milling machines has greatly increased within the past few years. At one time they were rather looked upon as a good type of machine for a limited variety of work, but that viewpoint has been entirely swept away, thanks to the necessity of increased production and interchangeability. Let anyone take a tour through a modern-equipped manufacturing plant and there they will see, not merely a few scattered milling machines, but regular batteries of them, all lined up to handle the work in operation sequence.

Whenever necessary, the regular machine is supplemented by special fixtures and cutters to increase production, the idea being to secure both speed and interchangeability.

Of course, there are numerous styles and sizes of such millers, but there is no need to enter into this phase of the question, as anyone desirous of becoming acquainted with the different types of machines on the market need only look through the advertising pages of any technical journal, such as the one they are reading. In fact, it is an education in itself to peruse and study the contents of the advertising pages of any up-to-date technical magazine.

It is not the intention of the writer, however, to moralize on the advantages of the advertising pages, so let us get back to the subject of milling machines. There is no need to delve into any particular design, for this information can be gleaned from the catalogue pages of the various makes. Let us leave all these points behind, and describe the phase of milling that the man in the shop is most interested in, namely, actual problems. We will, in as far as possible, illustrate a varied class of work, and we are indebted to the Kearney & Trecker Co., also the Kempsmith Manufacturing Co., both of Milwaukee, Wis., for the use of the illustrations in this article. They are actual examples of problems solved for various manufacturing plants by the makers of this particular type of miller, and show clearly what can be done in the way of miller production. Figs. 1 to 10 illustrate K. & T. practice, while Figs. 11 to 13 depict some work done on Kempsmith machines.

Let us commence at Fig. 1. This illustrates the milling of the faces of passenger car journal boxes for the Northwestern Malleable Iron Company's Milwaukee plant. This work is done on a No. 3-B plain machine, and from 1/16 inch to ⅛ inch of stock is removed, the time for each cut being one minute.

At present this concern is using two holding fixtures, one on each side of the table. The cutter is a 10-inch one, with inserted high speed bits, and runs at 38 r.p.m. The table travels at the rate of 6 inches per minute, and owing to the work being made of malleable iron, a soda water solution is used as a lubricant. A glance at the photograph illustrates clearly the nature of



FIG. 1—MILLING THE FACES OF PASSENGER CAR JOURNAL BOXES.

FIG. 2—MILLING THE SADDLES OF THEIR OWN MACHINES.

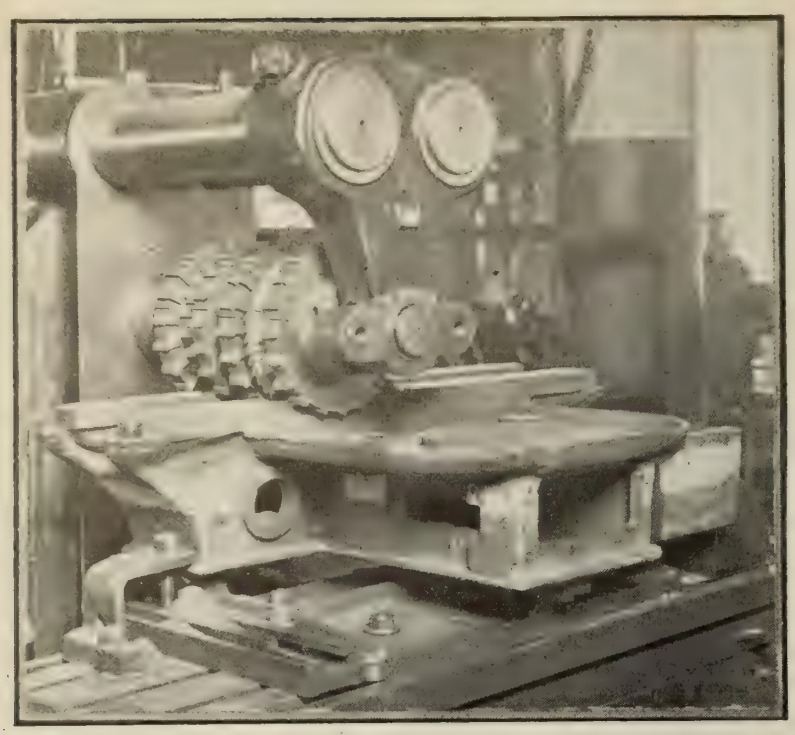


FIG. 3—MILLING THE WAYS OF A GRINDER BED.

the holding fixture, and it will be noted that simplicity has been combined with rigidity in the design of the work holder.

The next example, Fig. 2, is one adopted by themselves for milling the saddles of their own machines. A No. 3-B plain machine is again used, and, as can be noted the proposition is one of straddle milling, in fact a very wide straddle, as the outside cutter is approximately 30 inches away from the face of the column. The writer saw this operation being performed, and the rigidity of the machine was surprising. The double overarm is of course the true secret of the rigidity obtained, and although it is necessary to hold the piece being milled to limits of .001" plus, or minus, no difficulty has been experienced in so doing. It is a point such as this that makes or mars the success of a milling operation, and it is always safe policy to make sure that your milling arbor is well supported.

### Gang Milling

We will next consider some examples of gang milling, the first of which is shown at Fig. 3. In this view we see the milling of the ways for grinders made by the Ott Grinder Co., Indianapolis, Ind., and in fact the photograph was taken in the latter mentioned company's plant. A No. 3B plain machine is used, and the six cutters on the arbor are all of the inserted type, the bits being of high speed steel. Both sides and the top of one of the ways are milled, also both sides and groove in the other way. This operation is completed in one cut, and as can be noted the knee slide is being cut right out of the solid. The method of holding the grinder bed to the miller table is simple, yet very efficient, and it would be a good plan for readers to study each holding fixture carefully as they may later find a chance to adapt the same idea to other classes of work.

At Fig. 4 is shown an interesting example of rack cutting. The rack being cut is made of cast iron, and twenty-one 4-pitch tooth cutters are mounted on the machine arbor. The work is completed in one cut, and the double overarm, plus the arbor support, is largely responsible for the success of this operation. As the Kearney and Trecker Company puts it: "This work was really a test piece made to convince a prospect, and as can be noted the design of the piece did not allow us to use the arm braces. In spite of this the rack was cut from the solid, without the arm braces, and with perfect results."

### Another Example

Fig. 5 illustrates another example of milling, the work in this case being the milling of square punches. These punches have a 5 degree clearance to enable them to punch railroad tie plates, and five spiral slab cutters are used as shown.

The punches are held in a special five spindle indexing attachment, this fixture turning all five punches the necessary 90 degrees at a time. The work is performed on a No. 3B plain machine for the Whittaker Glaenster Co., Portsmouth, Ohio., and has proved very satisfactory. It will be noted that the five cutters are so arranged that the spiral of each cutter is oposite to the one next to it, this equalizing the torque on the arbor caused by the spiral angle. This is a point to be remembered when using a number of spiral cutters, especially if the cut is rather heavy.

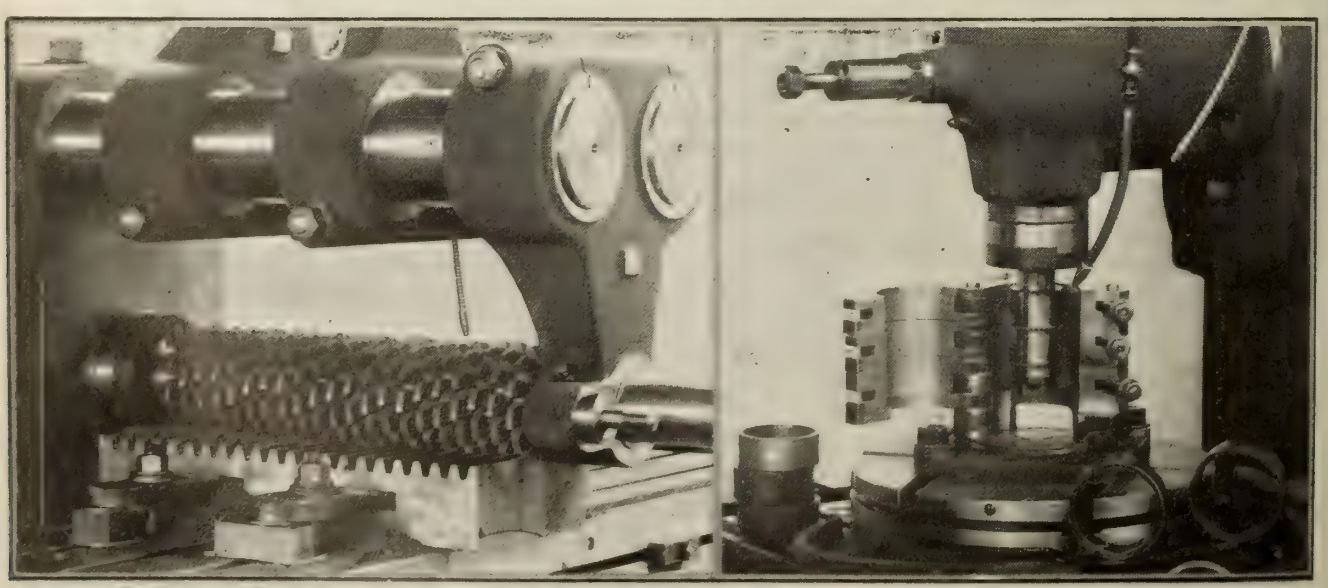


FIG. 4—CUTTING A RACK WITH 21 TEETH AT ONE CUT.

FIG. 7—A GOOD EXAMPLE OF THE VALUE OF VERTICAL MILLING ATTACHMENT.

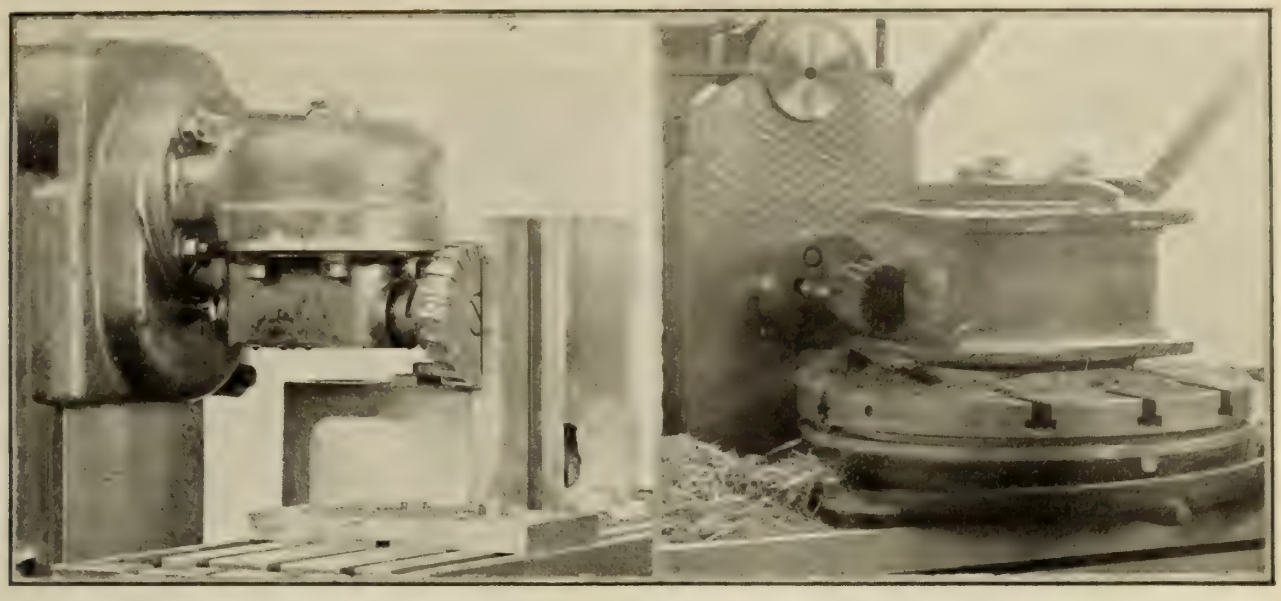


FIG. 6—USING THE UNIVERSAL ATTACHMENT.

FIG. 8—MILLING LOCOMOTIVE CONNECTING ROD BRASSES.

**Universal Milling Attachment**

It is often good policy, in fact it is often necessary, to use some auxiliary attachment in connection with the regular machine to perform the work most efficiently. Such a case is shown at Fig. 6. Here we see a No. 3B plain machine fitted up with the universal milling attachment. The work being performed is the milling of the vertical inside face of the housing which cannot be reached by a cutter on the end of the regular horizontal spindle, the extension on the base of the housing preventing this being done. The next best thing was to use the universal attachment, and as this fixture takes very little time to fasten to the column, it is no detriment whatever. Machinists and toolmakers in general should familiarize themselves with the use of the various attachments, and for this reason we will show further on in the article different applications of such attachments. However, returning to the work shown at Fig. 6. The universal attachment shown can be set at any angle, and can be fastened rigidly in any position, the size of the chips coming from the work in the pres-

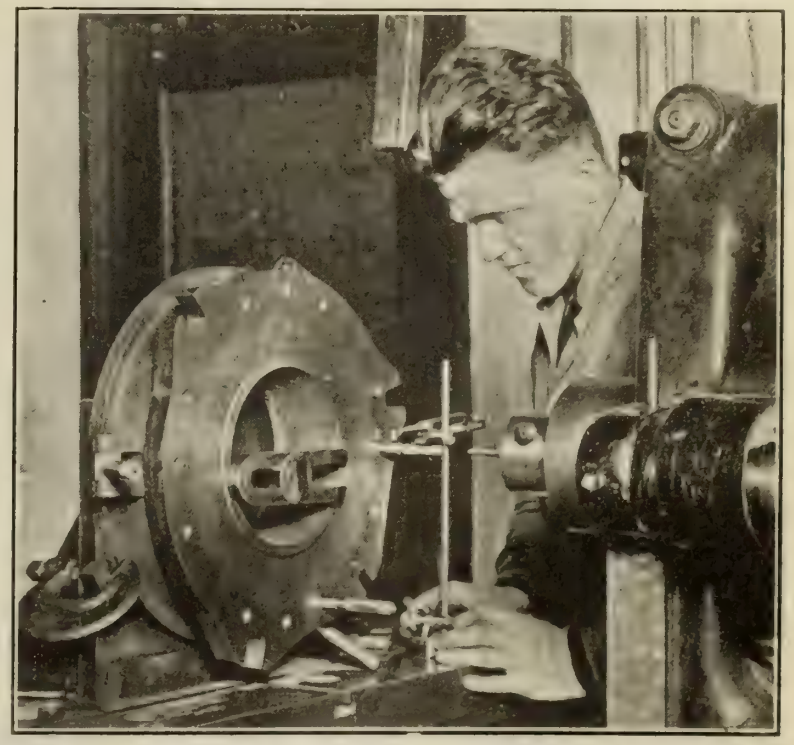
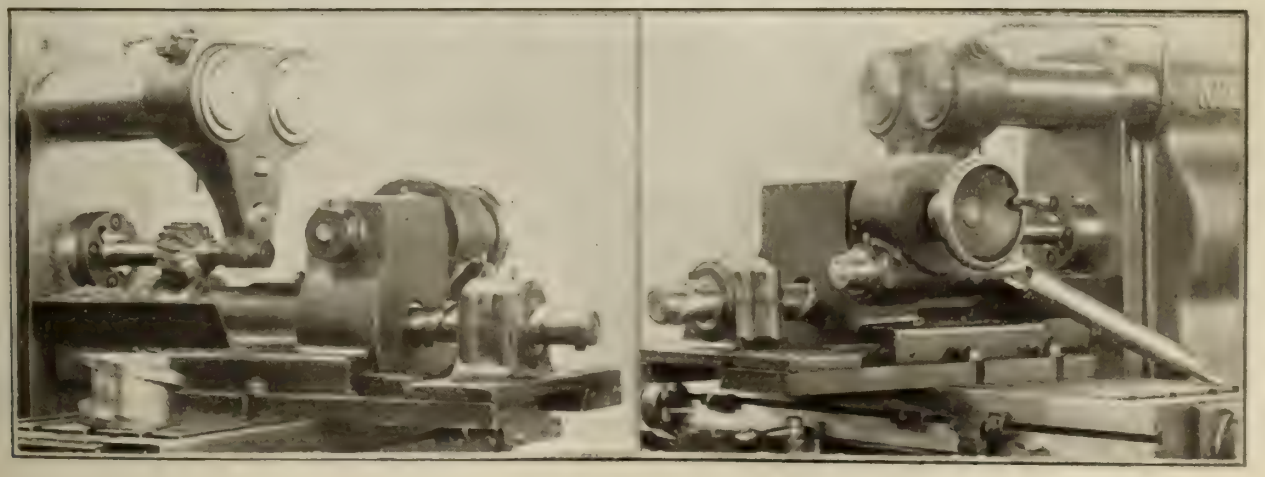


FIG. 11—USING THE MILLER FOR BORING OUT BUSHING HOLES.



FIGS. 9 AND 10.—FRONT AND REAR VIEWS OF A WORM CUTTING ATTACHMENT.

ent example being proof of this statement. There is many a job being done on other machines to-day that could be completed more economically, were the workers more familiar with the uses of milling machine attachments.

At Fig. 7 is depicted a very interesting operation on a No. 1½B plain miller, the vertical spindle attachment being used in this case. The work being performed is the milling of retainer spring grooves in the retainer rings of one of the styles of Hyatt roller bearings. Note the type of holding fixture used for this work. The fixture is attached to the rotary table, which is of course on top of the regular table, and after the three pieces of work are inserted in the holding fixture, the table is fed into the cutters by the table feed until the proper depth is reached. The automatic rotary table feed is now engaged, this giving the work a circular motion. The slitting saws used are 2 inches in diameter and are mounted on a heavy arbor to ensure rigidity. Needless to state absolute rigidity is necessary for work of this nature. The three cutters are 1-16 inch thick, and they cut the three rings in one minute floor to floor time. Samples of the work can be noted resting on the regular miller table.

### Milling Connecting Rod Brasses

In a previous paragraph in the present article the writer made a statement to the effect that many a job was being performed on other machines that could be better handled on a miller. To prove his assertion let us refer to Fig. 8. This view depicts the milling of locomotive connecting rod brasses on a No. 3B plain machine, the work being mounted on a rotary table that can be indexed at any angle. This allows the machining of the four sides at one set up. Three sides of these brasses are milled square, while an angle is milled on the fourth side for the take up work.

The size of the chips can be clearly noted in the photograph, and the work in this case completed in one hour and five minutes. In a great proportion of railroad shops this class of work is accomplished on the shaper, and approximately four hours are necessary to complete the job. On the shaper there is a chance of error owing to the different set ups necessary, so that in more ways than one, the miller is the better plan. This is only one case, but it proves conclusively that it pays to study your product, ascertaining if you are completing it in the best manner possible.

### Cutting Worms

The next two views are especially interesting, a front and rear view being shown. Fig. 9 illustrates the machine as it appears from the front, and in this case the attachment being used is a special worm cutting fixture. This attachment is fitted to a No. 3B universal machine, and a sample of the worm produced can be seen resting on the table. Briefly, here is how the worm is completed. The lead on the worm is obtained through the master screw which can be seen extended toward the front of the miller table. The power is furnished from the feed box to the attachment by a universal feed shaft as shown at right hand lower corner at Fig. 10. The worm itself is 5¾ inches diameter, and a cut of 2½ inches wide and ¾-inch deep is taken in this case. The worm is completed in 25 minutes. Here is an example of careful planning, and shows what really can be accomplished in the line of special fixtures. The attachment was made for the Visayan Refining Co., of the Philippine Islands.

The next three illustrations will depict Kempsmith machines in operation, and the first of these, Fig. 11, shows a rather interesting use for a miller. The work being done is the boring out of bushing holes in a jig plate. As will be noted the work is held on an angle plate, and the operator locates his boring positions by means of the surface gauge. This method of boring is very accurate, and just goes to show that millers can be used for more than mere manufacturing work. The material is cast iron, and we understand that the machine shown has been in use for the past five or six years.

Fig. 12 shows a No. 2 plain machine milling the slots on a small wringer bracket. The piece is of course held in a suitable jig, and the production obtained on this work is 40 per hour, or 360 per nine-hour day. The material is cast iron, and the depth of cut being taken is ½ inch.

The last example, Fig. 13, depicts the milling of splines on three rocker shafts. These shafts are made from 35-45 carbon O-H steel, and the work is to mill four splines on each shaft. The depth of cut is 1-16 inch, and work is held to limits of plus .003 inch and minus .000 inch. A dividing head is used to index the work, and the three dead centers can be clearly noted on the photograph.

Having thus led up from the very simple holding fixture to the more complex, we will leave the subject for the present, but will take up, in a later issue, still further examples of milling fixtures, some of these being of the continuous milling type.

## PENETRATION IN CASEHARDENING

In ordinary practice it is stated to be useful to include with the articles to be casehardened one or more standard mild-steel test-pieces. These, with all the other articles included in the charge of the pot, are subjected to the casehardening action; the degree to which this action has gone is judged by inspection of the fracture of these test specimens. So claim J. Galibourg and M. Ballay in the Institute C.E. Foreign Abstracts. The authors claim that the naked fracture of such specimens, whether unquenched or reheated and quenched, is deceiving; they therefore treat the fractured surface with a solution containing copper sulphate, the effect of which is to deposit copper differently on the carburised sections; this differential disposition is independent of whether the specimen is hardened or not; and it makes the evaluation of the depth of carburisation more exact.

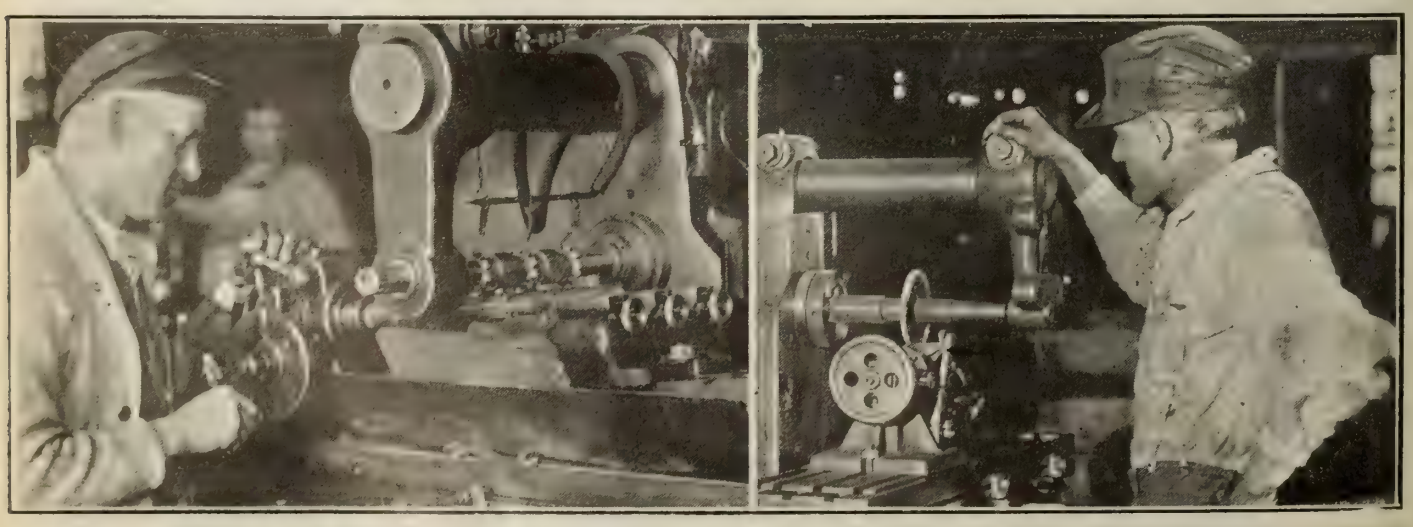


FIG. 12—MILLING SLOTS ON SMALL WRINGER BRACKET. FIG. 13—MILLING SPLINES ON THREE ROCKER SHAFTS AT ONE TIME.

# Producing Graduated Dials Economically

## Moderate Quantities Can be Produced Without Expensive Equipment—Automatic Screw Work—Knurling on Lathe, Reaming And Stamping Operations are Involved

By F. SCRIBER

THE making of dials in moderate quantities, accurate and at a reasonable cost, is apt to be rather a difficult proposition where suitable equipment is not at hand. In view of the fact that these are being used more extensively at present than in times past on all types of machinery, it is believed that the accompanying illustrations, which show a method of making a graduated dial without the aid of expensive equipment, will be of interest.

Fig. 1 is an illustration of a graduated dial that is to be machined, and shows the general proportions of this design. The dial is made of high-grade screw stock which is drilled out and finished all over. The first operations are performed on an automatic screw machine, the tools used in setting up the machine being shown in Fig. 2. Bar stock is used in this set up and is gripped in the revolving chuck on the machine. The various functions performed on the work are, first, spot drill; second, turn 1 7-16 inch and 1 5-16 inch diameters, at the same time drilling out the large holes. Third, ream the large hole, square the bottom of hole and chamfer; four, drill the small hole, turn the diameter at short end, form chamfer and cut off. Fifth, complete cutting off. Tools used are indicated over the various diagrams designated as first spindle, second spindle, etc., on drawing, Fig. 2, where it will be noticed that A is a short spotting drill held in a holder H. C is the tool used for turning the 1 7-16 inch diameter. Tool D is used for turning the 1 5-16 inch diameter, while drill E opens up the large hole. These are all contained in a box form tool F, which has adjustable shoes G and H for supporting the work while being turned. The split bushing I holds the drill in place, square-headed screw J being used for tightening. Over the diagram "third spindle" the reamer K is used for finishing the large hole. This reamer has one tooth cut across its end which is used to square the bottom of the hole leaving it slightly bevelled at the corner. A cutter L, held in a holder M, by screw N, is used to chamfer the end of the work.

Referring to the illustration over diagram "fourth spindle" the drill P opens up the small hole. This is held by bushing Q, in holder R, by means of set screw S, the bushing Q being split so it will securely grip the drill. Attached to the cross-slide of the machine by a suitable block is a formed cutter T. This turns the short length, chamfers

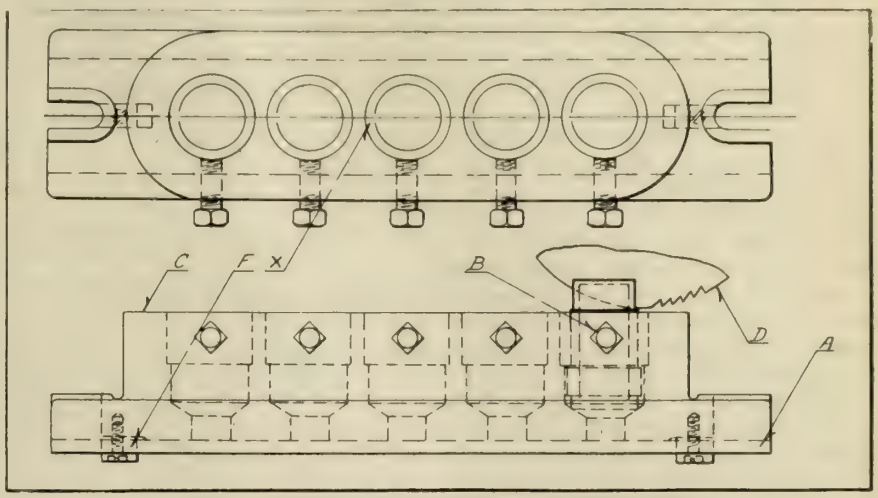



FIG. 3—FIXTURE IN WHICH SLOTS ARE MILLED.

the long bevel, and partly cuts off, while on the rear cross-slide of the machine the cutting-off tool U is mounted in a suitable holder W. This series of tools is arranged so as to permit the operations to be performed in the least amount of time consistent with a good quality of work.

It will be noted by referring to the first illustration that there is a slot across the end of the dial. This is milled by using a metal slitting saw. The object of this slot is to permit a split collar to clamp the dial in place on the machine. The fixture employed is shown by Fig. 3, and the manner of using it is quite obvious. A bushing A, or a series of bushings, one for each hole, of which there are five, are slipped over the 1 7-16 inch diameter of the work. The work is then located in the holes as shown, and the bushing which has previously been slipped over is clamped by a square-headed set screw B. Five parts are held simultaneously in the fixture, the body of which is indicated as C, this being made of cast iron. The bushing A, previously mentioned, is split at X and is made of tool steel hardened and tempered so it will spring together slightly and clamp the work. D indicates a section of a cutter, and the arrow shows the direction of rotation as it is fed into the work.

Another feature is that a slot E is cut under the lower side of the fixture. Into this slot the various clearance holes are drilled from the holes in which the pieces rest. This permits the

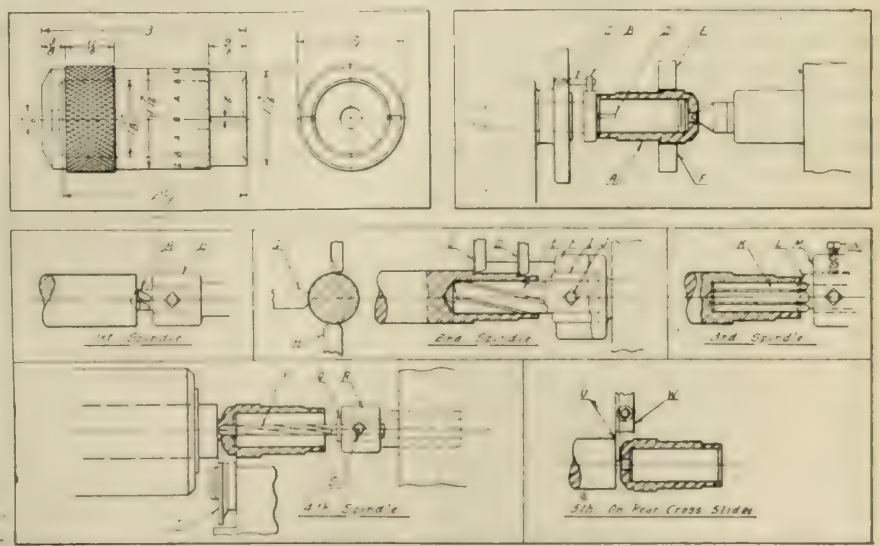


FIG. 1—UPPER LEFT VIEW. DETAIL OF THE PART.
FIG. 4—UPPER RIGHT VIEW. HOLDING ARBOR FOR KNURLING AND POLISHING.
FIG. 2—BALANCE OF VIEWS, SHOWING THE 5 SPINDLES USED IN DRILLING AND FORMING DIAL.

chips to fall through into the slot, after which they can be readily blown out by an air tube. Tongues are set into the fixtures and locate the same in the tee slot of the machine, all of which makes a very economical arrangement. Another operation which still has to be performed on this piece is that of knurling and this is very easily accomplished on a lathe using the tools shown in Fig. 4.

This consists of an arbor A which fits the spindle of the lathe. The arbor N has a pin B in it which comes in contact with a driving pin held in the face plate of the lathe. This causes the arbor to revolve under the strain of knurling so there will be no slippage. The tailstock of lathe is fitted with a spindle which can be quickly pulled back to remove the work, being operated by a lever with a spring arrangement. The work is slipped over the arbor into the position shown and the slot previously milled fits over a pin D which drives the work. The spindle knurl holder, having left and right-hand knurls, E and F, is fed across the work in the usual manner. It is next desirable to polish the dial, which is accomplished with a file and emery cloth on a speed lathe using a similar arbor, except that driving pins are omitted.

Referring to Fig. 1 it will be noted that the 1 7-16 inch diameter has numerals marked on it and indicating lines cut in its surface. In order to conform this surface and make all parts exactly the same size after filing and polishing, it was found desirable to compress it slightly in dies such as are shown in Fig. 5, where A and B are hardened steel plates with a very glossy surface which conforms to the diameter desired. C is the die holder which is clamped to the bed of the punch press. The dies are held to the holders by screws and dowels, and two guide pins E and F hold the two in alignment while the operation is performed. This die is constructed so that it will close the split end slightly. Next come two reaming operations. These are very economically performed in bench fixtures as there was hardly enough pieces machined at one time to warrant elaborate fixtures. The jig at Fig. 6 is for cutting the graduated lines on the periphery of the 1 7-16 inch diameter. The base of the fixture A is made of cast iron and has a plate B mounted on it, which is made in part with a hub to fit the hole in the base at C, This plate has a number of holes in it which correspond to the number of lines that are to be cut on the periphery of the dial. A plunger D enters these holes, spring E being used to force the plunger up. A pin F, which is pushed down by the operator, causes the spring to contract when it is desired to turn the plate from one hole to the other. Mounted in this plate is a stud G which

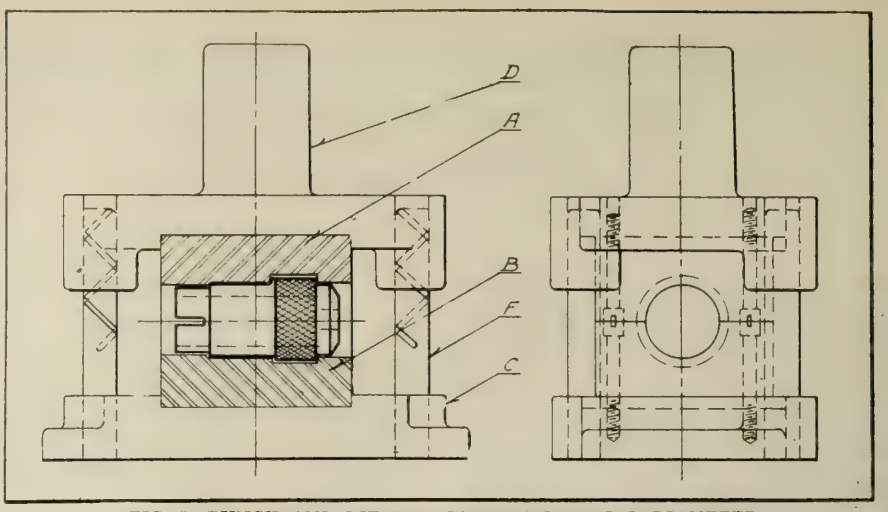



FIG. 5—PUNCH AND DIE FOR CONFORMING DIAL DIAMETER.

is held by a collar H threaded on its end. This collar likewise keeps the plate B in the base of the fixture. The dials X are slipped over this plug 6, the end of the plug being relieved and split. At I a tapered screw, having a square end J on it, expands the end of the stud, causing it to grip in the hole of the dial.

With the work thus clamped it is a simple matter to adjust the cutter K by means of the screw L so it will cut a line of the desired depth in the dial or work. To perform this operation the cutter is mounted in a slide M, the lever N being employed to move this slide up, its own weight, of course, keeping it down into the position shown. This lever has a screw P which comes against a pin Q, and the action of lifting the lever up causes the slide to be pulled up, thus cutting a line the required length on the periphery of the dial.

Graduated lines are cut on the body

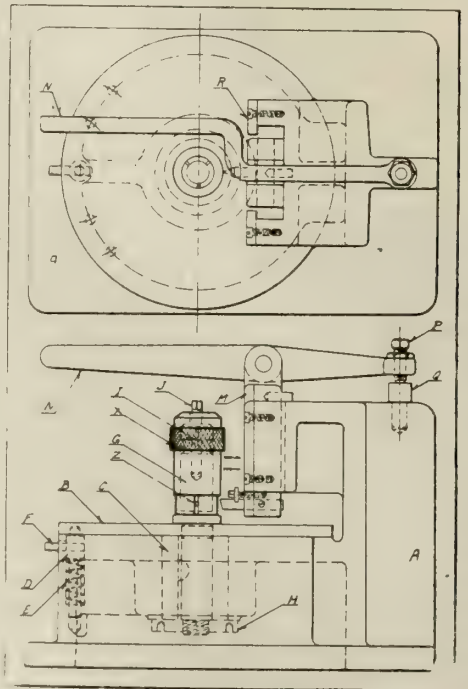


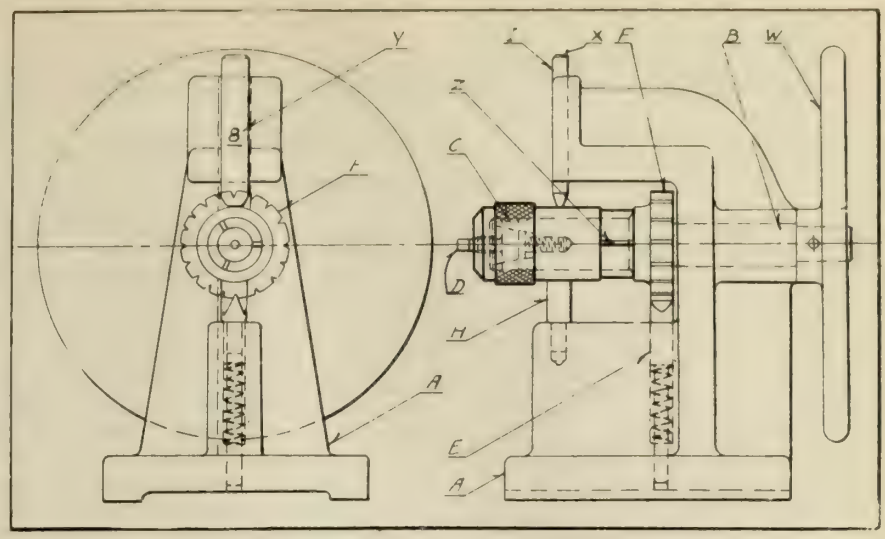
FIG. 6—FIXTURE FOR CUTTING INDICATING LINES.

of the fixture and on the slide as indicated by arrows, and these lines match at either position as desired for either long or short lines, this governing the length of the same. The slide is of the square type held in place by straps R at both sides. After one line is cut, the operator pushes down pin F, indexes plate B to the next hole, cuts the second line, and follows this procedure until all lines are cut. Long or short lines are cut at each hole on the plate to indicate to the operator whether he is to pull the slide up to the indication mark for a long or short line on the slide. The starting point is also indicated on the indexing plate to guide against the cutting of one line twice which might possibly result in spoiled work.

The fixture Fig. 7 is used for stamping the numbers on the periphery of the dial. This fixture is constructed of cast iron, having a base A in which is mounted a stud B somewhat similar to that used in the preceding fixture, this stud is split at C and is expanded by the screw D to clamp inside of the dial. This is made so that the dial may readily slip on without removal of any parts. A spring pin E having a beveled top engages slots cut in the periphery of a dial F; these correspond to the number and lines on the work. A pin Z, not previously mentioned, is used in both this and the former fixtures to locate the dial radially, and hand wheel G is used for turning the arbor B, while the pin H is made to fit the outer 1 7-16 inch diameter of the work. In using the fixture the operator takes a steel stamp I which fits a slot in the body of the fixture, and holding it in the position shown, strikes it a blow at X, thus causing an impression of the number at the opposite end to be stamped in the work. He then turns the hand wheel G until pin E engages dial F at the next cut. After placing the next number in position he hits that with a hammer, likewise making the impression of the number on the dial. This is continued until all the numbers

are stamped in place. In this connection it should be noted that numbers are stamped on the hand wheel at W and also at Y on the stamps, and when a number is up at W the number on the stamp must correspond, thus guiding against errors in the marking.

As it is not necessary to maintain the same accuracy in numbering that is desirable when cutting the lines, a much smaller indexing dial is used on the marking fixture than that which is employed on the line-cutting fixture. While this equipment, with the exception of the screw machine tools, cannot be termed speedy operating, they are of the type which makes for a good degree of accuracy, and a fair amount of economy on repeat work required in small lots, such as used in machine building. They are, of course, of the type which are used by many manufacturers in building up a business before reaching the point where they can specialize on a few things of the large quantity type.



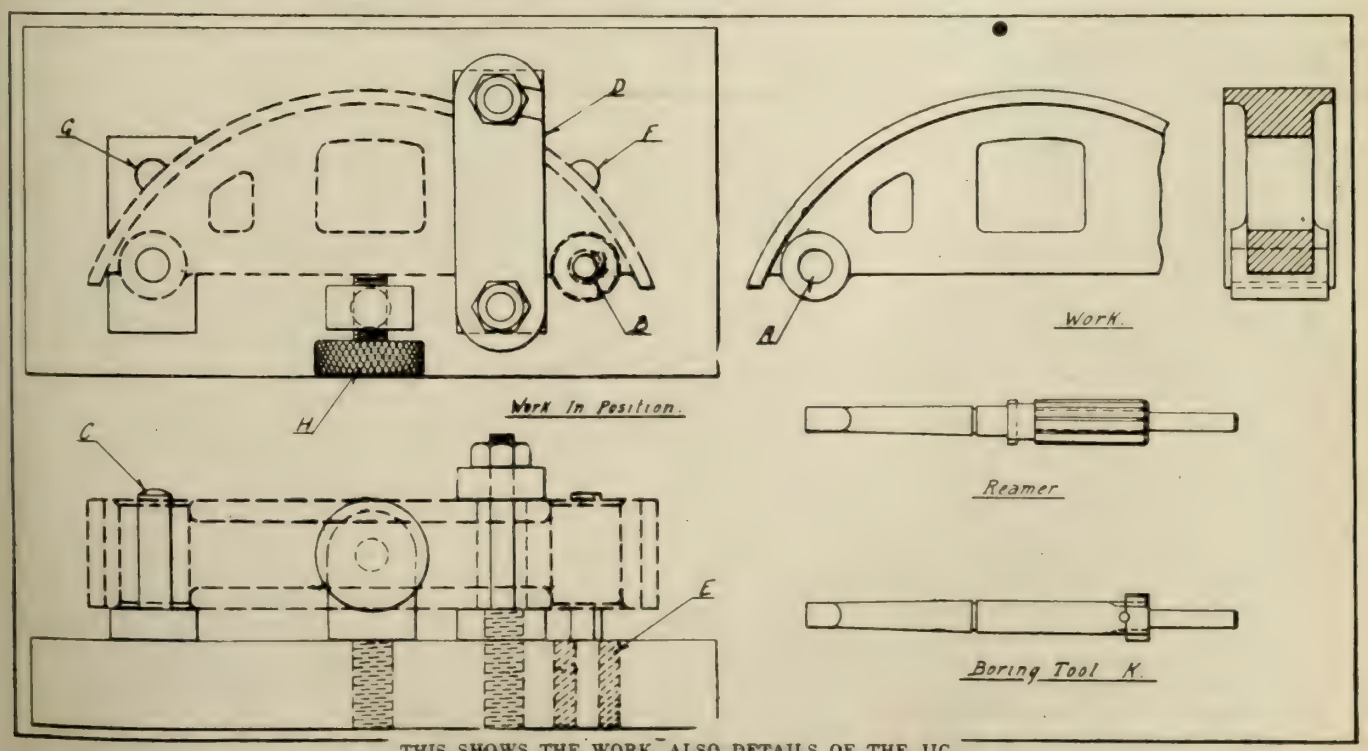

FIXTURE IN WHICH THE NUMBERING IS DONE.

## DRILL JIG WITH PILOT BUSH IN BASE

By G. BLAKE

The accompanying drawings illustrate a method of boring cored holes with the pilot bush in the base of the jig instead of in the top portion. The usual practice in jig drilling is to have the guide or pilot bush on the top side of the jig, with the drill or boring bar entering therein. In the case of cored holes it is often very difficult to prevent the drill from following the rough hole, even though it is well supported by the bushing. The work here shown is that of an aluminum brake shoe for an automobile. The hole A is first laid off and drilled and reamed without the use of a jig. B is the cored hole to be bored. After the hole A has been finished the shoe is placed in position as indicated, locating from the finished hole A on the stud C, and clamped down by the swinging clamp D. The boring bar K, with the pilot on the end, is fed down, the pilot passing through the cored hole and entering the guide bush E in the base of the jig. The jig is simply a cast iron plate machined on the base and provided with raised strips on the upper surface for locating the work, allowing about ½ inch between the bottom of the shoe and the top of the guide bushing, this space being necessary to avoid any possibility of the cutter coming in contact with the hardened bush, after the hole has been bored. The thrust screw H locates the work in position against the stop pins F and G. One of the chief advantages of this type of jig is that the operator can see the boring of the hole as it is in process. The finished size of the hole in this particular instance is 1⅜ inches, the cored hole being about one inch in diameter. A 1⅛ inch twist drill is used to rough out the hole before using the boring bar. A shell reamer on a floating arbor is used for finishing the hole to size. The boring bar pilot is provided with a helical groove for lubricating purposes; it is likewise case-hardened.

R. J. Barrie, of Galt, Ont., has purchased the Wragg Pattern Works of the same city. This plant is said to be particularly well equipped, and the present owner was previously one of the master craftsmen engaged by the former owners.




THIS SHOWS THE WORK, ALSO DETAILS OF THE JIG.

# Novel Method of Making a Surface Plate

*By T. Kenney*

MANY small and medium sized shops are admirably equipped with various types and styles of measuring instruments, gauges and fine tools of all kinds, but very few indeed can boast of having a first-class surface plate, one that can be absolutely relied upon, and without which it is impossible to measure with any degree of accuracy some of the complicated pieces of mechanism, jigs, fixtures, etc.

Before proceeding on how to make one perhaps a few words along historical lines may be of interest, and probably news to a good many of the younger mechanics. About 1830 the late Sir Joseph Whitworth, the eminent English engineer, was working in London, England, for a man by the name of Henry Maudslay, and he had to produce a perfectly true plane. Needless to say, it does not require an extraordinary amount of imagination to realize what a difficult task he had before him, especially when one bears in mind that the variety of machine tools were, at that time, limited. He had no standard or true plane with which to test his work when finished, or even to help him in making the one he had in hand. However, he came to the conclusion that in order to generate a true plane, and to be absolutely sure that he had produced one it would be necessary to produce three. This he was successful in doing, but not before a lot of thinking, and probably much more hard work. So far as the writer knows, there is no record of how long he was in producing these three true planes, but many years afterwards, in 1840 to be correct, Sir Joseph read a paper on the preparation and value of a true plane at a meeting of the British Association, and at that time pointed out that it depended upon the principle that, if any two of three surfaces exactly fit each other all three must fit, and consequently all three must be true planes and flat. Such great accuracy of workmanship was far ahead of what was contemplated at that time as possible in mechanical engineering, but Whitworth proved that it could not only be attained in practice, but also showed that it could be measured—truly a remarkable achievement at that period.

Coming to the present article. It will be seen upon referring to Fig. 1, which represents the three plates marked A, B and C that if A and B fit exactly, even though they are slightly curved, that is, A is convex and B concave (exaggerated in the diagram), B cannot possibly fit C, but would look as shown. By scraping each one and fitting first A to B, then B to C, and C to A, and repeating the operation time after time, a true plane in each case will be the ultimate result. When? That is, how far has this scraping to be carried before a practical, yet true, plane is in such condition as to say it is now OK. The writer, who has produced several, generally strives to have the finish markings and contact points not more than one-eighth of an inch apart at any place, in some cases less. Needless to say, the marking medium must be a mere suggestion for the finishing cut with the scraper, and after carefully cleaning the plate, then trying same with one or other of the plates already very slightly smeared with prussian blue or lampblack, the result should look like that shown in Fig. 2. You can then be sure of having a first-class and practically perfect surface plate.

### Question of Design

A good many designs are employed, but it is now universally conceded that a well ribbed plate having three feet, that is, a three point bearing, is the best in most cases, inasmuch as three feet are always in contact with the bench, whereas four feet are seldom all on the bench, the four point bearing making this condition practically impossible. This is an important point to remember, as it is a known fact that cast iron continues to work, be it ever so little, for a long time, therefore it will be readily seen that if the plate has four feet instead of three, one of the feet may be suspended in the air, as it were, for several days or weeks at a time. The stresses set up by this overhang would be the means of bringing about abnormal and troublesome warping, which may result in a permanent set, thus impairing the plate's accuracy. In such a case some day, someone might get badly fooled, and there would be no alternative but to rescrape the plate to a good standard before it could again be thoroughly relied upon.

### Size of Plate

A good size of plate for the average small shop is 10 inches wide and 16 inches long, or if one desires a larger or smaller one the same proportions will be found to be excellent, that is, the sides in the ratio of 5 to 8. Fig. 3 shows a plate of good general design which can be thoroughly depended upon in practice. It will be seen that the webbing is about the same thickness as the top, the sections being slightly tapered for drawing from the sand. This reduces the possibilities of unequal stresses. Some makers prefer to make the webs half the thickness as the top, and while this makes the plate lighter, the writer believes it sets up unequal stresses. As shown in Fig. 3 the depth of the webs from the top of the plate, for a plate



Fig. 1.

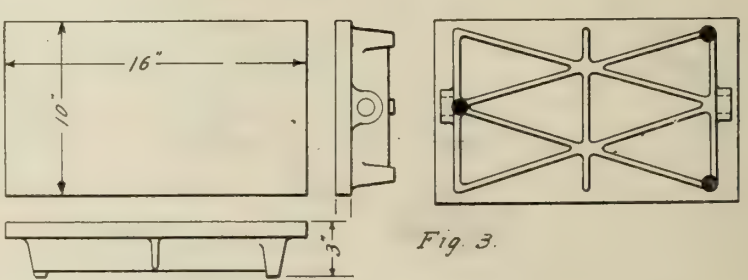


Fig. 3.

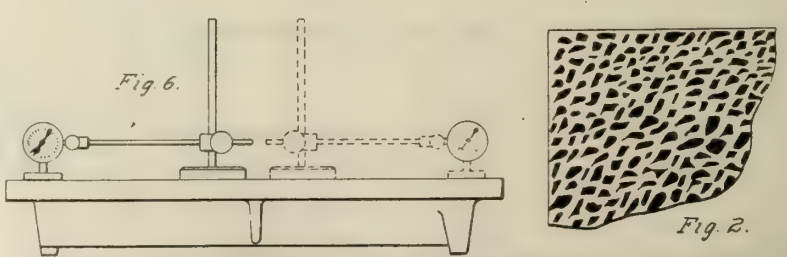

Fig. 6.


Fig. 2.

FIGS. 1, 2, 3, AND 6. REFER TO TEXT MATTER FOR EXPLANATION.

of the dimensions given, should not be less than 3 inches to insure rigidity.

After having made the pattern, a casting of good grade iron should be secured, not too hard, but of a close grain. Previous to machining these should be very thoroughly peened all over to relieve internal stresses. This precaution against subsequent warping is well worth the time and adds very materially to the length of life and accuracy of the finished plate. The three plates are now ready for machining on the feet, top and sides, after which they can be set on one side for several months, or used as rough marking off plates, provided they are not ill used. After a lapse of from six to nine months they can be again machined all over, taking great care to have the sides as nearly square as possible. The top is now given a finishing cut, which is done with a shaving tool

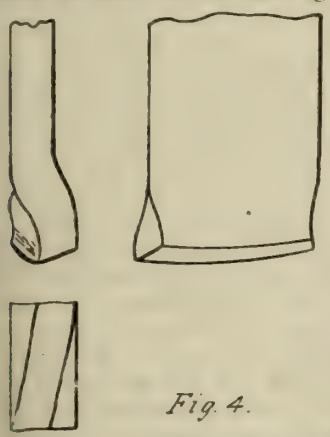


Fig. 4.

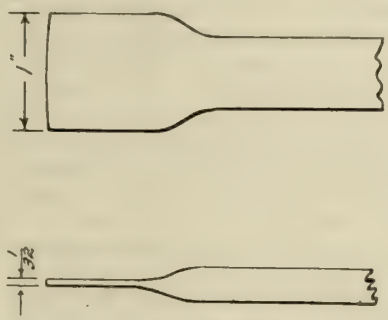


Fig. 5.

FIGS. 4 AND 5.—SHOWING THE TOOLS USED.

shown in Fig. 4. This is a very old fashioned tool, but a good one nevertheless, and the writer can strongly recommend it as one of the best where a first-class finish is desired. The twist of the cutting edge is about 15 degrees, and the cutting edge is slightly convexed. It should be tempered to a dark straw, then carefully ground and stoned, producing a very keen and even cutting edge. If this tool is nicely made and care taken in storing, practically no wear takes place, as the action of the tool is one of shaving rather than actually cutting, whilst the finish is superb.

After the finishing cut the plates are marked, A, B and C, and one, usually the one that appears to have the best face, say B, should be smeared with prussian blue or lampblack. This marking medium should be spread evenly upon its face, then the plate is rubbed with a circular motion with its face on, say, plate A. In the early stages this testing of one plate on another need not be of long duration, as the plates will be found to be far from flat, and much roughing down with the scraper will be necessary before one can settle down to the real job. The three plates are worked alternately, always carefully cleaning the one scraped. By using turpentine the scraping will be found to be much easier.

A suggestion or two on the scraper used will not be amiss. The writer has seen a variety of these, some very handsome tools indeed, but that is all. A first-class practical tool can be quickly made out of an 8 inch flat file, with about one inch of the tip broken off. It is first ground to eliminate the teeth, then flattened to about 1-32 of an inch, and re-ground to shape, and about 1 inch wide, similar to that shown in Fig. 5. It is then hardened dead hard, taking care not to burn the thin cutting edge during the heating. It should be oil-stoned with the cutting edges square with the faces, and finally finished on an Arkansas stone. You will find that this scraper will actually cut, and not scratch.

When on the finishing cut of the plates have the scraper in the keenest condition and merely pick off, as it were, the marked portions, taking care to use just about the same strength of cut at all times during the operation. If the cuts are taken first in one direction and then in another much better results will be obtained. It is a heavy, tedious job, but when finished such a plate is a pleasure to work over and it can truly be classed among the gauges.

A good method for testing the surface against any subsequent warping is shown in Fig. 6. A lapped test block of small area is placed at one corner, then a surface gauge, carrying a test indicator is placed about the centre of the plate with the test indicator registering, .005 on the test block. The test block is then moved to another corner and the reading of the indicator should be the same, and so on for the four corners. After this different places on the plate's surface can be tried in the same manner, and if no appreciable difference is shown on the indicator, one can rest assured that the plate has not "moved" to any serious degree. If, however, you can borrow a standard plate, known to be in good condition, it will not be necessary to make three plates, as the one in hand could be scraped and tested by this, although way back in the thirties there was no such thing as getting the loan of a plate, or even reading of the method employed in producing a true plane.

## HEATING DROP FORGE DIES

A rather interesting patented method of heating drop forging dies is spoken of in a recent issue of the "American Drop Forger." This idea is patented by H. R. Reinhardt, and here is what he has to say:

"My method is to increase the life of drop forge dies by keeping them during use at a temperature considerably above atmospheric and somewhat below the hardening temperature of the die. In general, the temperature at which the tools or dies are to be kept during periods of active use varies from 300 degrees to 1,100 degrees F., depending on the characteristics of the steel or alloy of which the die or tool is made. Dies of ordinary carbon steel, containing from .75 to .90 per cent. carbon, should be kept at a temperature of 400 degrees to 500 degrees F. For this material, the lighter the dropping-weight of the machine in which the die is used, or the lighter the stock of which the forging is to be produced, the lower the temperature at which the die should be kept. A high-speed tungsten-steel die containing, say, 16 per cent. tungsten, 3.4 per cent. chromium, .8 per cent. vanadium, and .65 per cent. carbon, should have a working temperature of 1,100 degrees F. A steel containing 2 per cent. tungsten, 1 per cent. chromium, .80 per cent. silicon, and .45 per cent. carbon, which is much used for dies for hydraulic bulldosing and compression work, as well as hot-trimming and blanking, should have a working temperature of 500 degrees F. A die for hot-trimming, drop-forging, and hot or cold bolt-heading, made of steel containing .90 per cent. carbon, .40 per cent. manganese, 3.50 per cent. chromium, and .20 per cent. silicon, should have a working temperature of 750 degrees F.

There are various ways by which this heating of the dies may be accomplished. The tool may be surrounded with a jacket packed with infusorial earth or with fine molding sand, the whole apparatus being heated with gas-burners. Where the required temperature is relatively low, a bath of oil, lead, or lead-and-tin alloy may be used. By varying the proportions of lead and tin in the alloy, almost any melting-point between 400 degrees and 600 degrees F. may be obtained, thus furnishing a simple method of attaining and maintaining the proper temperature.

## CUTTING SOFT METALS

In cutting copper, tin, lead, or, in fact, any soft metal, it is good policy to see that a small amount of water is kept in the cut already made. If this is done it will be found that the metal separates easier and the edge of the saw keeps in good condition longer than when dry cutting is done. Even an ordinary chipping chisel does better work when the edge is kept wet than when it is dry.

# Present Day Illumination Standards

## Artificial Lighting Now Considered an Asset Rather Than a Liability—Careful Placing of Machines Necessary if Artificial Lighting is to Accomplish Its Purpose

*By GEORGE C. COUSINS

IN planning the layout of machinery in factories the relative importance of daylight and artificial light is frequently not given sufficient study, with the result that machines are placed so as to utilize daylight under best conditions. This arrangement often complicates utilization of artificial light to the best advantage. Daylight has usually been considered satisfactory and has been used as a reference standard in the absence of real data on the actual conditions.

Surveys of daylight illumination in factories have revealed the fact that in many plants the natural illumination is inferior to good artificial lighting. The following is a typical example: A machine shop is built with practically continuous window area on south, west and north walls. On a clear cloudless morning measurements of intensities at the benches near the windows showed over 50 foot candles (ft-c.), while about 30 feet from the windows the intensities at the work points of machine tools ranged from 3 to 14 ft. c. In some cases artificial light was used to supplement the daylight. The shop under consideration was on the second floor of the building, there were no high buildings within several hundred feet and a clear sky exposure is obtained on all sides. This is a very favorable condition. Where buildings are grouped together so that the sky is obscured the conditions would be very much worse. A more extended study of daylight intensities in 18 factories showed average intensities ranging from 1.5 to 10 ft. c. for lower grades of work and 4 to 18 for finer grades.

These results tend to show that daylight illumination in factories is not as good as is ordinarily supposed to be the case and that the distribution of daylight is far inferior to that of reasonably good artificial lighting. As a result of the knowledge of these conditions it has been proved that artificial lighting can be economically produced that is superior to daylight in both average intensity and distribution, and that when the lighting system and the machinery or work spaces are properly co-ordinated, the resulting illumination will have the greatest all-day effectiveness and manufacturing can be maintained on a really productive basis throughout the entire day.

For many years the conviction of illuminating engineers has been that factory output could be increased by the use of high intensities of illumination, but the putting of this opinion to the test was a difficult problem and it required some strong action to break the ice of opposition.

*Abstract of paper presented at the general professional meeting of the E. I. of Canada at Toronto.

### A Convincing Test of Better Lighting

The problem was attacked in a rather novel manner by the Commonwealth Edison Co. of Chicago. Their engineers approached a number of manufacturers, at whose plants accurate cost records were kept, with the proposal to instal trial lighting systems to produce three times the intensities previously recommended for the various classes of work. Records of cost and output were to be kept for a month under the existing lighting systems, then for a month under the new and finally a reversion to the old systems for another month. This was expected to furnish reliable data on the unit cost of output. The results were so gratifying that all the trial systems were retained as permanent, and in some cases the manufacturers would not permit a reversion to the old systems, realizing that it would mean financial loss. Some of the effects of the high intensities were that the increase in production was from 10 to 20 per cent., with a maximum cost increase of 5.5 per cent. of the payroll. In one case the production was increased 15 per cent., with no increase in the cost. The increased economy is due to more work being turned out with a decrease in the amount of spoiled and defective work. The indirect beneficial results to the workers in the form of more cheerful surroundings, cleaner shops, less eye strain and fewer accidents react to the benefit of the manufacturer in keeping the working force in a more efficient and contented mood.

*POINTS OF INTEREST*

*Proper artificial lighting is essential, if productive night work is to be obtained.*

*Watch the relative importance of daylight and artificial light. Study both conditions.*

*Artificial lighting can be produced economically, at the same time making it superior to daylight if properly distributed.*

*Increase in both production and pay roll is possible if light is of sufficient intensity.*

*Artificial light is used on an average of 5 hours per day throughout the year. In view of this figure, the subject requires proper attention.*

A very important phase of the effects of high intensity is its effect on the accident rate. About ten years ago approximately 24 per cent. of industrial accidents were caused by poor lighting, by improving the lighting conditions this percentage has been reduced to about 15 per cent. The economic loss caused by these accidents amounts to approximately $300,000,000 per year in the United States, which is more than the yearly lighting bill.

The relative importance of daylight and artificial light may be estimated from the fact that artificial light is used on an average of about five hours per day throughout the year. This is roughly about 50 per cent. of the working day and in view of this the importance of giving proper weight to artificial lighting is evident. When plants are operated at night the balance is overwhelmingly in favor of artificial light.

Here are some figures showing the intensity recommended for different kinds of work. These figures are stated in foot-candles. Shipping rooms, 1.5 to 2.5; paint shop, 2.0 to 4.0 for coarse work and 4.0 to 8.0 for fine work; passageways, .25 to .5; metal pattern dept., 4.0 to 6.0; power house boiler room, .8 to 1.5; engine room, 2.0 to 3.5; sheet meta dept., 3.0 to 6.0; average factory—assembling 4.0 to 7.0, drills 2.0 to 4.0, millers 3.0 to 6.0, planers 3.0 to 5.0, rough manufacturing 1.25 to 3.0, fine manufacturing 3.5 to 6.0, special cases of fine work 10.0 to 15.0; forge and blacksmithing—ordinary anvil work 2.0 to 4.0, machine forging 2.0 to 3.0, tempering 2.0 to 4.0, tool forging 3.0 to 5.0; foundry—bench moulding 1.0 to 3.0, floor moulding 1.0 to 2.0.

Stairways, 0.25 to 0.5; steel work—blast furnace (cast house) 0.3 to 0.5 loading yards (inspection) 0.3 to 0.5 mould, skull cracker and ore yards 0. to 0.3, open hearth floors (soaking pit and cast house) 0.1 to 0.3, rolling mill 1.0 to 2.0, stamping and punching shee metal 2.0 to 5.0, stock room 0.8 to 2.0 transfer and storage bays 0.5 to 1.0 unloading yards 0.1 to 0.3, warehous 0.5 to 1.0; stock rooms—rough materia 1.0 to 3.0, fine materials 2.0 to 4.0; sto age, 0.25 to 0.5; wire drawing—coars 2.0 to 4.0, fence machines 2.0 to 5.0, fir 4.0 to 8.0; woodworking—rough 2.0 4.0; fine 3.0 to 5.0.

### Revised Estimates

The figures given show the intensiti recommended for various classes of wo in 1916. A reference to a few of the might be interesting for the sake comparison. Machine tools were list as requiring from 2 to 6 ft. c., rou manufacturing 1.25 to 3, fine manufac-

turing 3.5 to 6, special cases of fine work 10 to 15, drafting 7. Compare these with some of the recent installations; for an aluminum working plant 14 ft. c., a drawn steel factory 15 to 16 ft. c., manufacturing automobile springs 21 to 22, ordinary machine shop work 10 to 11 and punch presses 6 to 10. These cases do not require particularly fine work and yet the intensities are equal to or greater than daylight intensities in many factories.

As far as can be learned all the installations of high intensities have resulted in economy and are considered good investments. How far high intensity can be carried before the limit of economy is reached is problematical, but that limit has not yet been reached. It appears evident, however, that as intensities are increased the increase in economy will be by smaller increments and that the gain resulting from an increase in intensity of from 10 to 15 ft. c. would not be as great as it would from 5 to 10.

Considerable headway is being made in the elimination of drop cords. In some cases workers have clung so tenaciously to these that their removal has resulted in mutiny. In some operations they are indispensable, and to provide for such contingencies in up-to-date plants they are kept in tool check rooms and supplied as special tools being returned when the operation requiring them is completed. Experience has proved that there are very few industries that cannot be lighted quite satisfactorily by overhead units. Drop cords are relics of the early days, when carbon lamps were the only suitable electric lamps for interior lighting, and should find no place in modern installations of high-powered lamps in suitably selected and placed reflectors except in special cases where overhead light cannot reach the point where work is being done. The practical solution of the elimination of drop cords is the correct placing of lamps relative to the work places or vice-versa. In large plans of mill construction it is sometimes necessary to provide individual lamps for machine tools placed in open bays. In some cases flood lighting units placed close to the ceiling are suitable and for others an adjustable lamp with its reflector is mounted on the end of a pipe arm which can be adjusted horizontally through an unthreaded T, which can in turn be raised or lowered on the end of a telescoping upright. By this means a substantial construction is provided without the dangers accompanying exposed insulated wire.

### Office Lighting

On account of the connection of offices with factories some of the improvement in the lighting of the latter has extended to the former. Office work as a rule does not require as high intensity as factory work, but requires more refinement in the form of diffusion. One of the important factors in the success of office lighting is the elimination of bright reflections from furniture and paper surfaces. This has been very successfully accomplished by the use of semi-indirect and indirect fixtures. It has been found that the eye suffers less fatigue under indirect than under any other type of fixture. The dense bowl semi-indirect unit gives practically the same illumination effect and the more dense the bowl the less eye fatigue is caused. Considerable improvement has been made in the design of semi-indirect bowls during the last few years. These are mainly in the way of dust proof units. Totally enclosing units can now be obtained that have all the good qualities of the open inverted bowls with the dust proof feature of enclosing globes. Some of these have reflecting domes above the bowls for use where ceilings are not suitable for use as secondary light sources and others have clear glass tops. Other fixtures are equipped with automatic cleaning devices operated by the same pull-chain that operates the switch. Every time the lamp is lighted or extinguished a felt squeegee makes a complete revolution of the interior of the bowl, removing all dust. About 5 to 10 ft. c. might be considered as representative of good office lighting at present, although there are some installations of from 14 to 19 ft. c.

The period of transition from daylight to darkness when the fading daylight must be reinforced by artificial light has always been one of the difficult problems to solve. During this period the eye is attempting to work under two conflicting conditions. It is adapted to the color of daylight and the introduction of the yellower artificial light disturbs its condition of equilibrium; comfortable vision is not obtained until artificial light dominates the situation and the eye becomes adapted. To reduce the annoyance of this period C2 mazda lamps have been found very successful. The color of this light, nearly white, blends with the daylight and work can be carried on with very little interference.

In the foregoing only the monetary aspect of artificial lighting has been considered. The physiological aspect has been studied, showing the effect of intensity of illumination on the working of the eye. This investigation was conducted over a range of intensities from 4 to 36 ft. c. It was found that with increasing intensity a gain was obtained in visual acuity, power to sustain acuity, speed of discrimination and speed of adjustment of the eye for clear vision at different distances, figs. 4, 5, 6 and 7. These gains were greater for eyes with slight uncorrected defects than for normal eyes and there are indications that the middle-aged and aged eyes are benefited more than young eyes. The increase in acuity is very rapid up to about 5 or 6 ft. c., after which it becomes more gradual. The other functions of the eye that are affected by time show a more gradual gain at lower values and more rapid at higher intensities. The power to sustain acuity of vision shows the greatest increase.

These functions of the eye all have a very direct bearing on the amount and quality of work that can be performed by an individual and the ease with which it can be done and a knowledge of their performance under varying intensities of illumination proves that increased production with increased intensity is based upon sound physiological facts and is the logical result. It also points the way for the conservation of the eyesight of the people and the elimination of the evils that have resulted in the past from prolonged use of poor lighting.

In view of the conditions under which high intensity lighting has been evolved, it is not surprising that the greatest improvement has been made in the industrial field. The value of high intensity has been firmly established from both the economic and hygienic viewpoints and there are strong indications that we are in the threshold of a new era of artificial lighting that will include all branches of industry and commerce.

## RIVET CUTTING RECORD

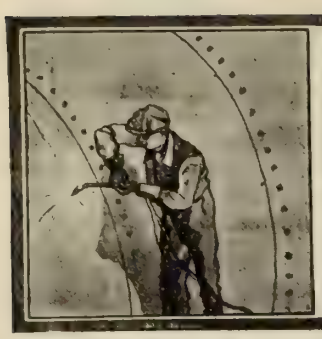
What is believed to be a record for cutting rivets in the dismembering of steel freight cars was recently established by an operator who cut out 1,308 rivets in 2 hours and 46 minutes. Of this number 683 were ⅝-inch rivets, 228 were ¾-inch rivets, and 127 were ⅞-inch rivets.

The cutting was done on a standard Erie car under general yard conditions, the operator taking the rivets as they came, working inside, outside and under the car. The car was one that had been retired from active service and that was in the car shop for repair, the rivets and plates being covered with heavy scale and rust, thereby rendering the cutting extremely difficult.

It is said that the record applies not only to the number of rivets cut in the time required, but also to the low consumption of gases used, the job taking only 384 cubic feet of oxygen and 83 cubic feet of acetylene. The operator used an Oxweld cutting blowpipe with a rivet cutting nozzle.

## AUTOMOBILE INDUSTRY HAS A BETTER OUTLOOK

There is a much better feeling existent regarding the automobile industry. Representatives of Wall Street brokerage houses state that production is still about 50 per cent. of capacity, but many companies are receiving new orders. This is particularly true of the manufacturers of parts, indicating that motor car manufacturers have used up their supply and the fact that they are buying parts was taken to mean that motor car buying is on the increase.



# WELDING AND CUTTING



# Hints on Oxy-Acetylene Welding and Cutting

## Care of Welding Rods—The Use of Fluxes—Manipulation of Blowpipe—Proper Adding of Welding Rod

STEEL and iron welding rods should always be kept in a dry place to prevent rusting. If they do become rusted they must be thoroughly cleaned before using.

### Fluxes

Some metals do not flow together readily under the action of the blowpipe flame. By using a suitable flux this difficulty is overcome. A welding flux is a combination of chemicals in the form of a powder which assists fusion and either prevents the formation of oxides, or breaks down oxides when formed; or, as in the case of grey cast iron, keeps the carbon in the "graphitic" or free state.

Flux should not be sprinkled on the weld, but should be applied by dipping the heated welding rod from time to time into the flux, enough of which will adhere to the rod. Flux at all times should be used sparingly.

Fluxes always should be kept in air-tight tins, as some absorb moisture and others deteriorate if exposed to the air for any length of time.

For successful welding, it is absolutely necessary that the proper flux be used. Fluxes should be purchased from a reliable company, preferably from one making a specialty of this particular line and recognizing fully the conditions to be met. Cheapness should never be a guide in the purchase of this material.

### Manipulation of Blowpipe

The blowpipe must be grasped firmly but not rigidly in the hand. It is not good practice to hold it in the fingers, because it is impossible to manipulate the flame with as great regularity and control, nor will it be possible to do as heavy work without tiring.

Occasionally the hose is thrown over the man's shoulder. In this case the weight of the blowpipe is suspended and held by the tubing, so that it is only necessary to impart the typical welding motion to the blowpipe, which can usually be done by the fingers. The movement of the welding flame is hindered, however; and this method is therefore not recommended, and should be used only as a relief when the work is of long duration and the operator's wrist and forearm become tired.

The head of the blowpipe should be inclined at an angle of about 60 degrees to the plane of the weld, as in Fig. 15.

*This information will be continued in later issues, and we will take up the subjects of irons and steels, pipe welding, cast iron, etc. We are indebted to the Oxweld Acetylene Co. for the use of this material.*—EDITOR.

The inclination of the head should not be too great, because the molten metal will be blown ahead of the welding zone and will adhere to the comparatively cold sides of the weld. On the other hand, the welding head should not be inclined too near the vertical because the preheating effect of the secondary flame will not be efficiently applied.

There are certain cases, however, where the conductivity of the metal is such that it is not necessary to utilize this preheating. Also certain metals have the property of absorbing the gases of this flame. Consequently, in these cases it is best that the flame impingement be concentrated to as small an area as possible.

The motion of the blowpipe should be away from the welder and not toward him, as closer observation of the work can be obtained and greater facility in making the weld will be experienced.

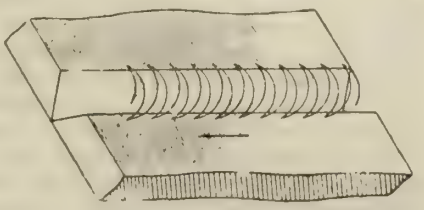


FIG. 16—MOTION OF FLAME FOR WELDING

Where thin sheet material is being welded and it is not necessary to use a welding rod or wire, a weld may be produced by moving the blowpipe in a straight line. It can readily be seen that this does not apply to welds which have been bevelled, and which require the use of filling material, for in this case a swinging motion must be imparted to the blowpipe to take in both edges of the weld and the welding wire at practically the same time.

In comparatively light work a motion is imparted to the blowpipe which will cause the incandescent cone to describe a series of overlapping circles, the overlapping extending in the direction of the welding. In order that the weld be of a good appearance this must be constant and regular in its advance. The width of this motion is dependent upon the size of the material being welded and varies accordingly with the nature of the work.

In heavier work, if the above system were used, a great deal of the motion would be superfluous. Consequently either an oscillating movement or one in which the jet of the blowpipe will describe semi-circles should be used (Fig. 16). This confines the welding zone and while the progress is not so fast, it is more thorough than the other system for this class of work.

To the average beginner the regular control of these motions is difficult, and considerable practice is required to become skilled. It is the regularity of these motions that produces the characteristic even-rippled surface of good autogenous welding. The progress of a welder and the quality of his work can be determined to some extent by the skill with which he produces this effect.

After the swinging motions of the blowpipe have been mastered, the next step will be to introduce the welding rod into the weld in such a manner that the regular advance of the blowpipe will not be hindered nor retarded. It can be seen that there is quite a little attention needed to secure perfect co-operation between the two hands, one controlling the blow-

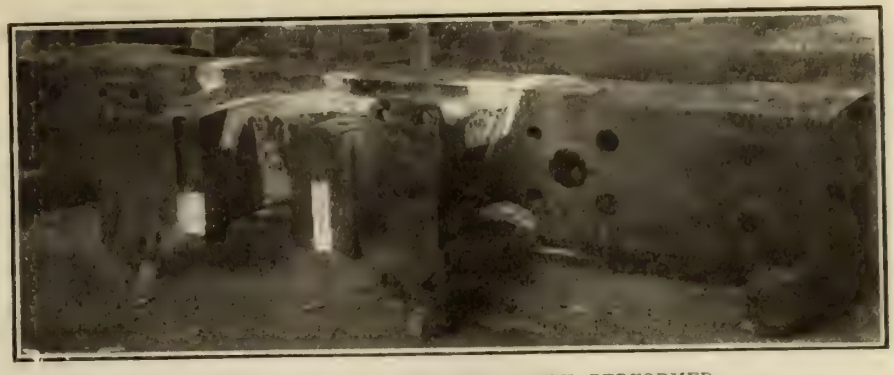
pipe and the other adding the welding rod.

The welding rod should be held and inclined as shown in Fig. 17. In this position sufficient quantity of metal may be added at the right time. With the welding rod held in a vertical position or horizontal, the possibility of the addition of an excess of metal, part of which is not fused, is great. In adding this metal, care must be exercised that the edges of the weld are in the proper state of fusion to receive it. If the metal is not sufficiently hot, the added material will merely stick to the sides and fusion will not exist. It is therefore necessary that, by the motion of the blowpipe, fusion be produced at the edges of the weld equal with that of the welding rod.

The usual faults of the beginner are failure to introduce the welding rod at the proper time into the welding zone, to hold the rod at the wrong angle, or to fuse either too little or too much of the rod. The filling material when melted should never be allowed to fall into the weld in drops or globules. When the proper time arrives to add it, the welding rod is lowered into the weld until it is in contact with the molten metal of the edges. When in this position the flame of the blowpipe is directed around it, and thus fusion is produced. It is customary to add metal in excess to that of the original section. There are several very important reasons for doing this. First, the weld is reinforced and the strength is accordingly increased. Second, in case a finished surface is desired a sufficient stock must remain to allow for finish. Third, small pinholes or blowholes may be found just under the surface of the weld, which do not extend to any depth, and may be removed by filing or machining.

The welding of different kinds of metals very often requires different methods, all of which cannot possibly be covered under any general rule. For this reason we will consider these subjects in a later issue.

H. Massicotte and Freres, Inc., Cap de la Madeleine, Que., intend erecting a plumbing shop and public hall costing $10,000.



THIS VIEW SHOWS THE WORK PERFORMED.

## ANTI-CARBURIZING PAINT

As is well known, it is necessary on occasions to localize the effects of case-hardening. Messrs. Alfred Herbert, Ltd., Coventry, England, have placed an anti-carburizing paint on the market for such purposes. Any spot which is required to remain soft is merely covered with this paint, which prevents the carbonizing of that particular place. No special preparation of the part is necessary except that the surface should be quite free from dirt or grease. The compound is applied to the article with an ordinary brush on such parts as are to remain unaffected by the casehardening. It is then allowed to dry, and the article packed in the case-hardening box in the usual way. When the hardening process is concluded the paint will be found to have fused to a glass-like substance, which can be removed by scraping or sandblast. Their Canadian office is at 1-3 Jarvis Street, Toronto.

Tests with glass insulators have been in progress in Switzerland for several years, and numbers of these insulators have been used in France and the United States for potentials up to 50,000 volts. The principal application for glass insulators is, however, up to 25,000 volts. Such failures as have occurred with glass insulators, says Practical Engineer, have been due principally to internal stresses which cause cracking when the insulator is subjected to heavy mechanical stress or sudden temperature change. The occurrence of such failures has been made less frequent by the use of improved material and better annealing. As for the puncture strength, it is higher than that of glazed hard porcelain. The glass used in Switzerland is clear and transparent, hence the absorption of solar heat is less than in the dark green glass hitherto employed.

## THE OLD TERM HORSEPOWER

What is a horsepower? Briefly, it is a rate of doing work. If you lift 550 pounds, one foot, in one second, you have actually completed a horsepower of work. Naturally, a horsepower is able to raise twice that weight one foot in twice the time, or one-half foot in just that time. Moreover, it can raise half 550 pounds one foot in half a second, or two feet in a second, and so on. Therefore, when we lift one-fourth of that weight, 137½ pounds, four feet in one second, we are exerting a horsepower.

This being granted here is what we get. If a person who weighs 137½ pounds runs upstairs at the rate of four feet a second, he is exerting the equivalent of a horsepower. For a man weighing twice that much, 275 pounds, it would be necessary to climb at the rate of only two feet a second to exert a horsepower. It is possible to do much more.

As a matter of fact, a horse often exerts many times a horsepower. The average horse can draw a wagon up a hill where a ten horsepower engine would fail. A horsepower does not represent the greatest momentary strength of the average horse, but is a measure of the power which he can exert continuously.

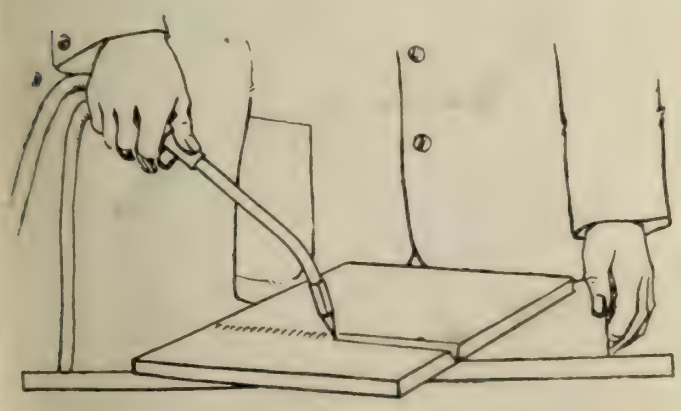


FIG. 15—CORRECT METHOD OF HOLDING THE WELDING BLOWPIPE.

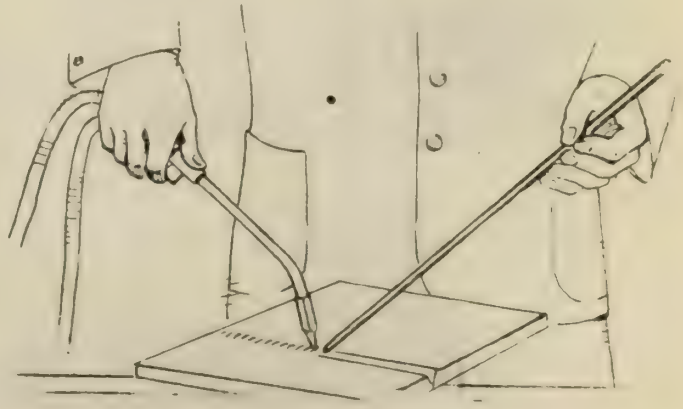


FIG. 17—CORRECT METHOD OF ADDING THE WELDING ROD.



# DEVELOPMENTS IN SHOP EQUIPMENT



## RADIAL DRILL DRIVE

The Fosdick Machine Tool Co., Cincinnati, Ohio, have introduced a new drive for their radial drilling machines. The illustration depicts their 4-foot heavy-duty radial drilling machine equipped with a five horsepower R. & M. 3 to 1 variable speed motor. It will be noted that the motor is mounted on the radial arm. A Cutler Hammer controller is also located directly on the spindle head.

One advantage of this arrangement is the swing of power through the elimination of two sets of bevel gears. The motor is also away from the dirt that usually accumulates on the floor. The arm is partially balanced and additional floor space around the base is available.

The outstanding feature of this particular application is the standardization. By such a method any standard make or speed of 3 to 1 variable speed motor may be used, thus avoiding the usual delay caused by the necessity of special patterns and castings for each particular type. A bakelite pinion is placed on the motor shaft, this varying in size according to the speed of the motor selected. All other gears are kept standard.

The fact that one motor only is used is regarded as a strong feature. The elevating mechanism drives from this motor through the regular standard gear arrangement. The controller, as seen mounted on the spindle head, is made more convenient of operation by the bevel gear connection to the handwheel below it. This type of control is preferred in shops where the work is usually on large castings where the spindle head is frequently at the upper and outer extreme.

A more popular location for the controller is on the arm girdle, convenient to the operator's left hand. This eliminates the large flexible conduit in the rear of the arm, and is the most satisfactory for the average run of work. This type of drive is furnished on the 4, 5 and 6-foot heavy-duty radials.

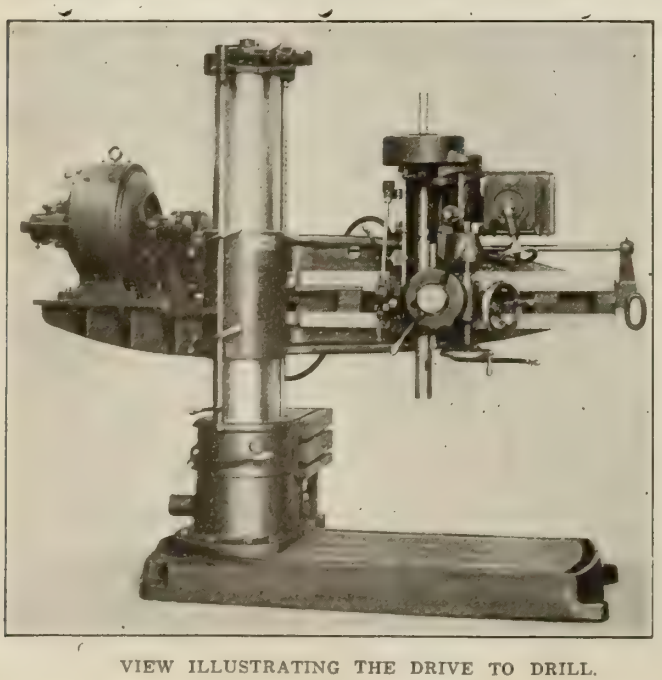
## ROCKFORD AUTOMATIC LATHE

The accompanying illustration shows an automatic lathe that has recently been added to the line of the Rockford Machine Tool Co., Rockford, Ill. The machine is intended for the rapid production of duplicate parts, especially for the turning of pistons, pulleys, cone pulleys and gear blanks where multiple tools can be used and the turning and facing operations done at the same time. It is built on the lines of a 22-inch heavy-duty lathe so as to insure absorption of vibration and to withstand the severest service.

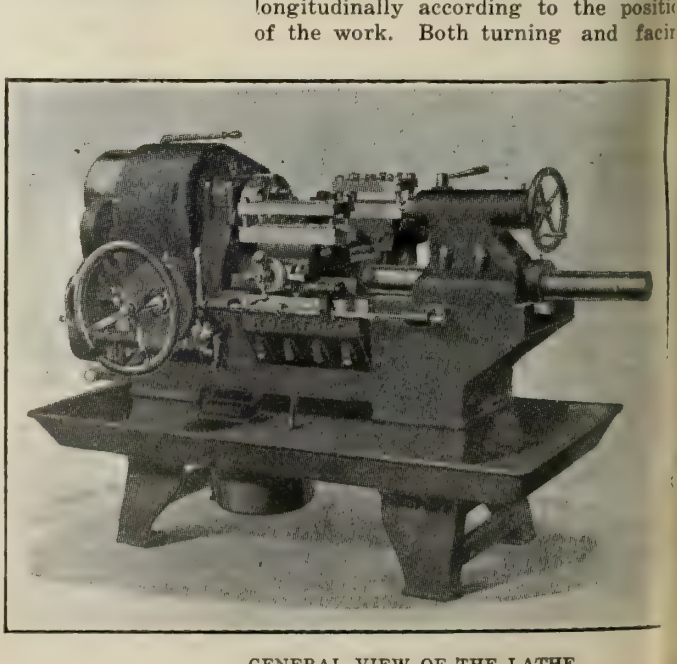
The machine is provided with three changes of speed, operated by means of a gear-shift lever. The driving gears are of wide face and large pitch, the main drive being through helical gears, to give smooth running. The machine is driven by a single pulley of large diameter and wide face, the operating lever for controlling the starting and stopping of the machine by means of the clutch within the pulley being in easy reach of the operator. The machine has geared feed driven direct from the spindle through a train of spur gears, the lower two being slip gears so that variation of the rate of feed may be obtained.

The head stock is cast in one piece with the bed so that there is no chance for give of the head. The front, or turning carriage, is mounted on a 3½-inch bar, which has long bearings in both the headstock and the tailstock, the outer end of the carriage being supported on hardened steel way that can be shaped so as to give to the work taper, convex or concave form. Rack teeth are cut in the bar and mesh with the cross spindle of the machine for obtaining the feed. A worm and worm gear driven direct from the feed gears furnish power to the cross spindle, the worm being mounted in a drop frame so that the feed may be released at any predetermined position.

The back or facing head is mounted on a bracket on the back of the machine in alignment with the spindle and is held in place by a tongue and groove and four bolts. This facing head is adjustable longitudinally according to the position of the work. Both turning and facing



VIEW ILLUSTRATING THE DRIVE TO DRILL.



GENERAL VIEW OF THE LATHE.

carriages are provided with suitable tool blocks so that any desired number of tools may be used at the same time. The power feed for the rear or facing head is obtained through a cam drum, driven from the cross spindle by rack and pinion, enabling both the turning and the facing heads to be controlled by the same stop, the time taken to finish any operation being the time of the longest cut. Any shaped cam may be mounted on the drum, making it possible to secure different feeds on the rear head than provided by the feed gears for the turning head. The tail stock is of the four-bolt type, and has a quick-acting spindle for releasing the center. It is provided with a rack and pinion for changing its position. The bed has an oil pan with reservoir for supplying cooling lubricant to the work, the pump being driven from the pulley shaft of the machine. The machine can be furnished arranged for direct motor drive. The motor is then mounted on a bracket and connected to the pulley shaft of the machine through spur gears, a large clutch gear being used in place of the clutch pulley used for belt drive. Following are the principal specifications:

Swing over side carriage bar 14 inches, swing over cross carriage 10¼ inches, maximum distance between centers 18 inches, travel of side carriage 12 inches, front spindle bearing 4⅝ x 6⅜ inches long, rear spindle bearing 3½ x 4⅞ inches long, hole through spindle 1¼ inches, taper hole in spindle No. 5, diameter spindle nose 3⅝ inches, length spindle nose 2⅝ inches, threads per inch 5 U.S., tailstock spindle diameter 2⅞ inches, diameter drive pulley 14 inches, width of drive belt 6 inches, weight 3,500 pounds.

## ROTARY EMBOSSING MACHINE

A rotary embossing machine has been placed on the market by Julius Merey, Chicago, Ill. The machine is intended to emboss legends especially on tubular objects, such as cans and similar containers. It does embossing on flat objects.

The main frame of this machine is made from cast iron, wherein four large cast iron boxes with phosphor bronze bushings are housed. The two lower ones are stationary, while the upper ones are fitted for up and down movements. Two large embossing shafts are fitted into above bearings.

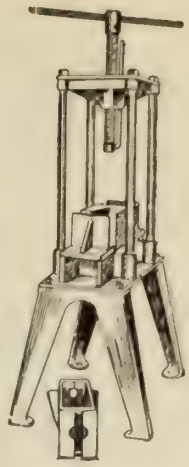
The machine has a lock device to keep embossing shafts closed while embossing is in progress, and has also an automatic stop. The embossing dies, male and female, are made of segments, which are interchangeable, and provide for setting out any names, etc.

The smaller frame is intended to hold objects by means of chuck, and has a longitudinal and vertical movement subject to various dimensions of objects, and connected from main frame by means of spur gears. At the end of the connecting main shaft is an adjustable friction plate, this permitting objects for various diameter dimensions to follow the arcs of the embossing die segments. The machine weighs about 2,000 lbs., and has a capacity for three rows of embossing at the same time on 16 gauge steel or lighter. Power required, 3 h.p.

## BENCH TAPPING MACHINE

The Taylor-Shantz Co., Rochester, N.Y., have placed on the market a bench tapping machine as shown in the illustration. The machine is used in tapping threads of all sizes up to and including 5-16-inch diameter. The tap is driven in the required direction for tapping as soon as the work is pressed against it. It is also automatically reversed when the work is pulled away.

A leather faced disc is used between the pulleys, this minimizing the danger of tap breakage. The machine can be driven from the lineshaft with one straight and one cross belt. The bed of machine is 7⅝ inches, and the pulleys are 5 inches diameter by 1½ inches face. The weight of the machine complete is 21 pounds.



GENERAL VIEW OF THE ARBOR PRESS.

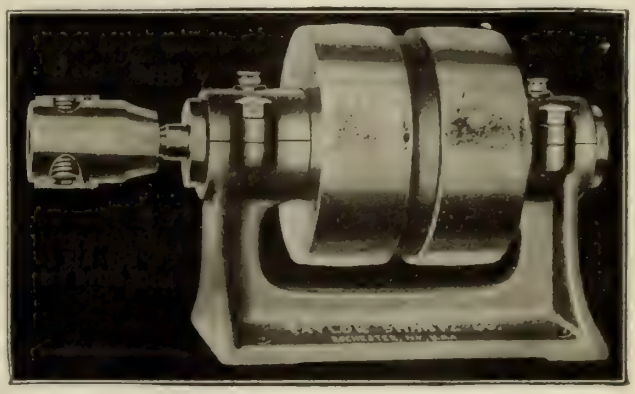
ments, such as sliding L-blocks, etc., are used in conjunction with the press where necessary.

## ROTARY WIRE BRUSH

The Independent Pneumatic Tool Company, Chicago, Ill., have placed on the market a special rotary wire brush for use on their No. 71 portable pneumatic grinder and No. 6 electric grinder. In reality the brush attachment makes two tools in one. The grinder can be used with emery wheel, and with very few changes the brush attachment can be added. The brush, which is attached to the No. 6 electric grinder, is smaller, because of a higher number of revolutions per minute and requires a few attachments not necessary on the grinder.

The wires in the brush are of equal length, interchangeable, and are made of specially treated steel. The concave wood back, which, in turn, is fitted inside a metal cover, secures the brushes in position, which also permits of tapered ends or working surface allowing the wires to bend under pressure without breaking.

These brushes are said to be particularly useful for removing paint, rust, scale, grit, dirt, sand; also for cleaning steel cars, automobile bodies, steel frames, tank cars, foundry castings, and sheet metal of all kinds.



GENERAL VIEW OF THE TAPPING MACHINE.

## ARBOR PRESS

The R. S. Whitney Co., Lewiston, Me., have placed on the market an arbor press as illustrated. These presses are said to be light in weight, and compact in construction. Both the head and base of press are webbed to supply strength and withstand strains.

The base is provided with ways like a lathe, this permitting the blocks to slide into various positions. A large recess through the base is provided to allow the passage of shafts, gears, etc.

The screw of press has a square thread, the head being supplied with recesses allowing the use of two bars when exceptionally heavy pressure is necessary. The press has a patented feature that consists of a single rod sliding parallel with the screw and attached to a cap on the pressure end of the screw. This prevents twisting strains on the surface of the works. The press is made in two sizes, namely, 30-ton and 50-ton, and various attach-

# Have You Tried This Contest Yet? If not--- Do so Now

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.



The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

## What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

The winner for February 17th issue is Charles E. Mars, Brantford. There is quite a story connected with this contestant. He forwarded a list of answers, thought better of it and sent us another list, requesting that we destroy the first one. His persistence counted, for his second list was correct. It's the old story of "If at first you don't succeed, try again." Readers who have tried and failed to land on top will no doubt get added pep from this little story.

**CONTEST FOR MARCH 10TH ISSUE**

**Contestants are required to write us, stating to which advertisements we refer in this number.**

1—Something in a machine that ensures proper lubrication.
2—How to secure expert advice on a certain kind of problem.
3—How to save money.
4—A reasonable request.
5—Something claimed to have accuracy and a wide range of service.
6—How to keep your shop clean.
7—How to get high cutting and high return speeds on a certain type of machine.
8—Something that is said to be free from vibration.
9—How to boost your production.
10—Something that costs less for upkeep.
11—A product that has four heads, yet no eyes in any of them.
12—That you can reverse a part of a certain product and use it with equal success.

**These are Correct Answers for List from February 17th Issue:**

1—Morse Chain Co.
2—Oliver Machinery Co.
3—L. S. Starrett Co.
4—The Hull Iron & Steel Foundries.
5—United States Electrical Tool Co.
6—Garlock-Walker Machine Co.
7—E. C. Atkins & Co.
8—Dunbar Brothers.
9—Algoma Steel Corporation.
10—The Walton Co.
11—Tallman Brass & Metal, Ltd.
12—Katie Foundry.

## Closing Date for This Contest is March 24th.

# Proper Safeguarding of Machine Tools in General

## Use of Cast Iron as Suitable Material for Safeguarding—Forms and Types of Guards—The Danger of Projections—Flywheels—Revolving Cutting Tools and Sliding Parts.

By G. STEVENSON TAYLOR, O.B.E.

THE subject of properly safeguarding machine tools is at all times an interesting study, and in a recent paper by Mr. G. Stevenson Taylor some interesting and valuable points were brought out. This paper was presented at the Industrial Safety Conference in England and the following points abstracted from the talk should prove of decided interest to our readers:

In safeguarding the ordinary parts of machines the following are regarded as the essentials of a satisfactory safeguard: (1) It should prevent access to the dangerous part so long as the danger exists; (2) it should be constructed of such materials and in such a manner as to withstand the wear and tear to which it is likely to be subjected; (3) wherever practicable it should form an integral part of the machine and have been considered in its design; (4) it should, where necessary for intermittent dangers, be automatic in action; (5) its removal should not be necessary for the purpose of lubricating parts of the machine or the material under operation, or for changing belts, gears, etc.; (6) it should not introduce any fresh risk of accident; (7) it should be so hinged or hung as to be easily opened or removed when frequent adjustments and alterations are necessary, but in such cases should not be easily removable from the immediate neighborhood of the machine; (8) it should not interfere unduly with the output of the machine.

The selection of a suitable material for the construction of safeguards is a matter of utmost importance, but, unfortunately, often receives very scant attention from machine users, and sometimes from machine makers. Wood, cast iron, sheet metal; rods, tubes, and bars of metal; wire work and all expanding metal, millboard, and papier-mache, may all be utilized, and may all prove satisfactory under particular circumstances. When substantially and firmly constructed of sound timber, wooden guards for such parts of machinery as pulleys, belts, small fly-wheels, and shafting, can be both neat and effective. The use of wood for guards has, however, many disadvantages; it is easily splintered and broken, readily absorbs liquids, and increases the fire risk.

### Use of Cast Iron

Cast iron is a particularly suitable material for the safeguarding of many dangerous parts of machinery. Guards of this material can be designed so as to form an integral part of the machine and to meet all other conditions which have been laid down. One objection often raised against cast-iron guards is that the gears or parts covered cannot be readily seen or oiled. Generally the guards can be removed at intervals to make an examination, and if there is any special danger of keys or screws working loose inside the guards, small sight holes with loose covers can always be arranged in them. Lubrication with the guard in place can nearly always be arranged, and in many cases the cast-iron guard will serve as an oil bath.

### POINTS BROUGHT OUT

First—The guard should protect the dangerous part as long as the danger exists.

It should be constructed of proper material to withstand wear and tear.

It should form an integral part of machine if at all possible, and should be embodied in the design.

Should the danger be intermittent, the guard should be automatic in action.

Guards should be so constructed that oiling can be accomplished without their removal.

Above all, the guard should help rather than hinder the output of the machine.

Sheet metal, especially sheet steel of suitable gauge, is an excellent material for guards. Simple forms of guards can be easily and cheaply produced by stamping when required in sufficient numbers, and can be made to conform to all the conditions which have been laid down for a satisfactory guard.

Rods, tubes, and bars of metal are suitable for some classes of safeguards, especially those which are effective at a distance of 18 in. from the part of machinery guarded. Unless this is the case these materials should not be used except with small spacing, or in conjunction with sheet metal, wire work, or expanded metal.

Wirework and expanded metal are similar materials for guard construction, except that expanded metal often has a somewhat sharp edge which may cause cuts and may also render it unsuitable for guards where delicate or fibrous materials are dealt with. Such guards, however, are likely to be deformed by rough usage, they do not exclude grit or dust from the parts covered, and they are difficult to clean, especially where fibrous dusts are produced or adhesive materials handled.

Millboard, papier-mache, and similar materials have only been used in the construction of some patented types of safeguards for revolving shafting. Where, as on overhead shafting, they are not subjected to rough usage, such safeguards have proved effective and durable.

The following are the principal accident-producing parts of machinery, or machines in engineering works: (1) Plain shafting, spindles, etc., bars and rods in automatic lathes; (2) projections, such as set-screws, studs, bolts, key-heads on collars, couplings, clutches, pulleys, etc., lathe carriers, drivers and jaws of chucks; (3) fly-wheels, armed pulleys and wheels; (4) driving belts, ropes and chains; (5) spur and friction gearing; (6) revolving cutting tools; (7) grindstones and abrasive wheels (bursts); (8) sliding and reciprocating parts, including plungers of presses, punches, etc.; (9) hoists and lifting appliances, cranes, etc. This list is not exhaustive, but it shows the principal sources of machinery accidents where safeguards can be adopted with advantage.

### Forms and Types of Safeguards

All shafting within 6½ ft. of the floor, or within this distance of any place where persons have access whilst the shafting is in motion, should be efficiently safeguarded. It is not possible to guard the whole of the exposed parts of drill spindles, but additional protection could be fitted with advantage in many cases. Accidents due to clothing being caught by twist and other drills can only be prevented when a satisfactory drill holder is devised which will allow the drill to run free except when pressed on the work. The safeguarding of the shafts and universal couplings of milling machines is more difficult than that of ordinary shafting, as the shaft varies in both length and direction. Two telescopic lengths of tube with gimbal fittings at each end will generally meet the difficulty. Some machine-tool makers have fitted cast-iron covers over the universal joints, but have left the shafts exposed; others have fitted an open coil of wire over both joint and shaft, but this is only a partial guard and does not prevent a loose end of clothing from getting on to the joint or shaft. As in the case of lineshafting, the best form of guard consists of a tube or tubes completely enclosing the bar. The tubes can

be carried on standards and adjusted to the length of the bar.

### Projections

The risk of serious accident from revolving plain shafting, spindles, etc., is considerably enhanced if they carry collars, couplings, clutches, pulleys with any projecting parts, such as set-screws, key-heads, etc. All set-screws in collars and other revolving parts of machinery and machine tools should be recessed below the surface of the revolving part; and there is no reason why this simple precaution should not be taken on all new machinery. Where this is not practicable on existing machinery the projecting screws should be properly covered with suitable sheet or cast-metal casings.

### Flywheels

For safeguarding fly-wheels, etc., standard and rail fencing may be satisfactory if double or treble rails are used and placed not less than 18 in. from the moving parts, the top rail being not less than 4 ft. from the floor, and if there is a covering of sheet metal or wire work, either from the floor to the bottom rail or extending at least 6 in. above the floor to prevent tools, etc., falling under the rail.

If it is necessary to carry the fencing closer to the fly-wheel or pulley—and, on the whole, close fencing is the more satisfactory—then the guard should extend to a height of 6 ft. 6 in., or to the top of the pulley or fly-wheel if less than this. The guard should consist of sheet-metal, wirework or other close material on a suitable frame. Fly-wheels and pulleys should be fenced on both sides as described if they have to be approached for any reason. The fly-wheel of a gas or oil engine is often well guarded on the outside, but on the crank side, where it is constantly approached by the attendant when feeling the bearings, it is frequently left quite unguarded.

The parts of overhead pulleys which are within reach of workers—i.e., less than 6 ft. 6 in. from the standing place—should be safeguarded underneath by strong sheet-metal or other guards.

### Driving Belts—Ropes and Chains

Accidents from belts mainly arise (1) by trapping at the intake of belt and pulley, (2) by persons being caught by loose belts hanging on shafting, (3) by belt or belt fasteners striking a person, (4) from fracture of belt. Accidents from rope and chain drives arise chiefly from causes (1) and (4). Where a pulley is suitably guarded the intake of the belt will also be guarded. Many accidents at belt intakes are caused by persons removing, replacing, or shifting belts by hand. The danger in connection with the first two operations can be largely eliminated by the use of fast and loose pulleys and proper striking gear, also by the use of proper belt poles or mechanical belt shippers. A belt should never be allowed to rest on a revolving shaft, owing to its liability to seize on the shaft and wind up, involving either accident to the person who may be touching the belt, or injury to the machine with which it is associated. Belt perches, hooks, or hangers should be provided for loose belts, unless they can rest upon the guard provided for the shafting.

Driving chains are now largely used in connection with motor and other drives for machine tools. They should always be completely enclosed by either cast-iron or sheet-metal guards. The majority of machine-tool makers have embodied some excellent guards for chain drives in the design of their machines. The guards not only form an oilbath, but also a dustproof casing for the chain and sprocket wheels.

### Revolving Cutting Tools

Milling machines are the principal machine tools with revolving cutters which give rise to accidents in engineering shops. The majority of accidents occur on the narrow circular-saw type of cutter, but also to some extent on other types. They are generally due to the worker's fingers or hand or arm coming into contact with the cutter whilst reaching over the revolving cutter or whilst gauging his work. Guards for milling cutters should (1) prevent contact with the cutter, (2) be readily adjustable, (3) not interfere with a view of the work, (4) not prevent proper lubrication of the work. Several guards have been patented which comply with these requirements, and some in addition facilitate proper lubrication of the work.

### Sliding and Reciprocating Parts

Accidents are caused either by crushes between the moving parts and some fixed structure, or, in the case of quick-moving parts like the tailrod of an engine, by a direct blow. Such parts as the latter can be readily safeguarded by being enclosed in a metal tube or covered with an inverted trough of sheet metal. Planing and similar machines with sliding parts should be fixed in the shop so that the part cannot run within 18 in. of any wall or other fixed structure, nor should it traverse any alleyway or the space in front of any doorway. The beds of planing machines should be filled in with perforated sheet metal or similar material, as accidents have occurred through men either slipping into the bed or attempting to obtain tools stored therein (a dangerous practice) whilst the machine was in motion.

Accidents due to crushing of hand or fingers by the plunger on power presses of various kinds form an appreciable percentage of the total machinery accidents. The essential feature of a satisfactory guard for the plunger of a power press is that it should prevent the hand or fingers of the operator being under the plunger when the latter descends, whether its motion is due to the proper use of the controlling mechanism or to "repeating." It may be noted that the use of a double-handed control on presses does not obviate accidents due to "repeat" strokes. For straight blanking on small work and other simple operations, fixed guards are quite effective. They may be made of sheet metal, rods, or wire work, and should surround the plunger, merely leaving a narrow slot through which the sheet can be inserted. Guards of varying sizes must be used with the different sizes of guides.

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# CANADIAN MACHINERY
## AND MANUFACTURING NEWS

THURSDAY, MARCH 10th, 1921
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JOHN BAYNE MACLEAN, President
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## The Use of Milling Machines

THE development of the miller as a manufacturing tool has been nothing short of marvellous within the past few years. There was a time when a milling machine was looked upon as a tool-room proposition—and a very risky one at that. This condition, however, is past and gone, and at the present time there is hardly a plant of any proportions that cannot boast of its miller equipment.

In fact in the larger manufacturing plants they have their milling machine department. Row upon row stand these accurate producers. Small, medium, and large, they each accomplish the work best suited to them. The manufacturing miller of to-day is a more rugged machine tool than formerly. It is built to stand the gaff, to use a common expression.

Operations are now performed on this type of machine that were deemed impossible before. Take for example the problem of cutting the worm shown at Fig. 10 in the first article of the present issue. Here is a job that would have puzzled the old boys of the early school, but nowadays a little problem like this is of no account. By building a special attachment to operate in conjunction with the regular machine the difficulty is overcome.

This brings out very forcibly the need of proper fixtures to be used as an aid to the machine itself. To obtain production we must have jigs that are as fool proof as possible. No machine can do its best work unless aided by fixtures of some nature or other.

Time occupied in the studying of the problems shown in this first article will be time well spent, for it may throw light on the very problem you have been concentrating on for some time past.

## Protecting the Fireman

IN a recent issue of a journal which specializes in technical subjects arranged for the understanding of the layman, there appeared recently an article of interest to the engineering profession.

From this it appeared that the man who is engaged in the task of generating steam in the boiler by shovelling coal is frequently inconvenienced by the heat. This is something we have noticed ourselves, but it is nice to have it confirmed by such an authority. We must confess, however, that the way to avoid this inconvenience had not previously suggested itself to us. This is all the more remarkable as it appears so simple. All that is required is to make the furnace doors and fronts hollow, and through the passage thus formed circulate cool and refreshing water. The author goes further, and says this system can be applied to other parts of the boiler. Why of course it can! When we come to think of it there are lots of places it could be applied. For instance, imagine what a delightful place the boiler room would become were the shells of the boilers jacketed before the lagging was put on. The steam pipes could be run through a larger pipe, with circulating water in the space between. There would be all kinds of comfort in the boiler and engine room then.

However, we always had the idea that all the heat possible should be retained in the boiler and steam pipes. The method of keeping boiler furnace doors cool always seemed to us to be by keeping the fire clear of the dead plate, as we always found that burning coal on the dead plate didn't help the generation of steam greatly. On the other hand, it was good for the manufacturer of arch bricks, furnace door baffle plates, etc.

Again we must confess, however, that the simple idea of a water jacket never entered our head.

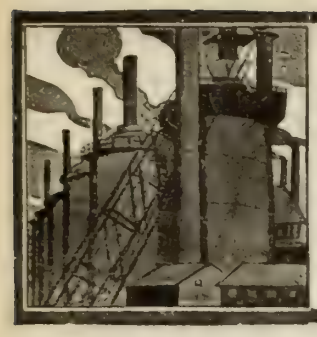
## It Crops Up Again

SOMETIMES we think the type of inventor who believes he can get more out of a machine than he puts in has died out. Then suddenly our hopes are shattered, and from out of the void comes a voice crying "Eureka! I have found it." Needless to say the owner of the voice only thinks he has found it. It isn't there to find.

A gentleman by the name of H. Nicolaides is the latest to spring the old story. He has a machine, or principle by which he claims he can do roughly 173,000 foot-pounds of work in an air cylinder by the expenditure of 60,000 foot-pounds in the steam cylinder. The method he proposes is somewhat involved, and requires careful reading before his idea is grasped. However, we still believe that Baylis Law holds good, our inventor to the contrary notwithstanding. He traces back the prophecy of his invention through the shades of Greek mythology, leading up to a vision which was vouchsafed to him, which started him to thinking deeply.

This inventor is generous. He wants no reward but renounces his claims freely to the government and the people. He wishes the government to proceed gradually with the manufacture, as he does not wish existing industry to be shattered at one fell swoop. He is quite ready to appear before a body of scientists and engineers, and if he does not convince them, will voluntarily retire to an asylum. That would seem to us to be a wise step.

The machine has never yet been built by man which is 100 per cent. efficient, let alone over 100 per cent. We doubt very much that it ever will. The fundamental principle that you cannot get more out of a machine than you put in remains as immutable as ever. If ever that condition should be changed, then indeed would this world, in the words of Mr. Nicolaides: "Be transformed from a vale of tears to a veritable Paradise."



# MARKET DEVELOPMENTS



# Reduction in Price of Steel, Will it Come Soon?

## Interest Centers on This Possibility—Machine Tool Enquiries Are Much Larger—Scrap Market Still Dull, But in All Phases of the Market Good Times are Looked For

"GOOD times are ahead." Machine tool dealers feel sure on this point and expect that the enquiries they have been receiving will lead to actual business. American concerns locating in Canada are taking advantage of the exchange rate and are purchasing everything possible in Canada, as by so doing they get better value for their money.

Many stories are rife regarding the U.S. Steel Corporation. One report states that a decline is looked for hourly, but whether this is so or not remains to be seen. Many large agricultural implement makers have taken on stocks at present prices and should a sudden drop take place these interests would be seriously involved.

Trading in the steel industry is extremely light at some points, the customer in many cases ordering only sufficient material to carry him over. In fact in some quarters business is confined almost entirely to repair work. Hope is expressed that next month will see a decided improvement.

The scrap metal market remains dull. Some dealers are said to be losing money every day and in some quarters manufacturers are storing their scrap in the yards until prices are better. One dealer states that prices will advance when conditions reach normal.

Ontario holds the spotlight this week, there being more actual buying in this province than in any other. The labor situation in United States demands attention, also the steel and freight problem.

Independents are not operating at more than 20 to 25 per cent. of capacity, while the corporation have dropped to about 60 per cent. against 90 per cent. in last January. Pig iron is also less than 50 per cent. of its actual productive capacity.

## BUSINESS AT PRESENT CONFINED ALMOST ENTIRELY TO REPAIR WORK

Special to CANADIAN MACHINERY.

MONTREAL, Que., March 7.—Spring weather has had a cheering effect upon many individuals, but business has not, as yet, responded to the encouraging rays of a warmer sun. Merchants and dealers still report more than a seasonable dullness; as a matter of fact, past years have generally experienced a noticeable revival of trade at this period of the year, but there is little evidence that improvement in any direction has yet taken place, although many statements seem to prove the contrary. A representative of a large Montreal house, recently returned from a business trip to the States, told Canadian Machinery that many industrial centres across the line were gradually returning to more normal conditions and that operations in many of the metal trades were showing gradual but steady increase. Local dealers are still awaiting the time when they can truthfully say that business has improved. Occasionally an order comes through that leads one to believe that the tide has turned, but it proves to be only a wave slightly larger than the usual ripple. There is no particular business where activity is pronounced, as quietness in all directions is still more or less general.

### Repair Business Only

The steel situation has little to offer of special interest. Trading is carried on in a quiet way with a steady but light business done in warehouse supplies. Few tonnage orders are placed now, the requirements being for one or more plates, shapes, bars or tubes, for special purposes. Little attempt is made, on the part of the consumer, to secure more than he actually needs for the work in hand, and in many cases the dealer has quit urging the purchase of other materials, generally leaving everything in the hands of the user. Little has transpired during the past week to change the general tone of the market here, and dealers show no inclination to pass on possible developments. "Business at present," said one dealer, "is confined almost entirely to repair work, where one or two plates, a few bars or tubes, are sufficient to make the repair, and it is seldom that we see a big order. Of course, it is the time of year when demand is never very brisk and we live on in the hope that the coming months will be a little brighter."

### Metals Lower and Movement Light

The movement of non-ferrous metals continues light as consumers are still buying conservatively. Rock bottom prices do not appear to affect the market, and the buyer is not awakened even when quotations decline sharply. One satisfactory feature of the day is that manufacturers are not carrying stocks of any kind, for the stated reason that they desire to be in a position to take advantage of the lowest price. This would be all right if one could be assured of what was the lowest price. The depleted state of stock supplies in the average plant to-day means that a return to normal market would likewise mean a return of a demand, which at first would be greater than normal, the consequence being a strengthening of prices. An alternative to this possible condition would be to cover, in part, future requirements from existing supplies, to avoid excessive demand for material should business suddenly revive. "Speaking of

a waning market," remarked a dealer here, "there is little to wane, as prices on non-ferrous ingots and semi-finished materials are as low as they can possibly go.

"We may see slightly lower quotations, but with the present cost of production as a basis, a lower market would mean considerable loss to the seller of the commodity. What the trade should do now is to buy carefully, even for the future, but buy, as it is only in this way that normal business can be revived." A further slight decline has developed in ingot metals, coppers declining ½ cent per lb., tin, on a 2-cent drop, is quoted at 37 cents, and lead is off ¼ cent per lb. at 6½ cents. Spelter, antimony and aluminum hold firm at previous quotations. Copper products have likewise declined, the reduction being $2.00 per hundred pounds. Copper bars, ½ to 2 inch, are now quoted at 30 cents per lb. Tinned copper sheets, 14 oz., are quoted at 38 cents, and plain sheets at 32 cents per lb. Lead sheets now range from 9 to 9½ cents per lb. Demand in all cases is light.

### Non-Ferrous Scraps Decline

There is little doubt that many old material dealers are losing money at the present time, and stand to lose considerably more if the present dull condition continues. Some dealers are carrying stocks that cost them much more to lay in than they could buy the stuff for just now. They are in hopes, however, that the spring and summer activity may be sufficient to establish a better market in scrap and that prices on many lines will advance to higher levels, enough to prevent any heavy run on stocks now held. One feature of the old metal situation is the comparatively low overhead necessary, but even in the scrap business it is not always good policy to break up the organization, as experience in the handling of old materials is often as essential as in other lines of activity. Apart from a further decline on prices quoted the market holds little of interest to the dealers, as consumers are not buying except to cover urgent needs, and these are exceptionally light.

Non-ferrous metals show a dullness that is reflected in lower price quotations. Coppers are down from one to one and a half cents, light copper being quoted at 9½ cents per lb. No. 1 machine composition has declined 3 cents, the price quoted now being 10 cents per lb. Brass scraps are also weaker. Zinc is now 4 cents and tea lead 2 cents per lb. Aluminum has dropped from 15 to 12 cents per lb. Iron and steel scraps are holding firm on light movement, the only change being on cast borings, dealers quoting $5.00 and under. Despite the declining prices no revival is apparent.

## POINTS IN WEEK'S MARKETING NOTES

**Surface developments in the iron and steel market are of no importance, but important things are working out under the surface.**

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**Independents are not operating at over 20 to 25 per cent. of capacity. Steel Corporation's operations have dropped to about 60 per cent., against 90 per cent. early in January. Steel industry as a whole is operating at about 40 per cent. capacity.**

—

**Pig iron production is a little less than 50 per cent. of actual productive capacity. Prices for steel products have declined very little.**

—

**Wire nails have formed the most interesting price decline of the week. One company claims the reduction was made because two other producers were quietly doing so, although nominally quoting a higher price.**

—

**Pig iron prices in New England have shown a tendency toward a lower level during the week. Prices in castings have softened.**

—

**The scrap market is slightly weaker, although no change is registered in price. Where scrap is available, offers are so out of line with the ideas of the producers that the latter hold scrap in their yards for a rise in price.**

—

**Small tool dealers report that more inquiries are coming in, but that this is as far as it goes. Rebuilt tools are favorites at present. Improvement is looked for from now on.**

—

**There is a feeling that prices in steel will drop shortly. In fact, one dealer states he expects it hourly—"A substantial cut is what I expect," to use his own words.**

## GOOD BUSINESS LOOKED FOR IN NEAR FUTURE

TORONTO.—There is a feeling of optimism throughout the trade generally, but while everyone is absolutely convinced that good times are ahead, they feel they are coming gradually and cannot be rushed in any way. In fact, it is the general opinion that more benefit will come if the improvement is gradual and steady.

One dealer expressed the view that small tools, etc., were just the same as last week. He claims business is dull at present, but that things were in line for an improvement. Prices remain where they have been in the machine tool market, but there is a feeling that things are on the up-grade. In fact, one dealer stated that business looked very much better, and that there appeared to be a better feeling than there was last week. Quite a number of enquiries had been received during the last month. Actual business, however, is not so well advanced, as most people appear to be mostly writing for prices, etc. The general feeling, however, is that conditions will gradually improve from now on. Ontario is in a much better position than other provinces, and there are more enquiries and actual buying here than in any other province. American concerns locating here expect to do considerable business, and look favorably on the exchange rate, buying chiefly in Canada. They get much better value for their money, with the exception of special lines, some of which are not even procurable in this country. There is a marked tendency all over to enquire regarding machinery and equipment. Rebuilt or used machinery is in preference at present.

### Steel Situation

Prices remain practically the same as last week. Conditions in other parts of Ontario are better than in the city here, remarks one dealer. Interest is very keen regarding the U. S. Steel Corporation, one gentleman stating that he was practically waiting for a reduction every hour. "When a cut does come," he said, "it will be a substantial one." Prices are being received from the independents that are much lower than corporation prices. As one dealer put it: "They are playing an old game, but it's too old to put over. It is only a question of time before they will have to give in." Another gentleman had this story to tell: "Prices and conditions are exactly the same as last week." Speaking of a possible reduction in U.S. Corporation prices he remarked that he would not even predict 48 hours ahead at the present time.

### The Scrap Market

"Absolutely no change in the prices of scrap iron or pig." Briefly, this describes the situation. There is a distinct glut of metals of all kinds on the market, and according to one dealer, prices can hardly be lower than they are are present. To his mind this is the proper time to buy. The steel and freight situation is demanding considerable attention and thought among those in the metal industry. When conditions get back to normal, some dealers claim that metals will be harder to get and more expensive. Practically all the larger plants have banked their furnaces, and only a very small percentage are operating to capacity.

A point that is retarding everything, according to one dealer, is the labor

situation in the United States. This, of course, is the dispute between the unions and the open shop. They all consider that Canada is 100 per cent. better placed as regards labor than the United States and that Quebec is perhaps best of any province in this respect. Despite continued dullness, everybody is optimistic. Improvement is looked for round the middle or end of May. Taken in all conditions are better than they were last week.

# IMPROVEMENT IN DEMAND LOOKED FOR WITHIN THE NEXT FEW WEEKS

Special to CANADIAN MACHINERY.

PITTSBURG, March 10.—Surface developments in the iron and steel market are meagre and of no particular importance, but under the surface important things are working out.

Demand continues stagnant. The independents are booking scarcely any business with their cut prices. The Steel Corporation is not booking much business, but it is booking some. Its bookings are not due to its price or to the service it can render, as the independents will make lower prices and can give fairly prompt shipment. The corporation can usually beat the independents in promptness of shipment by a small margin, as the corporation has all kinds of departments in operation, while with an independent the shipment must frequently wait until enough orders accumulate to start the department involved. The chief reason the corporation is booking business is that consumers wish to secure, or retain, a place on its order books, after the spectacular example in 1920 of how much saving there was in having an allotment by the corporation.

### Operations

The common estimate is that the independents are not operating at over 20 or 25 per cent. of capacity. In January they operated at 25 or 30 per cent. The Steel Corporation's operations have dropped to about 60 per cent. against fully 90 per cent. early in January. Some decrease was certain to come, even if the price situation had not been disturbed, since the corporation's customers were in many cases receiving much more steel than they could distribute or consume, but the price-cutting by independents has sharply accentuated the decrease, causing many corporation customers to instruct the corporation to curtail or discontinue shipments. There is not much cancellation, however, and there is no buying from independents as a substitute.

The steel industry as a whole is operating at about 40 per cent. of capacity, against an average of 80 per cent. during the first nine months of last year. After all, the present rate is rather a high one, considering both the general stagnation in business and various other circumstances. There is, for instance, the item that rail production has been curtailed of late because the railroads are unable to pay for all the rails already shipped them thus far this year.

Pig iron production now is at the rate of about 22,000,000 tons a year or at a little less than 50 per cent. of actual productive, not rated, capacity. On account of coke shortage and other difficulties the maximum rate attained last year was 40,000,000 tons, in March. Production has decreased much more by the merchant furnaces than by the steel works furnaces, being not over one-third of capacity, but the steel interests continue to curtail. The Steel Corporation is operating very much better than the independents, and of all the corporation subsidiaries the Carnegie Steel Company stands second in point of operation, yet of its 59 blast furnaces the Carnegie company at last report was operating only 38, against 48 about the middle of January, and additional furnaces are to be put out.

### Steel Prices

Minimum prices for steel products done by independents have declined very little, on the whole, in the past week. On ordinary orders bars are still quotable at 2c and shapes and plates at 2.10c, while there is less talk of its being possible to shade these prices materially in case a really good order was going. Sheets are commonly quotable at 3.20c for blue annealed, 4.10c for black and 5.25c for galvanized. These prices could be shaded on a sufficiently attractive order.

The most interesting price decline in the week is furnished by the action of the Pittsburg Steel Company in quoting wire nails openly at $3.00 per keg, base, against the regular or Steel Corporation price of $3.25. Nails were regarded as being priced very closely at $3.25, relative to other steel commodities, hence shading of the price is particularly interesting. When the Midvale Steel and Ordnance Company began cutting prices generally, about a month ago, it sold some nails at $3.10, but afterwards announced that it had withdrawn the $3.10 price. It is understood the Pittsburg Steel Company maintains that it made the $3.00 price because at least two other producers were quietly doing $3.00, although nominally quoting $3.25.

### Undercurrents in Steel

The United States Steel Corporation has not reduced its prices or wages, and no indication can be seen that it contemplates doing so in the near future. To many in the trade the Steel Corporation has seemed an enigma, and yet its action is not necessarily out of line with precedents and present conditions if these are considered carefully. Thus, it has been the steel trade practice in the past that when prices are cut by some producers others follow and in a very short time the cut prices become the general market. The present, however, is an exceptional case. The mills used to cut prices when they could get business thereby. This time they cannot and probably they knew they could not. It is commonly believed that the cutting was done with the ulterior object of securing a "redistribution" of business and forcing the Steel Corporation to reduce wages, as practically all the independents have done. But there is no redistribution of business. The corporation has lost in shipments, but that is merely postponement. The corporation has not lost customers and independents have not gotten any business away from the corporation. As to wages, obviously the corporation cannot fairly reduce wages when it has not reduced prices. Its shipments are at the old prices, why should not wages be at the old rates? So the corporation does not seem to be as much of an enigma as is commonly thought.

In the past few days there is beginning to be observed an undercurrent of the independents being less disposed to continue their price-cutting course. Perhaps they are influenced by the extremely small amount of business secured thereby, and probably they are impressed by the Steel Corporation's calm refusal to be governed. Possibly they feel that if steel prices are once gotten down they cannot be gotten up again, as used to be the case. There will necessarily be an improvement in demand in the next few weeks, and later there will be much further improvement, even to a point of there being really a large demand, according to past standards, but that is a different thing from a demand equal to the present capacity, which is 50 per cent. greater than in 1914. In the past steel prices never advanced unless the mills were operating at 85 per cent. or more.

### Pig Iron

Foundry pig iron has been quoted and sold at $26.50, valley, or 50c decline in the week. Bessemer remains nominally quotable at $27, valley, and basic at $25, valley, but one sale of a few hundred tons of basic has just been made at $23, under somewhat mysterious circumstances. If it turns out that there is more iron to be had in the same quarter the quotable market will be $23. Only four merchant furnaces in the Mahoning and Shenango Valleys are operating and some of them are thinking of going out, as they are piling up more iron than they are shipping.

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The Hamilton Products, Ltd., has been incorporated with head office at Hamilton, Canada, and capital stock of $1,500,000, to carry on the business of iron masters, iron makers, iron and steel converters, smelters, engineers, etc.

## Pig Iron Market

The pig iron market remains very dull and a base price of $26 is now appearing. On the Philadelphia market the price of $26 Eastern Pennsylvania furnace on No. 2 plain foundry iron (1.75 to 2.25 silicon) has appeared during the past week, but only in connection with live inquiries of 500 tons or more. No. 2 (2.25 to 2.75 silicon) on large inquiries has been quoted at $27 and $27.50. An eastern consumer is inquiring for basic, but is unwilling to pay higher than $25, delivered, which is lower apparently than furnaces would do.

On the Chicago market foundry pig iron has been sold to a consumer in Wisconsin at a price which would figure back to $24 Chicago furnace for 1.75 to 2.25 silicon. This iron is for March delivery to a maker of sanitary goods and involves 2,000 tons. It is understood that this iron was sold at $26, delivered. Freight from Chicago is approximately $2. Some inquiry is coming out, one calling for 250 tons of foundry iron and another being for 500 tons of low phosphorus iron, both for Chicago users.

The pig iron market at Cleveland continues to reflect the depressed condition among the foundries and sales are light. The American Radiator Co. has been the most active buyer, particularly for Detroit, but it has not been found that it has taken much tonnage direct from the furnaces. The main lots closed for Detroit appear to have been resale iron and these obtained from various sources in the week have exceeded 1,000 tons. In some of these cases it is reported that as low as $25, Detroit, was done, but producers have been unwilling to meet this figure.

The low prices available on basic and bessemer pig iron on the Pittsburg market does not appear to bring any measurable increase in buying of the steelmaking grades. Some inquiries are before sellers, but mostly they represent only an effort of users to get a line on the market. Only a few sales are reported at $25 and $27, valley, respectively, involving from one to three carloads. The merchant interest which was first to establish the $25 and $27 levels and which reports closing on a fair proportion of the 16,000 or 17,000 tons figured on in February, states, however, that it declined a 3,000-ton order for basic offered at $25, valley, less commission. It is selling iron only to its regular customers. Intermittent sales of foundry iron continue to be made.

While actual selling of pig iron on the New York market during the week has been limited to small tonnage, inquiry has improved to some extent, and in addition to numerous small lots includes one lot of 1,000 tons, another of 800 and one of 500 tons. All of these are for quick shipment, excepting the 800-ton inquiry. There is no assurance as to when these inquiries will result in business. Foundrymen, however, are speaking more hopefully. Business prospects look better to them, and some of them that only a short time ago said they would need no more iron for a year or more are among those now inquiring. On Eastern Pennsylvania foundry iron the minimum price of the past week was $27 furnace for 1.75 to 2.25 silicon, while in some cases this iron sold as high as $30.

With the continued absence of consuming demand on the Boston market, pig iron prices in New England have shown a tendency toward a lower level during the week. A Rhode Island melter bought 100 tons of No. 2X (2.25 to 2.75 silicon) in two lots, including 50 tons from an Eastern Pennsylvania furnace at $31.75, delivered, or approximately $26.50 furnace. Foundries in general continue to melt about the same tonnage they were consuming a week ago. Prices in castings have softened.

Buffalo reports that the price on pig iron now is ranging from $28 to $30 base on sales of resale and furnace iron by furnaces. A broker sold 300 tons of No. 2 foundry (2.25 to 2.75 silicon) for $28. This is equivalent to a base price of $26.75. One interest sold about 2,000 tons, part of which was resale metal, at $28 to $29, and part of which was $30 for the straight furnace No. 2 grade (1.75 to 2.25). Malleable inquiry is light.

Lower prices have brought out but little business and melters of pig iron continue buying from hand to mouth in the Birmingham district. General quotations for pig iron are on a level of $27.50 for No. 2 foundry (1.75 to 2.25 silicon). It is reported that a 1,000 ton order was accepted under that figure and some business is known to have been closed at $26.50 base.

## Scrap Metal Market

Dullness continues in the scrap market. Prices are generally weaker, although at Boston and Buffalo heavy melting steel advances. There is no buying worth speaking of on the Chicago market. Quotations at present are lower than the level attained early in 1919, which has been the record for several years, and while the bottom seems to have been reached, experience forbids prophecy as to the future.

The situation in Boston is sufficiently encouraging to create a slightly better interest among dealers. The price range is wide as buying is largely for storage purposes. Heavy melting steel which was $9.50 the middle of February, is now better represented by $10 as the large dealers are willing to pay this price. Mills are paying $13 for rerolling rails but the future appears sufficiently encouraging to warrant some dealers paying as high as $15 for storage. Four or five cars of No. 1 machinery scrap were sold to Massachusetts consumers at prices ranging from $23 to $25, delivered, depending upon location.

New York reports that operations at the local scrap yards are somewhat better, as a result of open weather. However, they are far from active as buying continues virtually at a standstill. Heavy melting steel for eastern consumption continues at $9.50 to $10 f.o.b. New York, machine shop turnings $8.50 to $9; heavy cast $18 to $19, and machinery cast at $19 to $20.

The demand for heavy melting steel and forge scrap on the Philadelphia market has improved somewhat. Current buying involves only moderate sized tonnages, however, and the total is comparatively small.

The position of the market is weaker, though no change is registered in prices. This is due to the continued restricted operations of the Steel Corporation and the spasmodic operations of the independent companies. Where scrap is available, offers by bidders are so out of line with the idea of the producers, the latter decide to hold the scrap in their yards or bins for a rise in price.

On the Buffalo market during the past week, one mill was willing to pay $14.50 for scattered tonnages of heavy melting steel, but the top price now offered is $14. Little selling is being done and the market is really a nominal one. Mill operation has been reduced here and the scrap output is lighter.

With the exception of cast borings, a general decline in prices has taken place in the Detroit iron and steel scrap market. Heavy melting steel is down to $10.50, heavy axle turnings to $10, and machine shop turnings to $5.

The southern market is still quiet, and dealers are uncertain as to when business will improve. The largest consumer of heavy melting steel in the Birmingham district, buying on the open market, is not operating its open-hearth furnaces.

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## UPWARD TENDENCY RECOVERY BETTER

"There is a decidedly upward tendency, whereas, one month ago, we felt that the bottom was a long way down," declared a manufacturer to Canadian Machinery. As one interested in production work in forgings and stampings, he pointed out that while the slump in that particular line had been sharp and sudden, the recovery had been much more encouraging than expected. Some firms had suspended activities so completely last fall that they had made little or nor provision for a resumption that was sure to come with spring. Hence, there has been, during the past few weeks, quite an activity in small tools and other equipment, although it must be admitted this was short lived in some departments. The feeling in many quarters is that the turn had been made to the upgrade.

# SELECTED MARKET QUOTATIONS

**Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.**

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $26 00 |
| Lake Superior, charcoal, Chicago | 40 50 |
| Standard low phos., Philadelphia | 41 50 |
| Bessemer, Pittsburgh | 28 96 |
| Basic, Valley furnace | 26 00 |
| Toronto price:— | |
| Silicon, 2.25% to 2.75% | 39 25 |

## IRON AND STEEL

| Per lb. to Large Buyers | Cents |
|---|---|
| Iron bars, base, Toronto | $ 4 50 |
| Steel bars, base, Toronto | 4 50 |
| Iron bars, base, Montreal | 4 25 |
| Steel bars, base, Montreal | 4 25 |
| Reinforcing bars, base | 4 50 |
| Steel hoops | 6 00 |
| Tire steel | 5 00 |
| Spring steel | 8 00 |
| Band steel, No. 10 gauge and 3-16 in. base | 5 50 |
| Chequered floor plate 3-16 aud heavier | 7 50 |
| Bessemer rails, heavy, at mill | 2 35 |
| Steel bars, Pittsburgh | 3 00-4 00 |
| Tank plates, Pittsburgh | 3 50 |
| Structural shapes, Pittsburgh | 2 45 |
| Steel hoops, Pittsburgh | 3 05 |
| F.O.B., Toronto Warehouse | |
| Small shapes | 4 50 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 3 48 |
| Structural shapes | 3 58 |
| Plates | 3 78 |
| Small shapes under 3-in. | 3 48 |

## FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

| | C.L. | L C.L. |
|---|---|---|
| Montreal | 58½ | 73 |
| St. John, N.B. | 84½ | 106½ |
| Halifax | 86 | 108 |
| Toronto | 38 | 54 |
| Guelph | 38 | 54 |
| London | 38 | 54 |
| Windsor | 35 | 50½ |

## METALS

| | Gross Montreal | Gross Toronto |
|---|---|---|
| Lake copper | $18 00 | $17 50 |
| Electric copper | 17 50 | 17 50 |
| Castings, copper | 17 25 | 18 00 |
| Tin | 37 00 | 40 00 |
| Spelter | 7 75 | 7 50 |
| Lead | 6 50 | 7 50 |
| Antimony | 8 00 | 8 25 |
| Aluminum | 34 50 | 30 00 |

Prices per 100 lbs.

## PLATES

| | | |
|---|---|---|
| Plates, 3-16 in. | $5 25 | $5 25 |
| Plates, ¼ up | 4 75 | 4 75 |

## PIPE—WROUGHT

Standard Buttweld Pipe

Per 100 Ft.

| | Steel Blk. | Steel Galv. | Gen. Wrought Iron Blk. | Gen. Wrought Iron Galv. |
|---|---|---|---|---|
| ⅛ | $ 6 50 | $ 8 50 | $.... | $.... |
| ¼ | 5 31 | 7 41 | 5 91 | 8 01 |
| ⅜ | 5 31 | 7 41 | 5 91 | 8 01 |
| ½ | 7 10 | 8 63 | 7 95 | 9 48 |
| ¾ | 8 80 | 10 87 | 9 95 | 12 02 |
| 1 | 13 01 | 16 07 | 14 71 | 17 77 |
| 1¼ | 17 60 | 21 74 | 19 90 | 24 04 |
| 1½ | 21 04 | 25 99 | 23 79 | 27 84 |
| 2 | 28 31 | 34 97 | 32 01 | 38 67 |
| 2½ | 44 75 | 55 28 | .... | .... |
| 3 | 58 52 | 72 29 | .... | .... |
| 3½ | 74 06 | 90 62 | .... | .... |
| 4 | 87 75 | 107 37 | .... | .... |

Standard Lapweld Pipe

Per 100 Ft.

| | Steel Blk. | Steel Galv. | Gen. Wrought Iron Blk. | Gen. Wrought Iron Galv. |
|---|---|---|---|---|
| 2 | $32 01 | $ 38 67 | $35 71 | $42 37 |
| 2½ | 48 26 | 58 79 | 54 11 | 64 64 |
| 3 | 63 11 | 76 88 | 70 76 | 84 53 |
| 3½ | 75 90 | 92 46 | 85 10 | 101 66 |
| 4 | 89 93 | 107 55 | 100 83 | 120 45 |
| 4½ | 1 05 | 1 29 | 1 30 | 1 54 |
| 5 | 1 22 | 1 50 | 1 52 | 1 80 |
| 6 | 1 58 | 1 95 | 1 97 | 2 33 |
| 7 | 2 06 | 2 53 | 2 53 | 3 01 |
| 8L | 2 16 | 2 66 | 2 66 | 3 16 |
| 8 | 2 49 | 3 07 | 3 07 | 3 64 |
| 9 | 2 98 | 3 67 | 3 67 | 4 36 |
| 10L | 2 77 | 3 41 | 3 41 | 4 05 |
| 10 | 3 56 | 4 39 | 4 39 | 5 21 |

**Prices—Ontario, Quebec and Maritime Provinces**

## WROUGHT NIPPLES

4-in. and under, 50 per cent.

4½-in. and larger, 40 per cent.

4-in. and under, running thread, 20%.

Standard couplings, 4-in. and under, 20%

Do., 4½-in. and larger, net.

## OLD MATERIAL

Dealers' Average Buying Prices

Per 100 Pounds.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $ 9 50 | $ 9 00 |
| Copper, crucible | 11 50 | 11 00 |
| Copper, heavy | 11 00 | 11 00 |
| Copper wire | 11 00 | 11 00 |
| No. 1 machine composition | 10 00 | 9 75 |
| New brass cuttings | 7 00 | 8 00 |
| Red brass turnings | 8 00 | 8 00 |
| Yellow brass turnings | 6 00 | 6 00 |
| Light brass | 5 00 | 5 00 |
| Medium brass | 6 00 | 6 00 |
| Scrap zinc | 4 00 | 4 00 |
| Heavy lead | 4 50 | 4 00 |
| Tea lead | 2 00 | 2 00 |
| Aluminum | 12 00 | 10 00 |

| | Per Ton | Gross |
|---|---|---|
| Boiler plate | $11 00 | $12 00 |
| Heavy melting steel | 15 00 | 14 00 |
| Axles (wrought iron) | 25 00 | 20 00 |
| Rails (scrap) | 15 00 | 14 00 |
| Malleable scrap | 20 00 | 20 00 |
| No. 1 machine cast iron | 30 00 | 25 00 |
| Pipe, wrought | 8 50 | 8 00 |
| Car wheel | 30 00 | 25 00 |
| Steel axles | 20 00 | 18 00 |
| Mach. shop turnings | 8 00 | 6 00 |
| Stove plate | 23 00 | 20 00 |
| Cast boring | 5 00 | 7 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent |
|---|---|
| Carriage bolts, 7-16 and up | Net list |
| Carriage bolts, ⅜" and less | 15 |
| Coach and lag screws | —20 |
| Stove bolts | 55 |
| Wrought washers | —25 |
| Elevator bolts | Net |
| Machine bolts, 7-16 and over | —5 |
| Machine bolts, ⅜-in. and less | —30 |
| Blank bolts | Net |
| Bolt ends | —5 |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | +25 |
| Machine screws, fl. and rd. hd., brass | Net |
| Machine screws, o. and fil. hd., brass | Net |
| Nuts, square, blank | +25 add |
| Nuts, square, tapped | add 2 25 |
| Nuts, hex., blank | add 2 25 |
| Nuts, hex., tapped | add 2 75 |
| Copper rivets and burrs, list less | 27½ |
| Burrs only, list plus | 10 |
| Iron rivets and burrs | 37½ and 5 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, bright | 67½ |
| Wood screws, flat, brass | 55 |
| Wood screws, O. & R., brass | 55½ |
| Wood screws, flat, bronze | 50 |
| Wood screws, O. & R., bronze | 47½ |

## MILLED PRODUCTS

(Prices on unbroken packages)

| | Per Cent |
|---|---|
| Set screws | Less 40% |
| Square and hexagon head cap screws | Less 30% |
| Round head cap screws | Plus 10% |
| Fillister head cap screws | Less 10% |
| Flat head cap screws | Net list |
| Button head cap screws | Plus 10% |
| Studs | Less 20% |
| Semi-finished nuts up to and including 1-in. | Less 35% |
| Semi-finished nuts 1⅛ to 1½" | Less 30% |
| Semi-finished nuts 1⅝ to 2 in. | Net list |
| Coupling bolts | Plus 10% |
| Taper pins | Less 40% |
| Planer bolts without fillet | Plus 40% |
| Planer bolts with fillet | Pus 50% |
| Patch bolts | Plus 80% |
| Hollow set screws | Plus 20% |
| Thumb screws | Less 35% |
| Thumb nuts | Less 65% |

## BILLETS

F.O.B. Pittsburgh.

| | Per gross ton |
|---|---|
| Bessemer billets | $43 50 |
| Open-hearth billets | 43 50 |
| O.H. sheet bars | 47 00 |
| Forging billets | 48 50 |
| Wire rods | 57 00 |

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails, base | $5 10 |
| Cut nails, base | 5 75 |
| Miscellaneous wire nails | 50% |

## ROPE AND PACKING

| | |
|---|---|
| Plumbers' oakum, per lb. | 0 10¼ |
| Packing, square braided | 0 38 |
| Packing, No. 1 Italian | 0 44 |
| Packing, No. 2 Italian | 0 36 |
| Pure Manila rope | 0 26 |
| British Manila rope | 0 20 |
| New Zealand hemp | 0 20 |

## POLISHED DRILL ROD

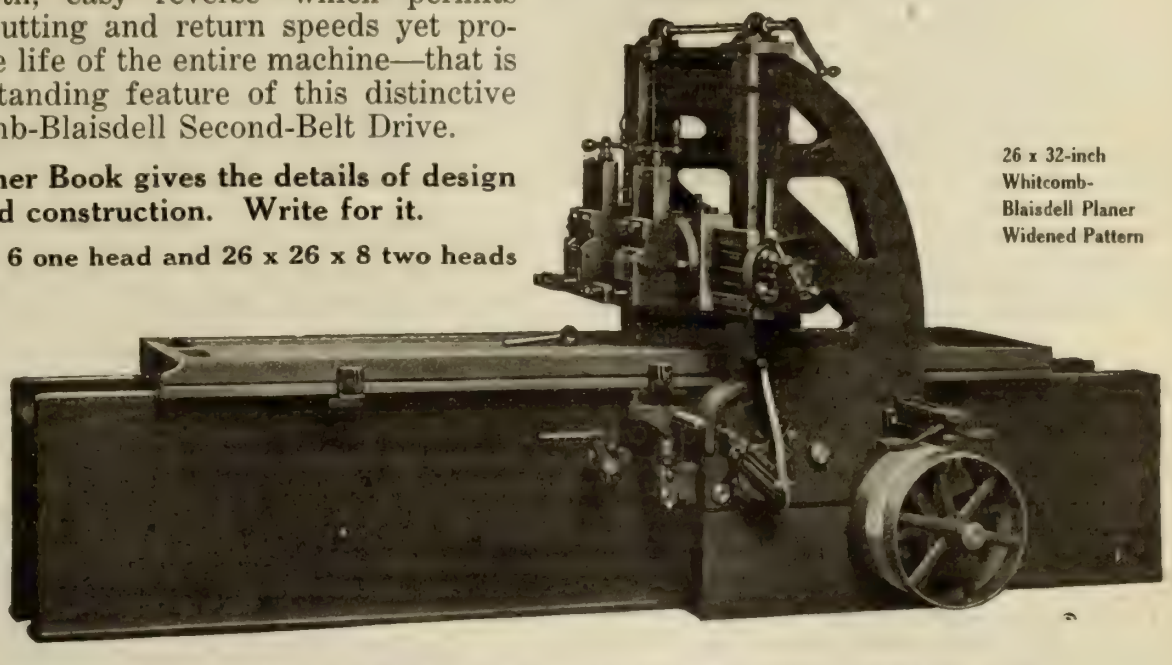
| | |
|---|---|
| Discount off list, Montreal and Toronto | Net |

# The Planer With the Second-Belt Drive

A smooth, easy reverse—which permits higher cutting and return speeds yet prolongs the life of the entire machine—that is the outstanding feature of this distinctive Whitcomb-Blaisdell Second-Belt Drive.

**Our Planer Book gives the details of design and construction. Write for it.**

**24 x 24 x 6 one head and 26 x 26 x 8 two heads in stock.**



26 x 32-inch Whitcomb-Blaisdell Planer Widened Pattern

## THE A. R. WILLIAMS MACHINERY CO., LIMITED

Halifax, St. John, Montreal, Winnipeg, Vancouver

If It's Machinery---Write "Williams"

64 Front St. W TORONTO

## "Nichrome" Castings

"Made to Endure High Temperature"

**CANADIAN DRIVER-HARRIS CO., Ltd.**

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WALKERVILLE, ONT. CANADA AMERICAN OFFICE AND WORKS HARRISON, N.J.

BRITISH WORKS MANCHESTER ENGLAND

## DARLING BROTHERS, LIMITED

*Engineers, Manufacturers and Founders*

120 Prince Street, MONTREAL, P.Q.

*Pumps for any Service—Steam Appliances—Freight Elevators—Webster Vacuum Heating System.*

## OILGAS

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Most modern, efficient and economical heating method. Made in Canada! Full details on request.

General Combustion Co. of Canada, Limited

619-623 New Birks Building, Montreal

## MORTON MANUFACTURING COMPANY

Muskegon Heights, Mich., U.S.A.

Heavy Duty Draw Cut Shapers, Special Heavy Duty Draw Cut R.R. Shapers, Special Locomotive Cylinder Planers, Traveling Head Planers, Special Roll Wobble Planers, Portable Planers, Stationary and Portable Keyway Cutters, Finished Machine Keys. See our full page advertisement in the first issue each month of "Canadian Machinery."

## HŒFER

Drillers and Auxiliary Drilling Heads

Produce exact work in record time.

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## Toronto Testing Laboratory LIMITED

METALLURGISTS CHEMISTS FUEL ENGINEERS

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Tests of Metals, Fuels, Oils, Water, Etc.

INDUSTRIAL RESEARCH

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Secure Data and Estimates of "MORSE" DRIVES

SAVE Construction, Space, Light, Fuel. Producing More with Less.

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|---|---|---|---|
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| Baltimore | Cleveland | Montreal | San Francisco |
| Boston | Detroit | New York | St. Louis |
| Charlotte, N.C. | Kansas City | Philadelphia | |

## VICTORIA Special Machinery

DESIGNS PATTERNS

CASTINGS FORGINGS

*Send for Catalogue*

Victoria Foundry Co., Limited, Ottawa, Canada

# The Week's Events in Montreal Industry

E. A. Schofield, manager of Jones and Glassco, St. Nicholas Building, Montreal, who has been on a business trip to England for the past two months, is expected back in Canada early in April.

Edmund F. Conway, president and managing-director of the St. Lawrence Foundry Company, has been elected as a member of the board of directors of Canada Foundry and Forgings, Limited. Mr. Conway has been associated with the foundry business for many years.

Reconstruction of the plant of W. R. Cuthbert & Company is progressing with rapidity and it is expected that within a few weeks they will be able to resume operations. The changes to plant and equipment will make it one of the most modern of its kind in the district, and the improved facilities will add to the efficiency of production.

In order to meet the full requirements of users of the Armstrong-Siddeley cars, the Canadian agents, the Armstrong-Whitworth Company of Canada, 298 St. James Street, Montreal, have arranged to carry a complete set of repair parts at their Montreal warehouse. They have also secured the services of an expert from the works in England, who will be entirely at the disposal of the patrons of these cars.

The shipping firm of Furness, Withy & Company has purchased the Fraser building and site in Montreal and will remodel the building or rebuild the structure in keeping with other of their offices in other world ports. Plans have not yet been completed, but it is expected that the two first floors will be reserved for the shipping firm. The site of the new offices is at the corner of St. Sacrement and St. Alexis Streets.

Mr. Th. Seidl, chief engineer of the Escher Wyss & Company, Zurich, Switzerland, who arrived in Montreal last January to look after the interests of his company in Canada, is now on a trip to the principal Ontario points as a part of the survey he is making of conditions in this country for the Escher Wyss Company. The Montreal office of the company, which has been in the Coristine Building for some years past, has been moved to the Guarantee Trust Building, 285 Beaver Hall Hill.

Announcement has been made by the Department of Naval Service that the new direction-finding radio-telegraph station at St. John, N.B., has been opened for service. This is the fourth of the kind now in use by the Naval Service on the Atlantic coast. This station will be known as the St. John station, but the actual location is on the east side of the harbor at Red Head, about four miles from the city. It will act in conjunction with the other finding stations, and in addition will serve the special needs of the Bay of Fundy, enabling ships to navigate this bay in safety in all weathers.

Walter P. Newman, secretary of the British Smelting and Refining Company, Drummond Building, Montreal, has just returned from a three months' trip to England in the interests of his company. He reports that the London organization is going strong, and brings a refreshingly optimistic viewpoint of conditions in the Old Country. Mr. Newman believes that things are on the turn for the better even though this may not yet be apparent to superficial observation. A hopeful spirit prevails in Britain, and Mr. Newman expects to see this condition of mind reflected here in actual business improvement in the very near future.

The importance and necessity of Imperial education was emphasized by Chas. R. Smith, of the London Times, at a recent meeting of the Canadian Association of British Manufacturers, held in Montreal. The theme of the address was "Think, trade and read Imperially." He stated that every home should read at least one empire magazine to keep in touch with its affairs; they should not attain that result by merely reading American journals. People did not yet realize the simplicity of it: there were many people talking of the independence of the Dominion, but now and then one should also think Imperially, and after that first step would trade Imperially.

T. H. Watson & Company, of Sheffield, England, announce that arrangements have been made with the General Combustion Company of Canada, Limited, New Birks Building, Montreal, to handle, build and sell their various electric smelting, melting and refining furnaces. The Canadian rights for the "Greaves-Etchells" type of furnace, which has been widely adopted in the United States and England, France and Spain, are also included in the arrangements made. The General Combustion Company is also taking over the designs of the Electric Furnace Construction Company of Philadelphia, on the various types of electrically heated core ovens, annealing and heat-treating furnaces, and will have the active co-operation of the American company on electric furnace problems generally.

In speaking before the annual meeting of the Quebec Provincial Council of the St. John Ambulance Association last week in Montreal, Col. C. A. Hodgetts, of Ottawa, emphasized the necessity of establishing instruction classes in first aid to the injured in every factory or plant where there many employees. A resolution to the following effect was adopted at the close of the address: "That in view of the importance of first aid from an industrial standpoint, this meeting goes on record as approving the policy of organized classes of instruction in every factory or other establishment where a number of men and women are gathered together; and that regulations calling for first-aid certificates, with qualified attendants, should be incorporated in the Workmen's Compensation Act of the Province."

At the annual meeting of the shareholders of the Canada Cement Company, held last week, in Montreal, F. P. Jones, the vice-president and general manager, stated that business outlook for the coming year was more or less obscure. He thought that the activity in building trades this year would show an improvement over that of the past two years, but did not anticipate any marked boom. Summing up the prospects before his company, he stated: "I do not hold out any great hopes for an active business in cement in the near future. If our company secures enough business this year to warrant the running of our plants to within 60 per cent. of their capacity I think we shall be doing well." The company is contemplating the erection of a new ten-storey building on Phillips Square, and work on this will likely be started in the near future.

## BUSINESS BOOMING CREATES CONFIDENCE

Recent statements by company officials of the Canadian General Electric Co. to the effect that business was booming has created a fresh flurry, in so far as trading of shares are concerned. Nearly 700 shares changed hands on Saturday and for a stock of which the floating supply is known to be small, this was unusual, and seemed to indicate a good deal of faith or expectation on the part of traders. The president of the company, Senator Nicholls, having disposed of the rumor of absorption by the American General Electric, new theories for the demand were found. One who has watched the company's progress closely spoke guardedly of some favor which he expected would come to shareholders. In any case, he said the company had now orders on hand to keep the plants going for a full year.

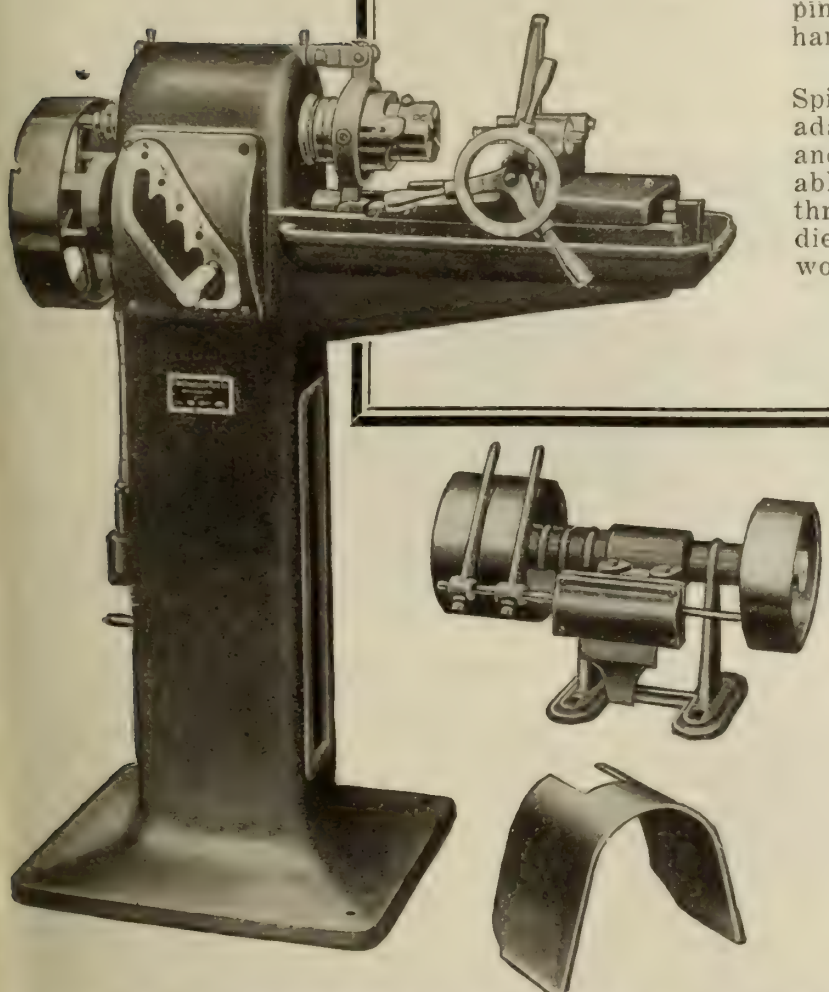
# THIS WAY, PLEASE

Where quantity and exactness have to be considered, the Geometric Threading Machine is just the way that suits. These machines have been tested and proved over and over again on speed, accuracy and endurance.

Geometric Threading Machines are employed on a large class of small threaded parts that cannot be produced economically on the ordinary screw machine.

Made in three sizes—to cut 1/8 to 1/2 inch, 1/4 to 3/4 inch, and 3/4 to 1 1/2 inch diameter threads. The carriage is mounted on slides and on the largest size machine is moved back and forth by rack and pinion, and in the smaller sizes by hand.

Spindle speed changes readily made, adapting the machine to the diameter and material of the work. An adjustable stop assures accurate length of thread, and automatically opens the die head, permitting of drawing the work straight back.







*A line from you brings full details regarding this machine. Tell us your threading requirements—let us recommend the proper Geometric Collapsing Tap or Self-opening Die.*

## THE GEOMETRIC TOOL COMPANY

**NEW HAVEN CONNECTICUT**

*Canadian Agents:*

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B., Halifax, N.S.

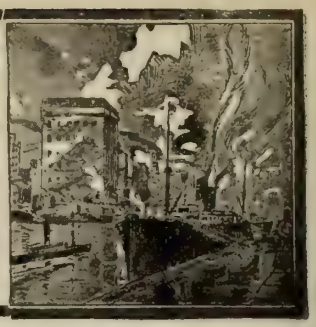
Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

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# INDUSTRIAL NEWS

## NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES



## WOULD ADD REVENUE ADVOCATES 1 P.C. TAX

**Such a Tax on Business Would Be an Improvement on Present Method, According to J. F. M. Stewart.**

Speaking before the Chamber of Commerce at Stratford, Ont., J. F. M. Stewart, of Toronto, a member of the board of directors of the Dominion Steel Co., and of the Canada Steamships Limited, had the following to say on business conditions.

He advocated the abolition of existing methods of Dominion taxation and the placing in effect of a system of taxes of one per cent. on all business transactions. He produced figures showing that the revenue from business sources of the Government would be about $160,000,000 under a system such as he suggests, or between $30,000,000 and $40,000,000 more than that derived under the present plan, and that the proposed plan would stimulate trade instead of stifling it.

Mr. Stewart was accompanied by his father-in-law, William H. Shaw, of Toronto, formerly of Stratford, who also spoke briefly to the meeting.

### Criticizes Tax System

Attacking the system of taxation used in raising money needed for war obligations, Mr. Stewart described the business profits tax and the income tax as unsound legislation, as in both cases it stifled business expansion and put a premium on the destructive system of simply investing money in bonds and letting it lie rather than developing and expanding business. In both cases it is an attempt to tax profits that may the following year turn into losses. He pointed out that the Government takes the profit on industry and the man takes the loss.

In place of the various present systems of taxation, Mr. Stewart suggested that a tax of one per cent. on the net turnover, or rather on all commercial transactions, should be collected by the last man handling goods before they reach the ultimate consumer. This plan, as before mentioned, would bring many more millions of dollars' revenue to the country, and would affect all equally, as the more a man spent the more taxes he would pay, and this would include the farmer as well.

## TECHNICAL MAN JOINS THE STAFF

**Major F. H. Moody, B.A.Sc., Member A.S.M.E., Links Efforts With Automatic Electric Truck Company.**

Powley and Townsley, Limited, with head office at 907 Excelsior Life Building, Toronto, have added to their staff Major F. H. Moody, who will act in the dual capacity of secretary-treasurer and chief engineer. This is another case where the technically trained man is coming into his own. This concern deal exclusively in a complete line of electric industrial and mine haulage equipment, battery charging and control apparatus, also Edison nickel-alkaline storage batteries.



MAJOR F. H. MOODY, B.A.Sc., Mem. A.S.M.E.

Major Moody has had a varied experience that will prove both practical and useful in his new duties, an experience that will be of real worth to their already numerous clientele. Major Moody commenced his engineering experience in 1903 as machinist's apprentice with the John Inglis Co., Limited, Toronto. This was followed by mechanical and electrical engineering course at University of Toronto, for which he received his degree of bachelor of applied science (with honors) in 1909. His vacation periods were spent in practical work with the General Electric Company, Schenectady, N.Y., American Locomotive Company, Schenectady, N.Y., and International Steam Pump Company, East Cambridge, Mass. Following a year as demonstrator in thermodynamics at the University of Toronto, he was successively associate editor Canadian Machinery, Power House and Canadian Foundryman, Toronto; associate editor Machinery, New York; Canadian Railway and Marine World, Toronto, until in July, 1915, he joined up with the 83rd Battalion for overseas service.

He served three years overseas with the 116th Battalion C.I.; with them he attained the rank of major. Returning to Canada with that unit in March, 1919, he became assistant chief engineer, McLaughlin Motor Car Company, Oshawa, relinquishing that position in January, this year, to assume the above new duties.

Major Moody intends to use his mechanical knowledge to the best advantage, viz., give advice that is based on experience. After all, this is the best kind of advice we can get, for all guesswork is eliminated.

## BUSINESS IS GOOD NO DECLINE LOOKED FOR

**Factory Running to Full Capacity—New Equipment Necessary to Meet the Demand**

In a recent letter to the trade in general the Williams Tool Corporation, Brantford, Ont., brings out some interesting points, the general trend of which follows:

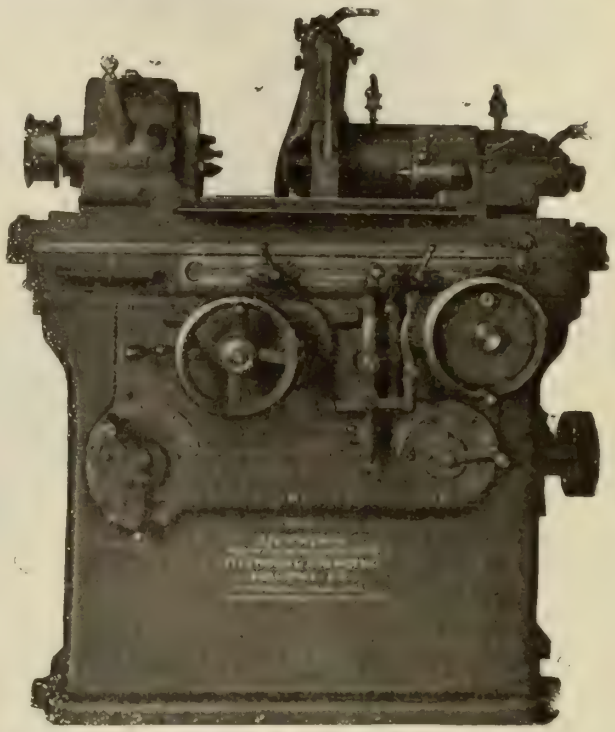
"The increasing demand for our pipe machines has kept our factory running to capacity and made necessary the installation of several large new machine tools. This in the face of the present readjustment.

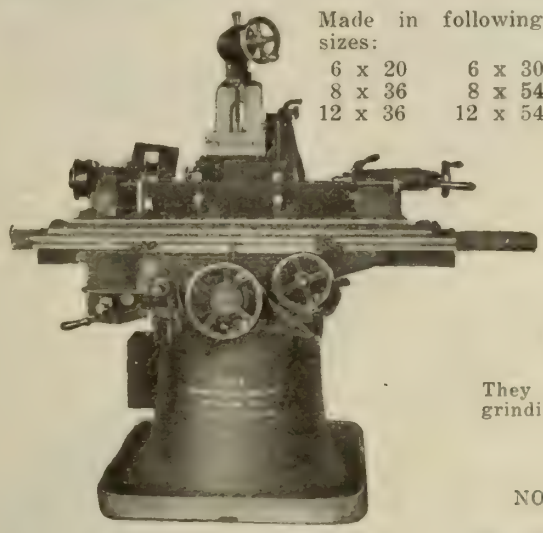
"Pipe manufacturers have their busy seasons the same as other lines of merchandise. During the war pipe machines practically disappeared from the market, but now it is a different story. January showed the second largest in the history of the company. Pipe machines will not decline in price for some time to come for the reason that the retail prices of these machines were not advanced in the same proportion to the present price of labor and material. We are even protecting dealers against a decline in prices just as long as machines purchased for stock purposes remain unsold."

# GRINDERS

## FITCHBURG
### Plain Cylindrical Grinders

Carefully designed to meet the great variety of cylindrical grinding requirements. Occupies just half the floor space of the larger cumbersome machines. Rigid and powerful. Constructed on the unit system, each unit being entirely independent of any other and can quickly be removed from the machine. Equipped with automatic feeds and arranged for motor drive on request.





Made in following sizes:

| | |
|---|---|
| 6 x 20 | 6 x 30 |
| 8 x 36 | 8 x 54 |
| 12 x 36 | 12 x 54 |

## BATH Universal Grinders

They will do your cylindrical, internal, surface, disc, tool and cutter grinding with speed and efficiency. Made in 3 sizes:

No. 1, 10″ Swing, 20″ between centres, Wheel 10x¾″
No. 2, 10″ Swing, 25″ between centres, Wheel 12x1½″
No. 2½, 10″ Swing, 36″ between centres, Wheel 12x1½″

NOTE—Bath No. 2 machine will grind surfaces 20 x 9, 7½″ high.

### Tool and Cutter Grinders

Designed with the idea of combining strength and general utility with accuracy and easy operation, the Globe Universal Tool and Cutter Grinder is a machine which every Canadian manufacturer should include in his tool room equipment.

Centers swing work up to 8″ diameter and 15″ long.



### Other Grinders

Disc Grinders, Floor Grinders, Bench Grinders, Water Tool Grinders, Swing Grinders, Portable Pneumatic and Electric Grinders, etc., to meet requirements of any shop.

*Full Information may be secured from*

## GARLOCK-WALKER MACHINERY CO., LIMITED

32 Front St. West TORONTO Telephone Main 5346

MONTREAL and WINNIPEG

GARLOCK WALKER

HIGH GRADE MACHINE TOOLS

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## Trade Gossip

There has been sharp price-cutting among English and Scotch iron and steel makers, particularly in shipbuilding steel, in order to capture the overseas markets.

The Canadian rights for the "Greaves-Etchells" type of furnace, which has been widely adopted in the United States, England, Spain and France, are also included in the arrangement made.

The Zionist colonies in the Holy Land state that they intend modeling their power generating system after that of the style adopted in Ontario. Power will be drawn from the principal streams of Palestine, including the River Jordan.

Captain Joseph Hough, a navigator on Lake Erie for more than forty years, died at his home in Port Stanley March 7, aged 70 years. He was born in Port Stanley and had resided there all his life, sailing his vessel out of that port.

Mr. T. J. Dillon, who recently resigned his position of president and general manager of the Canadian Foundries and Forgings Co., Ltd., Montreal, will interest himself in the manufacturing of different lines of steel products in Welland, Ont., and the Niagara district.

The E. A. James Co., Ltd., the well-known consulting engineering firm, have changed their name to James, Proctor and Redfern, Limited. This change in name gives recognition to Messrs. Proctor and Redfern, who have been connected with the company for some years.

T. H. Watson & Company, Sheffield, England, announce that arrangements have been made with the General Combustion Company of Canada, Limited, New Birks Building, Montreal, to handle, build and sell their various electric smelting, melting and refining furnaces.

The General Combustion Company of Canada, Limited, are also taking over the designs of the Electric Furnace Construction Company, Philadelphia, on the various types of electrically heated core ovens, annealing and heat treatment furnaces, and will have the active co-operation of the American company on electric furnace problems generally.

Senator Frederic Nicholls, vice-president of the Dominion Steel Corporation of Montreal, recently resigned from his position on the board of directors of the corporation. Senator Nicholls states by way of explanation that increasing duties in Toronto makes it difficult for him to attend the meetings of the corporation at Montreal.

The death occurred of James Albert Cole, a well-known manufacturer of North Bay, on March 6. Mr. Cole for some years had conducted a successful planing business. For 25 years he was foreman of the J. R. Eaton Co., of Orillia, and for the past year superintendent of the A. J. Young Lumber Co., of North Bay.

The Toronto Scale Co. have leased some available factory space in the building occupied by the MacFarlane Engineering Works at Paris, Ont.

The MacFarlane Engineering Works, Paris, Ont., are planning to extend their industry very materially by the production of a number of lines that have not been manufactured in Canada heretofore.

## Engineering

A new eight-roomed school will be built at Niagara Falls, Ont.

A factory at an estimated cost of $25,000 is planned by Nelson Match Co., Nelson, B.C.

Plans are in preparation for the $120,000 addition to the Brantford General Hospital.

Silverwoods, Ltd., London, Ont., are contemplating the installation of an ice plant with 25 tons capacity daily.

The Kamloops Canneries, Ltd., Kamloops, B.C., contemplate the erection of a fruit cannery costing $5,000.

It is expected that work will begin shortly on the erection of the plant for the Wills-Lee Co., Sarnia, Ont.

A match block factory to be built at Nelson, B.C., is being planned by J. D. Martin, of Neepawa, Man.

Thomas Wollings & Co., Connaught Station, Ont., contemplate the construction of rolling mills at cost of $60,000.

Application has been made by H. Savard, 124 Laurier Street, for permission to build a garage on Laurier Street, Montreal.

The erection of a building on the north-east corner of Spadina Road and Bridgeman Avenue is being planned by Langley's Limited at an estimated cost of $20,000.

The general contract for the erection of factory to cost $40,000 for Cridland and Sons, 1450 Gerrard Street E., Toronto, has been awarded A. Jeffries, Scarboro, Ont.

Provincial Government supplementary estimates for this year include, at cost of $60,000 each, for erection of new Veterinary College and Dairy Building at the O.A.C., Guelph, Ont.

New tenders will be called by W. H. E. Schmalz, architect, 288 Frederick St., Kitchener, Ont., from March 15 to April 1, for the erection of service station at an estimated cost of $15,000 for Reinhart and Doerr, 192 King Street west.

Cowie and Moore, 50 Craig Street, Ottawa, have the general contract for the erection of garage costing $18,000 for Drs. Liggett and Graham, 227 Clemow Avenue, and will receive tenders for gas tanks, Bowser pumps, roofing, electrical, plumbing and heating.

## Marine News

It was stated by P. A. S. Franklin, president of the company, that the agreement between the International Merchant Marine Company and the British Board of Trade, requiring the company to operate its ships without injury to British commerce applies only to British flag vessels.

The rumor that J. W. Norcross, president of the Canada Steamships, Ltd., would resign his office with this company, because he had been appointed as Canadian representative on the British Foreign Commercial Commission, has been denied by W. E. Burke, a director of Steamships.

A new wireless invention has been discovered by which ships may be guided during dense fogs, was announced by William Marconi at the British Shipmasters' Dinner. It is based on the principle that electric waves may be directed in any definite direction like flashes from a lighthouse. These waves would take the place of leading lights in thick weather and prevent collision of vessels during fogs. His invention has not been in operation anywhere yet.

It has been announced by Norman B. Conger, United States weather forecaster, that the radiophone will supplant the telephone and the telegraph in the distribution of weather forecasts from the United States Weather Bureau. Mr. Conger stated that the "radiophone" was being considered as a distributive medium. Storm warnings can be flashed to vessel masters at sea and vessel masters will be able to call up the weather office over the radiophone and get the very latest forecasts which will mean safety in sailing and no delays in taking of unnecessary chances by vessels.

That ice conditions in the Cabot Strait are the worst in ten years is reported by shipmasters who have succeeded in getting through the packs within the last few days. Newfoundland is reported to be entirely surrounded by impenetrable floes stretching from the Arctic circle to the gulf and dotted with monster bergs. It is expected that the opening of navigation in Cape Breton ports will be much later than usual this spring.

## YORKSHIRE PRICES ARE BEING CUT

**Producers Make a Bold Attempt to Revive Interest in a Dull Industry.**

London.—The pig iron producers of the Cleveland district of Yorkshire, in order to make a bold bid for a revival of the industry, which is in a state of stagnation, have made a record cut in prices of all Cleveland pig iron amounting to 45 shillings a ton. East coast hematite has been reduced forty shillings and steel prices are expected to follow.

# MORROW
## High Speed Forged Drills




TIME is saved when you use Morrow High Speed Drills. The operator thins out the centre at the point and only has to regrind about half as often as with ordinary high speed drills.

Don't merely say "drills" when ordering. Say "MORROW." More holes with less regrinding!

**Also manufacturers of cap screws, set screws, semi-nuts. Sole distributors of P-H and Imperial Brand Files.**

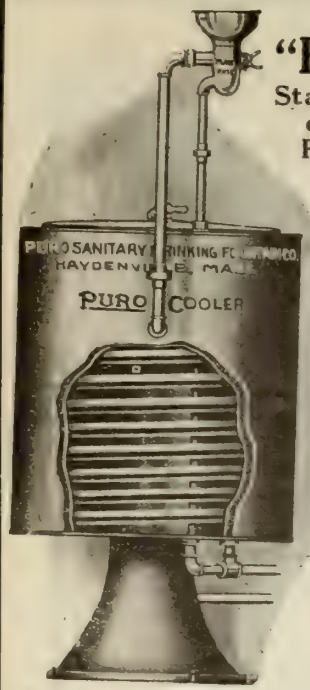
Please Note Our New Montreal Address:

**John Morrow Screw and Nut Co., Limited**
489 St. Paul Street West
MONTREAL, QUE.
*Telephone:* Main 8418

# *Works at* INGERSOLL

*If interested tear out this page and place with letters to be answered.*

THE "FLU" Stayed out of this PLANT



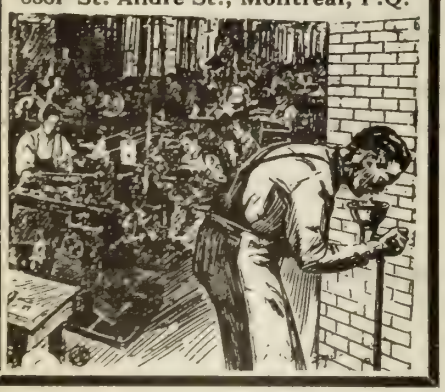

PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)

The only fountain with a bowl that prevents lips touching the bubbler paid its moderate cost over and over in all those well-ordered plants whose precautionary measures successfully barred the Spanish influenza. PURO saves lives, time and water. Write

**Puro Sanitary Drinking Fountain Co.**

888F St. Andre St., Montreal, P.Q.



HAMILTON ENGINEERING SERVICE LIMITED

*Consulting and Designing* — Tools, Jigs, Fixtures and Special Machinery. Let us shoulder your problems.

17 MAIN ST. EAST, HAMILTON

**DROP FORGE DIES**

Send us your blueprints and specifications. Entrust your requirements to experienced workmen and up-to-date equipment. Have your dies made in Canada. First-class workmanship guaranteed.

THE KIMBER & HILLIER MFG. CO.,
Thorold Road, - St. Catharines, Ont.

# INFORMATION DESIRED REGARDING VARIOUS TYPES OF MACHINES

"We are interested in the establishment of a factory in Sydney for the manufacture of conduit for electric wiring." So writes one of our correspondents, and they continue their query in the following manner: "As you may be aware, a company in Melbourne is already engaged on this class of material, but we think there is room for a plant in Sydney. We require the fullest possible information on the following:

"First—Machine for manufacturing hot rolled steel strip into close joint conduit. Sizes at first would be ½ inch, ⅝ inch and ¾ inch, or ⅝ inch size only. State shipping weights and measurements, also complete specification of machine, including output.

"Second—Machine for manufacturing steel strip into welded conduit. Sizes at first would be ⅝ inch and ¾ inch, or ⅝ inch size only. State shipping weights and measurements. Also complete specification of machine, including output.

"Third—Rolling mill for rolling steel billets into strip of required gauge for ½ inch, ⅝ inch and ¾ inch close joint; also ⅝ inch and ¾ inch welded (this machine will probably be too expensive a proposition at first). State shipping weights and measurements. Also complete specification of machine, including output.

"Fourth—Screwing machine for screwing ⅝ inch and ¾ inch welded. Alternatively for screwing ⅝ inch and up to 2 inch. State shipping weights and measurements; also specification of machine, including output.

"Fifth—Sample and price of hot rolled steel strip for manufacturing ½ inch and ⅝ inch close joint. In coils suitable for cutting into 12 ft. 6 in. lengths. State gauge, width, and number of feet to the ton. State packing particulars.

"Sixth—Sample and price of steel strip for manufacturing ⅝ inch and ¾ inch welded screwed conduit. In coils suitable for cutting into 12 ft. 6 in. lengths. State gauge, width, and number of feet to the ton. State packing particulars.

"Seventh—Samples and price of close joint conduit, rough, ready for enamelling, in ½ inch and ⅝ inch in 12 ft. 6 in. lengths. State gauge, and number of feet to the ton. State packing particulars.

"Eighth—Samples and price of welded conduit, rough, ready for screwing and enamelling, in ⅝ inch up to 2 inch, in 12 ft. 6 in. lengths. State gauge and number of feet to the ton. State packing particulars.

"We are anxious to purchase the most up-to-date plant available for the above industry and should be glad of all possible details regarding price, etc., making sure to state the best deliveries possible."

This is an ideal opportunity for manufacturers to send us in all possible information on the above queries, when we will forward the same to our correspondent without delay.

# DO ANY OF THESE LINES INTEREST YOU ?

Information regarding the following lines can be obtained by communicating with this paper and mentioning key number:

2758. **Electrical goods, leather belting, rubber goods, etc.**—A Turin house is willing to buy the foregoing articles in Canada.

2763. **Machine tools, etc.**—A very important Genoese firm would be disposed to negotiate with Canadian houses for machine tools.

2764. **Machine tools.**—A firm of import and export agents would like to enter into relations with Canada in the foregoing.

2766. **Steel wire ropes.**—A firm in Naples desires to hear from Canadian companies interested in doing business with Italy.

2769. **Wire rope.**—A Tokyo firm specializing in the import of British goods inquires for crucible steel wire rope of the following specifications:

Crucible steel wire rope, No. 7 (quality), 6 strand.—Cir. 2, 2¼, 2½, 2¾, 3 inches, 2,000 to 3,000 feet in length.

Crucible steel flexible wire rope, No. 24 (quality), 6 strand.—Cir. 1½, 1¾, 2, 2¼, 2½, 2¾ inches, 720 feet in length.

Samples and specifications are requested immediately.

2762. **Representation in Australia.**—Business gentleman at present in Toronto and returning to Australia would like to get into touch with manufacturers of millboard, suitable for shanks, toe-puffs, etc., in shoe and slipper manufactures. Kraft brown, sulphite and grease-proof papers, for paper bag manufacturing. Close-jointed tubing for bedsteads. Suspender and armband metal fittings. View to representation in Victoria, New South Wales, Queensland and South Australia.

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The discovery of a method of utilizing volcanic iron sand for the manufacture of steel, which, if adopted, would make Japan independent of steel imports, has been announced by the Japanese War Office. Experiments were started some time ago with iron sand, of which there are unlimited supplies in the country, and tolerably good results were obtained from practical experiments at the Penchihu blast-furnace. Although the discovery is successful from a military point of view, any economic advantage does not necessarily follow.

## WHO CAN SUPPLY HIGH TENSILE OVAL WIRE?

A correspondent writes as follows: We are desirous of forming connections with some well-equipped steel mill who are in a position to consider seriously the manufacture of galvanized high tensile oval wire, under the following specifications:

| Size. | Close Joint S. W. G. | Screwed S. W. G. |
|---|---|---|
| 1/2" | 19 | 16 |
| 5/8" | 19 | 16 |
| 3/4" | 18 | 15 |
| 1" | 18 | 15 |
| 1 1/4" | 17 | 15 |
| 1 1/2" | 16 | 14 |
| 2" | 16 | 13 |

| Paris Gauge | Resistance in Kilos. | No. of Bends. | Length of Coil in Meters. |
|---|---|---|---|
| 19 17 | 1000 | 4 | 625 |
| 18 16 | 850 | 5 | 830 |
| 17 15 | 700 | 6 | 1120 |
| 16 14 | 650 | 7 | 1410 |

Coils of 45 kilos each, coils of one piece of wire, electrically welded where necessary, and coils are usually wrapped in heavy, tarred, weatherproof paper.

We have virtually controlled the sale of oval wire in South American markets for the past two years, and during that period we have secured orders amounting to approximately five thousand tons. The South American buyers have not been entirely satisfied with the oval wire which has been furnished them, and as we are desirous of holding the trade, which we have established, we are looking for a mill who could co-operate with us as per above specifications.

If you will kindly put us in touch with a mill who would be disposed to enter into the manufacture of this material, we would then submit our proposition in detail and could probably offer the same volume of business. How about this? Who can give us this information?

### IMPORTANT TESTS

Tests carried out by the United States Bureau of Standards on the value of slags for fine and coarse aggregate indicate that the concrete so made seems to be of an equal strength with concrete made from ordinary gravel. The conclusions of the Bureau are as follows: Crushed slag as a coarse aggregate produced concrete of as high a strength as gravel. The tests were not extensive enough to determine the durability of the slag, but to the extent of the tests there were no signs of disintegration due to the sulphide sulphur or other causes. Slag sand, because of its lack of fine material, does not produce easily workable concrete when used as a fine aggregate. If it must be used its working qualities can probably be improved by the addition of small amounts of fine sea sand, hydrated lime, or other fine material. Provisions in specifications for slag aggregate calling for a maximum sulphide content of 1.5 per cent., and a minimum weight per cubic foot of 70 pounds, are tentatively recommended.





DOMINION CHUCKS

STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY



All Screws Are Reversible

SCREWS are made of the best grade steel. Both ends are broached and are heat treated after machining. They are reversible, so that either end may be used, are large enough in diameter to stand the torsional strains applied by operator when setting up his work. They are made to give the best service—and may be depended upon to stand up under the hardest usage.

DOMINION STEEL PRODUCTS CO. LIMITED
*Engineers • Manufacturers*
BRANTFORD, CANADA


### OAKOAL CO. IN LIQUIDATION

The Oakoal Co. has gone into voluntary liquidation. A statement issued by the company says that although not in a state of bankruptcy, the present financial depression made it difficult to collect on stock subscribed, which approximates the amount the company owes. E. R. C. Clarkson & Sons have been appointed receivers.

The statement adds that "the company has for the past three months been making anthracite briquettes and will continue to do so. The idea of going into voluntary liquidation is simply to give ample time for reorganization, collection of outstanding subscriptions and meeting all obligations."

## CATALOGUES

The Cincinnati Electrical Tool Co., Cincinnati, O., have recently issued a new catalogue No. 14, covering their complete line of Portable Electrical Drills, Grinders and Buffers. This catalogue contains several new type machines which the company recently brought out, and should prove of interest to anyone using or intending using such equipment.

### NEW CATALOGUE

The Williams Tool Corporation, Brantford, Ont., and Erie, Pa., have issued a loose-leaf catalogue dealing with their complete line of pipe threading and cutting machines. It is also descriptive of the Williams patent receding die head designed to cut straight or taper threads of any degree to any length. The Corporation is also issuing a monthly delivery sheet, listing machines and motors that are immediately available.

### PRESS BOOKLET

The Baird Machine Co., Bridgeport, Conn., have issued a booklet dealing with their double action tandem press. Examples of work performed are shown and it is stated that the press, when equipped with simple tools, will automatically feed the metal to the front press, pierce, stamp, letter or do any such follow-up work, blank, hold down the blank and draw, then transfer to the back press and redraw, pierce, stamp or perform any operation that might be carried out in a single action press. Tumbling barrels are depicted in the latter part of this booklet.

### CLUTCH CATALOGUE

The Hanson Clutch & Machinery Co., Tiffin, Ohio, have issued a catalogue No. C 3 which deals with their line of friction clutches. Different styles and sizes are shown, also typical installations. The book is in itself a regular text book on the subject of this type of clutch.

### DRILL PRESS BOOKLET

The Aurora Tool Works, Aurora, Ind., have issued an attractive booklet on their line of upright drills. The different styles as manufactured are shown with complete specifications, and the various features are explained in detail. The booklet is of loose-leaf construction and can be added to as the line grows.

### NEW FOLDER

The Canada Machinery Corporation, Galt, Ontario, have issued a rather interesting folder entitled "Cut Your Costs." The interior of the circular shows various machine tools manufactured by this concern, and tells of various features embodied in the same. An invitation is also issued to visit their works and see the facilities they have for machine tool building.

# Classified Opportunities

## HELP WANTED

WANTED AS ASSISTANT EDITOR, ON group of technical papers, live-wire mechanical engineer. Qualifications required are: Age, under 45; good education; certain amount of practical experience; ability to express ideas on paper; good mixer and aggressive worker. Splendid opportunity for the right man. State full particulars in first letter, mentioning present salary. Box 152, Canadian Machinery.

WANTED — SHAPER MAN, ALSO MILLwright; state wages, experience. Box 758M, Canadian Machinery.

## MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (etfm)

**MACHINE WORK WANTED**

We are equipped to handle all kinds of general or special machine work. All operations in our plant are done under the most careful supervision and we can satisfy you as to price. Always available for consultation.

**PERFECT MACHINE COMPANY. GALT**

Builders of Reliable Machinery.

**Grey Iron Castings**

Light and Medium-Bench and Floor Repetition Castings; Capacity 15 tons per day.
Expert Metal and Wood Pattern Work. Our advice and estimates will save you money.
Semi-finishing operations on Lathe or Grill on Castings supplied if required.
ASK US.

**THE KATIE FOUNDRY, GALT, ONT.**

PARTIAL LIST

**Machine Shop Equipment**

***At Extremely Low Prices***

LATHES All sizes and lengths of bed. Special price quoted on rebuilt 20 in. x 8 ft. C.M.C.

AIR COMPRESSOR—8 in. x 8 in. Chicago Pneumatic.

TANKS—10 Tanks 10 ft. 6 in. diam. x 29 ft. 6 in. long. 19,000 gals.
3 Tanks, 10 ft. 0 in. diam. x 39 ft. 0 in. long. ⅜ in. Heads. 22,893 gals.
Full line of other Steel Storage Tanks, open and closed, all sizes.

PUMPS—1 Triplex Power Pump, 1½ in. x 6 in. Hydraulic Machy. Co. Also 1 in. x 5 in. West Tire Setter.
1—Centrifugal Pump, 2½ in. x 1½ in. Gould.
1—Gould Triplex Power Pump, 2 in. x 3 in.

Milling Cutters and Reamers, full assortment, all sizes and shapes, at less than half price. Send us your enquiries.

**Standard Equipment & Tool Works**

Dept. K. 307 St. James St.
Main 2286 MONTREAL (20)

## POSITIONS WANTED

POSITION WANTED—MACHINE SHOP SUperintendent or general foreman. Acquainted with modern machine shop practice and heat-treatment of steel. Thirty years' experience. Production or contract work. Box 757, Canadian Machinery.

## FOR SALE

2—FARREL JAW CRUSHERS—12" x 20".

1—ARMINGTON-SIMS STEAM ENGINE, 450 h.p.

1—LEONARD STEAM ENGINE—100 h.p.

1—VERTICAL BOILER—36" x 8'—110 LBS. w.p.

Box 762F, Canadian Machinery.

BELTING, CORDWOOD SAWS, NEW CROSScut saws, thirty-inch at $9.50; twenty-eight-inch at $8.50; new rubber belting, six 4-ply at 50 cents; five-inch at 45; four-inch at 35. Box 759F, Canadian Machinery.

WE HAVE IN STOCK FOR IMMEDIATE DElivery new and second-hand electric motors; 3-phase, 25-cycle, 550-volt, 1 h.p. up to 75 h.p. Box 761F, Canadian Machinery.

THREE 50 H.P. TYPE C.C.L., TWO 50 H.P. type H.S.; Westinghouse motors, one 30 h.p., and one 32 h.p. and one 40 h.p. Chapman-Walker motor; twenty 16 in. Bliss turret lathes and eleven No. 2 Foster turret lathes, nine No. 3 Foster turret lathes, two 14 in. Warner & Swasey lathes, two No. 6 Warner & Swasey lathes, one No. D1 Colburn drill press, eleven No. 1 Burke hand millers, and one 68N Bliss press and one 57½ Toledo press, one hydraulic accumulator, two No. 55 National Acme automatics; also various other lathes, millers, pumps, hardness testing machines, etc. Apply Box 760F, Canadian Machinery.

**Modern Marine Machinery**

Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

**REGO**
**WELDING**
***and***
**CUTTING**
**APPARATUS**

Oxygen, Acetylene, and a complete line of Welding and Cutting Supplies.

**Carter Welding Co.**
**of Toronto, Limited**
**7-11 Sheppard St., Toronto, Ont.**
**Phones: Adelaide 2841 and 1524**
(TF)

## PATTERNS

TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (etfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (etfm)

## MACHINERY WANTED

WANTED—NEW AND RE-MANUFACTURED gas and gasoline engines, boilers, saw-mill machinery, planing mill and sash and door factory machinery. New and manufactured iron and wood-working machinery. Electric motors, dynamos, direct connected steam operated generators, portable electric tools. Builders' hoists, elevators. Box 739F, Canadian Machinery.

IF YOU HAVE IRON-WORKING OR WOODworking machines for sale, or idle machine shop equipment, call or write Canada's largest dealers in new and used machinery. H. W. Petrie Limited, Toronto, Ont. (cfm)

ONE SINGLE STAND 9 x 18 ROLL IN GOOD condition; one receiving separator, capacity about 1,000 bushels per hour. Crane Bros., 817 Ferry St., Niagara Falls, Ont.

**Machinery Wanted**

Advertisements under this heading will be inserted once free of charge. Readers are invited to use this department when in need of equipment. Replies may be sent to box number, care of Canadian Machinery, if desired.

**CANADIAN MACHINE SHOP**

—

Will handle medium Specialty Line — Manufacturing and Selling

—

**Apply Quickly**
**Box No. 715F**
**CANADIAN MACHINERY**

# Classified Opportunities

## ATTENTION!
## JOBBERS and DEALERS
### Engineering Supplies

There is absolutely no reason for paying exchange on your purchases of asbestos packings, gaskets and tape. We manufacture a line that is equal to any imported article and sold to jobbers at a price that allows a good margin of profit with protection. If you are not handling our line you are working at a disadvantage. Write us for set of samples, circulars and prices.

OUR LINE INCLUDES :

Tiger Superheat
Metallic Piston Packing
Tiger High Pressure Piston Packing
Flax Packings
Asbestos Gaskets
Asbestos Tape




**GUILDFORD & SONS LIMITED**
HALIFAX, N.S.

## NOW IS THE TIME TO BUY
## SHAPERS

**16″ Rae (new)**
**14″ Davis, S.G.**

**These shapers are furnished with cone pulley, table support and vise.**

## WOODWORKING MACHINES

**1 12″ Cowan, late type, square head.**

**1 No. 93 Berlin Sticker and Matcher, 4 heads, complete except for jointer grinding attachment.**

The above are only a few items from our large stock of new and used machines. Further information on application.

R. S. HOLLY
*Suit 502 Kent Building*
TORONTO, Ont., Adelaide 3147

## MACGOVERN & COMPANY INCORPORATED POWER MACHINERY

**1 1,333 KVA. WESTINGHOUSE-PARSONS CONDENSING TURBO UNIT.**

**Generator**—1,000 kw. (or 1,333 kva.), 80% P. F. Westinghouse, 3-phase, 60-cycle, 2,300 volt, 335 amp., 1,800 r.p.m. Direct coupled on common base to:

**Turbine**—Parsons three or four stage, designed for 150 lb. steam, parallel flow 1,800 r.p.m.

**Condenser**—Westinghouse LeBlanc, low level jet. With Pumps and Switchboard.

Have just purchased the above and will make an exceptionally attractive price prior to removal from power house where it is now located at Cleveland, Ohio. Excellent condition in every respect.

**MacGOVERN & COMPANY, INC.**
285 BEAVER HALL HILL, MONTREAL
Offices: New York, Pittsburgh, Seattle. Plant: Linden, N.J.
Buyers and Sellers of New and Used Machinery

## *STOCK SHIPMENTS*
## COLD ROLLED STRIP STEEL
### Deep Drawing, No. 4 Temper

| | | | |
|---|---|---|---|
| 10,000 lbs. | .028″ x 2⅞″ x 6′ lens. | 2,000 lbs. | .050″ x 1¾″ x 7′ lens. |
| 2,000 lbs. | .028″ x 4″ x 8′ lens. | 3,400 lbs. | .050″ x 4 ″ x 8′ lens. |
| 7,000 lbs. | .028″ x 6″ x 8′ lens. | 6,200 lbs. | .050″ x 5¾″ x 8′ lens. |
| 1,500 lbs. | .028″ x 8″ x 8′ lens. | 4,800 lbs. | .050″ x 6″ x 8′ lens. |
| 2,400 lbs. | .032″ x 4″ x 8′ lens. | 6,500 lbs. | .062″ x 6″ x 8′ lens. |
| 6,300 lbs. | .032″ x 8″ x 8′ lens. | 3,800 lbs. | .062″ x 8″ x 8′ lens. |
| 500 lbs. | .035″ x 6″ x 8′ lens. | 18,000 lbs. | .062″ x 13″ x 140″ lens. |
| 2,000 lbs. | .035″ x 8″ x 8′ lens. | 6,500 lbs. | .065″ x 6″ x 6′ lens. |
| | | 700 lbs. | .073″ x 6″ x 8′ lens. |

**The above all suitable for nickel-plating work. These items comprise only a few of the sizes we carry, and other material available for immediate shipment. Complete stock lists sent on request.**

## STEEL TUBING
WELDED FLEXIBLE SEAMLESS

## AUTO BODY SHEETS
**Black and Galvanized Sheets, Brass and Copper Sheets, Rods, Tubes**

*Send Us Your Enquiries*

**ONTARIO METAL PRODUCTS**
CO., LIMITED
237 Dufferin St., TORONTO, Canada

# GENUINE EMERY

Sizes 180, 160, 140, 120, 110, 100, 90, 80, 70, 60, 54, 46, 40, 36, 30, 24, 20, 18, 16, 14, 12, 10, 9, 8, hole.

EMERY FLOUR AND WASHED FLOUR

| | | |
|---|---|---|
| Emery<br>Glass<br>Flint<br>Garnet<br>Corundum<br>Carborundum | Paper and Cloth | In Sheets, Rolls, Discs, Bands, Strips and Tapes, &c. |

## JOHN OAKEY & SONS
LIMITED
WELLINGTON MILLS
LONDON, S.E. 1, ENGLAND

AGENTS:
F. Manley, 343 Garry St. Winnipeg, Man.
Sankey & Mason
839 Beatty St., Vancouver




*Manufacturers:*

## The Sheffield Twist Drill & Steel Co., Ltd.

Works: Summerfield Street, Sheffield.

To **PROMOTE TRADE** within the **EMPIRE, CANADIAN MANUFACTURERS** will find that **"DORMER BRAND DRILLS"** meet all requirements. **QUALITY DRILLS** for quick drilling—USE **"DORMER."**

Sheffield Engineering Supplies, Limited,
230, Craig Street West,
Montreal, Canada.

## *High Speed Twist Drills*
DORMER / BRAND

REG TRADE MARK
TRAHERN
REG U.S. PAT OFF

### Coolant Pumps Are Superior

first, because the working principle is correct. They are Rotary Geared and this type has not been surpassed since it was first designed, in the sixteenth century.

They will pump water, oil, or compound in heavy streams without pulsation. No loss of prime. Reverse with machine, work against 100 lbs. pressure, supply up to 16½ G.P.M. Run at low speeds, giving long life.

We shall gladly send our illustrated booklet giving details.

**TRAHERN PUMP DIV.**
Geo. D. Roper Corporation
ROCKFORD, ILL., U.S.A.



## Don't Keep It--Sell It!

If you have a lathe
a drill
a milling machine
a planer
a chain block
a chuck
a motor
a crane
a stock of belting
an engine
a compressor

or any other machine shop equipment for which you really have no further use, why not turn it into *cash?*

Someone may be looking for just the machine you may want to sell. Let us bring you together.

A "classified" ad. in CANADIAN MACHINERY, costing a few cents per issue, has done wonders for others. Why not try it?

Turn to the "Classified" section in this issue and see what is being offered and what is wanted at present.

**CANADIAN MACHINERY**
*Classified Advertising Section*
143-153 University Avenue TORONTO, ONT.

*If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.*

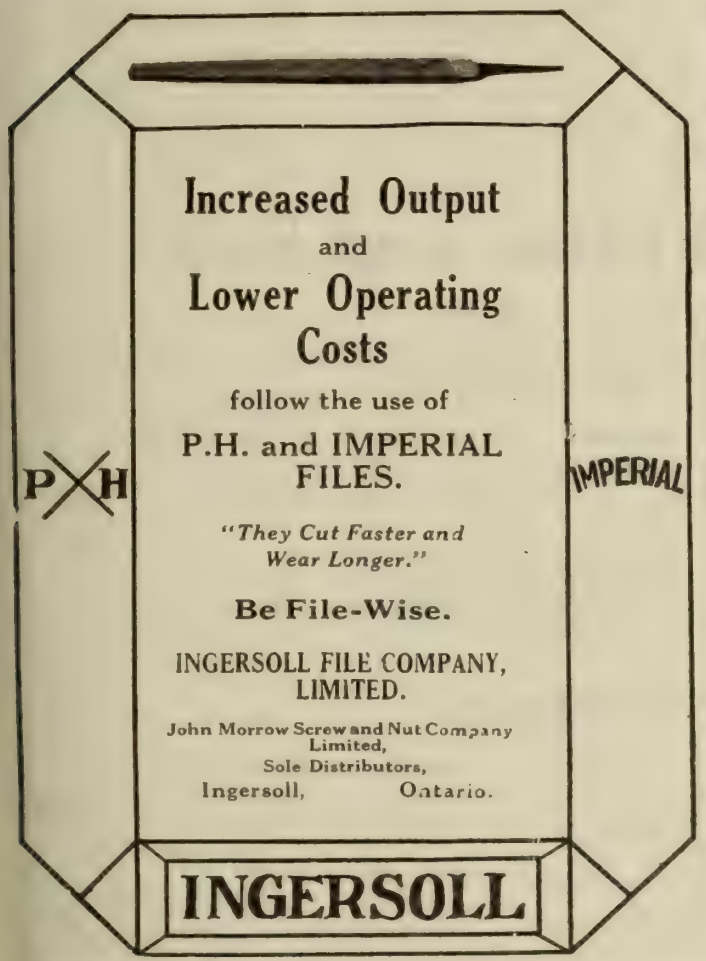
# HOYT

## BABBITTS—METALS—SOLDERS

HOYT METAL COMPANY

MONTREAL TORONTO WINNIPEG

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## Increased Output

and

## Lower Operating Costs

follow the use of

P.H. and IMPERIAL FILES.

*"They Cut Faster and Wear Longer."*

**Be File-Wise.**

INGERSOLL FILE COMPANY, LIMITED.

John Morrow Screw and Nut Company Limited,
Sole Distributors,
Ingersoll, Ontario.

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# STEEL CASTINGS

*QUICK DELIVERIES*

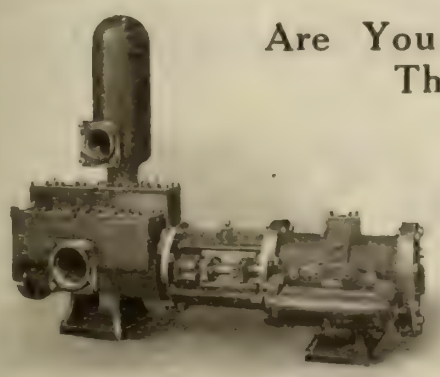
**High Carbon Steel**
**Manganese Steel**
**Chrome Steel**
**Mild Steel**

*QUALITY GUARANTEED*

Sizes—½ lb. to 5,000 lbs. each

THE WILLIAM KENNEDY & SONS,
*LIMITED*
OWEN SOUND, ONTARIO
ESTABLISHED 1860

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## Are You Looking for a Steam Pump that's Better Than the Ordinary? Then take Note of this

# HEPBURN

In the Hepburn Steam Pump the steam chest is located on the side of the cylinder and the low ports automatically drain away all condensation. This prevents water hammer in the cylinder and ensures a perfect **cushion for the steam piston.**

The Hepburn is the **only** self-draining Pump made in Canada. There are no levers or appets to get out of order. You **will find our prices right.**

We also make: Vertical Engines, Compressors, Winches, Cut Gears, Derricks, Road Machinery, Hydrants, Blacksmith Work and Grey Iron Castings.

JOHN T. HEPBURN, LIMITED *ENGINEERS AND IRON FOUNDERS*
18-60 VAN HORNE STREET, TORONTO, CAN.

# George Ham says "Good-Bye"

A STRIKING and affectionate farewell is bade by Col. George H. Ham in the March 15th issue of MACLEAN'S MAGAZINE, to his thousands of friends, as well as to other readers who may know him only by hearsay, who have been following his reminiscences in Canada's National Magazine since last August.

"The Curtain is Rolled Down, for seventy-three years makes a long act," says George. "Recalling three score and ten of these years has been a pleasant though difficult task; thirty-three of them have been spent in the service of the C.P.R., and one cannot but realize that the corridors of the Company's office will not long be trodden by the older ones of this generation and that some of us perhaps will soon not even be a memory."

# "There Were Giants in Those Days"

The concluding instalment of this remarkable, all-Canadian feature, is the biggest and best of the lot—and here is the proof: There are seven full magazine pages, chock full of stories of those amazing days when the C.P.R. was conceived and constructed; human, hitherto unpublished details of the lives and careers of those three veteran founders, and, later, presidents of our first transcontinental: **Lord Mount Stephen,** the late **Sir William Van Horne,** and **Baron Shaughnessy, K.C.V.O.** And funny stories! Well, just read about Baron Shaughnessy's racing experiences; the pranks George Ham and William Stitt used to play on each other; Fred Cook's "German Band," and countless other incidents that could only be retained in such a mind—and heart—as that possessed by Canada's grand old raconteur.

# Big Features of Fiction and Fact

**"Personality, Plus"**—By Guy Morton.

A fascinating story about an advertising agency man who put across a trick to close a contract—and then gave the whole game away.

**"Lenix Fools the Jinx"**—By Archie P. McKishnie.

Another of those deliciously droll Lenix Ballister negro stories, in which more than the usual number of comic and absurd scenes are depicted.

**"Pawned"**—By Frank L. Packard.

The third instalment of this masterful serial goes a long way to show how the triple regeneration is going to be effected.

**"Broadway to Brussels"**—By C. C. Jenkins.

The story of the rise of J. H. Gundy, a shy youngster, who developed into one of Canada's most brilliant orators and a leading financier.

**"Little Bundles of Pluck"**—By Agnes C. Laut.

In this, Miss Laut tells with graphic pen the story of some of the war brides who are making good out on the lonely prairies, where they and their husbands have been located by the S.S.B.

**"A Woman Would Know ——"**—By Charles G. Booth.

This whole gripping story centres around the possession of a wee bundle of humanity, cursed with a dope-fiend father. There is plenty of love interest, too.

**"Those Who Stood in Darkness"**—By J. L. Rutledge.

A symposium giving the opinions of a number of Ministers of various denominations on some of the doubts which have arisen in this war aftermath, in the minds of many Christians—and others. An Easter Message.

# Review of Reviews

**"What Does Future Hold for Mankind?"** H. G. Wells

**"The World's New Leaders."** Sir Philip Gibbs

**"Labor Espionage in the U.S."** Sydney Howard

**"Bismarck's Account of Dismissal."** Neue Zuricher Zeitung

**"Ireland, the Enemy?"** Harold Cox

**"Devil Duval's Treasure."** Chambers's Journal

**"A Winged Torpedo Boat."** "Tin-Fish"

**"How Van Horne Rose."** Walter Vaughan

**"Criminal Tribes of India."** London "Times"

**"Salvaging Submarine Victims."** Stuart Martin

**"Greece's Great Renunciation."** Pierre de Lacretelle

**"Labor Must be Partner."** George A. Greenwood

**"Common-Sense Bridge."** Manning Foster

*MARCH 15th ISSUE On All News-stands 20c*

MACLEAN'S

"CANADA'S NATIONAL MAGAZINE"

# Canadian Machinery BUYERS DIRECTORY

**If what you want is not here, write us, and we will tell you where to get it. Let us suggest that you consult also the advertisers' index—last page of book, after having secured advertisers' names from this directory. The information you desire may be found in the advertising pages. This department is maintained for the benefit and convenience of our readers. The insertion of our advertisers' names under proper headings is gladly undertaken, but does not become part of an advertising contract.**

**Abrasive Discs**
Norton Co. of Can., Ltd., Hamilton, Ont.
Oakey & Sons, Ltd., John London S.E., Eng.
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Abrasive Materials**
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Acetylene, Dissolved**
L'Air Liquide Society, Toronto, Ont.

**Accumulators, Hydraulic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Air Lifts**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Air Purifiers and Coolers**
Sturtevant Co., B. F., Boston, Mass.

**Analyses, Chemical**
Toronto Testing Laboratory, Toronto, Ont.

**Angle Bars**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Anvils**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Columbia Hdwe. Division, Cleveland, O.
Petrie, Ltd., H. W., Toronto, Ont.

**Arbors**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Cleveland Twist Drill Co., Cleveland, O.
Ford-Smith Machine Co., Hamilton, Ont
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Jacobs Mfg. Co., Hartford, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.

**Axles, Car**
Dom. Foundries & Steel, Hamilton, Ont.

**Babbitt Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Host Metal Co., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

**Balls, Brass, Bronze and Steel**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian SKF Co., Toronto, Ont.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rathway Roller Bearing Co., Syracuse, N.Y.

**Barrels, Tumbling**
Barnes Machine Co., Bridgeport, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Bars, Boring**
Armstrong Bros. Tool Co., Chicago, Ill.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis
Madison Mfg. Co., Muskegon, Mich.

**Bars, Boring, Portable**
Underwood Corp., H. B., Philadelphia, Pa.

**Bars, Bronze Cored**
Moore & Son, Thos., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

**Bars, Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Bars, Steel**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Pilot Steel & Tool Co., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.

**Bearings, Ball**
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Railway Roller Bearing Co., Syracuse, N.Y.

**Bearings, Bronze**
Tallman Brass & Metal Co., Hamilton, Ont.
Railway Roller Bearing Co., Syracuse, N.Y.

**Bearings, Die-Cast**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Tallman Brass & Metal Co., Hamilton, Ont.

**Bearings, Journal**
Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Bearings, Roller**
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

**Belt Cement**
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

**Belt Clamps**
Graton & Knight Mfg. Co., Worcester, Mass.

**Belt Dressings and Fillers**
Aikenhead Hardware Ltd., Toronto, Ont
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.

**Belt Fasteners**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que
Rice Lewis & Son, Ltd., Toronto, Ont.

**Belt Lacing**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que

**Belt Lacing, Steel**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing, Hinged**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing, Flexible Steel**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing Machines**
Clipper Belt Lacer Co., Grand Rapids, Mich
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
McLaren Belting Co., J. C., Montreal, Que
Petrie, Ltd., H. W., Toronto, Ont.

**Belt Joiners, Conveyor**
Flexible Steel Lacing Co., Chicago, Ill

**Belt Tools**
Graton & Knight Mfg. Co., Worcester, Mass

**Belting, Chain**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Belting, Fabric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
McLaren Belting Co., J. C., Montreal, Que.
Sumner & Co., New York City

**Belting, Leather**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Smith Belting Co., Toronto, Ont.
Sumner & Co., New York City.
Tullis & Son, Ltd., John, Glasgow, Scot.

**Belting, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.
Quaker City Rubber Co., Philadelphia, Pa.

**Belts, Abrasive**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.

**Bench Countershaft Standards**
Ford-Smith Machine Co., Hamilton, Ont.

**Benches, Work**
Aikenhead Hardware Ltd., Toronto, Ont.

**Bending Machines, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bertrams Ltd., Edinburgh, Scotland.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Bins, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Blocks**
Ford Chain Block Co., Philadelphia, Pa.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Chain (See Hoists, Hand)**
Aikenhead Hardware Ltd., Toronto, Ont.
Ford Chain Block Co., Philadelphia, Pa.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Die**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Blocks, Pillow**
Can. Link-Belt Co., Toronto, Ont.

**Blowers**
Can. Blower & Forge Co., Ltd., Kitchener.
General Combustion Co. of Can., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Bolt and Nut Machinery**
Acme Machinery Co., Cleveland, Ohio
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Bolt and Nut Machinery, Automatic**
National Acme Co., Cleveland, Ohio

**Bolts and Nuts**
London Bolt & Hinge Works, London, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio
N. S. Steel Co., Ltd., New Glasgow, N.S.
Petrie, Ltd., H. W., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Bolt Threading Die Heads**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa

**Boosters**
Sturtevant Co., B. F., Boston, Mass.

**Boring and Turning Mills, Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.

**Boring, Drilling and Milling Machines, Horizontal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa.

**Boring, Drilling and Milling Mach., Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Boring Heads**
Aikenhead Hardware Ltd., Toronto, Ont.

**Boring Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Gisholt Machine Co., Madison, Wis.

**Brakes, Magnetic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Brass**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bricks, Fire**
Elk Firebrick Co. of Can., Ltd., Hamilton, Ont.

**Bridges**
Hamilton Bridge Works Co., Ltd., Hamilton Ont.
MacKinnon Steel Co., Sherbrooke, Que.

**Broaching Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Bronze**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Bronze, Phosphor**
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.

**Bucket Carriers, Pivoted**
Can. Link-Belt Co., Toronto, Ont.

**Buffing or Polishing Machines (See Polishing and Buffing Machines)**
Blount Co., J. G., Everett, Mass.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.

**Bulldozers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Burners, Oil and Gas**
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

**Bushings**
Fisher Motor Co., Ltd., Orillia, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Cabinets, Oil**
S. F. Bowser & Co., Ltd., Toronto, Ont.

**Calipers**
Brown & Sharpe Mfg. Co., Providence, R.I.
Starrett Co., L. S., Athol, Mass

**Cams**
Canada Foundries & Forgings Co., Welland, Ont.

**Can-Making Machinery (See Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

# BUYERS' DIRECTORY

**Cars, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Castings, Aluminum**
Canada Electric Castings Co., Ltd., Orillia
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Brass and Bronze**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Canada Electric Castings Co., Ltd., Orillia
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Copper**
Can. Hanson & Van Winkle Co., Toronto, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Marine**
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Castings, Die Molded**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Ferro-Alloy**
Can. Steel Foundries, Montreal, Que.

**Castings, Iron**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Hyd. Press**
Can. Steel Foundries, Montreal, Que.

**Castings, Monel Metal**
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

**Castings, Naval Bronze**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Nichrome**
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Nickel**
Can. Hanson & Van Winkle Co., Toronto, Ont.

**Castings, Semi-Steel**
Davidson Mfg. Co., Thos., Montreal, Que
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

**Castings, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

**Cements, Iron**
Smooth Mfg. Co., Jersey City, N.J.

**Centering Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Chains (See Sprockets and Chains)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chains, Driving**
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chasers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chemists**
Toronto Testing Laboratory, Toronto, Ont

**Chucking Machines**
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Chucks, Drill**
Jacobs Mfg. Co., Hartford, Conn.

**Chucks, Drill and Tap**
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Lathe**
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Magnetic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**
Columbia Hdwe. Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

**Cleaners, Metal, Waste, General**
Oakley Chemical Co., New York, N.Y.

**Clocks, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Clutches, Friction**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**
Can. Link-Belt Co., Toronto, Ont.

**Collars, Shaft or Set**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

**Collets**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compressors, Air**
Curtis Pneumatic Machinery Co., St. Louis, Mo

**Compressors, Air and Gas**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**
Ford-Smith Machine Co., Hamilton, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Conveyor Belt Joiners**
Flexible Steel Lacing Co., Chicago, Ill.

**Copper**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Cored Bronze Bars**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Cotter Pins**
Morrow Screw & Nut Co., Ltd., Jonn, Ingersoll, Ont.

**Counterbores**
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Countershafts**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Couplers, Car and Locomotive**
Can. Steel Foundries, Montreal, Que.

**Couplings, Flexible**
Holden Co., Ltd., Montreal, Que.

**Couplings, Rigid**
Bernard Industrial Co., A., Fortierville, Que.

**Couplings, Shaft**
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

**Cranes, Electric**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.

**Cranes, Hand (See Hoists, Hand)**
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

**Cranes, Locomotive**
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Cranes, Traveling**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Crank Pin Turning Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia, Pa.

**Cutters, Flue**
Holden Co., Ltd., Montreal, Que.

**Cutters, Gear**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Milling**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Milling Machine Co., Cleveland.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.

**Cutters, Stay Bolt**
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Thread**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa

**Cutting-Off Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Cutting-Off Machines, Pipe (See Pipe-Cutting and Threading Machines)**
Landis Machine Co., Inc., Waynesboro, Pa
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Cutting-Off Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill
Pilot Steel & Tool Co., Montreal, Que.

**Cutting Oil Filters (See Oil Filtering Systems)**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Cataract Refining Co., Toronto, Ont.

**Cutting, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont

**Cutting, Oxy-Hydrogen**
National Electro Products, Ltd., Toronto Ont.

**Dealers, Machinery (See Searchlight Section)**
Ford-Smith Machine Co., Hamilton, Ont
Petrie, Ltd., H. W., Toronto, Ont.

**Deckle Straps**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Diamonds, Black and Rough**
Joyce-Koebel Co., Inc., New York, N.Y

**Diamond, Carbon and Bortz**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond Tools**
Aikenhead Hardware Ltd., Toronto, Ont
Can. Desmond-Stephan Co., Hamilton Ont.
Ford-Smith Machine Co., Hamilton, Ont
Wheel Trueing Tool Co., Detroit, Mich.

**Diamond Crossings**
Can. Steel Foundries, Montreal, Que.

**Die-Castings**
Tallman Brass & Metal, Ltd., Hamilton Ont.

**Dies, Pipe-Threading**
Jones & Lamson Machine Co., Springfield, Vt.

**Die Sinking Machines, Automatic**
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

**Die Sinkers**
Kimber & Hillier, St. Catharines, Ont

**Dies, Screw and Thread Cutting**
Ackworthie, Ltd., John, Birmingham, E
Butterfield & Co., Inc., Rock Island, Q
Greenfield Tap & Die Corp., Galt, Ont
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro,
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, O
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, O
Toledo Machine & Tool Co., Toledo, O

# BUYERS' DIRECTORY

**Dies, Forging**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

**Dies, Hammer**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Self-Opening, Adjustable**
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Dies, Threading-Opening**
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Disc Cement**
Ritchey Supply Co., Toronto, Ont
Wausau Abrasives Co., Chicago, Ill.

**Dividing Heads**
Ackworthle, Ltd., John, Birmingham, Eng.
Dickow, Fred. C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Dogs, Lathe and Milling Machine**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drafting Boards and Tables**
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes-Owens Co., Ltd., Montreal, Que.

**Drafting Materials**
American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes-Owens Co., Ltd., Montreal, Que.

**Dressers, Grinding Wheel**
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Drill Holders**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drill Rods**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Drill Speeders**
Canada Machinery Corp., Galt, Ont.

**Drilling Machine Heads**
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati Ohio.

**Drilling Machines, Automatic**
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind

**Drilling Machines, Bench**
Beacon Engineering Co., Tipton, England.
Can Blower & Forge Co., Ltd., Kitchener.
Henry & Wright Mfg Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U. S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Electric and Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis

**Drilling Machines, Gang**
Bertram & Son Co., Ltd., The John, Dundas, Ont
Fisher Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drilling Machines, Heavy Duty**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Multiple Spindle**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

**Drilling Machines, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Drilling Machines, Portable**
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Radial**
Bertram & Son Co., Ltd., The John, Dundas, Ont
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Drilling Machines, Sensitive**
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Turret**
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

**Drilling Machines, Vertical**
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener
Garlock-Walker Mchy. Co., Toronto, Ont
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng
Tweedale & Singer Co of Can., Ltd., Chas. A., Windsor, Ont.

**Drills, Center**
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drills, High Speed Twist**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Drills, Twist and Flat**
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.

**Dust Handling Equipment**
Can. Blower & Forge Co., Ltd., Kitchener
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass

**Electrical Instruments**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Electrical Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O.

**Elevating Trucks (See Trucks)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Elevators and Conveyors**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que
Main Belting Co. of Can., Montreal, Que
Mathews Gravity Carrier Co., Port Hope, Ont.

**Emery Wheels (See Grinding Wheels)**
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Engines, Capstan**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Engineers, Mechanical**
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.

**Expanders, Tube**
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Eyeglasses, Safety (See Goggles, Safety)**
Prest-O-Lite Co. of Can., Toronto, Ont.
Willson Goggles, Inc., Reading, Pa.

**Fans, Electric**
Can Blower & Forge Co., Ltd., Kitchener
Northern Electric Co., Montreal, Que
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Sturtevant Co., B. F., Boston, Mass.

**Fans, Exhaust**
Can Blower & Forge Co., Ltd., Kitchener
Petrie, Ltd., H. W., Toronto, Ont
Skinner Bros. Mfg. Co., Inc., St. Louis Mo
Sturtevant Co., B. F., Boston, Mass.

**Fans, Ventilating**
Can Blower & Forge Co., Ltd., Kitchener
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Petrie, Ltd., H. W., Toronto, Ont
Skinner Bros. Mfg. Co., Inc., St. Louis Mo
Sturtevant Co., B. F., Boston, Mass

**Fibre**
Diamond State Fibre Co., Toronto, Ont
Northern Electric Co., Montreal, Que

**File Handles**
Ingersoll File Co., Ltd., Ingersoll, Ont.

**Files and Rasps**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Canada Saw Co., Montreal, Que

**Filing Machines**
Garlock-Walker Mchy. Co., Toronto, Ont
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Filler, Iron (See Cements, Iron)**
Smooth Mfg. Co., Jersey City, N.J.

**Fire Extinguishers**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Fittings, Pipe**
International Malleable Iron Co., Guelph, Ont.

**Flexible Shafts**
Aikenhead Hardware Ltd., Toronto, Ont.

**Flux, Galvanizing**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Fluxes, Welding**
L'Air Liquide Society, Toronto, Ont.

**Forging Machinery**
Acme Machinery Co., Cleveland Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.

**Forgings, Drop**
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd., Toronto, Ont.

**Forgings, Hammer**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Foundry Equipment**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Foundry Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Frogs, Spring or Rigid**
Can. Steel Foundries, Montreal, Que.

**Fuel Oil Burning System**
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Heat Treating Coal**
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Oil and Gas**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bellevue Industrial Furnace Co., Detroit.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces and Ovens, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces, Tempering and Annealing**
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furniture, Machine Shop**
Garlock-Walker Mchy. Co., Toronto, Ont.

**Gages, Comparator**
Jones & Lamson Machine Co., Springfield, Vt.
Herbert Ltd., Alfred, Toronto, Ont
Johansson Inc., C. E., Windsor, Ont
Perdue, W. B., San Francisco Calif.
Starrett Co., L. S., Athol, Mass

**Gages, Measuring (See Tool Work)**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Q
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont
Starrett Co., L. S., Athol, Mass.

**Gages, Recording**
Bristol Co., Waterbury, Conn
Johansson Inc., C. E., Windsor, Ont

# BUYERS' DIRECTORY

**Gages, Snap, Thread and Cylindrical**
Ackworthie, Ltd., John, Birmingham, Eng.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Standard**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis, I.
Johansson Inc., C. E., Windsor, Ont.

**Gages, Thread**
Ackworthie, Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Garnet, Emery and Flint Paper and Cloth**
Ritchey Supply Co., Toronto, Ont.

**Gas, Coal Compressed**
L'Air Liquide Society, Toronto, Ont.

**Gas, Compressed**
Prest-O-Lite Co. of Can., Toronto, Ont.

**Gaskets**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

**Gear Blanks**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear-Cutting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

**Gear Testing Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Gears, Cast**
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

**Gears, Cut**
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hamilton Gear & Machine Co., Toronto, Ontario.
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Gears, Dressed**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Gears, Forged**
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Gears, Herringbone**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

**Gears, Machine Moulded**
Can. Steel Foundries, Montreal, Que.

**Gears, Rawhide (See Gears, Cut)**
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear, Silent Chain**
Gardner & Son, Robt., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Can. Link-Belt Co., Ltd., Toronto, Can.
Hans Renold of Canada, Ltd., Montreal, Quebec.

**Gears, Worm**
Dom Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.

**Generators, Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Generators, Electric**
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Goggles, Safety**
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

**Grab Buckets**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Grease Cups, Pressed Steel and Brass**
Can. Winkley Co., Ltd., Windsor, Ont.

**Greases, Lubricating**
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

**Grinding Discs**
Ritchey Supply Co., Toronto, Ont.

**Grinding Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Grinding Machines, Abrasive Belt**
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Automatic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Bench**
Aikenhead Hardware Ltd., Toronto, Ont.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Redford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Grinding Machines, Center**
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines Chaser**
Jones & Lamson Machine Co., Springfield, Vt.

**Grinding Machines, Cutter and Reamer**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Cylindrical**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Die**
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

**Grinding Machines, Disc**
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Drill**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Face**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Floor and Tool**
Beacon Engineering Co., Tipton, England.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Grinding Machines, Internal**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Portable**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Power Oscillating Tool**
Herbert Ltd., Alfred, Toronto, Ont.

**Grinding Machines, Ring Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Snagging**
Blount Co., J. G., Everett, Mass.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Surface**
Garlock-Walker Mchy. Co., Toronto Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machinery, Tool Post**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Universal**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Redford, Mass.
Petrie, Ltd., H. W., Toronto, Ont
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.

**Grinding Wheels**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Guards, Machinery and Window**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Guards, Electric Lamp**
Flexible Steel Lacing Co., Chicago, Ill.

**Gun-Barrel Machinery**
Steinle Turret Machine Co., Madison, Wis.

**Hack Saws, Power**
Ackworthie, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Hamilton, Canada
Garlock-Walker Mchy. Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hammers, Chipping**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hammers, Drop**
Bertram & Son Co., Ltd., The John, Dundas, Ont
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

**Hammers, Electric**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Hammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Hammers, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hammers, Riveting**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hangers, Shafting**
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Terry & Co., John C., Birmingham, Eng.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hardening, Case-Hardening and Tempering**
Hamilton Gear & Machine Co., Toronto, Ont.

**Hardness Testing Apparatus**
Shore Instrument Co., Jamaica, N.Y.

**Heating**
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.

**Hobbing Machines**
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hobs**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Hoists, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

**Hoists, Hand**
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Hoists, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Holders-On, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Hose, Flexible Steel**
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Hose, Industrial**
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Hose, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Foamite Firefoam Co., Hamilton, Ont.

**Hydraulic Leather**
Graton & Knight Mfg. Co., Worcester, Mass.

**Hydraulic Machinery**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.

**Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Index Centers**
Dickow, Fred. C., Machinery Co., Chicago, Ill.

**Igniters, Gas Engine**
Canada Foundries & Forgings Co., Welland, Ont.

**Indicators, Speed and Test**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.

**Insulation**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Jacks, Hydraulic**
Norton, A. O., Boston, Mass.

**Jacks, Planer**
Armstrong Bros. Tool Co., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que.
Crescent Machine Co., Ltd., Montreal, Q.

# BUYERS' DIRECTORY

**Jigs and Fixtures (See Tool Work)**
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Keyseating Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Keys, Machine**
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

**Knives, Machine**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich
Simonds Canada Saw Co., Montreal, Que.

**Knurl Holders**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lacing Leather**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

**Lamps, Electric**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**Lathe Attachments**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ort.

**Lathe Pans, Portable**
Canada Machinery Corp., Galt, Ont.

**Lathe Tools**
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

**Lathes, Automatic and Semi-Automatic**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Bench**
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lathes, Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
McDougall Co., Ltd., R., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Engine**
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Sidney Machine Tool Co., Sidney, Ohio
Strehlinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Extension and Gap**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich

**Lathes, Heavy Duty Projectile Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blaskill Wire Machy. Co., Ltd., Montreal.
Sidney Machine Tool Co., Sidney, Ohio
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio.
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Polishing (See Polishing and Buffing Machines)**
Ford-Smith Machine Co., Hamilton, Ont.

**Lathes, Relieving**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Lathe, Universal Hand**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Lathes, Screw-Cutting**
Jones & Lamson Machine Co., Springfield, Vt.

**Lathe, Speed and Hand**
Blount Co., J. G., Everett, Mass.
Garlock-Walker Mchy. Co., Toronto Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Lathes, Spinning**
Terry & Co., John C., Birmingham, Eng.

**Lathes, Threading**
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

**Lathes, Vertical Turret**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

**Lathes, Wood Turning**
Blount Co., J. G., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Lead Pipe**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Lighting Fixtures**
Northern Electric Co., Montreal Que.
Tallman Brass & Metal Co., Hamilton, Ont

**Linoleum Mill Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Liquid Air Plants**
L'Air Liquide Society, Toronto, Ont.

**Lockers, Clothes**
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

**Lubricants**
Cateract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Lubricating Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Machinists' Small Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strehlinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Manganese Steel**
Can. Steel Foundries, Montreal, Que

**Mandrels, Expanding**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Mandrels, Solid**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Measuring Machines**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Metals, Alloy**
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que
Tallman Brass & Metal, Ltd., Hamilton, Ontario.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Metalite Cloth**
Ritchey Supply Co., Toronto, Ont.

**Micrometer Calipers**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Milling Attachments**
Ackworthie, Ltd., John, Birmingham Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio
Ford-Smith Machine Co., Hamilton, Ont
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Milling Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Milling Machines, Automatic**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Bench**
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Hand**
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

**Milling Machines, Horizontal and Planer Type**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal Q.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Milling Machines, Plain**
Bilton Machine Co., Bridgeport Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cleveland Milling Machine Co., Cleveland
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred Toronto Ont
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis
Petrie, Ltd., H. W., Toronto, Ont
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng

**Milling Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Milling Machines, Universal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Cincinnati Milling Machine Co., Cincinnati, Ohio
Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Mchy. Co., Toronto, Ont
Hendey Machine Co., Torrington, Conn
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Milling Machines, Vertical**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

**Monel Metal**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Motors, Electric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Moulded Rubber Goods**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Nail Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Nails and Staples**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Nickel, Bars, Sheets, Wire, Etc.**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Nickel Plating Outfits**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Nickel Silver**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Nitrogen**
L'Air Liquide Society, Toronto, Ont.

**Nut Tappers (See Bolt and Nut Machinery)**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

**Nuts, Finished and Semi-finished**
Galt Machine Screw Co., Galt, Ont.

**Nuts, S.A.E., Plain and Castellated**
Galt Machine Screw Co., Galt, Ont.

**Oil Filtering and Storage Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oil Storage Engineers**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oils**
Canadian Oil Companies, Ltd., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Hole Covers**
Can. Winkley Co., Ltd., Windsor, Ont.

**Oils, Soluble**
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oxygen**
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

**Oxy-Acetylene Apparatus**
L'Air Liquide Society, Toronto, Ont.

**Packing, Hydraulic**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass
Guildford & Sons, L..., Halifax, N.S.

**Packing, Steam**
Can. Consolidated Rubber Co., Ltd., Montreal, Que
Graton & Knight Mfg. Co., Worcester, Mass
Guildford & Sons, Ltd., Halifax, N.S.

**Paper Mill Conveyors**
Bertrams Ltd., Edinburgh, Scotland

**Patents**
Fetherstonhaugh & Co., Ottawa, Ont
Marion & Marion, Montreal, Que.

**Pans, Wet and Dry**
Frost Mfg. Co., Chicago, Ill

**Pattern-Shop Machinery (See Woodworking Machinery)**
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Patterns, Wood and Metal**
Cresent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Wraggis Pattern Works, Galt, Ont.

**Penstocks, Steel**
MacKinnon Steel Co., Sherbrooke, Que

# BUYERS' DIRECTORY

**Phosphor Tin**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Photographic Duplicating Machines**
Commercial Camera Co., Providence, R.I.

**Pig Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Bending Machines**
American Pipe Bending Machine Co., Boston, Mass
Underwood Corp., H. B., Philadelphia, Pa
Williams Machinery Co., A. R., Toronto, Ont.

**Pipe Couplings**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Cutting and Threading Machines**
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**
Landis Machine Co., Inc., Waynesboro, Pa.

**Pipe Fitters' Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa.

**Piston-Ring Machines**
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Planers, Parallels**
L. & P. Mfg. Co., Niagara Falls, Ont.

**Planing Machines**
Bertram & Son Co., Ltd., The John Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Planing Machines, Rotary**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Pneumatic Tools**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**
Ackworthie, Ltd., John, Birmingham, Eng
Archibald & Co., Chas. P., Montreal, Q.
Blount Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng

**Pots, Steel**
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Pressed Steel Parts**
Ackworthie, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strellinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Presses, Drop and Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Toledo Machine & Tool Co., Toledo, Ohio

**Presses, Foot and Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont
Terry & Co., John C., Birmingham, Eng

**Presses, Forcing**
Atlas Press Co., Kalamazoo, Mich
Stewart & Co., Duncan, Glasgow, Scot

**Presses, Hydraulic**
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot
Williams Machinery Co., A. R., Toronto, Ont.

**Presses, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Protractors**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Propellers**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Pulleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal and Fibre**
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Pulp and Paper Mill Equipment**
MacKinnon Steel Co., Sherbrooke, Que.

**Pumps, Automobile Tire**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Pumps, Barrel and Boiler-feed**
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coalant**
Trahern Pump Co., Rockford, Ill.

**Pumps, Geared and Hand**
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

**Pumps, Lubricant and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener
Jardine & Co., A. B., Hespeler, Ont.

**Punches, Power**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo, Ohio

**Punching Machines, Horizontal**
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Racks, Cut**
Ford-Smith Machine Co., Hamilton, Ont
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**
Holden Co., Ltd., Montreal, Que.

**Reamer Holders**
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

**Reamers, Expanding**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Reamers, Solid**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Reamers, Taper**
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Recorders, Temperature**
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Recorders, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Rheostats**
Northern Electric Co., Montreal, Que.

**Resistance Materials**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Respirators**
Willson Goggles, Inc., Reading, Pa.

**Rivets**
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Rivet Heaters**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.

**Riveting Machines**
Bilton Machine Co., Bridgeport, Conn.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**
Stewart & Co., Duncan, Glasgow, Scot.

**Rolls (Rubber Covered)**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rudder Frames, Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Rubber Goods, Mechanical**
Quaker City Rubber Co., Philadelphia, Pa.

**Rules, Steel**
Chesterman & Co., Ltd., J., Sheffield, Eng.

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R.I

**Rust Preventatives**
Oakley Chemical Co., New York, N.Y.

**Sand Equipment**
Can. Link-Belt Co., Toronto, Ont.

**Sand Mills**
Frost Mfg. Co., Chicago, Ill.

**Sanding Machinery**
Oliver Machy. Co., Grand Rapids, Mich.

**Sand Rammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Saw Frames and Blades, Hack**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Sawing Machines, Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Sawing Machines, Power Hack**
Ackworthie, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Saw Sharpening Machines**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saw Tables, Universal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Hot and Cold**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Saws, High Speed Steel**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Metal Band**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saws, Metal, Power**
Clemson Bros., Inc., Hamilton, Ont.

**Saws, Metal Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

**Saws, Milling**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Saws, Screw Slotting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Swing Cut-off**
Oliver Machinery Co., Grand Rapids, Mich.

**Scales**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal, Q.

**Screens**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Screw Driving Machine**
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill

**Screw Extractors**
Cleveland Twist Drill Co., Cleveland, O

**Screw Machine Work**
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
Tallman Brass & Metal Co., Hamilton Ont.

# BUYERS' DIRECTORY

**Screw Machinery, Wood and Lag**
Cook Co., Asa S., Hartford, Conn.

**Screw Machines**
Brown & Sharpe Mfg. Co., Providence, R. I.

**Screw Machines, Automatic**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

**Screw Machines, Plain or Hand**
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio.

**Screw Plates**
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

**Screws, Cap and Set**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Screws, Machine**
Barnes Co., Wallace, Bristol, Conn.
Steel Co. of Canada, Ltd., Hamilton, Ont

**Screws, Safety Set**
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Second-Hand Machinery**
**( See Searchlight Section)**
Petrie, Ltd., H. W., Toronto, Ont.

**Separators, Moisture and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que

**Separators, Oil and Waste**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Shafting**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Shapes, Cold-Drawn Special Steel**
Union Drawn Steel Co., Hamilton, Ont.

**Shaping Machines**
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Walcott Lathe Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont

**Shapers, Wood**
Oliver Machinery Co., Grand Rapids, Mich.

**Shears, Hand**
Can. Blower & Forge Co., Ltd., Kitchener.

**Shears, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y.
Stewart & Co., Duncan, Glasgow, Scot
Toledo Machine & Tool Co., Toledo, Ohio
Williams Machinery Co., A. R., Toronto, Ont

**Shearing Machines, Angle, Iron Bar and Gate**
Bertrams Ltd., Edinburgh, Scotland

**Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio.

**Sheets, Nickel, Resist, Alloy**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Sheets, Nickel, Monel and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Side Frames, Locomotive**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont

**Slotting Attachments**
Ford-Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Keuffel & Esser Co., Hoboken, N.J.
Smith Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

**Slotting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

**Solders**
British Smelting & Refining Co., Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Canada.

**Snap Flasks**
Oliver Machy. Co., Grand Rapids, Mich

**Special Machinery and Tools**
Brown Engineering Corp., Ltd., Toronto.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Spectacles, Industrial**
Willson Goggles, Inc., Reading, Pa.

**Springs**
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

**Spring-making Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Sprockets and Chains**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Squares**
Brown & Sharpe Mfg. Co., Providence, R. I.

**Stamping, Metal**
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Stamps, Steel**
Diamond Saw & Stamping Works, Buffalo, N.Y.

**Stairways, Wrought Iron**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Steam Specialties**
Crane Ltd., Montreal, Que.

**Steel Plate**
Dom. Foundries & Steel, Hamilton, Ont.

**Steels, Tool**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa

**Steel Blooms and Billets**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steel, Cold-Rolled Strip**
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
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Toronto Iron Works, Toronto, Ont

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Can. John Wood Mfg. Co., Toronto, Ont.

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**Steels, Alloy, Open Hearth and Electric**
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Atkins & Co., Ltd., Wm., Sheffield, Eng
Barnes Co., Wallace, Bristol, Conn
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.
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Pilot Steel & Tool Co., Montreal, Que.
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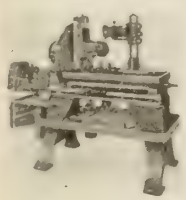
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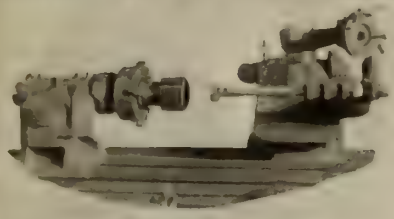
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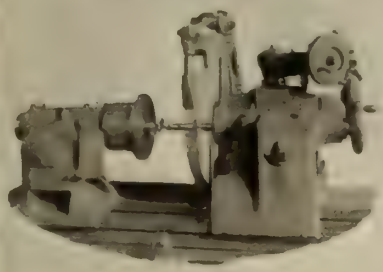
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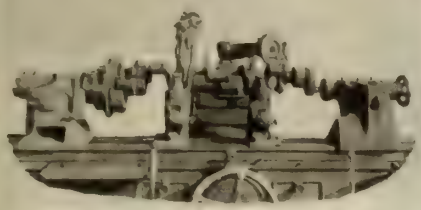
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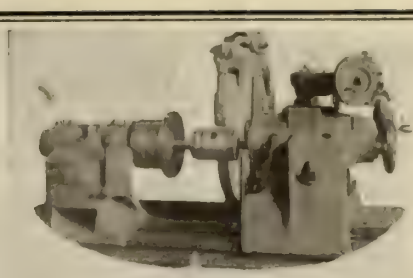


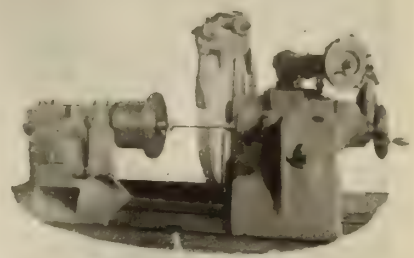


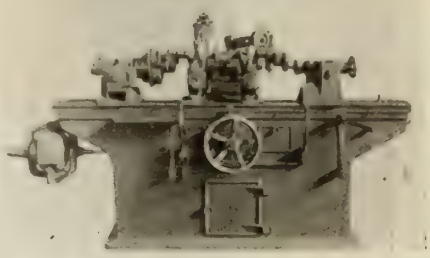


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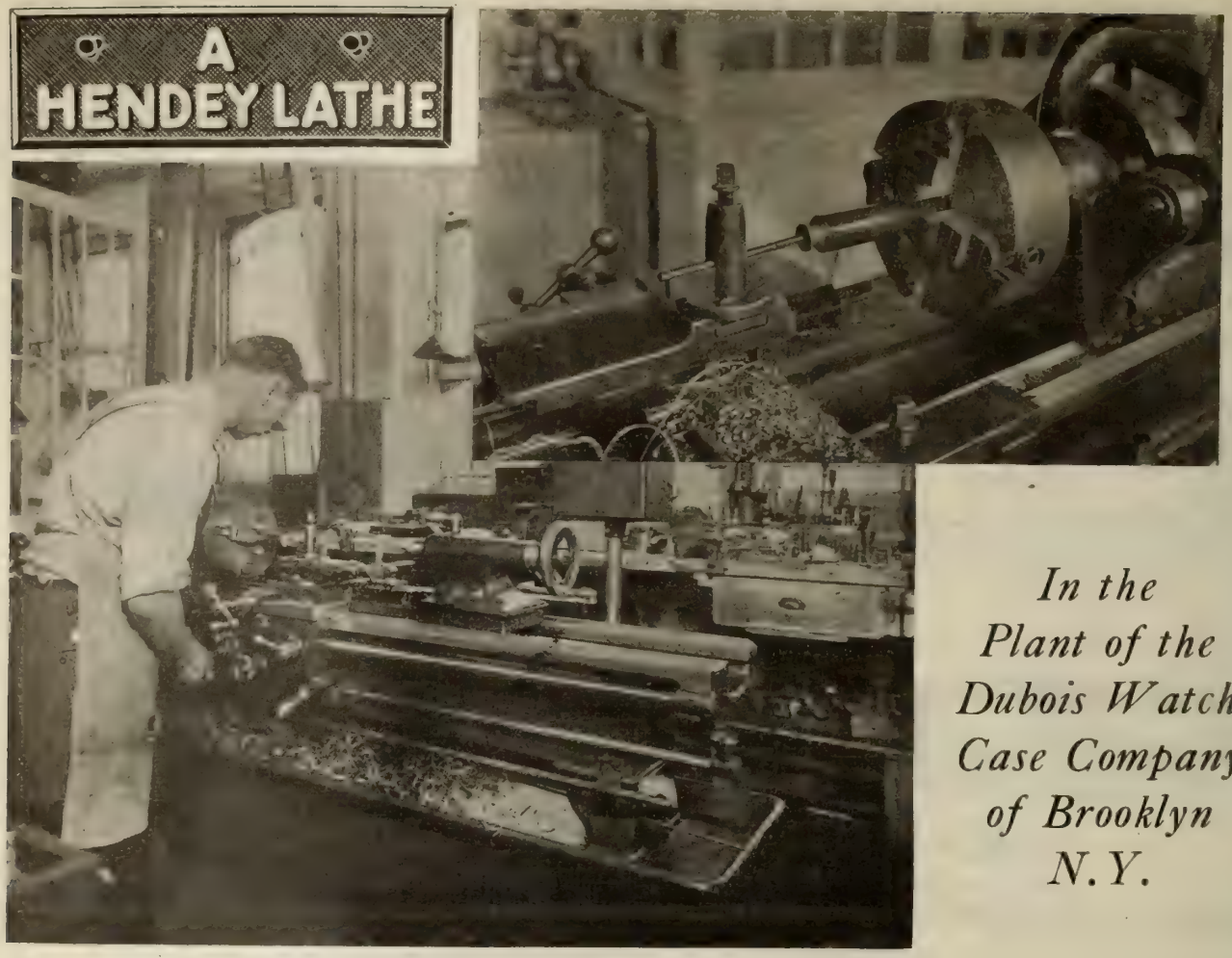
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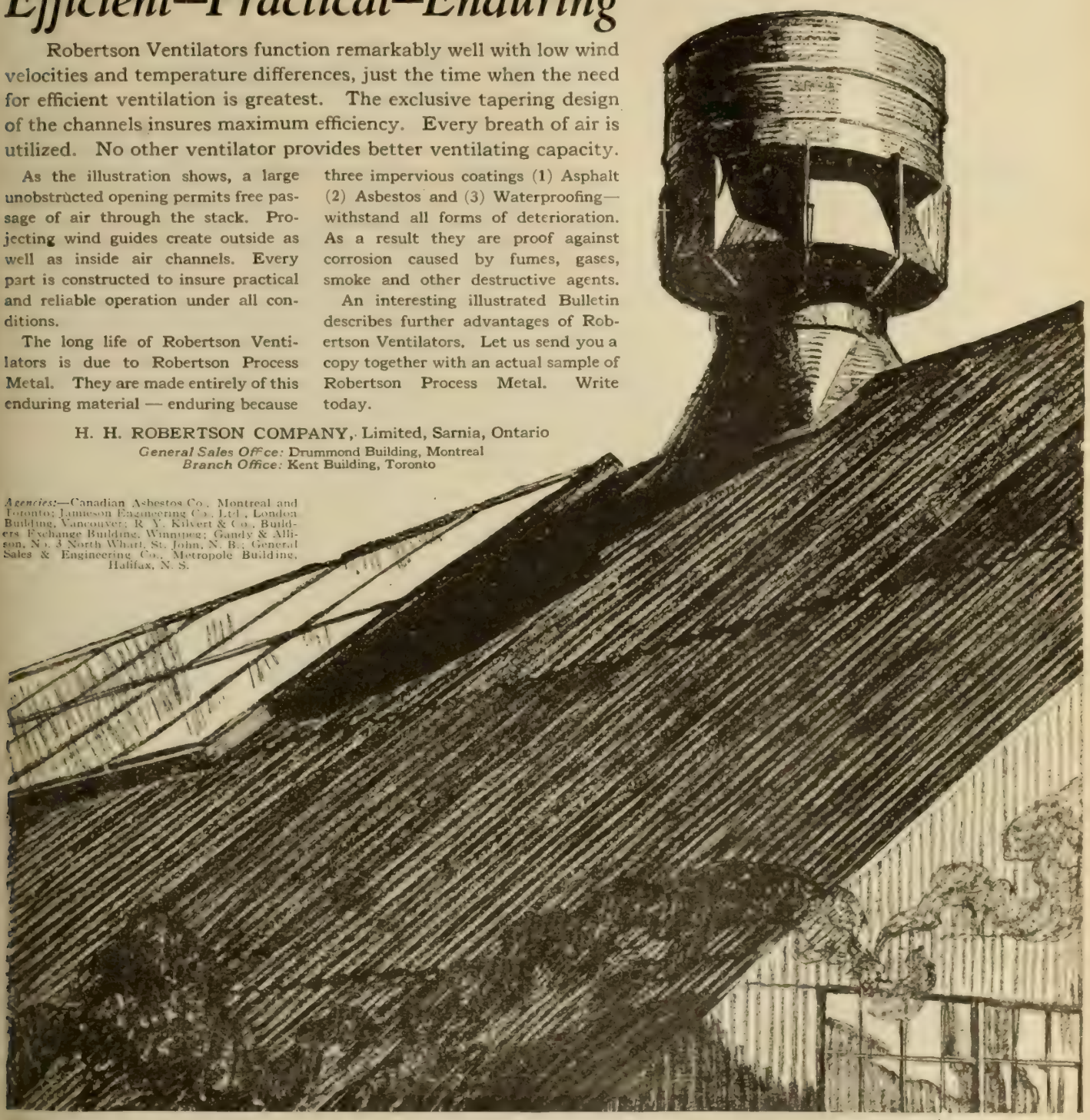
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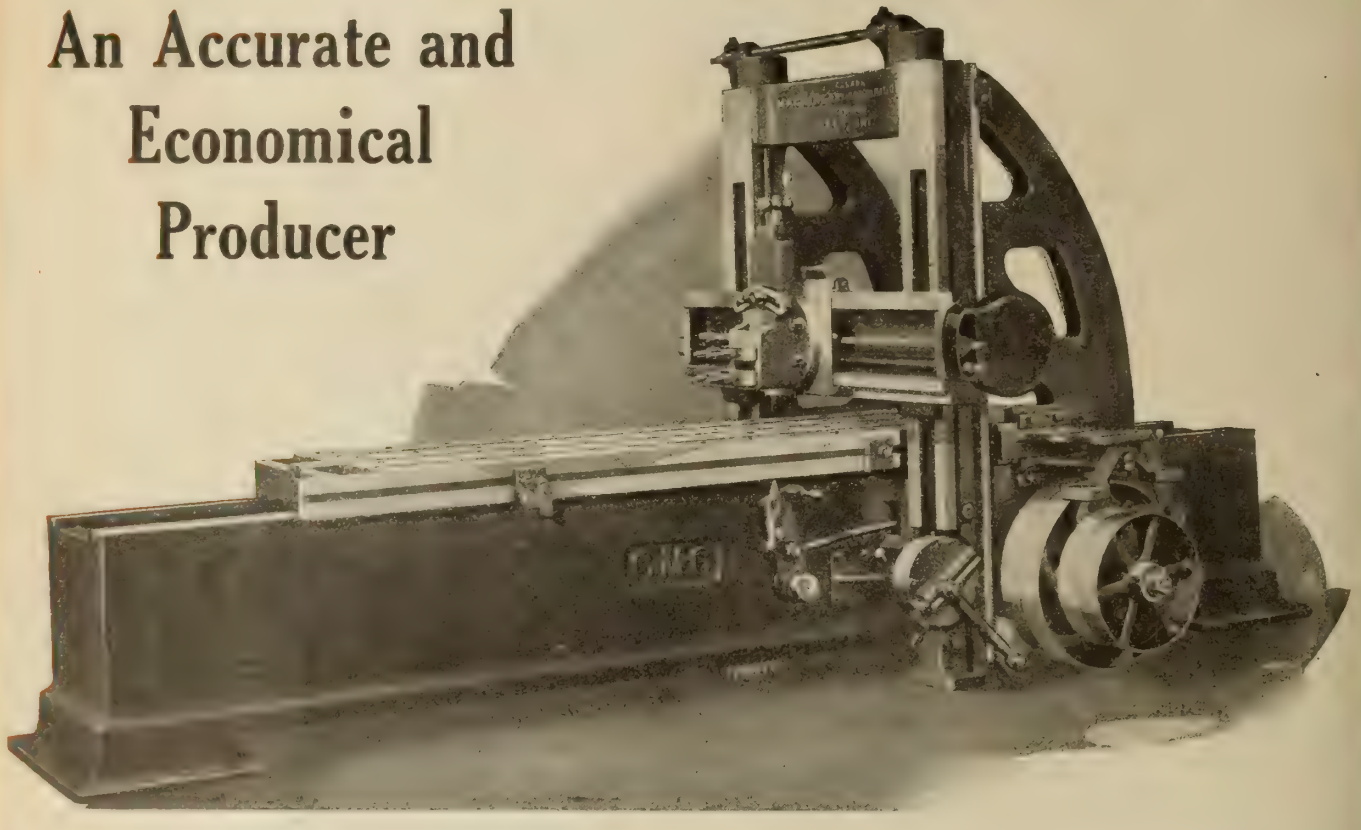
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SKF

How to save power by reducing friction
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—in machines.

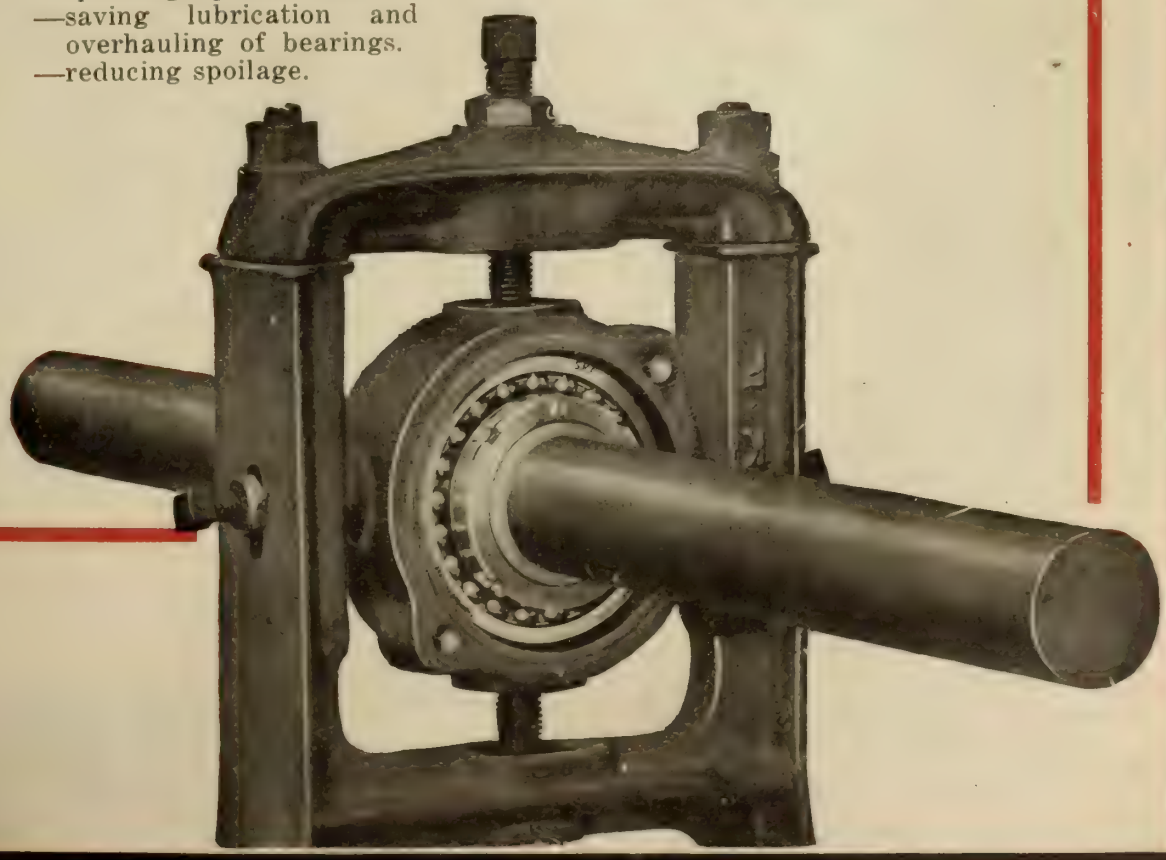
How to improve product by
—insuring accuracy and precision of machines.
—increasing speed.

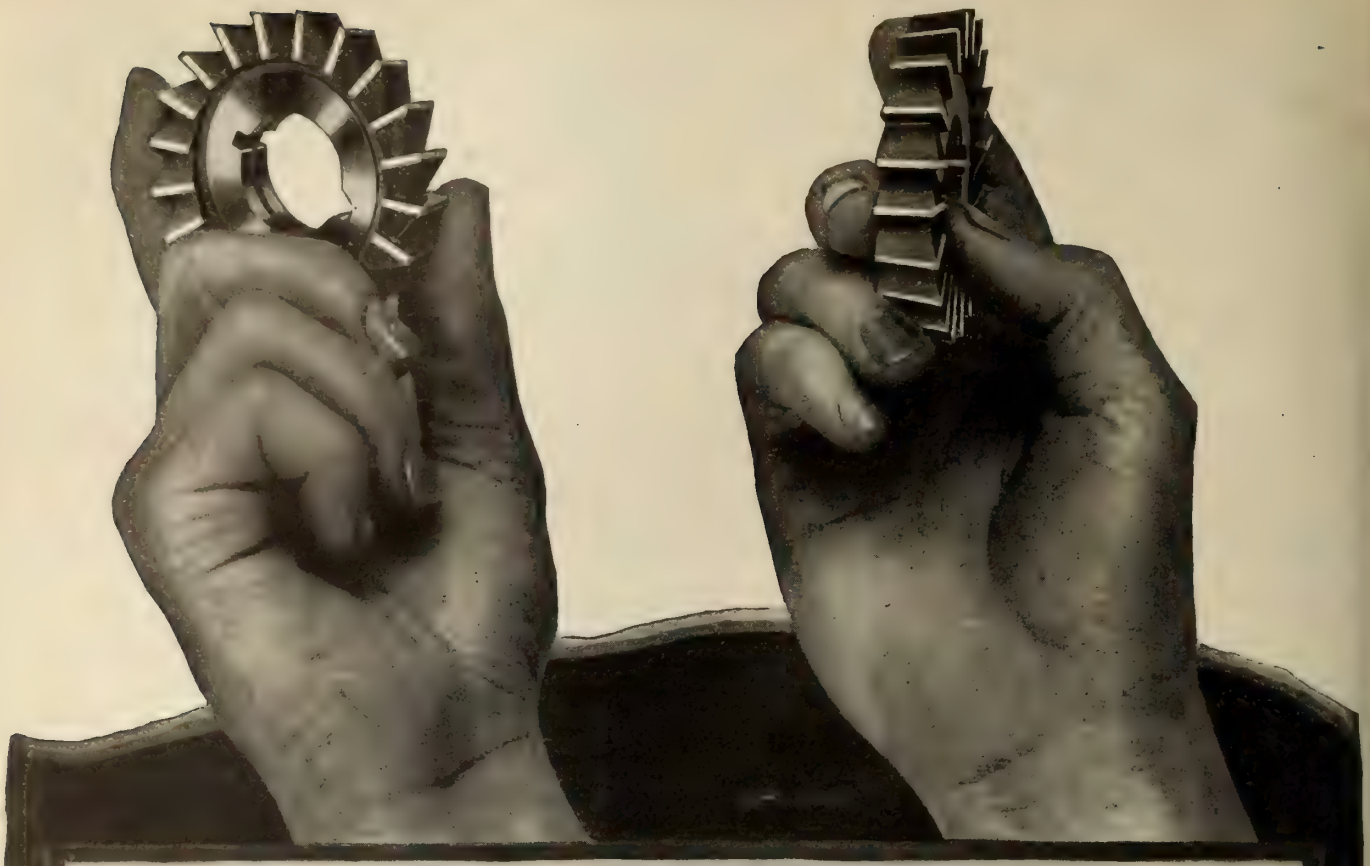
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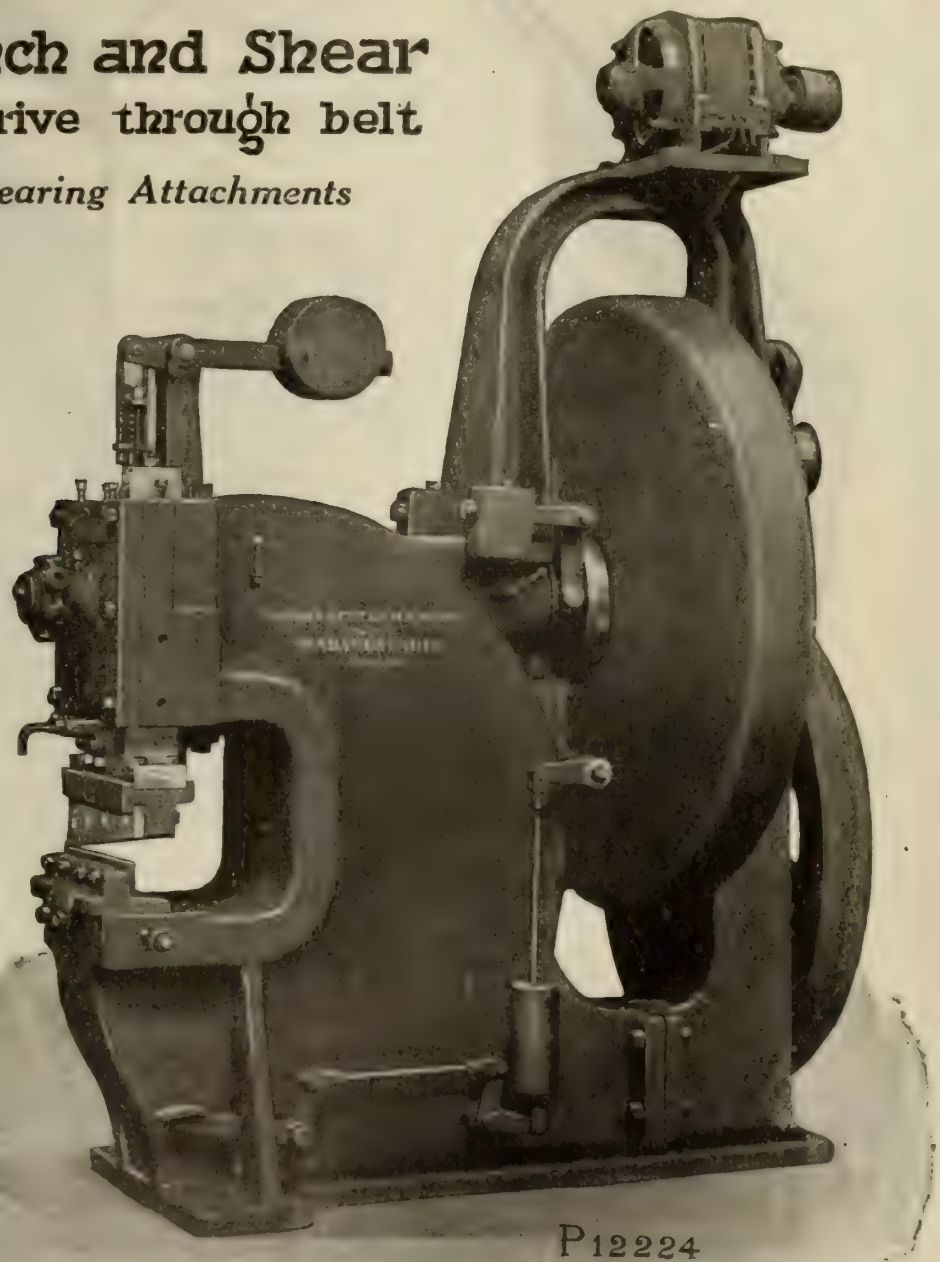
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*Fitted with Plate Shearing Attachments*



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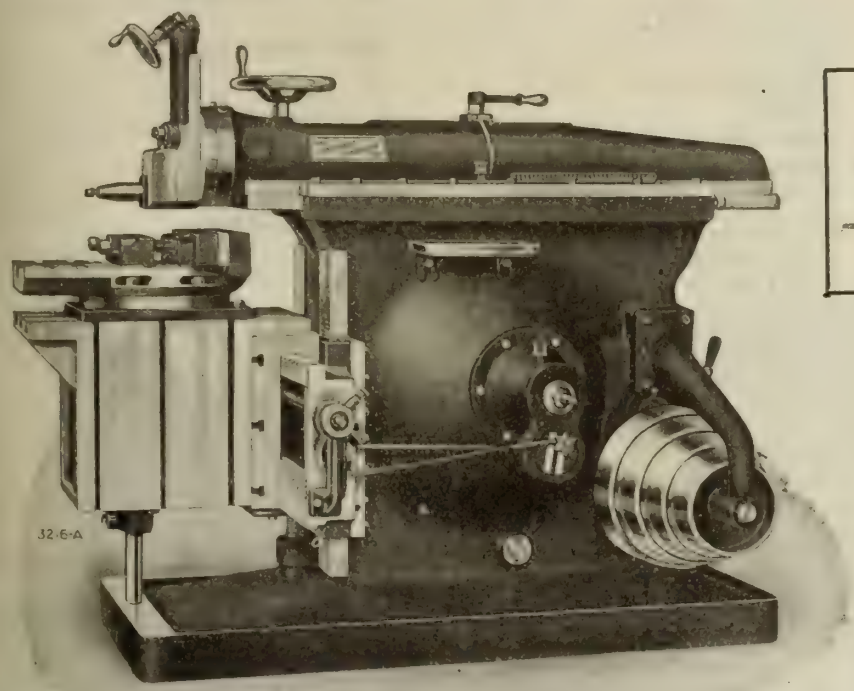
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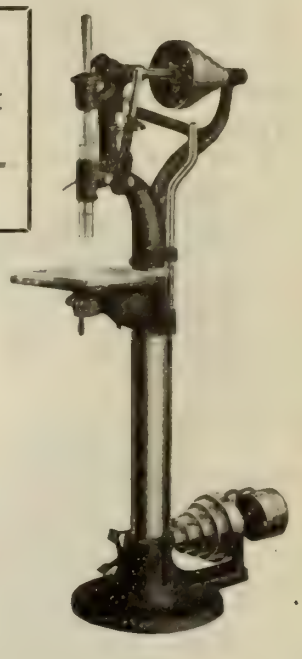
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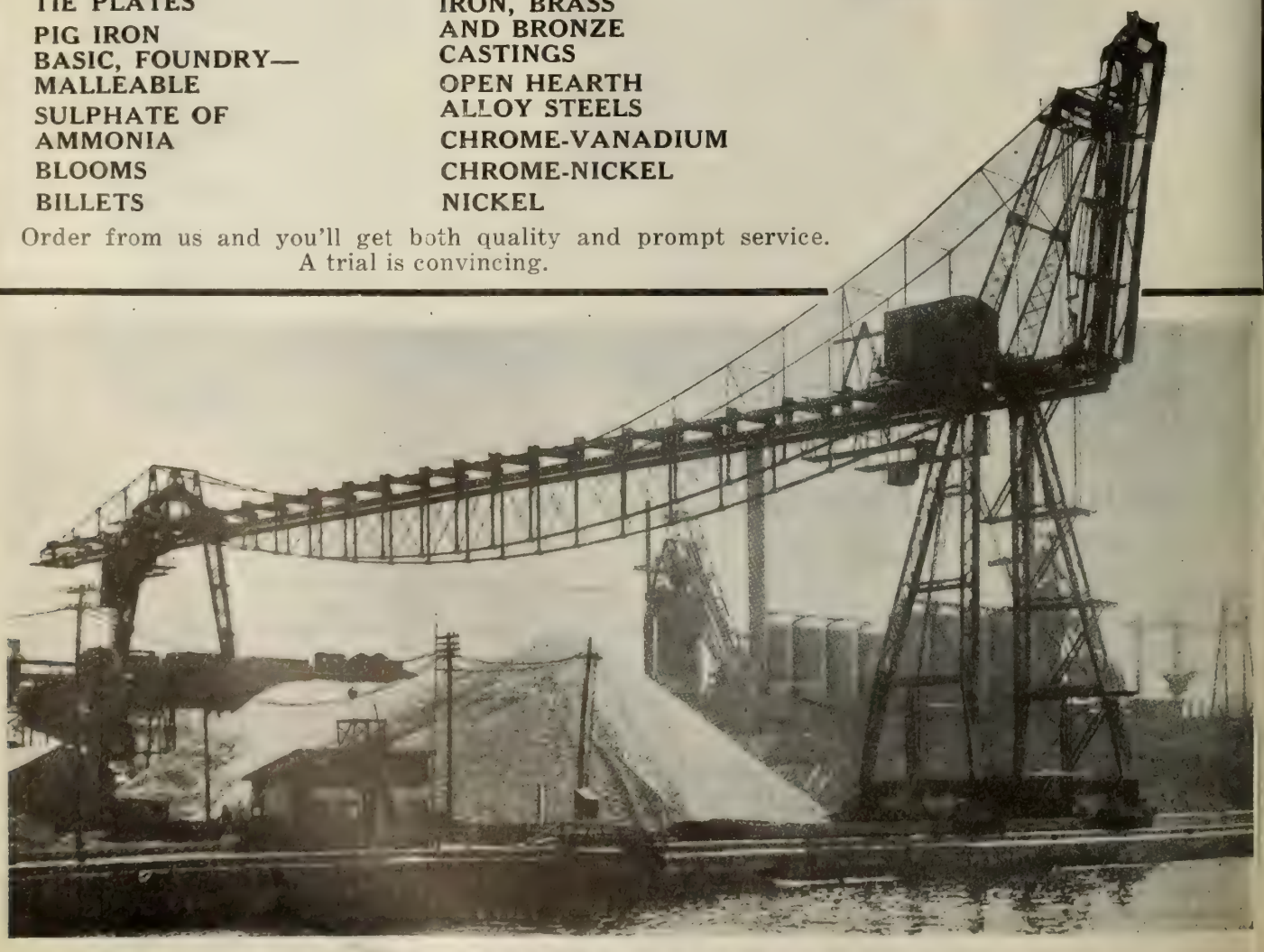
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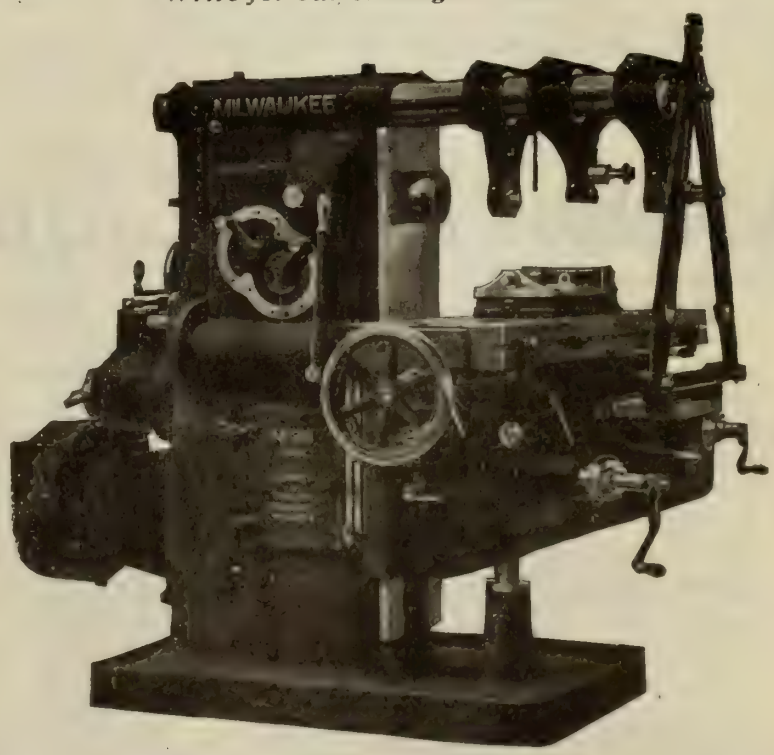
## EFFICIENT MILLING

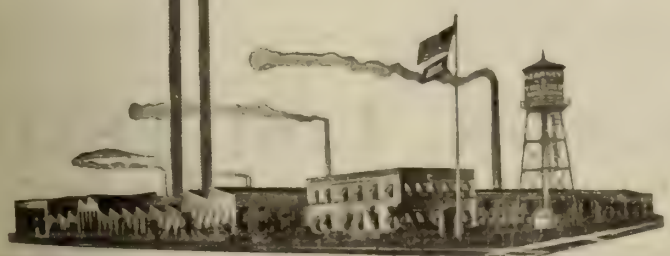
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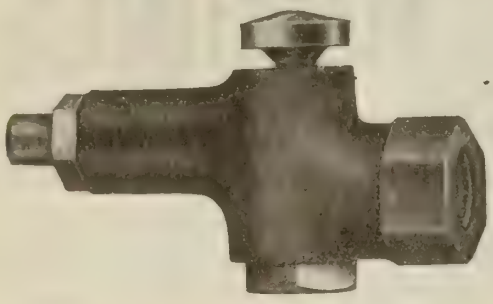


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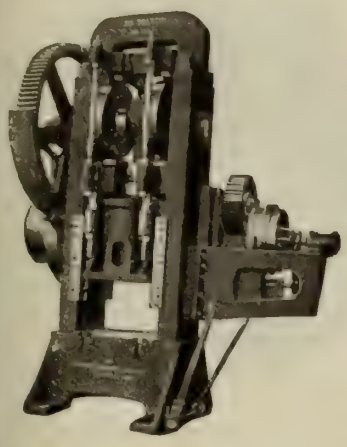
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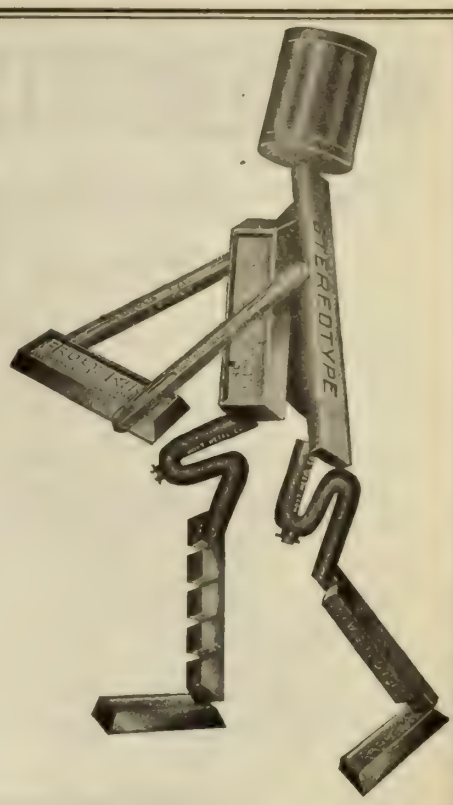
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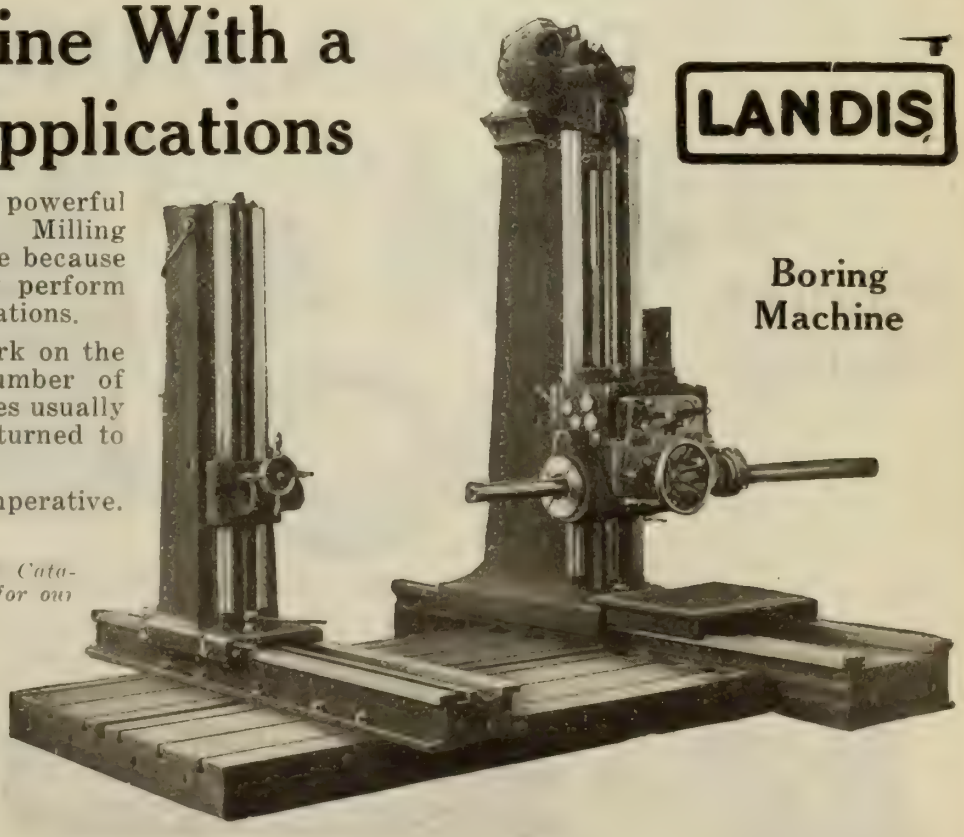
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Boring Machine

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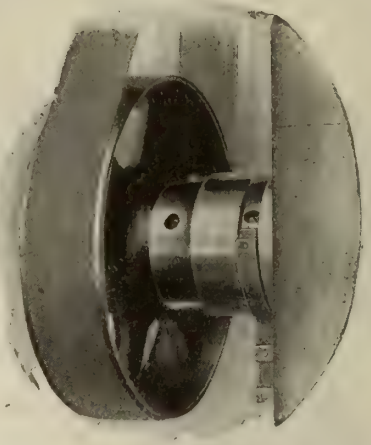
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Replace your tight and loose pulleys with Johnson Clutches.



*Single Clutch with Pulley Mounted*

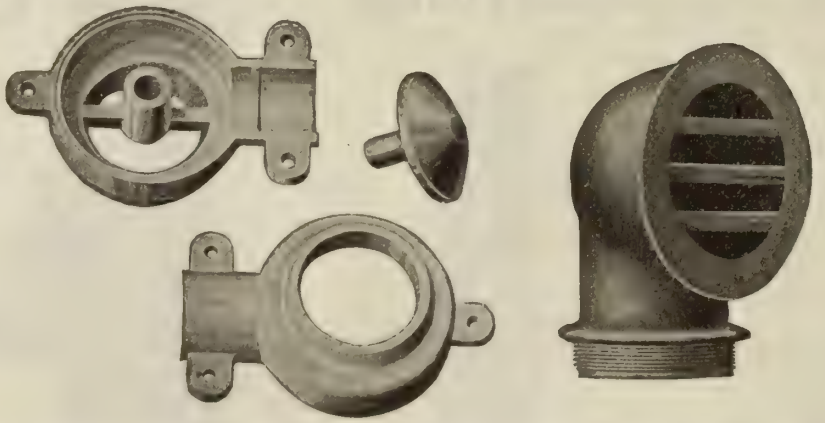
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**Any Thickness** **Any Lengths**

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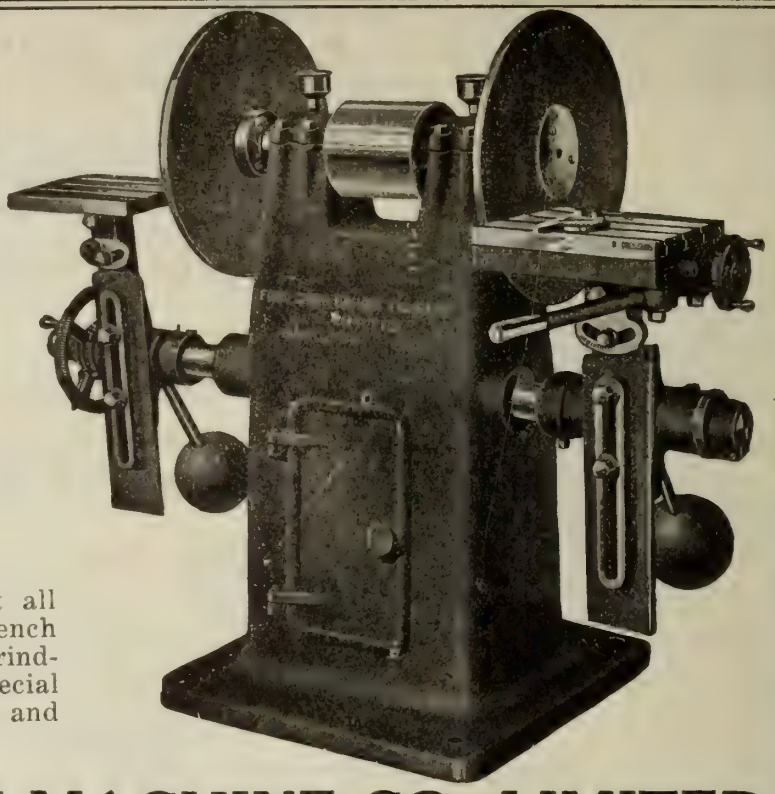
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## DOMINION ABRASIVE WHEEL CO., Ltd., Mimico, Ont.

# BROWN-BOGGS

B B

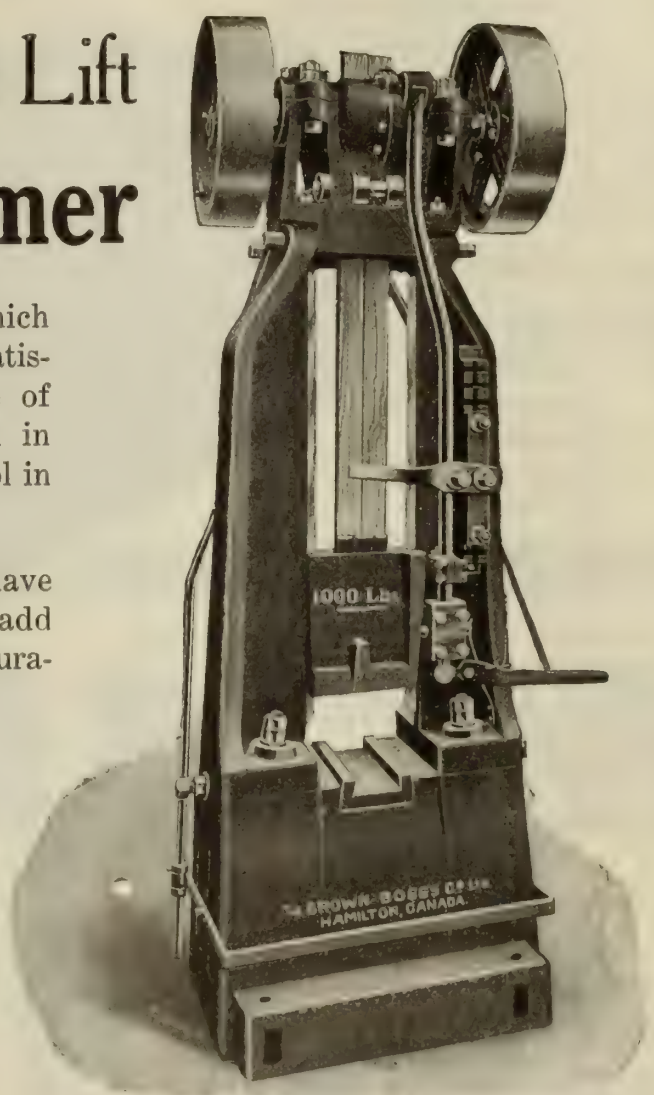
## 1000 lb. Board Lift
# Drop Hammer

It pays to choose machinery which has a reputation for giving long, satisfactory service. The excellence of Brown-Boggs products is shown in the results which every "B-B" tool in use is attaining.

The latest type "B-B" hammers have many exclusive features which add greatly to their efficiency and durability.

The old-fashioned, noisy gears have been eliminated entirely, the hammer being lifted by friction excrted by a powerful eccentric motion under perfect control of the operator at all times.

On all the sheet metal working machinery, presses, shears, rolls, etc., which you buy, make sure of the Brown-Boggs trade mark—it means **reliable service!**




# THE BROWN-BOGGS CO. LIMITED
## HAMILTON, CANADA.

*If interested tear out this page and place with letters to be answered.*

# STEEL *for*
## Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

**We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.**

**Nova Scotia Steel and Coal Co., Limited**

*Head Offices:*
New Glasgow, N.S.

Sales Offices:
Western Room 14 Windsor Hotel
MONTREAL



Steel Ingots
*by the*
**HARMET**
Liquid Process

# CANADIAN ATLAS CRUCIBLE STEEL Co. LIMITED

Made in Canada

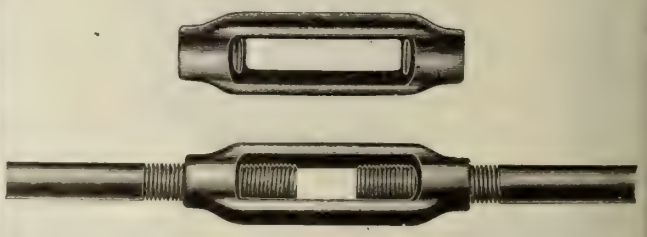
## L-XX HIGH-SPEED
## ATLAS TOOL STEELS
## ATLAS ALLOY STEELS

Hot Rolled, Forged Blocks and Discs
Cold Drawn Steel and Drill Rod

GENERAL SALES OFFICE:
133 Eastern Avenue, TORONTO, ONT.
Works: WELLAND, ONT.
Sales Offices and Warehouses:
TORONTO, ONT. MONTREAL, QUE. WINNIPEG, MAN.

CANADA FOUNDRIES & FORGINGS LIMITED

# Drop Forged Steel



SOLID—NOT WELDED

16 Sizes with / without Stubs

**Canada Foundries & Forgings**
Welland, Ont.

TRADE MARK

# "AW" DRILLS

Milled or Twisted

From the raw materials entering the steel to the finished drill a rigid inspection is given after each operation, which assures a superior product.

*Prompt Deliveries on Special Sizes*



## High Speed Twist Drills

The Drills for MAXIMUM PRODUCTION

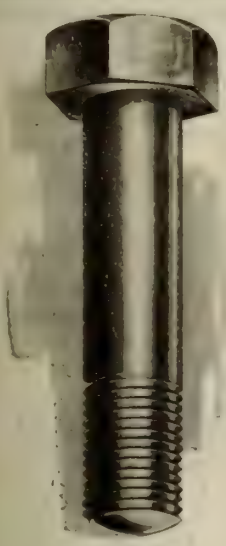
*All Standard Sizes Carried In Stock.*

## ARMSTRONG WHITWORTH OF CANADA, LIMITED

Head Office:— 298 St. James St., Montreal

Works:— Longueuil, Que.

BRANCHES :
126 WELLINGTON ST. W., TORONTO McARTHUR BLDG., WINNIPEG



## ACCURACY

Just now all jobbers should have a complete stock of SAE Cap Screws, Plain and Castellated Nuts and Taper Pins to meet the automobile repair trade requirements.

Your rush orders filled promptly by



## The Galt Machine Screw Co., Limited

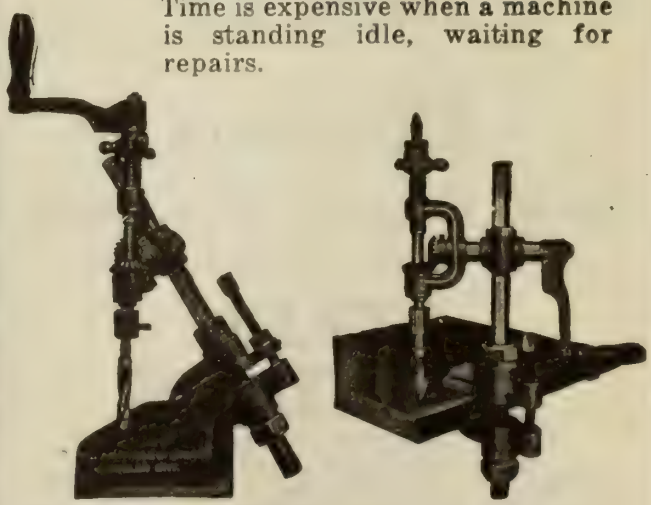
GALT, ONTARIO

*Eastern Representatives:*
Messrs. F. BACON & COMPANY
131 St. Paul Street West, Montreal, Que.

*Western Representative:*
Mr. D. PHILIP
138 Portage Avenue, Winnipeg, Man.

## Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.
Sold by all Machinery and Supply Houses.

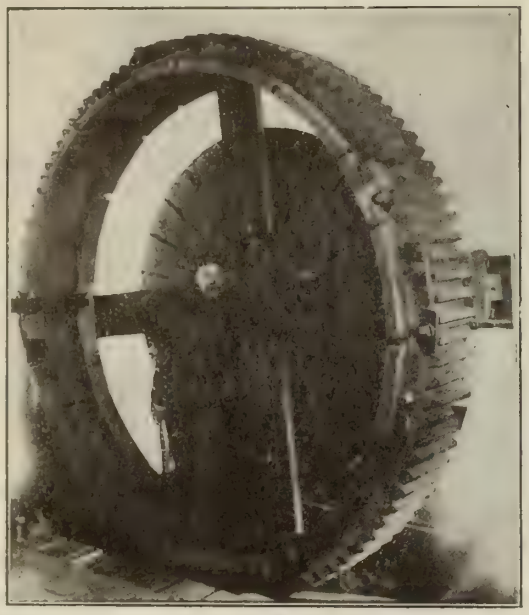
## A. B. JARDINE & CO., Limited

HESPELER, ONTARIO

*If interested tear out this page and place with letters to be answered.*

# Hull Iron and Steel Foundries, Limited

HULL, QUEBEC



## Specify "HISCO" Regd. Products

Steel, Chrome, Manganese and Nickel

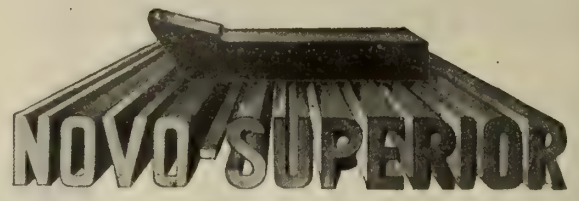
**STEEL CASTINGS**

Annealed and Unannealed

Cement Mill and Mining Machinery, Castings, Stamp Mills, Crushing Plants, Excavating Outfits, Steel Car Wheels, Locomotive Driving Wheels and Frames, etc.

## Machine-Moulded GEARS

"HISCO" machine-moulded gears, while requiring no pattern, insure accuracy, dependability, quality, and the price is minus the cost of patterns—which in these days of high prices of lumber and labor is something to be considered.




HIGH SPEED STEEL

INTRA STEEL GIBRALTAR STEEL

Tool Steel for Every Purpose

Swedish Lancashire Iron

Twist Drills, Taps, Hack Saw Blades, Milling Cutters, Files, Etc.; Music Wire for Springs, Steel Balls, Cold Rolled Tool Steel in Strips and Sheets, Circular Saws, Machine Knives.

**PILOT STEEL & TOOL COMPANY,** LIMITED

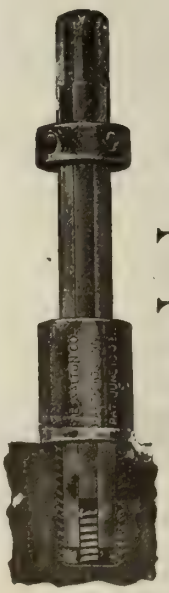
332 St. James Street, Montreal

*Sole Agents for*

JONAS & COLVER, LIMITED
Novo and Continental Steel Works, Sheffield, Eng.

H. BOKER & CO., Inc.
New York, N.Y.

## Steel Fingers Slip into The Flutes



Grip the broken tap and back it out before you've had time to count three times sixty.

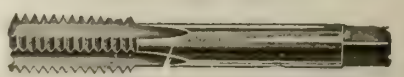
## The Walton Tap Extractor

removes broken taps buried below the surface of the work without trouble or loss of time. It removes any broken tap without injuring the thread. It saves the casting or forging. Pays for itself over and over—often on the very first job.

**How many do you want on trial?**

**The Walton Co.**

Hartford - - - Conn.





THE
# ACKWORTHIE
## TAPPING ATTACHMENT.

BRITAIN'S PREMIER CHUCK

Made in 6 sizes.
To tap from ⅛ in. to 1½ in. Whit.

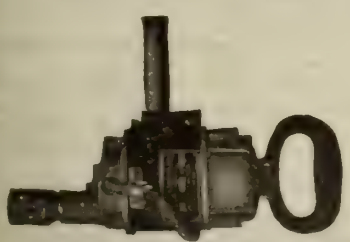
We have made some thousands of these Chucks during the last 11 years, every one of which has given satisfaction. For tapping holes there is nothing to equal them for speed and handiness.

*Shall we mail you particulars?*

**J. ACKWORTHIE, Ltd.**
**Coleshill Street,**
**BIRMINGHAM**

# U. S. Electric Drills and Grinders

**Save Time, Labor and Money**



They can be attached to any lamp socket.

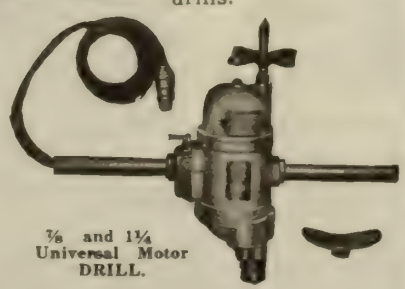
For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

3 SIZES
3-16 in., W.G.T., 6 lbs.
¼ in., W.G.T. 9 lbs.
⅜ in., W.G.T. 12 lbs.

All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



⅜ and 1¼ Universal Motor DRILL.

For Sale By
**The Canadian Fairbanks-Morse Co., Limited**
Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver

**THE UNITED STATES ELECTRICAL TOOL CO.**
CINCINNATI, OHIO

# *Examine the Grain!*

A properly alloyed babbitt has a perfectly uniform grain.

Break a bar of the babbitt you are using—

If you find the grain irregular—if it shows a mixture of fine and coarse particles—if it shows a separation of layers—one dark and one light in color—

then you may know that it is poorly alloyed—and that you can get far better wear from

# *Lionroyal*

produced by the STANLEY PROCESS of alloying.

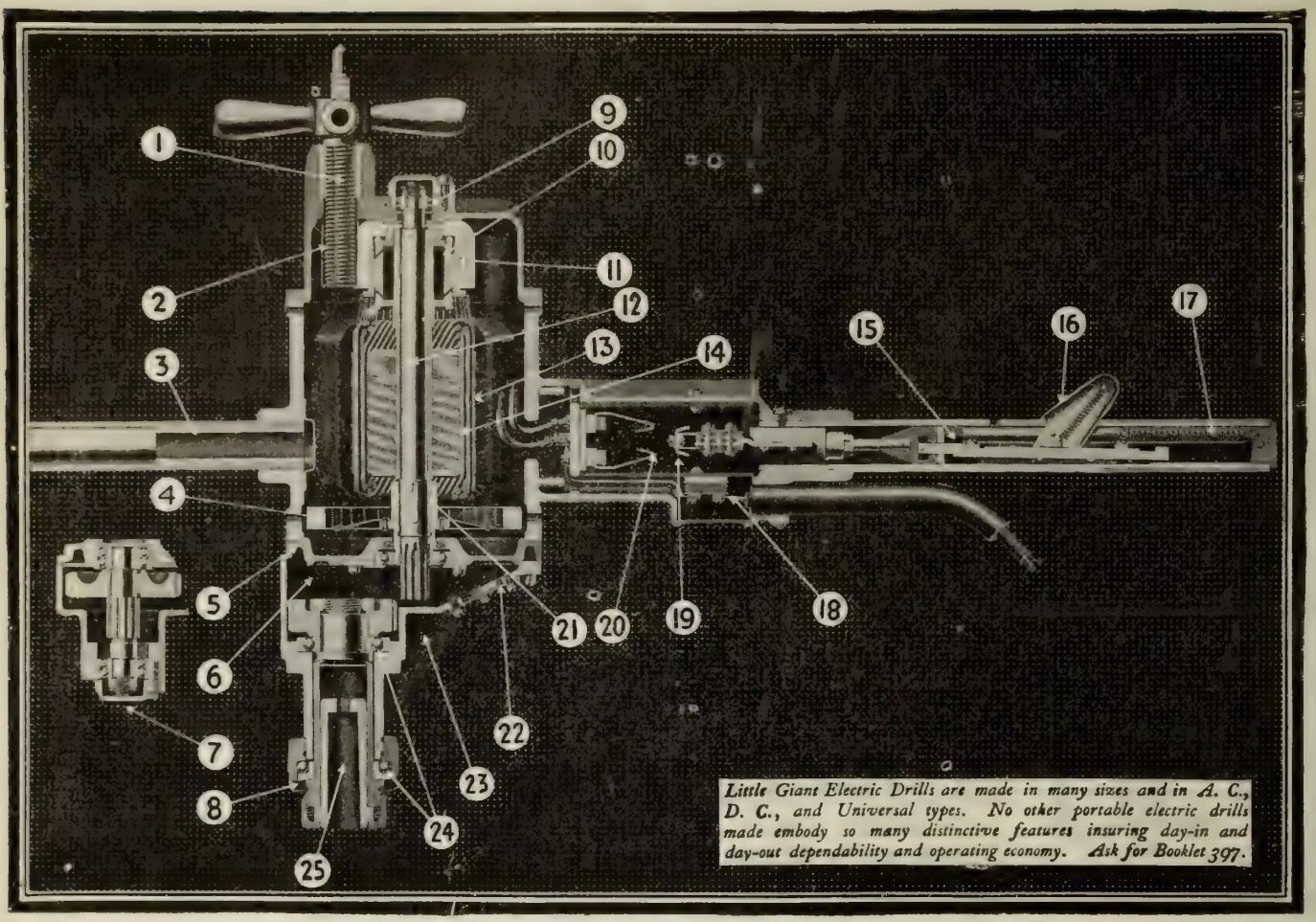
Lionroyal is clean—uniform—dense grained—and durable.

It is copper-hardened and tin-toughened. Bearings lined with it carry the load evenly—every inch of bearing surface equally durable.

It has no hard spots of copper or antimony, because the hard elements are thoroughly and uniformly amalgamated with the tough elements. This fact bespeaks steady service and long wear.

***Write for Booklet "AB" to know more about pouring and using Babbitt.***

**BRITISH SMELTING & REFINING COMPANY LIMITED**
**MONTREAL**




*Little Giant Electric Drills are made in many sizes and in A. C., D. C., and Universal types. No other portable electric drills made embody so many distinctive features insuring day-in and day-out dependability and operating economy. Ask for Booklet 397.*

# Inside Information

## *why Little Giant Electric Drills accomplish results*

1 Long feed screw entering into body of supporting bracket, thus giving same results as telescopic feed.
2 Protecting sheath, preventing entrance of dirt into drill if feed screw is removed.
3 Dead handle reinforced at point of greatest strain.
4 Sheet steel fan, carefully balanced and reinforced, providing thorough ventilation.
5 Solid transfer plate or diaphragm preventing grease or oil in gear case from entering windings.
6 Liberal grease compartment for providing reliable lubrication of gears and ball bearings.
7 Section thru intermediate gears. Note wide *double* row of ball bearings at each end of gear shaft (used on large drills). Pinion and gears made of special alloy steel carefully heat treated.
8 Dust protector for excluding dust from lower thrust ball bearing.
9 Ball bearing easily accessible for lubrication and inspection.
10 Commutator of sturdy design and construction, thoroughly insulated with mica.
11 Large opening with well secured and readily removable cover plates providing easy access to brushes and commutator.
12 One-piece armature shaft and pinion of tool steel, hardened and ground, insuring perfect alignment of pinion at all times. On large size drills armature shaft is removable from the armature core and commutator, which are mounted jointly on a quill or spider.
13 Laminated pole pieces, minimizing pole face losses (used on large drills).
14 Armature coils form wound, heavily insulated, and carried in insulated slots in armature core. After winding and connecting to commutator, coils and armature are again dipped in insulating varnish and baked.
15 Quick acting control switch, making slow break impossible and preventing destructive burning of contacts.
16 Conveniently located trigger for operating switch.
17 Safety return spring for automatically opening switch when operator removes hand from switch handle (used on large drills).
18 Terminal block for cable, permitting ready removal of cable without disturbing other connections.
19 Cover plates on each side of switch, providing easy access to switch contacts.
20 Double pole, double break switch. Rugged contacts are readily removable.
21 Long fan-hub of high grade steel, hardened and ground. Press fit on shaft with long key insures permanent rigidity.
22 Cover plate quickly removable for inserting grease in gear case.
23 Reinforcing rib on gear case, insuring proper strength and rigidity.
24 Combined annular and thrust bearing at each end of spindle.
25 Removable socket inserted in spindle. Driving lugs on socket milled from the solid.

*Sales Representatives*

## The Holden Company, Limited

354-356 St. James Street, Montreal, Canada

*Sales and Service Branches:* TORONTO, 342 Adelaide Street, West WINNIPEG, 150 Princess Street VANCOUVER, 81 Pender Street EL-35-H

*Canadian Factory:* Canadian Pneumatic Tool Company, Montreal

BOYER PNEUMATIC HAMMERS · LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS
CHICAGO PNEUMATIC AIR COMPRESSORS · VACUUM PUMPS · PNEUMATIC HOISTS
GIANT OIL AND GAS ENGINES ROCK DRILLS · COAL DRILLS

CANADIAN

LITTLE GIANT

# FOR LARGER WORK AND GREATER PRODUCTION

# POTTER & JOHNSTON 8 B – AUTOMATIC

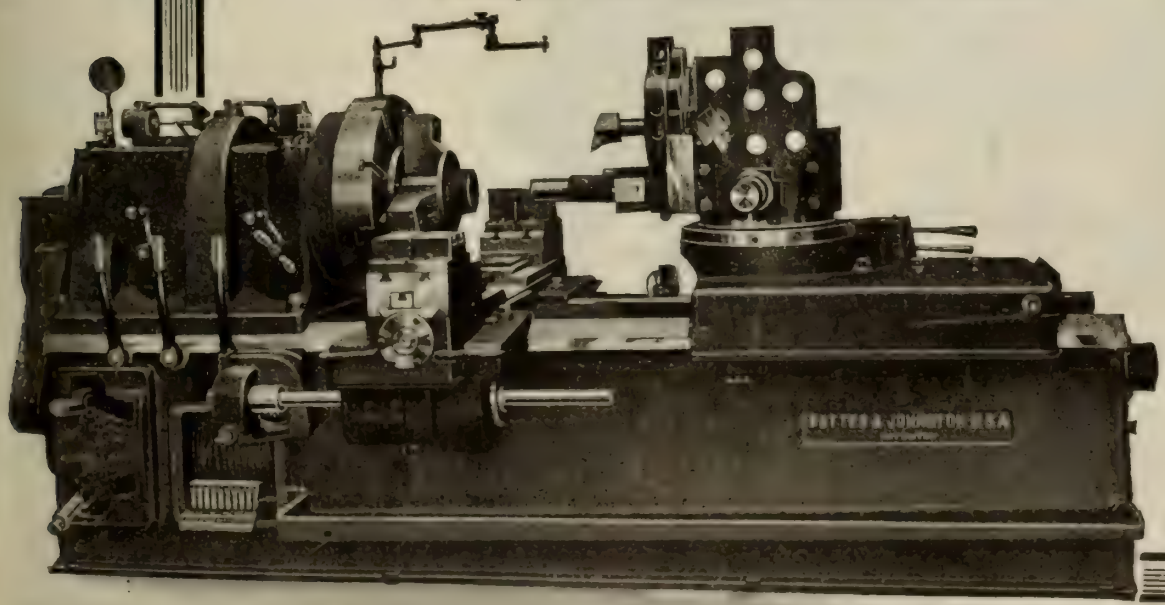
## Specifications

| | |
|---|---|
| Swing Over Bed | 35″ |
| Swing Over Cross Slide | 24″ |
| Travel of Cross Slide (Front and Rear Separate) | 10″ |
| Number of Turret Faces | 4 |
| Diameter of Holes in Turret | 3″ |
| Depth of Holes in Turret | 4½″ |
| Distances from Centre of Turret Hole to Top of Turret Slide | 5″ |
| Maximum Turret Slide Travel | 28″ |
| Turret Feed | 28″ |
| Length of Turret Slide Travel which permits of Supporting or Piloting Turret Boring Tools | 13½″ |
| Turret Slide Adjustment | 13 |
| Front Spindle Bearing | 7¾″ dia. by 7″ long |
| Rear Spindle Bearing | 5 5-16″ dia. by 5″ long |
| Diameter of Hole through Spindle | 6″ |
| Size of Geared Scroll Chuck furnished with Machine | 24″ |

*Canadian Offices:* POTTER & JOHNSTON MACHINE CO.

## ROELOFSON MACHINE & TOOL CO., LIMITED

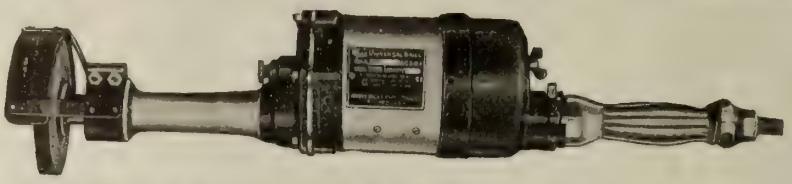
*HEAD OFFICE AND SHOW ROOM*
**11 Wellington Street East, TORONTO, CANADA**



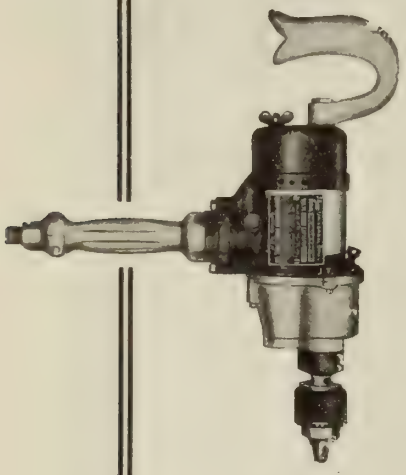
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# tools for Your Plant

Thor



## PORTABLE ELECTRIC DRILLS



Drills unequalled for power at their weight; motors, hand wound, triply insulated, all encased in light aluminum. The result is drilling power when needed, right from the nearest electric light socket. Many plants using air tools have a number of sturdy electrics to handle the special jobs away from the air line. Others have standardized in speeding up production with THOR electrics.

THOR Electric Tools include 8 sizes of Portable Drills, with drilling capacity in steel, ranging from ¼″ to 2″; and a Portable Grinder with 4″ wheel. Get three or four THORS for demonstration on your work. Until you are convinced of THOR quality, you are not obligated.

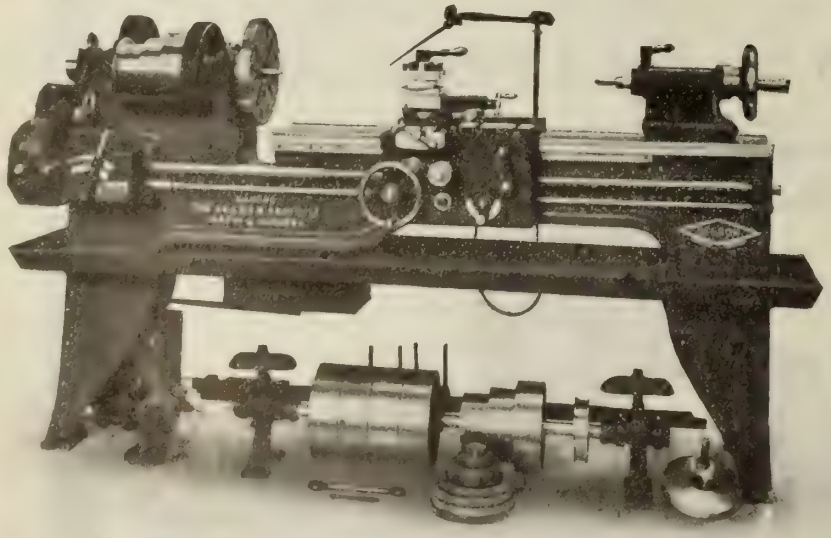
The THOR line also includes a complete list of Portable Pneumatic Tools.

***Full details upon request.***

**INDEPENDENT PNEUMATIC TOOL CO.**
**600 W. Jackson Blvd. Chicago**

334 St. James St., Montreal.
32 Front St. West, Toronto.
123 Bannatyne Ave. E., Winnipeg.
1142 Homer Street, Vancouver.

# The "SELSON" High-Speed, Vee Bed Gap Lathe



## 13" Swing

A Canadian once told us that he liked American lathes for their handiness and British for their durability. This sentence struck us, and therefore, we designed the 13" lathe.

# SELSON

*Engineering Co., Ltd.*

SELSON HOUSE, 83 and 85 QUEEN VICTORIA STREET
LONDON, E.C.4, ENGLAND. WORKS: COVENTRY

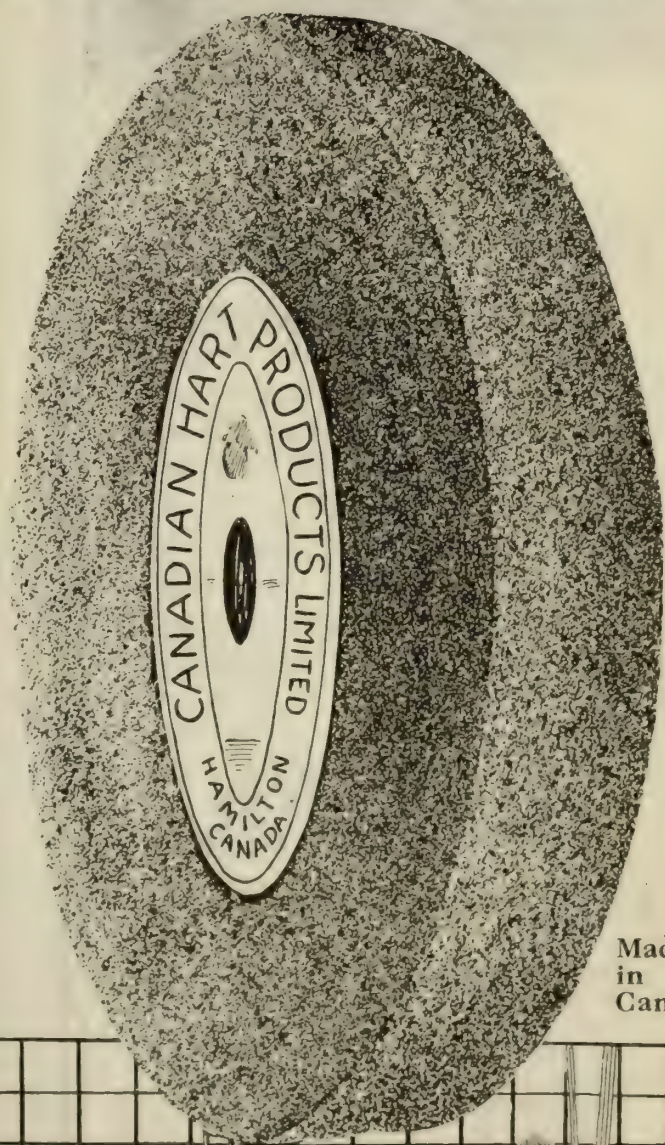
*Branches: Paris, Brussels, Turin, Milan, Melbourne, New York*

# CANADIAN HART GRINDING WHEELS

THE factory tests that all Canadian Hart Wheels are subjected to gives you an absolute guarantee that they are free from defects. Each wheel is also carefully inspected for size, grain and grade, so as to make certain that every wheel is in accordance with specifications on your order.

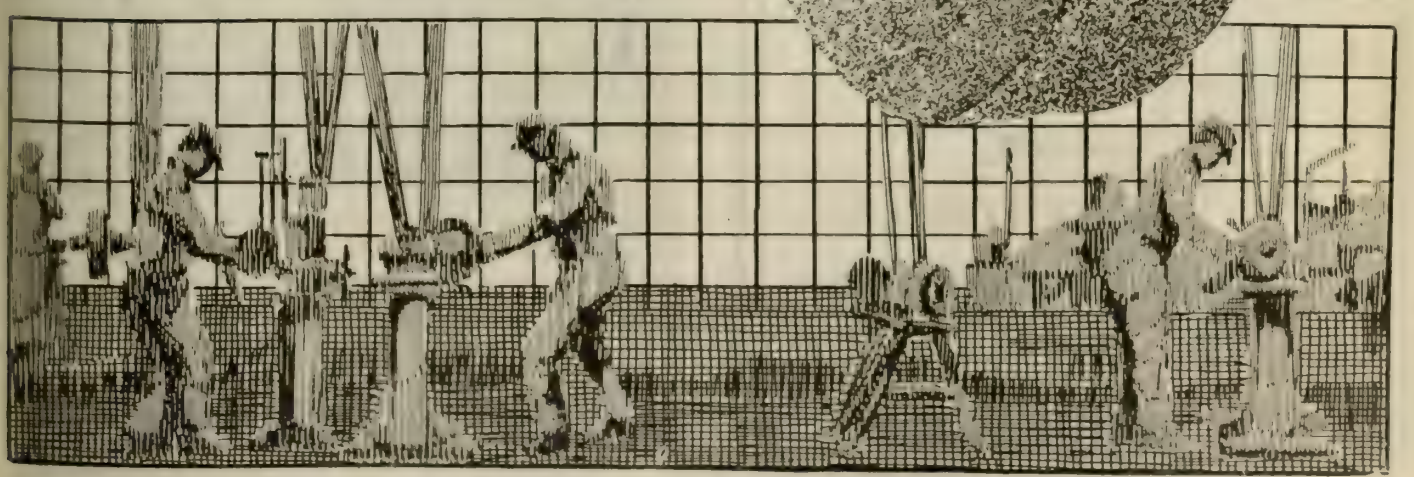
Canadian Hart Wheels are not inclined to "gum up" or "glaze," because they are made of proper abrasive grains of a suitable degree of hardness; especially is this true when the buyer secures the co-operation and advice of our engineering staff with a view of getting the right wheel for the job.

**How can we serve you?**




## Canadian Hart Products
LIMITED
*Manufacturers of Grinding Wheels and Machinery*
## Hamilton, Canada

Made in Canada



*If interested tear out this page and place with letters to be answered.*



# Take the Oils To The Machines

In a Bowser Portable Outfit and save Mechanics' time. Keep machines working and increase production.

Minutes spent by men in the oil room are wasted—lost. Your men don't want to lose those minutes. The old oil storage simply forces them to do it.

BOWSER ESTABLISHED 1885

## Oil Storage Systems

prevents these losses, bring a day's supply of oil to the machines—no loss of time or oil. Workmen enjoy the convenience and safety of Bowser equipment—employers appreciate the actual money saving effected.

OUR LITERATURE EXPLAINS WHY
WRITE FOR IT

**S. F. BOWSER COMPANY,**
LIMITED
66-68 Fraser Ave., TORONTO, CANADA
OFFICES IN THE PRINCIPAL CITIES OF U. S.

LONDON
32 Victoria, St., S. W. 1.
PARIS
5 Rue Denis-Poisson
HAVANA
Lonja del Comerico 427
SYDNEY
6 Castlereagh Street

# STEEL CASTINGS

*QUICK DELIVERIES*

**High Carbon Steel**
**Manganese Steel**
**Chrome Steel**
**Mild Steel**

*QUALITY GUARANTEED*

Sizes—½ lb. to 5,000 lbs. each

**THE WILLIAM KENNEDY & SONS,**
*LIMITED*
OWEN SOUND, ONTARIO
ESTABLISHED 1860



# DIAMOND TOOLS

FOR TRUEING GRINDING WHEELS

QUALITY SERVICE SATISFACTION

INDUSTRIAL GEMS

Tools For All Mechanical Purposes

FURNISS CLARKE & COMPANY

364 University St.

MONTREAL

*Sole Canadian Agents for*

THE JOYCE-KOEBEL COMPANY, INC.

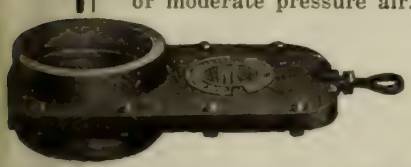
Formerly Geo. A. Joyce Co, Ltd.

NEW YORK LONDON



## New Air-Tight Blast Gates

will help you maintain the safety, economy and efficiency so essential in the operation of furnaces and other appliances using low or moderate pressure air.



THEY ARE SAFE— because they are ruggedly built of only a few simple parts; the blade stays fixed in any position and by a slight pull of the handle is easily adjusted to give the blast desired.

THEY ARE ECONOMICAL—because the initial cost is small; the simple construction eliminates wear and tear.

THEY ARE EFFICIENT—because careful machining makes them AIR-TIGHT; they afford the full area of the blast pipe, in striking contrast to a stop cock; they are quick in operation; they can be placed in any position.

*In short, these New Air-Tight Blast Gates possess all the advantages of stop cocks and valves, and have special features that tend for greater usefulness and economy.*

SIZES 2" TO 16"

Write for Bulletin 210-T

W. S. ROCKWELL COMPANY

Furnace Engineers and Contractors

50 Church St., New York

*Canadian Distributers:*

*Drummond, McCall & Co., Limited, Montreal*



SHEPARD

ELECTRIC CRANES & HOISTS



## This "Shepard" reaches every point outdoors and indoors

A Shepard Crane travels the length of the yard, and a Shepard Cage-Controlled Hoist operating on the I-Beam track of the crane covers the width. In this manner a load can be picked or lowered at any point in the yard.

The crane can be run opposite and connected with the overhead Monorail trackage that extends throughout the plant. Here the hoist and load can be run on to the track that makes accessible the various departments indoors.

This equipment is a big aid to production and expedites the necessary rehandling between departments.

Shepard Traveling Cranes are made in capacities of 1 to 50 tons, Electric Hoists and Monorail Cranes ½ to 30 tons.

***The advice Shepard engineers are able to offer will prove helpful if you are contemplating a faster and more economical method of rehandling.***

Shepard Electric Crane & Hoist Co.

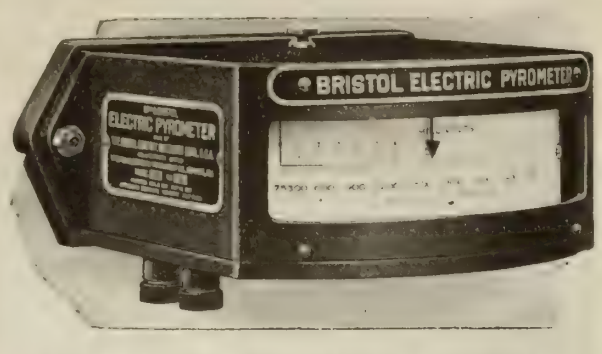
426 Schuyler Ave., Montour Falls, N.Y.

*Canadian Representative:*

Rudel-Belnap - Montreal

*Agents in Principal Cities*

*Member Electric Hoist Manufacturers' Ass'n.*




## ELIMINATE GUESS WORK
### In Heat Treating

Heat-treating Furnaces equipped with BRISTOL'S Pyrometers assure perfect heat treated products through the elimination of all guess work.

The Patented Automatic Internal Cold End Compensator is an exclusive feature with Bristol's Pyrometers. It makes of every pyrometer a direct-reading instrument—no allowance to be made for cold end errors.

**Get copy of Bulletin I-291.**

**THE BRISTOL COMPANY**
Waterbury, Conn.
Canadian Distributors: A. H. WINTER JOYNER, Toronto and Montreal

## LA SALLE
### Has an Advantage Over Other Grinders

There is some outstanding feature of all La Salle Grinding Machines that lends it exceptional productive ability.
The American Drill Grinder is especially adaptable for grinding twist, flat and three-lipped drills, because it has automatic lip rest and caliper jaw device, which assures proper clearance on all sizes of drills automatically. Send for descriptive matter covering our entire line of grinding machinery.



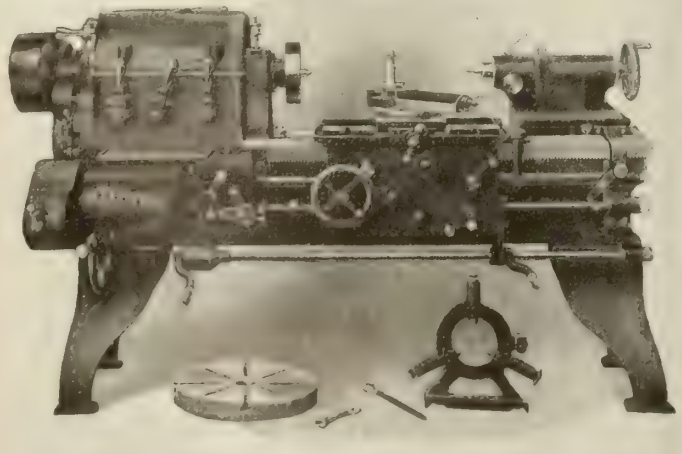
American Drill Grinder
For Wet or Dry Drill Grinding 1/8" to 2¼". Also 1/8" to 3½" dia.

**LA SALLE TOOL CO.**
La Salle, Illinois, U.S.A.
Represented in Canada by
**A. R. Williams Machinery Co., Ltd.**
64-66 Front Street W., Toronto
Halifax St. John, N.B. Montreal Winnipeg Vancouver

## The "Lehmann" Improved Selective Head Lathes
(Patents Pending)

SIZES—14" to 24" SWING

On account of its simplicity of construction, great driving power and rigidity, ample range of speeds, moderate tooth travel of its gears, compact and shapely appearance, the "LEHMANN" Selective Head Engine Lathe stands to-day in a class *ahead* and *alone*. Some of the features of construction are:



Sixteen Spindle Speeds in correct geometrical progression obtained with the use of only ten gears.

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All Shafts, except spindle, running on ball bearings.

Spindle of alloy steel, hardened and ground at the bearings and running in phosphor bronze boxes.

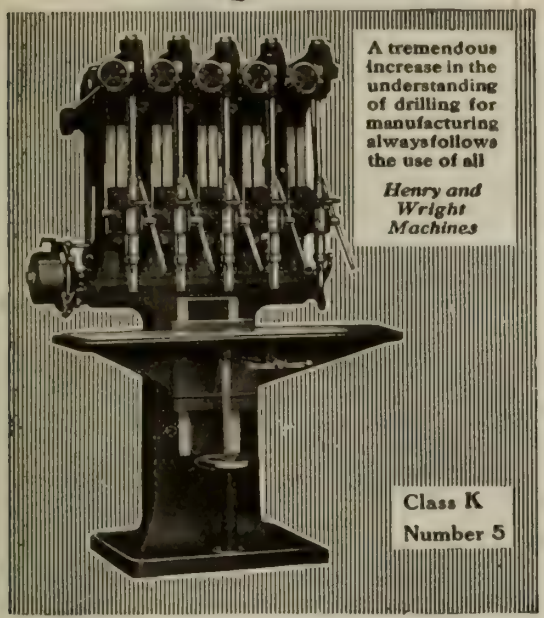
Head Casting forms oil-tight case enclosing all running parts.

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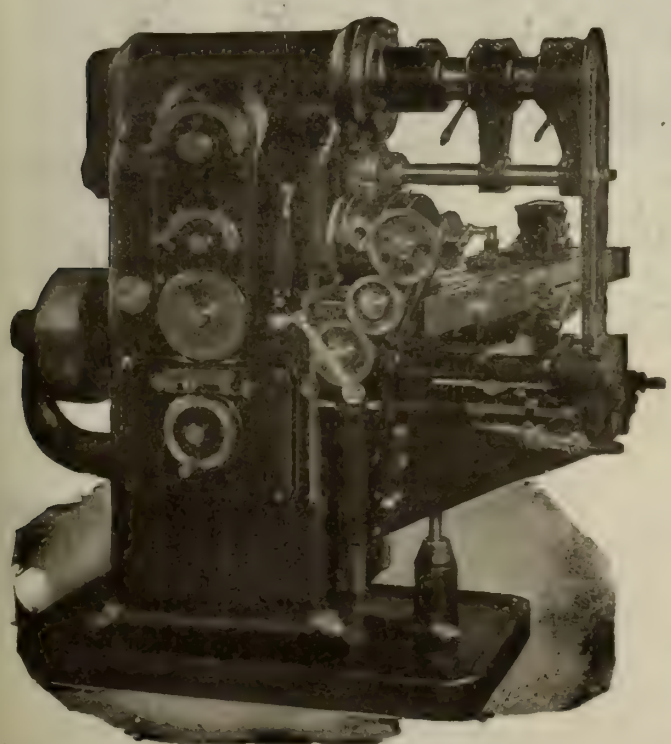
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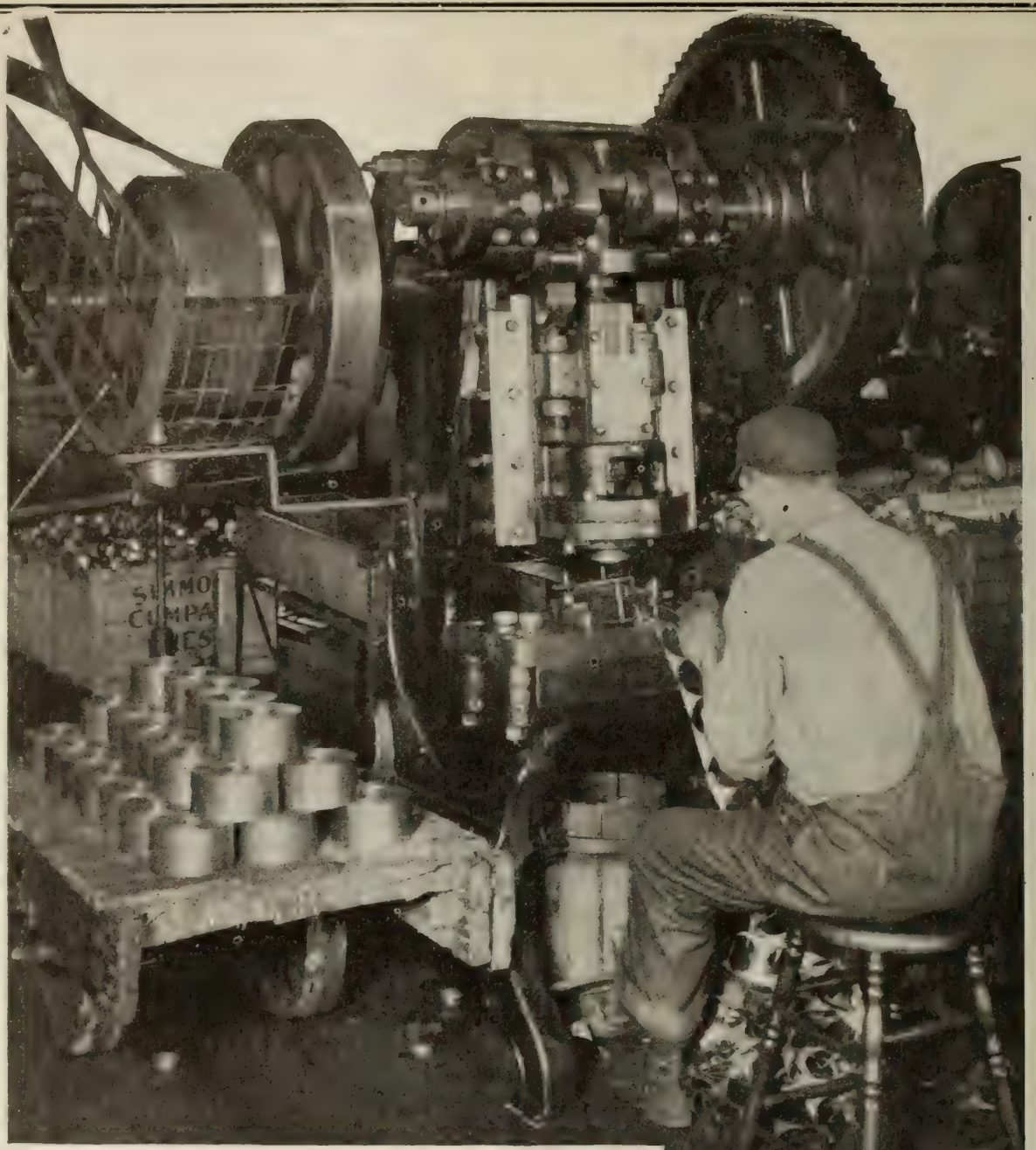
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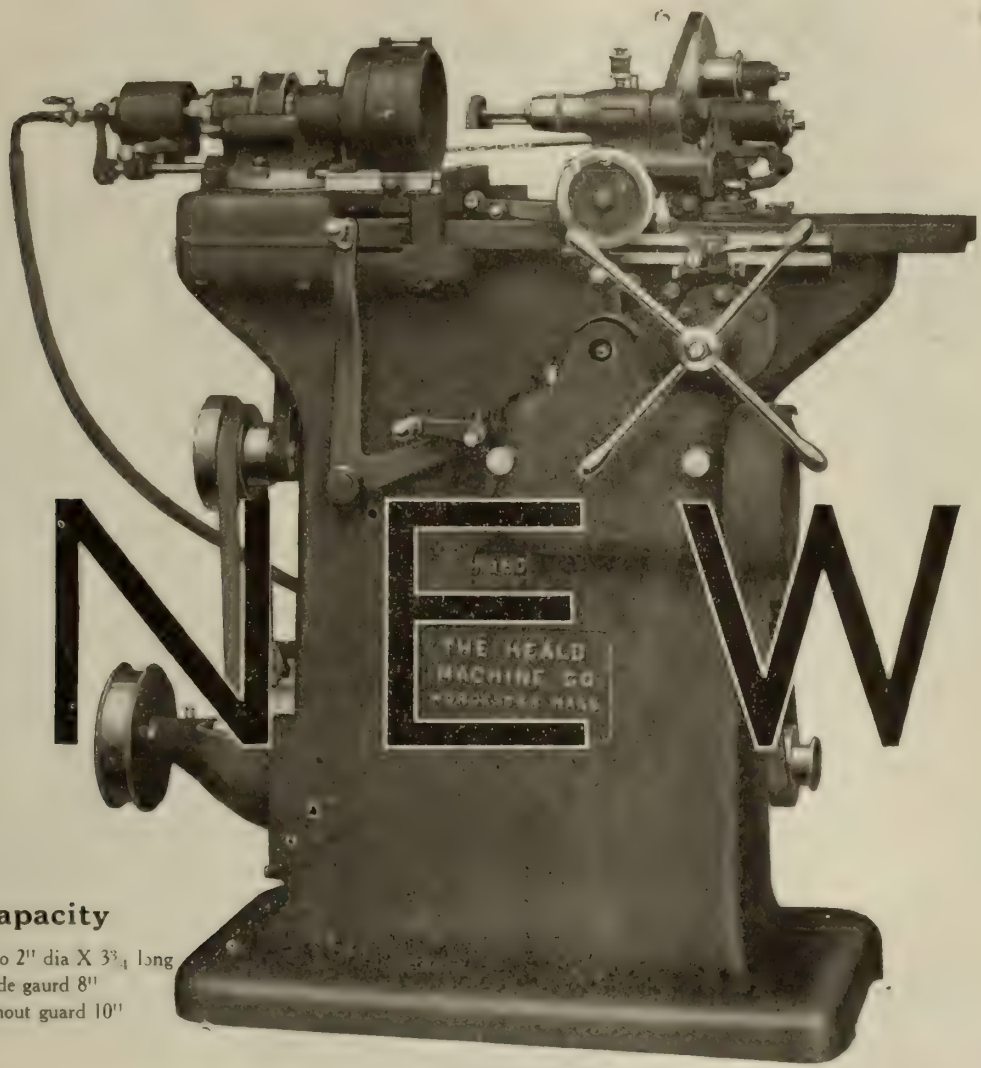
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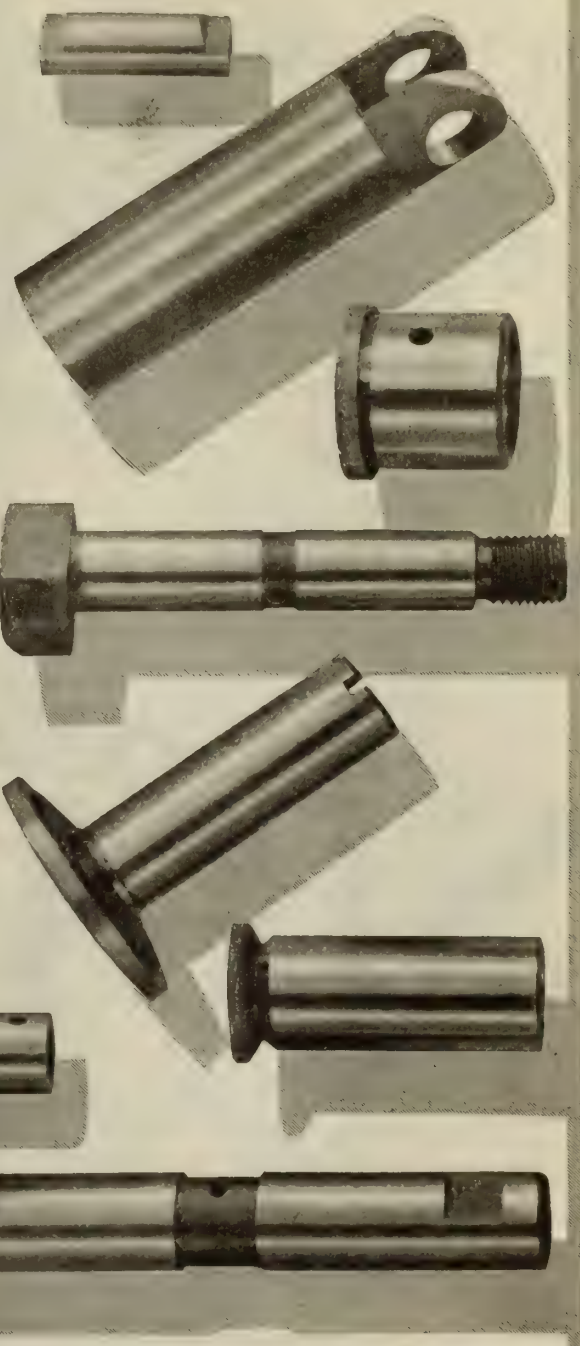
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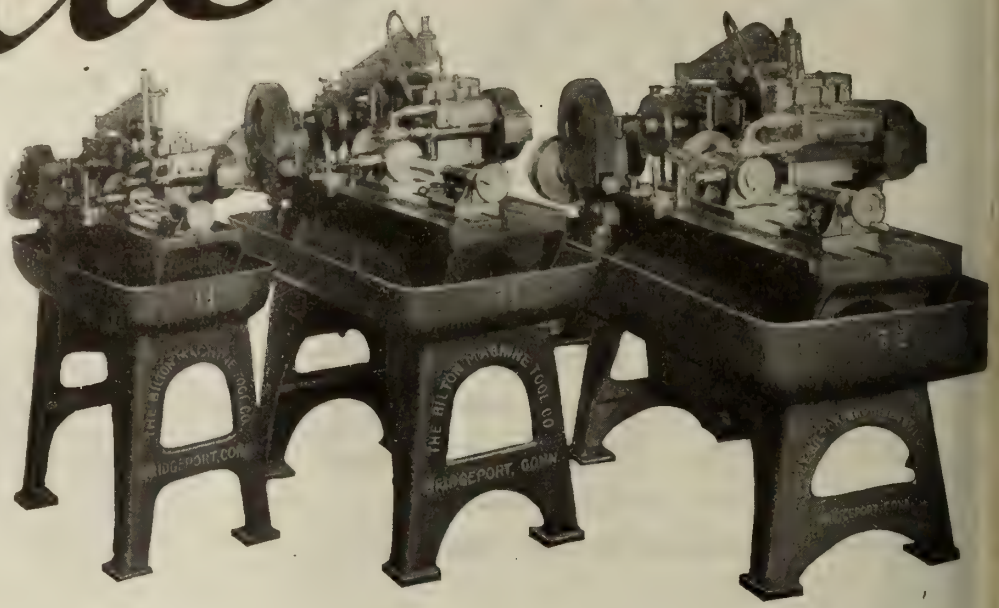
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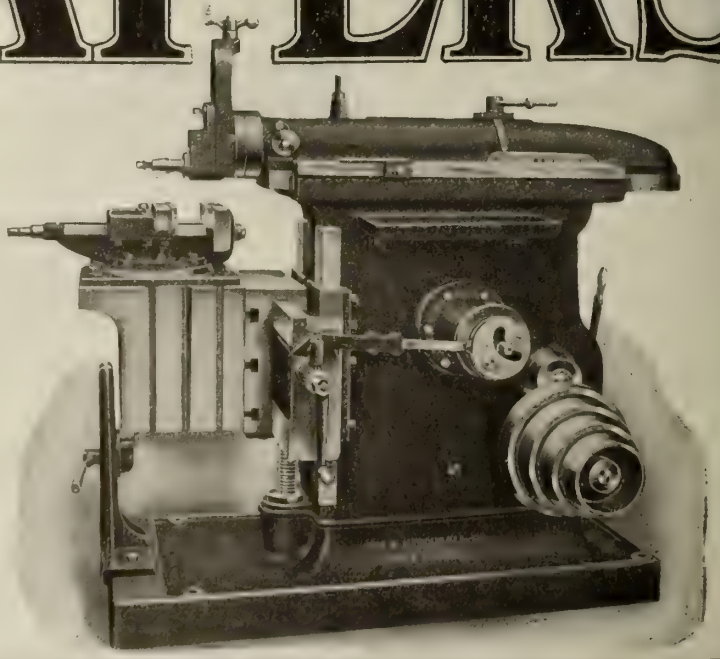
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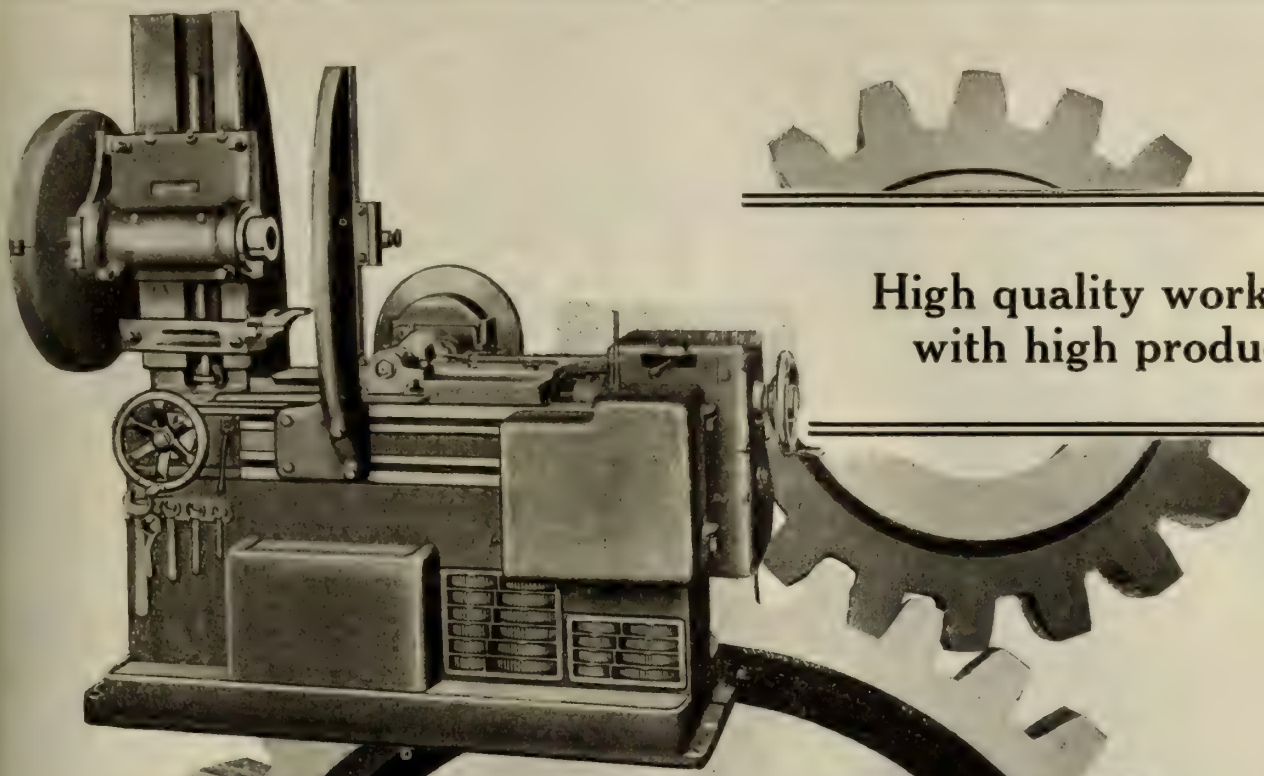
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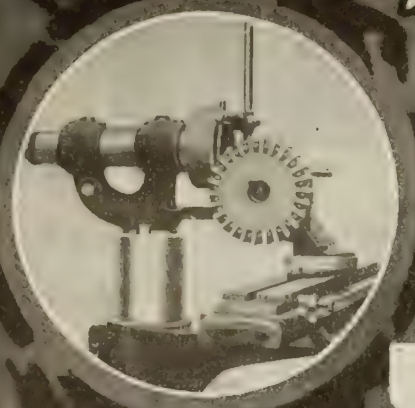
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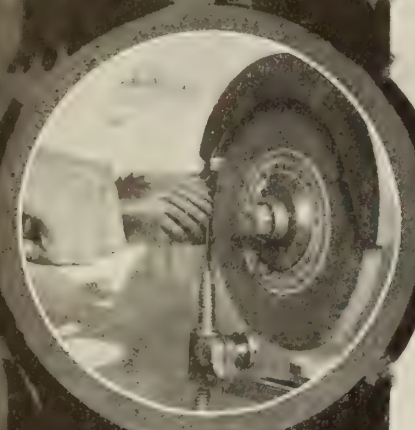
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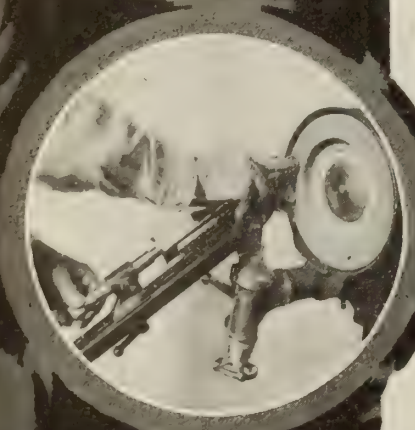
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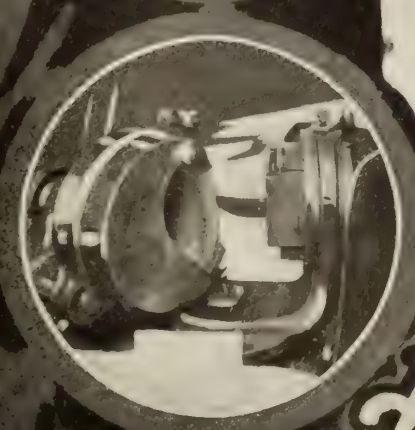
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# Tool Room Work









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For sharpening twist drills we recommend a 46-grain Alundum, either vitrified or silicate, grades K to M.

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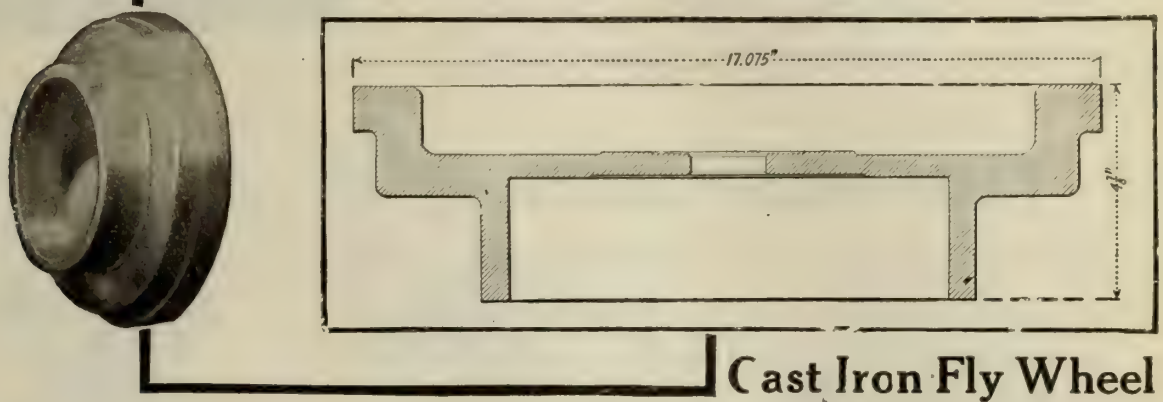
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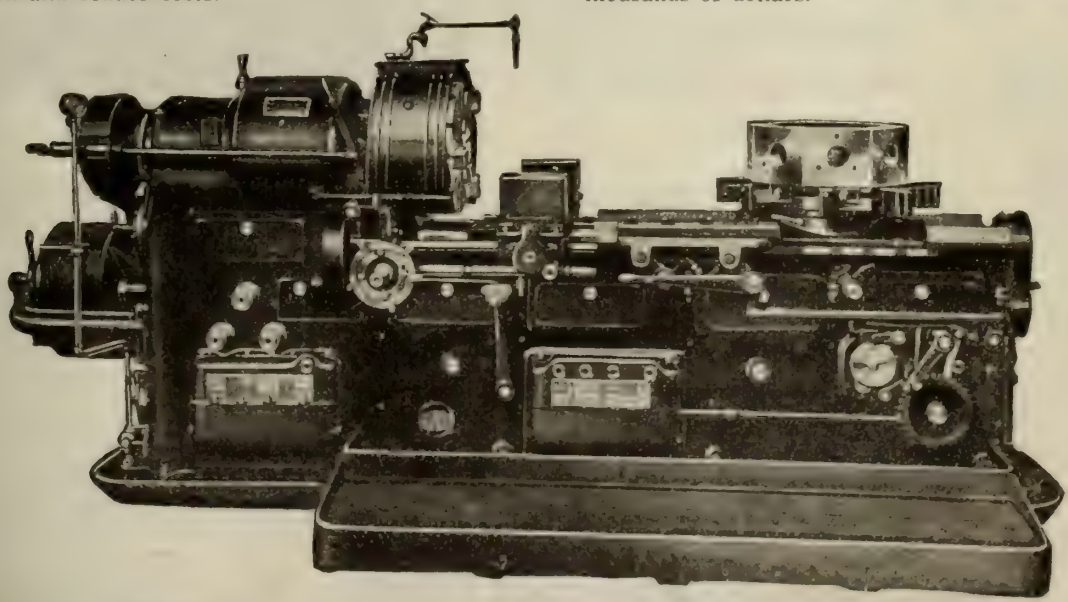

Cast Iron Fly Wheel

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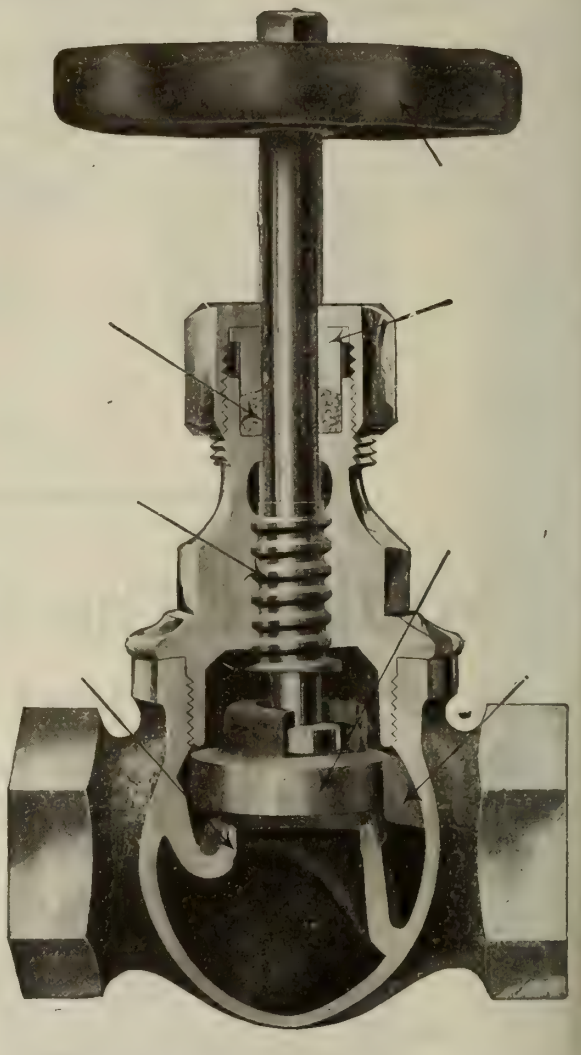
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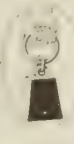
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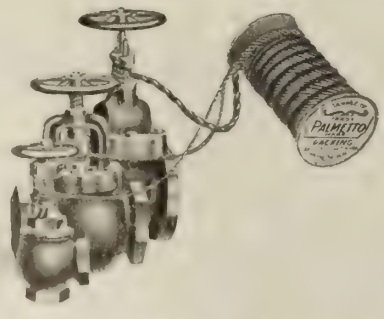


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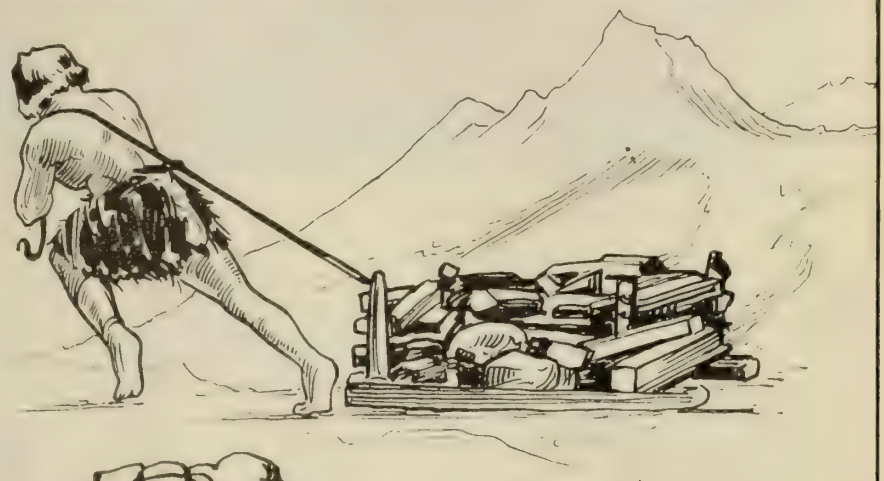
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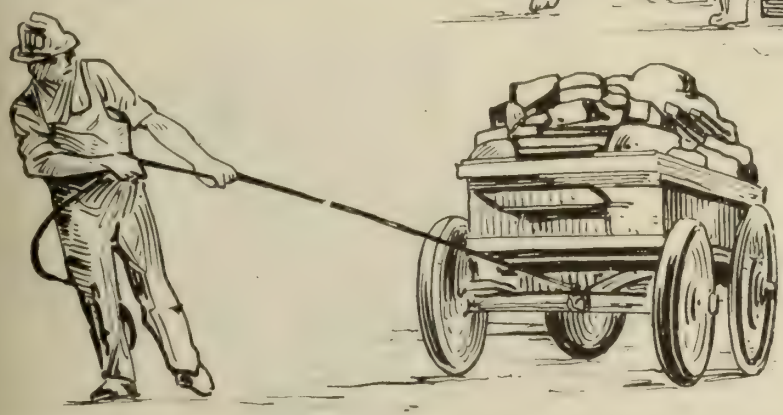
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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

VOL. XXV. No. 11 March 17, 1921

# *Application of Ball Bearings to Machine Tools*





Motors — Fans — Countershafts—Worm Drives—Saws — Grinders — Shapers and Lathes. Method of Applying Ball Bearings to These Machine Tools

*By Gordon Janes*

IN the Feb. 24th issue of Canadian Machinery there appeared an article dealing briefly with the history of ball bearings, from that point leading up to the actual installation of the same. In the present article we shall go into the mounting and installation of such bearings, illustrating wherever possible the sectional view of the equipment.

### Annular Bearings

In mounting annular bearings, care must be taken that the inner race is a permanently tight fit on the shaft; otherwise the continued action of the load, concentrated on the short shaft length corresponding to the bearing width, will, in time, peen down the shaft. It is unwise to place reliance on a drive fit alone, as they may be destroyed by an occasional dismounting, or by the action referred to above. Binding the inner race endwise between a substantial shoulder and well set up nut creates a frictional grip on the shoulder and nut faces that prevents the transfer to the shaft surface of the destructive influences cited. This binding action forms an excellent substitute for bearing seat length. Neglect in this direction results more generally in damage to the shaft, but occasionally to the bearing as well.

The outer race should be a sucking fit in the housing. If this race be fixed against rotation, the load always comes in the same place; but if allowed to take up a different position from time to time, new sections of the race are constantly coming under the influence of the load. A sucking fit of the race will be accompanied by a slow intermittent creep under the slight vibrations of the load. In order not to prevent this beneficial creep, the sides of the outer race should never be absolutely clamped, even when the race is held between shoulders to prevent end movements of a shaft. A slight clearance of 1/100 of an inch, or as much as is admissible, should be left on each side.

If the outer race is a tight or driving fit in the housing, it is impossible, in assembly, to be sure the bearing is not assembled out of line, due to the narrow width of the bearing compared with the diameter. In fact, it is nearly a certainty the outer race will be cramped or out of line when assembled under such conditions, with the consequently rapid destruction of bearing races and balls. Such bearings will appear as if subjected to a heavy end thrust and overloaded. Fig. 15 (shown in February 21st issue) illustrates the correct method of mounting a shaft on ball bearings, bearing B restraining the shaft against end wise motion, and bearing A being free to move axially in the housing.

### Thrust Bearings

When mounting self-aligning thrust bearings on vertical shafts, it is advisable to give the aligning washer some freedom of sidewise movement to permit it to assume its best position in case of shaft oscillation. With such a freedom allowed, the shaft should be a snug fit

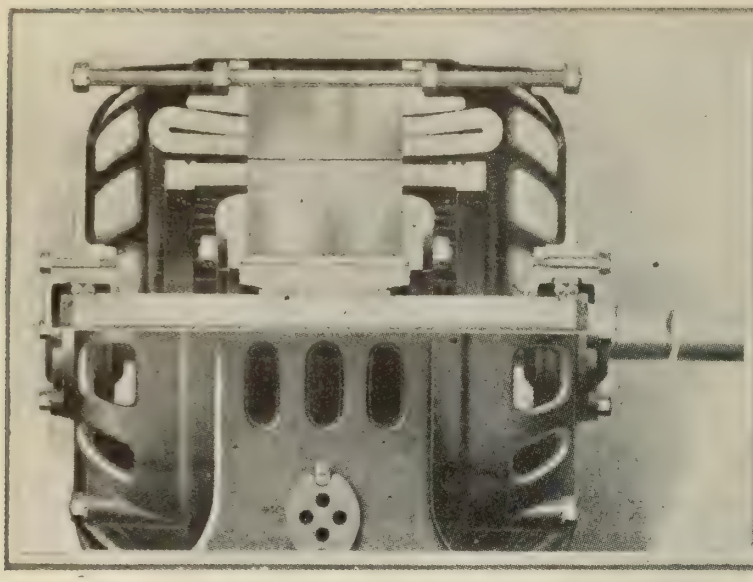


FIG. 16—MOTOR EQUIPPED WITH BALL BEARINGS.

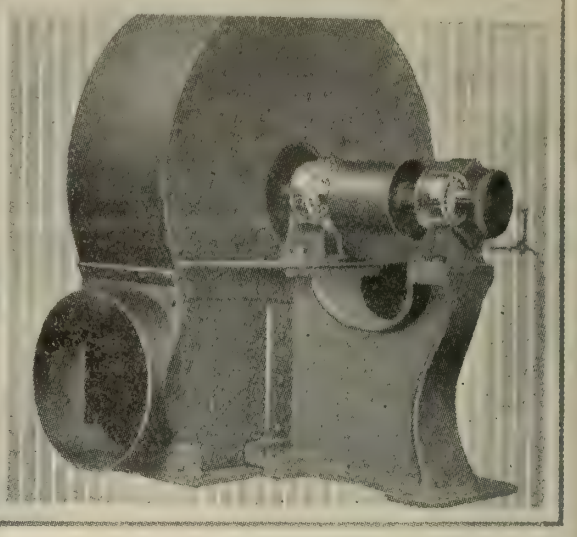


FIG .17—A GOOD EXAMPLE OF A FAN SPINDLE EQUIPPED WITH BALL BEARINGS.

in the upper or smaller collar B. See Fig. 11 in previous part of article.

For horizontal shafts, the collar B should be snug fit on the shaft, and the aligning washer should not have more than 0.01 inch clearance each side, so as to prevent the ball cage, spherically seated race and aligning washer from dropping when the load is released, thereby bringing up possibility of destructive pinching of balls when load is again applied.

Wherever shaft deflections are liable to occur, it is particularly necessary that a self-aligning type of bearing be used, and that the bearing be mounted as outlined above.

### Typical Ball Bearing Applications

While twenty years ago ball bearings were generally known only in bicycles, today they are used in almost every industry. Indeed many machines, or developments in machines, owe their very existence to the modern ball bearings, some excellent examples of this being the Dumore precision grinder, the eleven thousand r.p.m. wood-working shaper, the Sperry gyroscopic compass and the Sperry gyroscopic stabilizer for aeroplanes. The rotor runs at 8,600 r.p.m on the Sperry compass, and at 14,000 r.p.m. on the stabilizer.

As the field of ballbearing applications is now so broad and the number of proven successes so great, it is impossible to give even a summary of them in an article of this nature. It will be sufficient, therefore, to select a few examples at random, not because they possess greater merit than others, but because they happen to come first to mind.

Nearly all types of electric motors have been ball bearing equipped, and in no case have they failed to show a distinct advantage over the old plain bearings. An analysis of the records of such motors shows that fewer repairs are required, longer periods can be allowed between motor inspections, and the while cost of maintenance is considerably decreased. The extent to which this

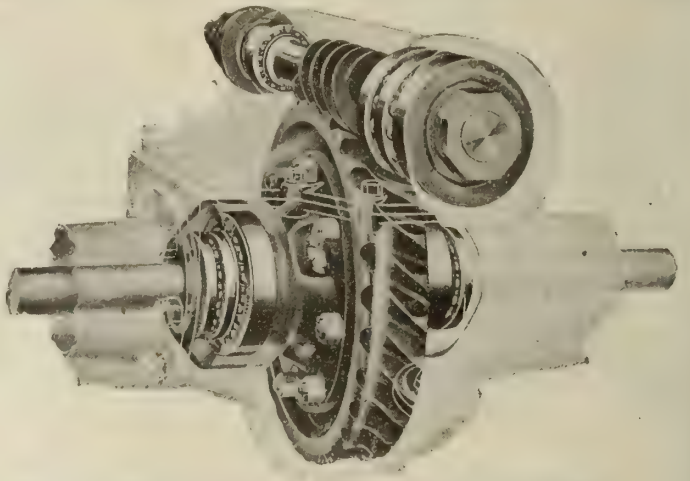


FIG. 18—WORM DRIVE EQUIPPED WITH BALL BEARINGS.

plies in car lighting generators is cl shown in the following testimony superintendent of inspection of one o largest railroads in the United St He claims that due to ball bearings cost of generator maintenance has reduced on coaches 66 per cent. ar diners 46 per cent. He has never hot bearing, never lost a field or a ture, the inside of the generator is and he has had no trouble due to gr or short circuits. Truly this is markable record when it is remem the severe conditions under which lighting generator is called upon to ate—exposed to snow and ice, heat and water, and the jolts and shoc passing cross-overs and switches.

Owing to the precision of a ball ing and its freedom from wear, the ing adjustment remains constant ar the rotor is kept in the centre of the netic field. This permits the motor ufacturer to employ air gaps with

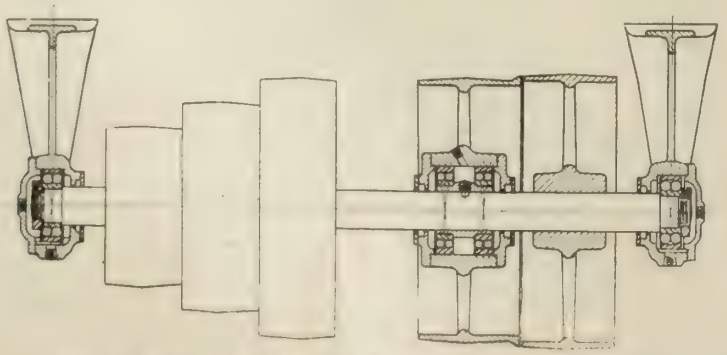


FIG. 20—TYPICAL EXAMPLE OF BALL BEARING HANGER.

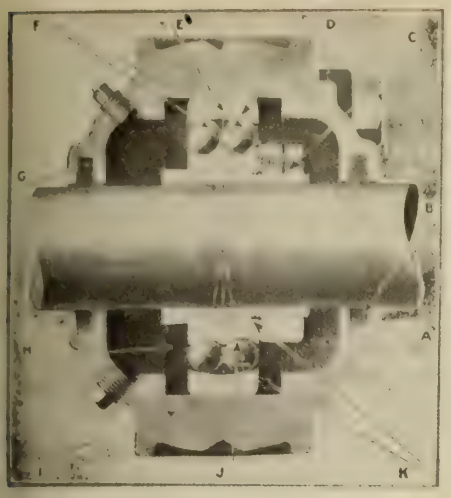



FIG. 21—CONSTRUCTION DETAILS OF BEARING CASING.

ances so slight that they could not be considered on motors having any other type of bearing. On induction motors a close air gap is of vital importance in the improvement of the power factor and the machine efficiency. A ball bearing equipped motor is shown in Fig. 16.

Fans or blowers, such as that shown in Fig. 17, provide an excellent example of what ball bearings will do in the way of improving the equipment of the average plant. Owing to the high speed at which they are driven they are a constant source of trouble and expense, but, as has been proven for years now, ball bearings not only reduce the friction load but eliminate all bearing trouble as well. The change is usually a simple one to make, it being necessary only to bolt a ball bearing pillow block on the frame from which the plain bearing has been removed.

With regard to the automobile, little need be said as its present success is made possible by the anti-friction bearing. Fig. 18 illustrates a worm drive on ball bearings.

Fig. 20 depicts a countershaft equipped with ball bearings. All necessary information can be secured from this view, so let us pass on to Fig. 21, which gives the constructional details of the bearing casing used in the installation shown in Fig. 20.

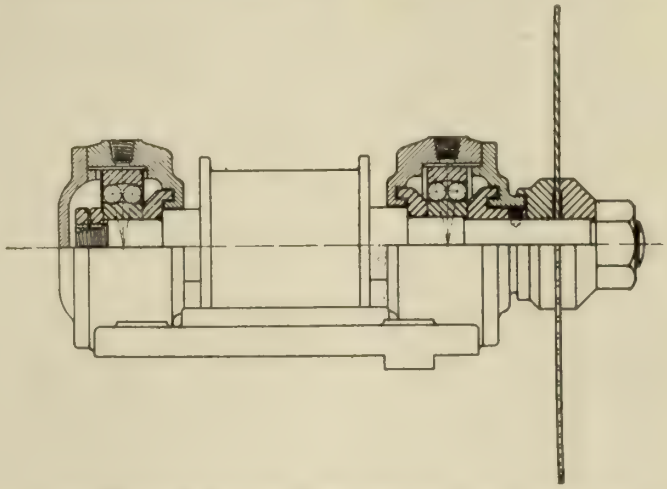
The points to be noted are the large lubricant chambers at A (sufficient for several months' running) and the method of rendering the housing oil-tight and dust proof by using a sealing groove containing a stiff felt washer as shown at B. This washer closes on the shaft and effectively closes the opening. It should be remembered that there is enough give in the washer to allow for any deflections of the shaft in the self-aligning bearing, and that the casing is thus kept oil tight under all conditions of shaft deflection that will be met with in practice.

The split sleeve and locking nut is shown at C, while D illustrates the self-aligning feature. E illustrates the outer race, while F depicts the principle of the two rows of balls, viz., the least load per ball. G illustrates the other sealing groove, while H shows how the bearing is open at both sides, permitting a positive circulation of lubricant. I denotes the bearing casing, while J illustrates the one-piece ball cage. The last letter K depicts both the outer and inner race.

The construction of the loose pulleys mentioned is clearly shown in the line drawing, Fig. 22. Two radial bearings are mounted on a steel sleeve, which is held to the shaft by a set collar and used to locate the pulley in position. The design is simple and provides a large lubricant chamber between the bearings, sufficient to hold enough grease for six months' running. The end caps keep out the dirt and prevent the escape of lubricant. The pulley is strong, well balanced, and will carry any belt at any speed without running hot.

An application of interest to all woodworking plants is the circular saw arbor shown in Fig. 23. The high speed and heavy load impose a severe duty on the bearings, but these conditions are easily taken care of by ball bearings, if the bearings are properly protected. The distinctive feature of this design is the labyrinth type of packing used to prevent the leakage of oil and the intrusion of dirt. The rings fit against shoulders on the shaft and are let into the housing. The inner race of the left hand bearing is locked against the ring by means of a nut and covered in by an end cap. In the right hand housing a ring is pressed against the inner race of the bearing, the ring being held in position by a set screw.

Another application to woodworking machinery, which has been revolutionary in nature, is that of ball bearings to the spindles of high speed shapers. By this means, shapers have been developed until now they can be run successfully at 11,000 r.p.m. High speed ball bearing shapers will turn out about twice the work of a plain bearing shaper and do it better. Very often the work is of such fine quality no sanding is required. This is important because sanding means considerable expense, and in connection with



CIRCULAR SAW ARBOR MOUNTED ON BALL BEARINGS.

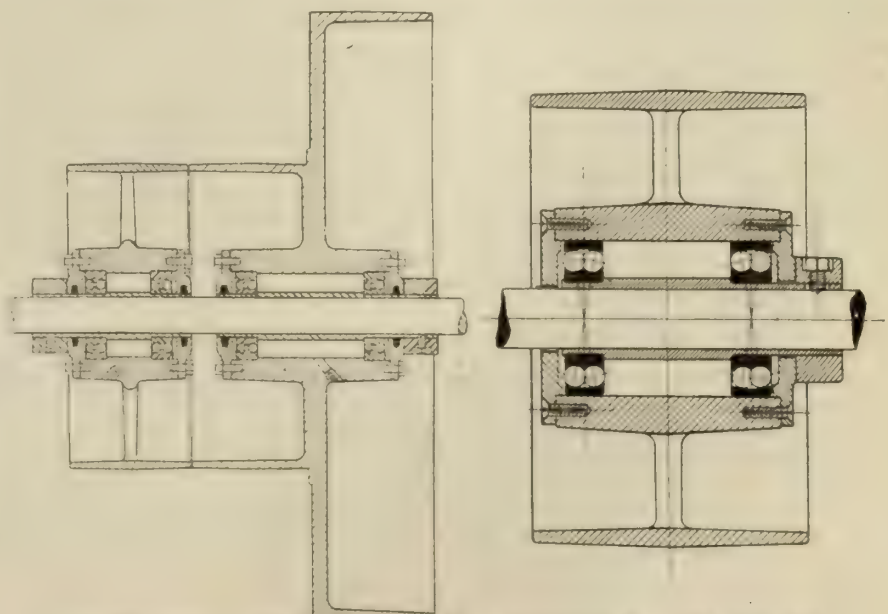


FIG. 22—TYPICAL INSTALLATION OF BALL BEARINGS TO LOOSE PULLEYS.

shaper work it often amounts to twice the cost of the work itself. As will be seen from Fig. 24, the mounting is very simple, the spindle being steadied by means of two radial bearings—one above the pulley and one below. The weight of the spindle or thrust is taken on a ball at the lower end of the spindle. Great care must be exercised to see that the spindle and pulley are accurately balanced, as, otherwise, at the high speed employed, the vibration will become excessive.

### Grinder Installations

Figs. 25 and 26 illustrate two types of mountings for precision grinders where elimination of chatter is a necessity. The first illustration shows a high speed precision grinder spindle with a take up feature which eliminates any possibility of chatter; two radial bearings on the wheel end of the spindle being pressed against each other on the outer raceways. This mounting is suitable for high speed grinding where endless belts are used. It is necessary in this case, that there be no joint in the belt, as this would cause shock to the spindle.

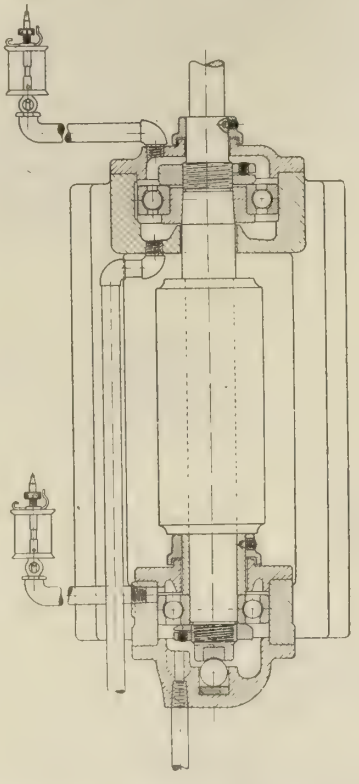
The second illustration is an application for a large precision grinder spindle; two bearings on the wheel end being adjustable against each other on the outer raceways to eliminate chatter. The bearing on the other end has to carry only the weight of the spindle. The driving pulley is carried separately by two radial bearings and the spindle is driven from it by slots or grooves in the shaft. The reason for mounting the pulley separately from the shaft is so that any shock from the belt joint cannot be transferred to the spindle. Both of these grinder designs are covered by patents.

Another illustration of ball bearing application to machine shop equipment is shown in Fig. 27, which is an excellent example of a ball bearing lathe head. The drawing which is a cross section through the headstock of a single purpose lathe, shows the method of mounting the ball bearings. The large radial bearing is locked against a shoulder on the spindle by means of a nut, thus holding it in position. The housing for this bearing has two felt washers on the outer end, and one on the inner end to prevent chips and dirt from getting into the bearing, and the lubricant from getting out. The cone pulleys are carried on two radial bearings held in position by means of a short and long sleeve and a locknut. The housing at the right hand of the headstock contains a radial bearing for carrying the spindle and a thrust bearing for taking the entire end thrust on the spindle. It will be noted that the radial bearing is locked against a shoulder on the spindle by a nut. One ring of the thrust bearing is mounted against a shoulder on the spindle, while the other, which has a spherical seat and is self-aligning, engages with a steel washer let into the end cap. The back gears are also carried on radial ball bearings.

These examples could be extended indefinitely, but space forbids. It may be stated generally, however, that wherever high speed is encountered or reliability is essential or power saving is a consideration, ball bearings should be adopted.

### Lubrication of Ball Bearings

Oils as well as greases may be used as lubricants for ball bearings. If oil be used, the housing of the bearing should



WOOD SHAPER SPINDLE EQUIPPED WITH BALL BEARINGS.

be filled up to about the centre of the lowest ball. If grease be used, the housing should be filled about one-half to three-quarters. On account of the fact that lubricants, particularly greases, which are sold under trade names, show great variations in composition and quality, it is advisable that lubricants for ball bearings be purchased according to specifications and not according to trade names only. Below are given a number of such specifications, which are designated A, B, C, etc.

**"A"—Very Light Ball Bearing Oil**

| | Maximum |
|---|---|
| Free Acid | .10% |
| Free Alkali | .10% |
| Sulphur | .03% |
| | Maximum |
| Ash | Trace |
| Resin | None |
| Salt | None |

Heat Test (15 min. at Flash Point) Darkening, but no sediment—slight.

Oil should be pure, mineral and have no tendency to gum or become sticky.

| | Minimum |
|---|---|
| Flash Point (Cleveland Open Cup) | 300°F. |
| Fire Test | 350°F. |

Viscosity (Saybolt from 50 to 100 secs. at 100° F.

"B"—Light Ball Bearing Oil. Same as "A" except Viscosity (Saybolt) from 100 to 200 secs.

"C"—Medium Ball Bearing Oil. Same as "A" except Viscosity from 200 to 300 secs.

"D"—Heavy Ball Bearing Oil. Same as "A" except Viscosity from 300 to 500 secs.

"E"—Extra Heavy Ball Bearing Oil. Viscosity from 500 secs. or above.

"F"—Same as "B" except that in addition Pour Test—5°F.

**"G"—Grease**

| | Maximum |
|---|---|
| Free Acid (calculated as oleic acid) | .10% |
| Free Alkali (calculated as sodium hydroxide) | .10% |
| Free Lime (calculated as Calc. Oxide) | .10% |
| Sulphur | .03% |
| Resin | None |
| Salt | None |
| Neutral Saponifiable Oil | 1.00% |
| Abrasive particles (sand, etc.) | None |
| Melting Point, about | 180°F |

Grease should have no tendency to gum or become sticky. It should not contain graphite or fillers of any kind.

### Selection of Lubricants

As a general guide, the following considerations may be useful:

1. For very high speed, say over 3,000 r.p.m., use a light oil, such as "A" or "B." If the surrounding temperature exceeds 150 degrees Fah., oil "C" may be used.

2. For speeds from 600 to 3,000 r.p.m., use oil "B" or "C." If the surrounding temperature exceeds 150 degrees Fah., oil "D" may be used.

3. For speeds from 100 to 600 r.p.m., use oil "C" or grease "G," or if surrounding temperature exceeds 150 degrees Fah., oil "D."

4. For speeds below 100 r.p.m., use oil "D" or grease "G," or if surrounding temperature exceeds 150 degrees Fah., oil "E."

5. For temperatures below 32 degrees Fah., use oil "F."

Grease should be used when, on account of local conditions, it is difficult to keep oil in the bearing. It is not generally recommended where the speed exceeds, say 600 r.p.m., or where the surrounding temperature may attain 140 degrees Fah. or above. The consistency of the grease to be used depends on the conditions of operation. The necessary con-

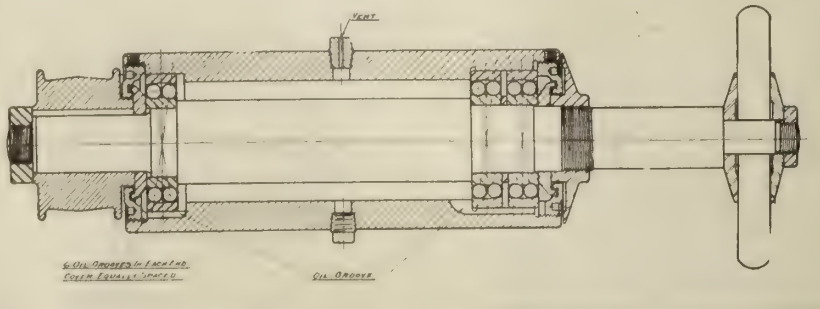


FIG. 25 BALL BEARINGS AS USED ON PRECISION GRINDER SPINDLE.

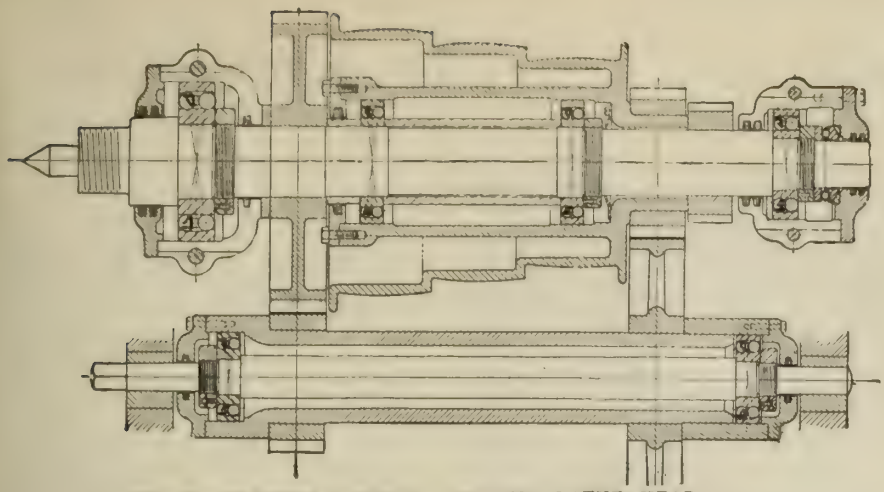


FIG. 27—EXAMPLE OF BALL BEARING LATHE HEAD.

sistencies in numerical values cannot be specified until a satisfactory testing method has been agreed upon by the trade.

The above speeds refer to bearings of an average size of 2-inch bore. If the actual size is greatly different, the speed of the bearing should be divided by two and multiplied by the actual shaft diameter. The speed so obtained should be used as a basis for selection of a lubricant.

### Application of Lubricants

The renewal of the lubricant in a ball bearing depends to a great extent upon the operating conditions of the machinery. In the ordinary type of installation, operating under normal conditions, renewal should be made about three times a year, although close observation for a short time after installation will enable a better estimate to be made of the proper period of time.

When feasible, in cleaning the bearings, the old oil should be removed, the drain plugs then inserted and the housing filled with kerosene. The drain plugs should then be removed and the housing carefully drained.

The drain plugs should again be inserted and the housing filled with a small supply of the proper oil. The bearings should then be rotated for a few moments and then drained in order to be certain that the last traces of kerosene have been removed. After this second operation, the housing should be filled with the correct grade of oil to the proper level, and the bearing is ready for operation.

Care should be exercised to avoid putting too much grease into the housing, as this will result in its being forced out through the packing. In cleaning a bearing lubricated with grease, it is advisable to wash the parts thoroughly first in kerosene, and then with some good light bodied oil. The bearing may then be reassembled and packed with grease. In case the bearing contains a residue of soap that cannot be removed with kerosene alone, it is advisable to use a hot mixture (not over 150 degrees Fah.) of kerosene and denatured alcohol.

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The Lakewood Engineering Company, Cleveland, Ohio, announce the appointment of Kelley Powell, Ltd., 403 McArthur Building, Winnipeg, Canada, as agents for the Provinces of Manitoba, Saskatchewan, Alberta and Western Ontario, for the sale of Lakewood paving, construction, and industrial equipment.

### A SAVING OF 50 PER CENT.

A rather interesting use for the photostat has recently come to our attention. H. B. Freeman, managing art director of Vogue, states as follows:

"Before adopting the photostat, layout work in our art department was done by the system of diagonals, and measurements commonly used to layout a page containing photographs and drawings according to specifications. This consumed time, and four days, often more, was required to get complete page material into the printer's hands. With the photostat we accomplish the same work in two days.

"For example: the page has four photographs and two drawings, and it requires titles and captions for every subject. The photostat makes a negative of each subject. Then positives in sizes governed by the initial rough layout. These subjects are then assembled, pasted on a dummy sheet, and arranged to best advantage. Titles and captions are marked in proper positions. The page is then complete.

"Next, a positive is made from a negative of the entire page. This goes to the engraver and serves as a guide as to position, crop marks, and sizes of copy. The original dummy goes to the editorial department for captions and titles. The dummy then goes to the printer's, where the titles and captions are set in type and positioned to receive the cuts when they arrive. Thus, every operation is independent of the others. That is why the time previously required has been reduced 50 per cent.

"Any changes can now be made at the small cost of another paper print. Remaking an engraved plate at a much larger expense was previously necessary. From this one example you can see how expensive several re-orders each issue would be. A year's total would give a rather large figure—a good reason for serious consideration of the practical value of this method."

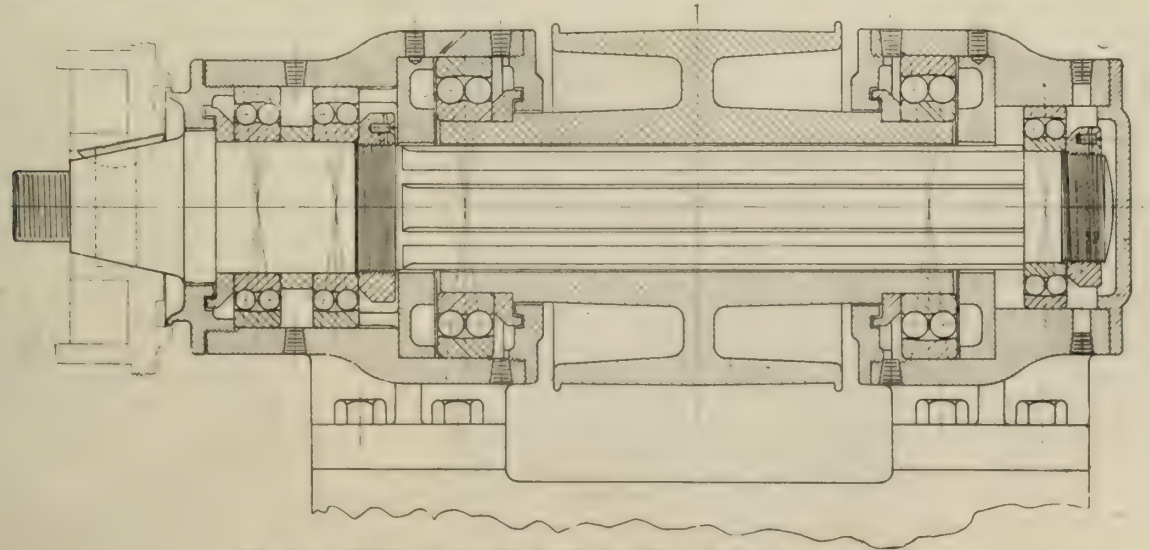


FIG. 26—A TYPICAL EXAMPLE OF GRINDER SPINDLE MOUNTING.

# *Apprentices Should Learn Trade Thoroughly*

*By PETER MASTERSON, Foreman of Tool Department, International Harvester Co., Ltd., Hamilton*

"I BELIEVE in being a pal—rather than a foreman to my apprentices." This, in a nutshell, is why Peter Masterson, foreman of the tool department at the International Harvester Company, Hamilton, Ontario, has made such a success of his position. He has held down his job for the past fourteen years, and is known, not as Mr. Masterson, but simply as "Pete." He is always open for suggestions, in fact is mighty glad to get them, with the result that he is a pal with his men as well as with his apprentices. No one takes advantage of his friendliness, and his orders are obeyed to the letter, not through fear of discharge, but because the men take an actual delight in pleasing him.

"What's your opinion of the possibilities in the machinist trade at the present time?" asked Canadian Machinery, "and how, in your opinion, should an apprentice be trained, that is, to make a real mechanic of him at the finish?"

"That's a large sized order you've handed me," countered Pete with a smile, "but I'll answer it to the best of my ability. First let me speak of the possibilities in the trade at the present time. To my mind they were never better. The young man of today has a wonderful chance. He has the privilege of working with the most up-to-date machine tools; he is given better and finer work than the old timers ever received, and what's more he is given better instruction than was possible in the old days.

"If you will pardon the personal reference, here is what I mean. When I was an apprentice my life was no bed of roses. I was continually bickering, for as soon as you proved adept at some particular machine, there they wanted to hold you. I remember on one occasion I had to walk for my coat and hat before I gained my point. I had just succeeded in being transferred from the lathe to the assembling department, but my success was apparently going to be short lived, for along came the superintendent a few days afterward with the order that I was to go back to my old job on the lathe.

"'Why do I have to go back?' I queried.

"'Because you're told to,' came the reply, 'and what is more, you're the only one familiar with the job we want.'

"It was a show down pure and simple, and I realized it.

"'All right,' I said, 'I guess I'm through. If you won't give me a chance to learn the different angles of the business, I guess I'd better get out and learn it some other place.'

"You can imagine the look on the superintendent's face, and off I walked for my coat and hat. There is no need of going into the details. Enough to say I won my point, and stayed in the assembly department, but I merely tell the story as one incident in my rather checkered career.



PETER MASTERSON

TO tell the complete story of Pete's career would read like a dime novel. Enough to say he started in the usual way by becoming an apprentice, but refused to follow the work at the usual pace, with the result that he was making tradesman's wages long before his time was out.

By persistent plugging he has now reached a position where he can guide the career of others, and is doing so to the best of his ability. Let any young fellow show Pete signs of ambition, then watch him bring it out. The boys like him, and he likes the boys. This, briefly, is why he is a success, and a real pal to men and boys alike.

"I was anxious to get on—in fact was determined to get on, no matter what the cost. The necessity of thus asserting yourself, however, is over. The apprentice of today, except perhaps in a few isolated cases, gets a real chance to learn the business from one end to the other."

"How were wages in those days?"

"Wages!" laughed Pete. "Well, the least said about them the better. Even the full fledged journeyman made only $1.80 per day, so guess for yourself how many cents I made per week.

### Technical Chances

"Then look at the technical chances at the present time. Take the first class technical schools. The apprentice can go to such schools as many nights a week as he cares to—and all free, or at least practically so. If he attends all the classes he gets his fees returned. The very best of instructors impart information that will stand him in good stead, and at the same time increase his earning power."

"Then you thoroughly believe in such schools?"

"Most assuredly," came back the answer. "The man or boy who doesn't believe in them has something wrong internally. You know, our boys here are sent up to the technical school half a day each week. The firm pays their regular wages, and even though they do this, it's funny how some will try to skip instruction, or in plain words, play hookey. Of course such boys are the exception—and we soon find them out. In fact, each apprentice must sign his name on a sheet as he enters the school, and the time of his entering and leaving are noted on the same sheet. I receive these reports at the office, and of course have an actual tab on every boy.

"I remember one particular case of a lad who looked as if he had the goods, but who would persist in playing hookey. I hated to let him out, for his father who worked for me was a real mechanic, and I felt the son had it in him too if he would only settle down to school. His work at the plant was splendid, so I decided to have a chat with his father about it. When I told him that his son had been skipping instruction he went higher than a kite and promised to wipe the floor with him. In fact, I had some trouble in holding back the exhibition right in the department, but finally I persuaded him that such a procedure would only make matters worse.

"After some further discussion I decided to try diplomacy. I got this prodigal aside and in a quiet way talked the matter over. I put it straight up to him that if he wanted to be a success he would have to do some home study, attend the technical school, and learn mechanical drawing and mathematics. Soon he began to see my angle of it and admitted that there might be something to this study stuff after all. Having gained my point, I did not follow it up by a lecture, but told him how glad I was he had seen it my way and we parted the best of friends. Today that boy is as good a worker as I have, and before you leave I'll let you have a chat with him, so that you can form your own judgment."

"His work at the school—how is that coming along?"

"Fine,—in fact I'm glad you raised that point, for I've got a hobby, if you might call it so, in watching the char-

*WORK THAT WAS OVERDONE*

*Here is a story that Mr. Masterson swears is true, and should serve both as a story and an object lesson.*

*"I remember a funny experience that happened to an apprentice—one of the type who would persist in roaming all over the shop while his machine was feeding. On this particular day he set his boring tool in position to bore out a rather long hole, slipped in the feed, then went a-visiting—but—he roamed too long.*

*"Imagine his surprise to find on his return that the tool had done its work well—in fact, too good, for it had not only bored out the hole, but the chuck and lathe spindle as well, the result being that the chuck, work and part of the lathe spindle rested gracefully (?) over the boring tool, while the machine was still feeding right merrily.*

*"Luckily, this apprentice had vision enough to imagine what was going to happen him, so without giving the foreman the trouble of discharging him, he secured his coat and hat, left the plant, and has never been heard from since."*

acter of each boy from his drawings that are completed at the school. The character of each individual stands right out of the drawing. If the boy is careless by nature his drawings are smudgy, sort of semi-finished, and lack the touch of the neat, painstaking worker who must have everything perfect before he calls it a day.

"To show you that we give the boys every chance to succeed, let me tell you two rather interesting stories. Some time ago the foreman of our bolt department said to me, 'Say, Pete, the first time you have an opening for an apprentice let me know. I have a young fellow in my department who is too good to stay there.'

"On the first opening occurring, I went down, had a talk with this young chap, and although he was doubtful about making the change, I signed him up. This fellow had no special education to speak of, yet by home and school study, plus the instruction he received from us, he developed into a splendid mechanic. He had it in him. We merely helped to bring it out.

### Taking a Chance

"In telling the next story, I'm sort of taking a chance, for some foremen may not agree with me. However, in my own mind I am fully convinced that my viewpoint is correct, so here goes the story.

"Some time ago I had a young apprentice working for me that showed great promise of success. He was always eager to learn, and I often invited him up to my house when we would continue his lessons in the quiet atmosphere of the home.

"Of course, neither he nor I discussed these meetings in the shop, for had we done so, I feel sure the rest of the boys would have thought he was a sponger. The real cause of his friendliness was his desire to learn more, and never once did he presume on that friendship. I tell this story because I want some young fellows to read it—then lose this idea of sponging. Go to your foreman, ask his advice and if he is the right kind, he will give you all the help he can, without ever considering you are sponging, or presuming in any way. Of course there are a few foremen, a very few, who would resent an apprentice bothering (?) them, but luckily the variety are dying out. The day of the driver is gone. I never bawl a man out in public. He resents it, and it doesn't do any good. Get a man to one side, tell him frankly if you have a grievance against him, and you've made still another friend, contradictory as it may seem.

"Then there is the question of technical literature. To my mind this is a very important aid to success. More reading of such magazines as the one you represent would aid apprentices, machinists and tool makers alike to keep up to date. I wish I could hit this point home to every mechanic, especially the apprentice, who is really the mechanic of the future."

Mr. Masterson is of the belief that specialization can be carried to extremes. As he so aptly put it, "The amount of specialization depends entirely on the nature of the work being produced." An apprentice should learn how to operate different machine tools, also fitting work, but if a journeyman decides to become a specialist on some particular machine—well, that is his own business. As long as specialization is looked at from the viewpoint of production it will continue irrespective of our opinions.

"In one plant that I know of, this spe-

*RIGHT FROM THE SHOULDER*

*"As I have told you already, I believe the day of the driver is gone," said Mr. Masterson. "But here is a rather humorous tale to show that even a bulldozing foreman can have a saving grace of humor.*

*"This particular foreman was about the worst grouch I ever met, and was continually nagging and threatening his men. They lived in terror of his ways, and used to warn each newcomer what to expect. One day, however, in came a chap who was extremely anxious to please the boss—and on being told by one of the men to watch out for old grouch, etc., he promptly went and told the foreman what had been said about him.*

*"It looked bad for the workman who had meant well in warning the tyro, and soon the three interested, namely, the foreman, new man, and informant, were all assembled in the one room.*

*" 'Did you tell this guy I was no good, a bulldozer, a grouch, etc.?' thundered the foreman."*

*"The poor worker had visions of losing his job, and jobs were none too plentiful at that time, but he decided to brave it out. 'I did,' he replied, 'and what's more, you're all I said you were.'*

*"The foreman growled in his throat, then said: 'Well, be that as it may—let him find the —— thing out for himself. Go back to work.' And he did, but strange to relate, the foreman was never so grouchy as he had been before to that particular chap."*



WHY COMMENT ON THIS PICTURE? IT SPEAKS FOR ITSELF. PETE STANDS IN THE CENTRE, WHILE THE FOUR HUSKIES IN VARIED ATTITUDES ARE THE APPRENTICES WHO WERE PRESENT WHEN THE WRITER CALLED.

cializing is carried to the extreme. A considerable number of die sinkers are employed; in fact the majority of their help is of this branch of the trade. Suppose a new man applies for a position, claims he is a die sinker, and is told to come into work in the morning. On arrival he is placed in a corner by himself, not with the regular workers, and there he must work out his destiny, namely, prove his worth without help of any kind. Providing he makes good, both as to quality and speed, he is moved beside the other men. Should he be of only average value he is gently but firmly shown the door. This, to my mind, is specialization carried to the point of being ridiculous.

"A new man entering our employ is not handed the hardest job first, but is given a chance to find himself. Some men are naturally nervous at the start and do not display their best work until accustomed to the surroundings. It is my contention that if you give a man a chance he will do better work in the end. In other words, have confidence in the men, and they in turn will have confidence in you. But let me stop at this point and take you out to see a few of the lads who are serving their apprenticeship. There are only four here today, as we split things up to let some go to school, others to stay and work, this preventing any severe change in our department, as far as the operation of the machines is concerned."

### The Boy's Viewpoint

The first one spoken to was a fellow called Turner.

"What do you think of the school idea?" we asked; and back came the answer, "Fine. I wouldn't be without the school training for anything. It has helped me wonderfully, and I can see the advantage of it clearly."

The second boy, McDougall, had a similar story to tell, and was especially thankful to the school for the help it had given him in fractions. "You know," he said, "I had forgotten all about fractions until I went back to school, and of course it is mighty handy, in fact necessary in my work."

"What studies do you cover?" we asked.

"Drawing and arithmetic of all kinds. In the drawing lessons we first of all make a sketch from some object, such as a casting for some machine. This is then taken away and we have to make a mechanical drawing from our sketch."

The other two chaps were of like mind, and one of these was the fellow who used to play hookey. He grinned sheepishly when we jollied him about it, but admitted he was now a strong booster. Decimals was his Jonah, until he went back to school, but now he has got them securely by the neck.

Every one of these boys, without any prompting, spoke of the value of the school in helping them read drawings. Each had his own way of putting it, but briefly here was the consensus of opinion —that they could now read a drawing quickly and intelligently, whereas before it looked Greek to them.

"You see," remarked Pete, on our returning to his office, "what I told you is absolutely true. Each of these boys is a booster and the others could tell the same story were they here. To my mind the profession is far from overcrowded and the benefits to be derived warrant a boy entering it. He should never be forced to enter it, merely because his father was a mechanic. He must first of all have a natural liking for it. As to the future, I believe it holds wonderful possibilities for the young fellow who really tries, and decides in his own mind to be a success."

## STRAIGHTENING A ROTOR SHAFT

By D. A. HAMPSON

The method of straightening a rotor shaft described in the February 10 issue is both novel and instructive; it is one that should suggest a way out of other ticklish straightening jobs. There is no question but that there are unrelieved stresses in a shaft so repaired—if there is a suitable factor of strength in the original shaft and if the service is not fatiguing, no harm will result. The conditions under which a repair is performed often make it necessary to violate the teachings of theory, but if results are the true test of engineering, then such repairs must constitute good practice.

Some time ago a screw was brought into our place to be straightened. It was a piece of steel twenty feet long over all with fifteen feet of square thread, single, having a pitch of one inch and an O.D. of three. This screw was part of a special machine and moved a heavy carriage back and forth. Something had blocked the carriage and the screw, making 200 R.P.M., had bent close up to the nut. It was a job we did not want to do for obvious reasons, and we frankly told the customer so, but he did not want to send it away to the people who made the machines and he agreed to pay well for the time and accept all risk.

There was no lathe within forty miles that would take the length or over half of it, but we had a planer with a fifteen foot table, and by placing the screw diagonally (to dodge the slots), we were able to roll it on the top for sighting purposes. It was not hard to pick out the bend—a straight-edge would do that —but it is always of great assistance to rotate a piece being straightened.

Actual straightening was done by putting the bend down, with a block under this part to raise it half an inch from the table, and then drawing down on clamps on each side of the spot. The planer was a heavy one and we had no fear as to which piece would go first. Our fear was that we would get too far, and, worse, would get a reverse bend alongside the original one. To be safe, we bored out a piece of cast iron to three inches, and sawed it up into three pieces, putting a short section under the screw and longer ones under the clamps.

A swaging tool was also forged out and fitted to the space and curve between the threads. This was used to force back the metal where it had been compressed, thus assisting the clamps as pulled down, and putting a stress of compression in the metal where there would otherwise have been only the tension due to drawing the screw back to a straight line. As the clamps were pulled down, this swaging, or peening, was carried on—greatest at the point of bend and tapering off in amount for a couple of threads each side.

After a cautious trial of this scheme, followed by more confident repetitions, we pronounced the screw commercially straight. Indeed, it was a first-class job and surprised us ourselves. There was a certain amount of stretch at the critical point, that we knew, but as it was not discernible with a rule and showed up only when calipers were applied, we thought there would be no interference in passing through the nut—and luckily there was none.

Editor's Note: This is the style of short articles we like. Snappy and to the point—yet imparting information of real value to the mechanic. Let us hear from others, not only on the subject of straightening, but about any unusual repairs.

## LACQUERING METALS

Occasionally tin and other white metals are required for decorative purposes, remarks Practical Engineer. Should a yellow be desirable, plus some degree of brightness, the following lacquers will prove very useful. Steep 2 oz. of turmeric (coarsely ground) and ½ oz. of gamboge in two pints of clear methylated spirit for about ten days and then add 2 oz. of pale shellac. When the shellac is dissolved strain it through fine muslin and use. Or take mastic in tears 1 oz., gum sundarac 1 oz., gum elerni ½ oz., gum animé ½ oz., and dissolve in one pint of clear spirit, and add gamboge, or soluble extract of saffron, or annatto previously dissolved in spirit, the amount depending on the color required. The articles to which the lacquer is applied must be quite clean and free from grease, and the coating should be applied in a warm apartment free from floating dust.

**New Branch.**—It has been announced by the W. S. Mahaffy Company, Gladstone and Trafalgar Avenues, Toronto, that they are operating a new department known as the Ornamental Iron Products Company. H. Harlander, former superintendent of the Canada Foundry Company, and for twelve years with the firm of John Williams, Inc., New York, is in charge of production.

# The First True Diesel Made In Canada

## The History of the Diesel Engine—Two-Cycle, Four-Cycle, Solid Injection and Atomised Injection—General Description of the D. S. P. 100 B. H. P. 4-Cylinder Diesel

THOSE people who were interested in the exhibits shown in the Machinery Hall at the Toronto Exposition last year doubtless all stopped for a more or less interested look at a new kind of engine. This was the 125 h.p. Diesel exhibited by the Dominion Steel Products Co. of Brantford, and the first of its kind to be built in Canada. It is of the full or true Diesel type, as distinguished from the hot bulb or other surface ignition engines. This type of engine will doubtless have a great part in the developing of some of the outlying parts of our country, and every engineer should understand its principles and operating features.

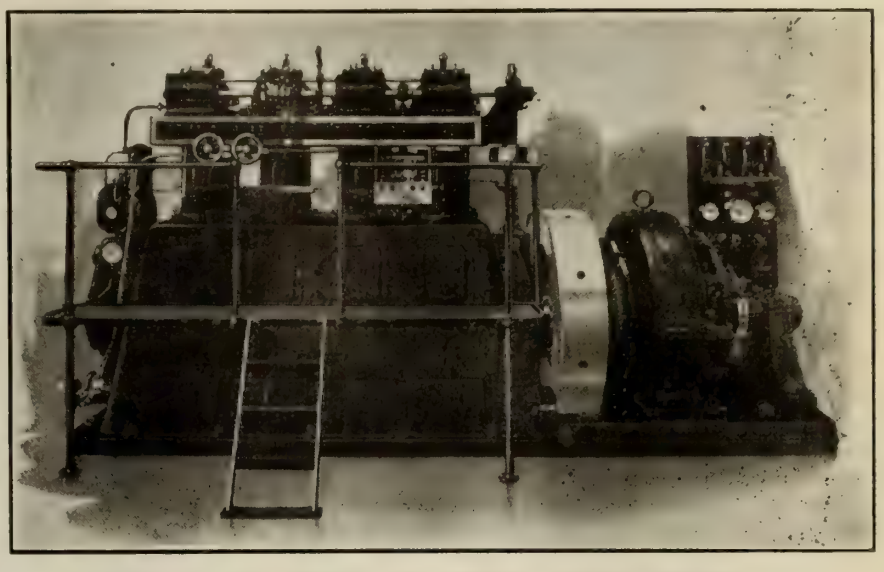
### The History of the Diesel

The Diesel engine should really be known as the Ackroyd Priestman engine, as the cycle it works on was first mooted by these two engineers in England, some years before Dr. Diesel took up the study of this principle. However, Dr. Diesel is usually conceded to be the man who first actually demonstrated its possibilities, and the basic patents were taken out by him in 1892. He built his first engine in 1893, and this was driven by a belt and did not do any work. What it did do, however, was to prove that oil could be ignited by the heat of compression of air, which is the main feature of the true Diesel engine. In the experimental engine, Dr. Diesel obtained a pressure of 1,350 pounds per square inch, and incidentally when the fuel was injected, the explosion that followed wrecked the engine. It almost resulted in the death of the inventor, but he rose from the ruins triumphant, for, even if the engine was demolished, the principle was established that the fuel could be ignited by means of the heat of compression.

Another engine was built, this time the compression being kept down to 500 pounds per square inch, and on this occasion the full cycle was obtained. Later another engine was built, with the cylinder water cooled, in 1896. Dr. Diesel sold his patents in 1897 for the sum of $1,500,000, so unlike many inventors, he actually realized the reward of his endeavor. His life ended in a tragic manner, he being lost at sea while journeying from Antwerp to Harwich in the year 1918.

### The Cycle of Operation

The Diesel engine is built in two principal types, the two and four stroke cycle. These types are divided again into other modified classifications. In general, the two stroke cycle gets an ignition at each revolution, and the four stroke cycle receives an impulse every second revolution. In the two cycle type, on the inward or upward stroke of the piston, the products of combustion are discharged, and a fresh charge of air drawn in and compressed. At the top of the stroke the fuel is injected, and the down stroke is the working stroke. In this type the scavenging, or getting rid of the exhaust gases, is a difficult problem, and various means are employed to effect it. The simplest, and most generally used, is crank case compression. The piston descending on the downward stroke, compresses the air in the crank case to five or ten pounds, and this air sweeps through ports on one side of the cylinder when uncovered by the piston, and drives the gases out through a set of ports on the opposite side of the cylinder. Enough air is received on top of the piston to give the necessary compression. In other types the scavenging is done by a separate pump. Then there is the opposed piston type, in which the compression takes place between two pistons in one cylinder, and the working stroke is obtained by one piston ascending and the other descending. These work on three cranks, two of them being at 180 degrees to the other. The top piston is supplied with a crosshead, from which two connecting rods are connected to the two cranks at the outside, while the bottom piston is attached to the centre crank. When explosion or ignition takes place, the top piston pulls the two outer cranks up, while the centre crank is pushed down by the bottom piston. This type is known as the Junker, pronounced Yunker. Very often the scavenging in this type is done by a separate air compressor, instead of using the crank case compression.



D.S.P. H.C. OIL ENGINE. FOR CENTRAL STATION SERVICE.

The four cycle type is divided into solid injection and air spray injection. In the solid injection type the fuel is injected by a fuel pump working at a pressure of 6,000 to 8,000 lbs., directly into the combustion chamber. In the air spray type, which is the one we are about to describe, the fuel is injected into a chamber containing compressed air at a pressure of about 1,000 lbs. per sq. inch, and shot into the combustion chamber as a finely atomized mixture of air and oil.

The two types have their different adherents, the solid injection school claiming that their method does away with the necessity of an air compressor steadily running, while the air spray school claim better combustion, which amply makes up for any supposed disadvantage from the use of a high-pressure air compressor.

### The Four Cycle Type

In the four cycle type the first downward stroke, or outward stroke perhaps is a better way to put it, draws in a charge of pure air from the atmosphere, not the crank case. On the inward stroke this air is compressed to the required pressure, about 550 lbs., and at the top of the stroke the finely atomized fuel is injected by the air pressure from the air compressor delivery chamber. Ignition takes place at constant pressure, and the third stroke is the working stroke. On the fourth stroke the exhaust gases are discharged through a special exhaust valve and the cylinder is ready for the cycle to be repeated. The cycle may be described as suction, compression, expansion, and exhaust.

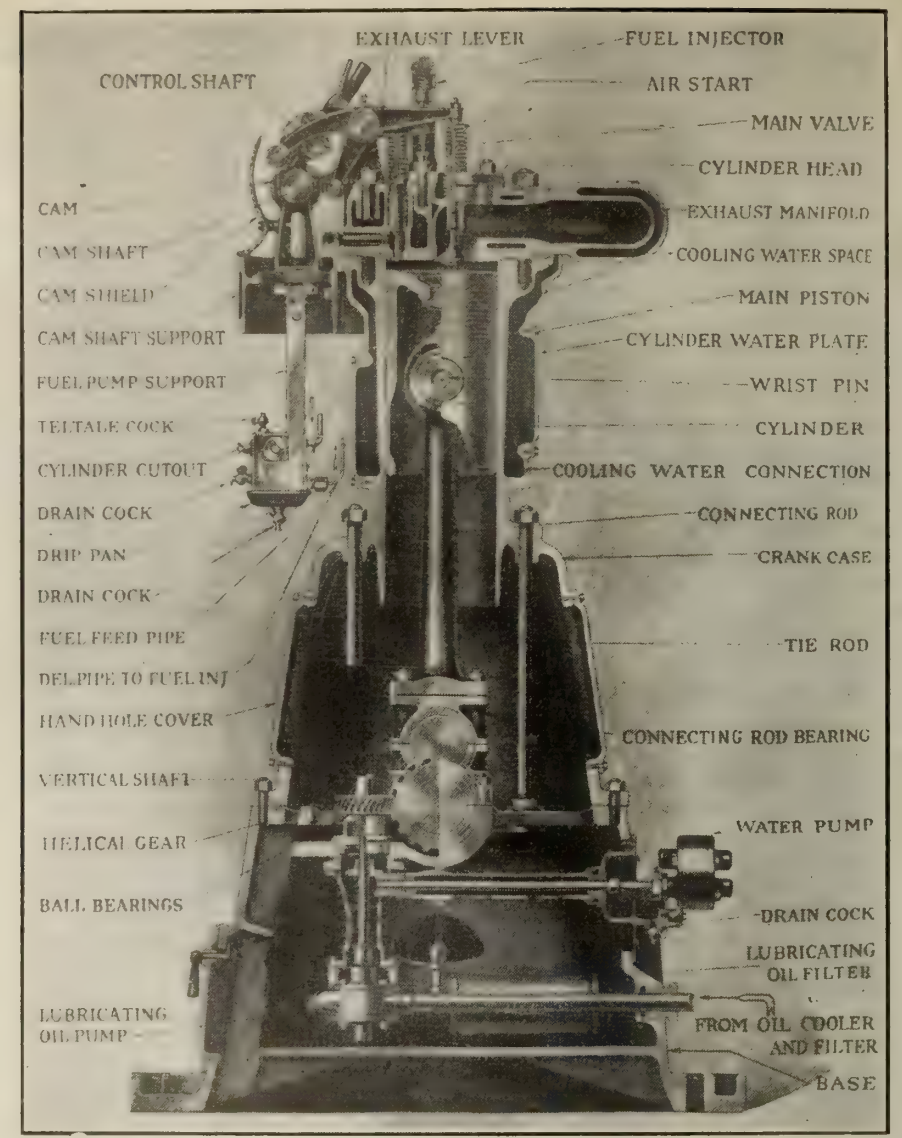
### The D.S.P. Engine

The illustration herewith gives a good

idea of the outside appearance of the engine, directly connected to a generator, for power and lighting service. This is exactly as the engine appears in the shop where it is now engaged in running a number of machines and overhead cranes. The engine is four-cylinder, four cycle, spray injection. On the end opposite the flywheel and generator is the air compressor for injecting the fuel, and supplying the air bottles, which are used for starting purposes. On the front can be seen the fuel pump. Both of these pieces of apparatus will be described fully later on. The engine operates on crude oil, with a specific gravity of about .865, or even higher, but with this specific gravity the oil will flow without heating in to the fuel pump. The efficiency of the engine is high, as it will deliver practically 30 per cent. of the fuel energy at the pulley as useful work. This is, of course, much bigger than with any type of steam prime mover, and is attained in the Diesel engine because the fuel combustion takes place in the same chamber that the work is done in. With the steam engine, the combustion takes place in a furnace, the heat is conveyed through the plates of the boiler into the water, and then carried by the steam through piping into a cylinder or turbine casing, with many losses on the way due to radiation and friction.

In the engine we are dealing with compactness of design has been studied to good effect. It is necessary, of course, in an engine of this type to make provision for starting up. The method of starting is to admit compressed air to the cylinder to obtain the initial revolutions and compression. In order to do this it is necessary to have always a reserve of compressed air, and for this purpose bottles or flasks are provided, much like ammonia or oxygen cylinders. In most cases these are mounted on a wall convenient to the engine, but in the D.S.P. engine, provision has been made for carrying these bottles in the bedplate of the engine. This arrangement makes the engine absolutely self-contained, and ready to start the minute it is dropped down and secured to the foundation, and connection made to the fuel oil supply. The air is supplied to the bottles by the two stage air compressor situated on the end of the engine, and after the engine is started up this compressor supplies the air continually to the air injection valve for atomising the fuel. Such surplus air as may be delivered is diverted to the bottles.

The fuel pump is worked from a small crosshead, which is driven from a special eccentric mounted on the cam-shaft, which operates the valves. There are four plungers on this pump, one for each cylinder. The amount of fuel injected at each stroke is varied by a governor, which operates by holding the suction valve of the fuel pump open for a longer or shorter time, thus controlling the amount of fuel delivered per stroke.

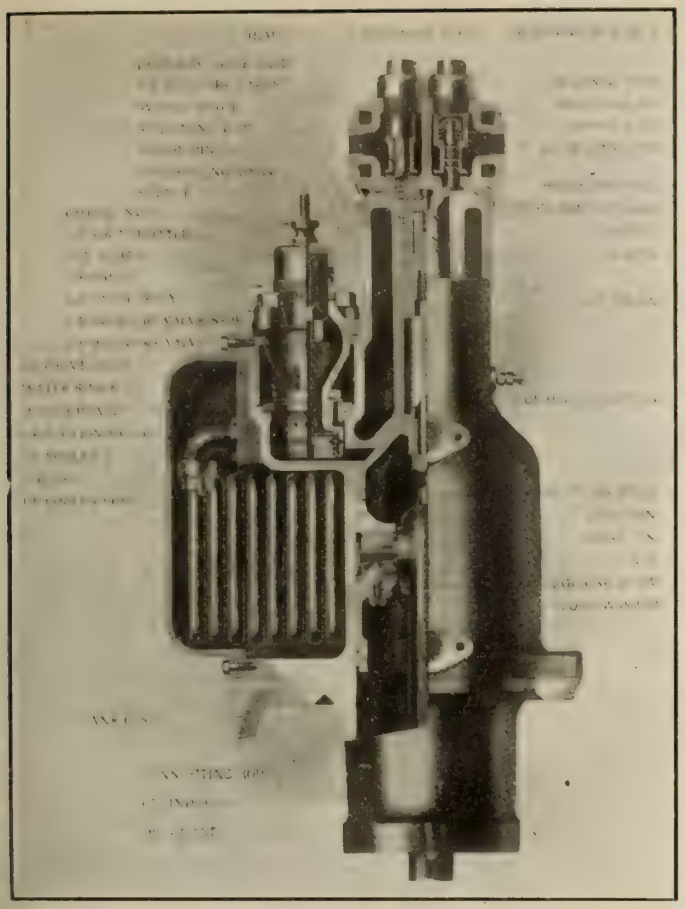



CROSS SECTION THROUGH CYLINDER.

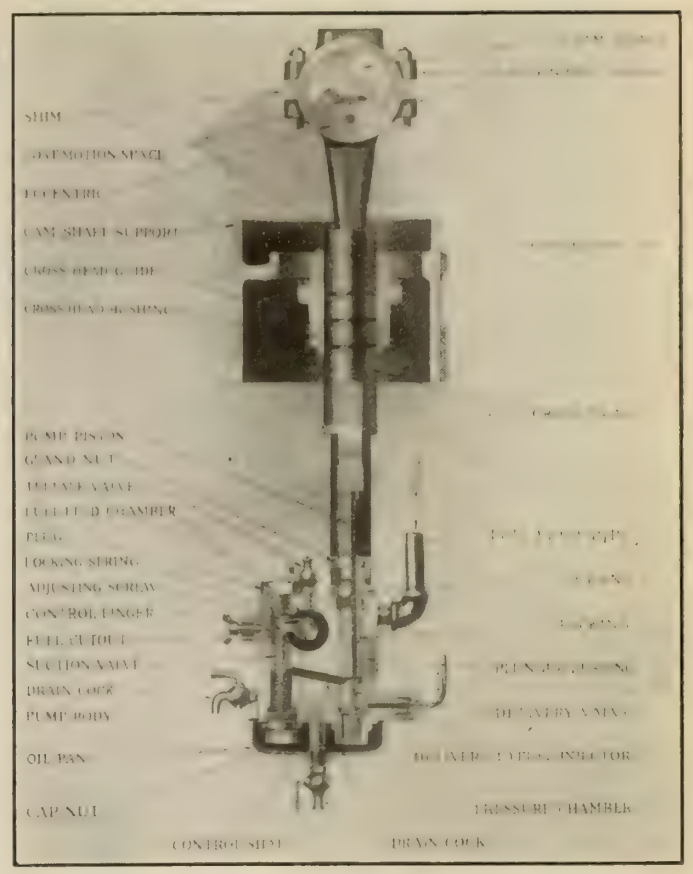
Holding the suction valve open, of course, is the same thing as shutting off the supply, and the speed of the engine is regulated very closely by this means. Each cylinder has the necessary valves for air start, fuel injection, and exhaust, and in addition to these, the two centre cylinders are supplied with air starting valves. These valves can be put on each cylinder if required, and the cylinder head is machined to receive them, but in practice it is only found necessary to use the two mentioned. These valves are all operated from a cam-shaft, driven by gearing from the main shaft. The cams operate levers, which open and shut the valves at the precise period of the stroke necessary to accomplish the various functions. The action of these cams is, of course, exactly the same as on a gas engine or a gasoline engine, with which most of us are familiar these days.

### Starting the Engine

In starting the engine the following is about the method of procedure. The reserve air bottles will have been left when the engine shut down with a pressure of about 950 to 1,000 pounds, and will have, perhaps, dropped owing to the cooling of the air to about 800 lbs. or perhaps a little less. The operator first of all raises the relief valves of the cylinders by means of a special lever, which action releases the compression in the cylinders, and allows him to bar the engine round to the air start position. This position is, of course, that in which the air start valves on the two inside cylinders will be open for the admission of air. He then closes the relief valves again, and opens the valve from the air bottle. The engine immediately turns over, and the operator, who has previously seen that the fuel tank is full and ready for the day's work, opens the fuel control valve to give fuel to the pump, and closes off the air start valves by means of a control lever, which puts the air start lever into neutral position. This particular engine usually picks up after a couple of revolutions from dead cold. The operator comes in about ten minutes before starting time, looks at his fuel tank, gives a general look around the engine, and starts her up



SECTION THROUGH AIR COMPRESSOR.




SECTION THROUGH FUEL PUMP.

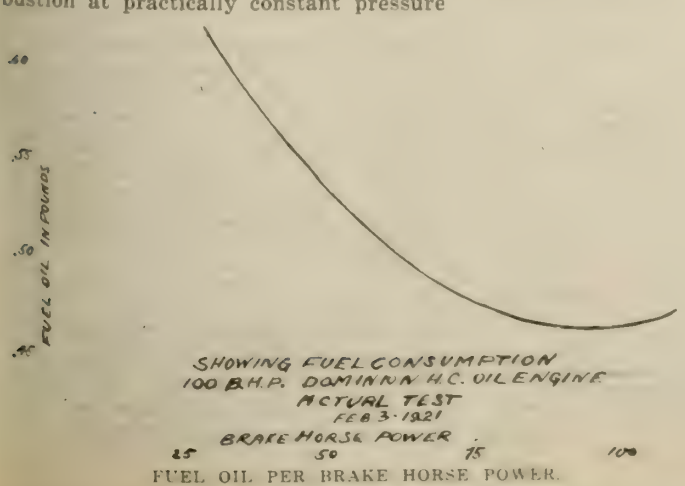
about five minutes to the hour, and is all ready with the current at the switchboard when the shop is ready to start.

Once started, the engine requires practically no attention. The air compressor draws in the air from the atmosphere, passes it over the element containing the air coming from the low pressure stage to the high pressure stage, thus cooling the latter, passes the air through its two stages, the final delivery pressure being from 900 to 1,100 lbs., according to the load being carried. This air is delivered to a chamber on top of the cylinder, and at the proper moment the fuel from the fuel pump is injected into this chamber and the valve from the chamber into the cylinder is opened, and the finely atomised spray of oil fuel injected. Ignition takes place without shock and combustion at practically constant pressure ensues, the gases expanding and driving out the piston. At a point just before the bottom of the working stroke is reached, the exhaust valve is opened, and held open throughout the return stroke discharging the exhaust gases. At about the top of the stroke, the cam closes the exhaust valve, and opens the air suction valve, and the cylinder is filled full of pure air. The valves are then all closed, while compression takes place on the fourth stroke, and at the end of this stroke ignition again occurs.

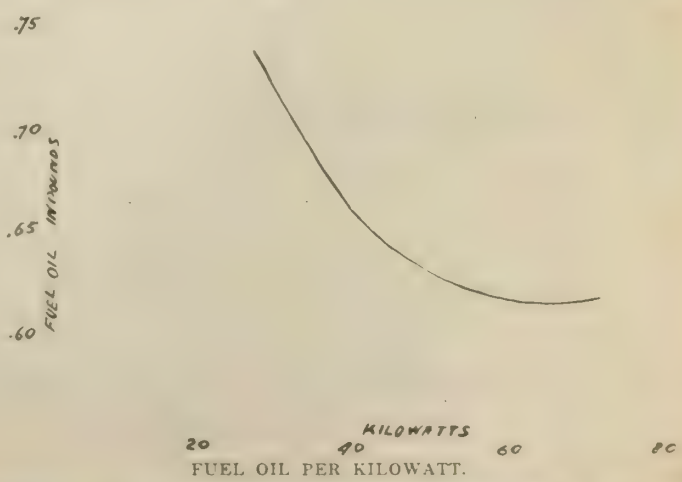
A pump situated in the base of the engine supplies oil under a pressure of ten to fifteen pounds to the crank pin, and through the connecting rod to the wrist pin, while special lubrication is supplied to the piston. The air compressor is lubricated by the oily spray generated in the crank pit by the passing of the cranks through the oil bath, and this is all the lubrication employed for the air compressor.

The accompanying illustration shows the typical indicator cards obtained from this engine, while the section cuts explain very clearly the working parts. Fuel consumption is shown by the curves illustrated here.

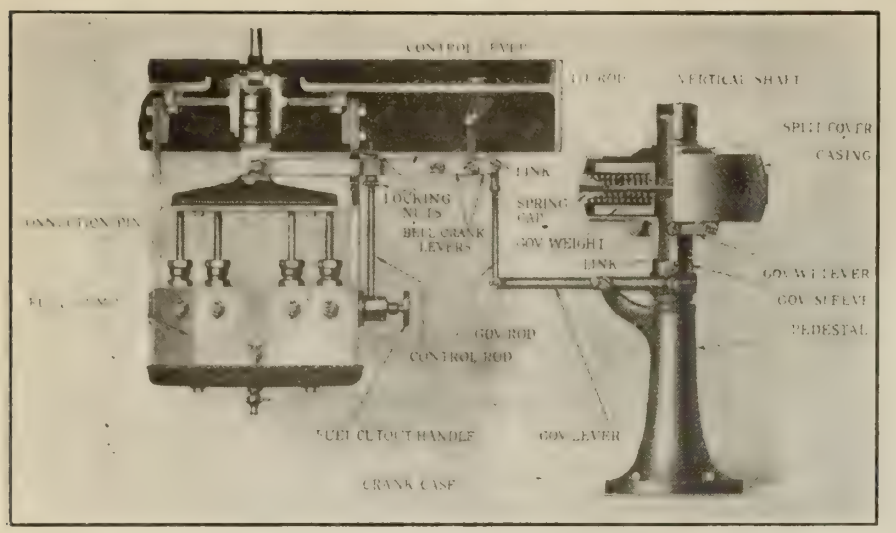
A representative of Power House had the opportunity recently of seeing this engine performing its daily task, and was impressed with its splendid performance under somewhat difficult circumstances. This engine was built with an ordinary sized flywheel, to drive a generator on fairly constant load. The work it is doing now is under very considerable variation of load, from no load to a 50 per




FUEL OIL PER BRAKE HORSE POWER.



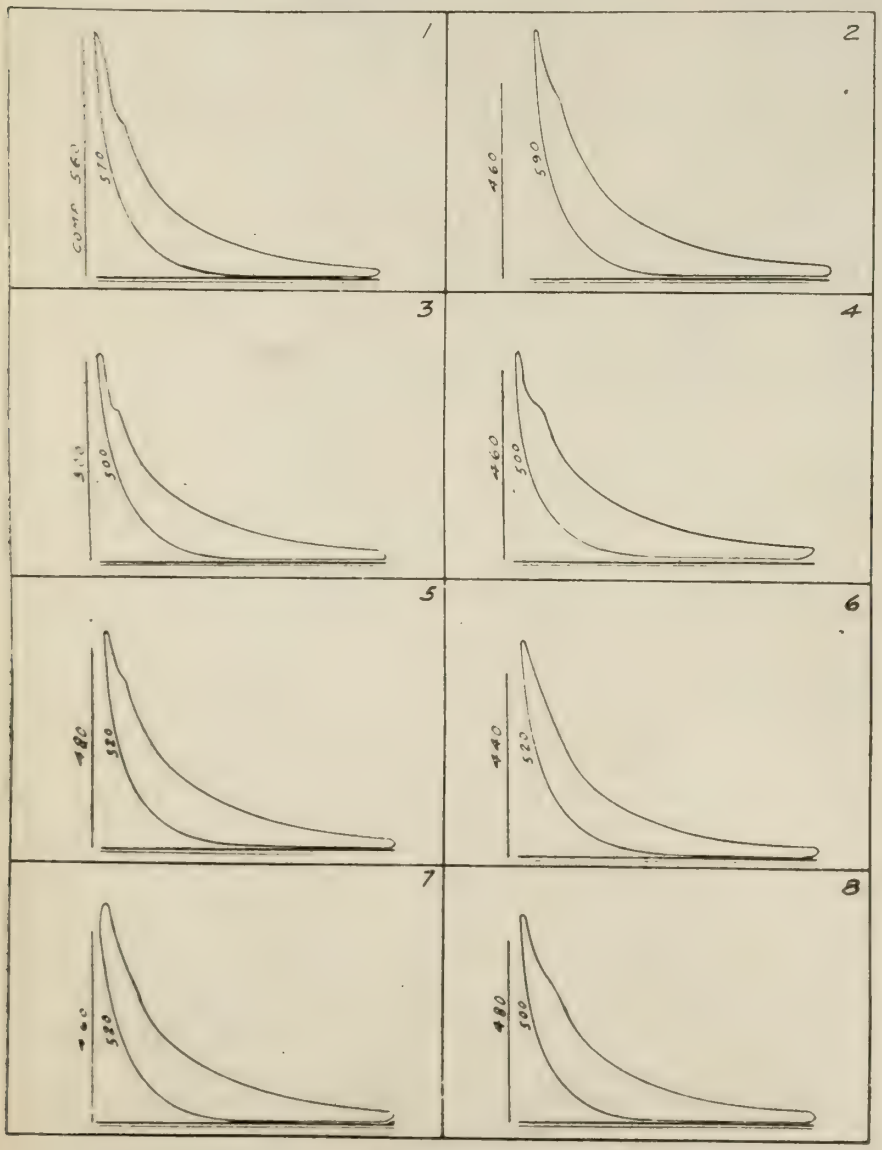

FUEL OIL PER KILOWATT.




THE GOVERNOR AND CONNECTIONS

cent. momentary overload occurring frequently. The speed regulation under these conditions was excellent, and standing at the exhaust pipe, the only indication of anything unusual was a puff of blue smoke. At ordinary load the exhaust was practically invisible, showing excellent conditions.

The Dominion Steel Products are to be congratulated on being the pioneers in Canada of this type of prime mover, and its development will be watched with interest by the engineering profession in general. Mr. Brown, the designer of the engine, gave a highly interesting lecture on the engine before the Canadian Association of Stationary Engineers recently, which was well attended, and discussed with interest by those present.




TYPICAL INDICATOR CARDS.

**POINTS ON CONSTANT PRESSURE DIESEL ENGINE.**

It can use high compression pressures as it does not compress a mixture.

The mixture is very lean and burns slowly and loss in cooling water is less.

Four gallons of cooling water per B.H.P. ample.

Perfect combustion due to complete atomizing and slow burning.

Oil of high flash point, thus cheap oil can be used.

Typical test data:—

Compression pressure per square inch, 510 lbs.

Mechanical efficiency, 82.5 lbs.

Fuel consumption per B.H.P., .45 lbs.

Cooling water Temp.—in, 46 deg. F.

Cooling water Temp.—out, 103 deg. F.

Exhaust gases, temperature, 600 deg. F.

Heat value of fuel, B.T.U., 19,000.

Specific gravity of fuel, B.T.U., 86.5.

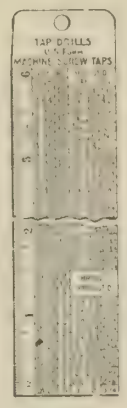
## NICKELING ALUMINIUM

A process for nickeling aluminium is described in Annales de Chimie Analytique as follows: The aluminium is immersed for two minutes in a cold solution of ammonia and potassium cyanide. The metal is then well washed and brushed with milk of lime until the surface acquires an even, brilliant white tint. Then the washing and brushing are repeated with water, so as to get rid of all traces of lime, and the metal immersed in an acid bath of manganese, and iron chloride. The metallic coating of iron or manganese which serves as the "mordant," as it were, to fix the nickel to the aluminium, forms upon the aluminium. After two to three minutes' immersion in the acid bath, the metal is rinsed with water and put in the nickeling bath, which consists of nickel sulphate. The anodes are plates of laminated nickel. The electric pressure used should lie between 2.5 and 3 volts, otherwise a non-adherent deposit would be obtained. The current density should be from 1 to 1.5 ampères per square decimetre. The treatment for moderate-sized objects lasts one hour to one hour and a half, and is followed by washing in boiling water and drying by compressed air.

It has been announced that the contract has been let for the erection of a ten-story hotel structure at the corner of London Street and Dougal Avenue, Windsor. Estimated cost $2,188,500.

# Have You Tried This Contest Yet? If not--- Do so Now

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.



The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

## What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

Evidently there was some doubt about question No. 6 in the Feb. 24th issue, for only one reader had it correct. The query was, "A reasonable request." Look on Page 31 of that issue and you'll see the request. Reginald Compton, 321 St. Philip St., St. Henry, Montreal, was the only reader who sent in twelve correct answers, so that the scale goes forward to him. We have had several letters stating that scales have not been received. Should there be any other prize winners who have not receivd their scales, write us at once. We have been posting these scales regularly, but for some reason or other they have been going astray. They are now being sent by registered mail, so we should have no further trouble.

**CONTEST FOR MARCH 17TH ISSUE**

**Contestants are required to write us, stating to which advertisements we refer in this number.**

1—Something that has a swing over the bed of 35". Some swing?
2—A product said to be a profitable producer.
3—Something useful in damp localities.
4—How to solve the problem of economic production.
5—Something that is beyond the experimental stage.
6—A product that cuts and draws in one operation.
7—Some valuable inside information.
8—How to make better workmen.
9—Something noted for their efficiency.
10—How to maintain safety, economy and efficiency.
11—Something that has been made for eleven years and is still giving satisfaction.
12—How to handle special jobs away from the air line.

**These are Correct Answers for List from February 24th Issue:**

1—Canadian Ingersoll-Rand Co.
2—Smooth-On Mfg. Co.
3—Northern Electric Co.
4—Butterfield & Co.
5—Taylor Instrument Co.
6—Gisholt Machine Co.
7—Nicholson File Co.
8—Cleveland Pneumatic Tool Co.
9—Independent Pneumatic Tool Co.
10—Canadian Detroit Twist Drill Co.
11—The Liquid Air Co.
12—Imperial Oil, Ltd.

## Closing Date for This Contest is April 7th.



# DEVELOPMENTS IN SHOP EQUIPMENT



## PATENTED CUTTERS

The Cleveland Cutter & Reamer Co., 1619 Merwin, Ave., Cleveland, Ohio, have placed on the market a line of patented inserted tooth milling cutters as shown in the accompanying illustrations.

The cutter shown at Fig. 1 is known as an inserted tooth side milling cutter and has a machine steel body. The blades are made with a corrugation on the back as shown, and it is claimed that this method eliminates all slipping and tilting, also the packing sometimes used underneath the blades. The blades are said to be so constructed that they can be moved out 50 per cent. farther than various other types with similar results.

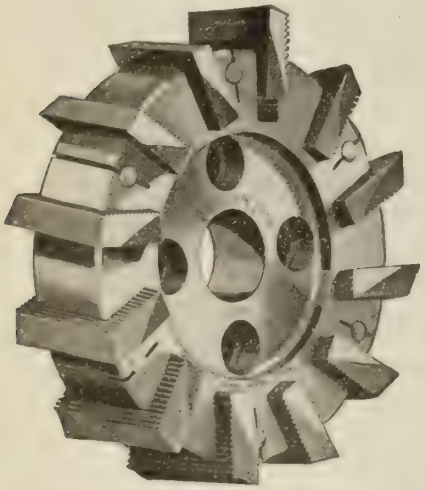


FIG. 1—SIDE MILLING CUTTER.

All blades are interchangeable and can be replaced at small cost.

The face milling cutter shown at Fig. 2 has all the other characteristics of the former styles and is made with both carbon and high speed blades. The blades are set so that they can be easily adjusted when worn. A taper hole, with keyway for driving, is used, but this same style cutter can be made with threaded hole, or to fit milling machine with flanged spindles if so desired.



FIG. 2—FACE MILLING CUTTER.

The third example, Fig. 3, depicts an adjustable reamer that is said to be the only reamer that has a double adjustment. Screwing back the lock nuts in back of the blades 5-16 of an inch will give .083 inch adjustment. Placing the blades up one step in the corrugation will give another .083 inch of adjustment. This procedure can be continued until the blades are worn out. The reamers are made with blades set in the body straight as shown, but spiral set blades are made when ordered. They can also be equipped with a float if desired. All sizes from 1 inch to 6 inches, or even over if on special order, can be furnished. The first type of cutter is made in sizes ranging from 6 to 12 inches, while Fig. 2 is made from 5½ inches to 9½ inches. It is, of course, understood that other sizes can be made if desired.

## POWER MOWER

The Aikenhead Hardware, Ltd., Temperance St., Toronto, Canada, are now Canadian distributors for the Ideal Power Lawn Mower Co. It might be well to add that these mowers are said to be a new departure, in so much that they are very simple in mechanism, and complete control is effected by two levers. One lever governs the power unit, the other raises or lowers the cutting unit. These mowers are made in various styles, but the type shown in illustration is a hand operated model. When the acreage is large enough, the tractor type is used, these of course cutting a larger swath.

The cutter on this mower is not driven direct from the engine, but the cutting reel is driven by the traction of the mower wheels. The mower is freely suspended from the frame by two side arms, these allowing sufficient play to permit a free tilting motion of the cutter. The wheels, of course, readily adapt themselves to any irregularity of the ground surface. This, of course, eliminates breakages when obstacles are met with.

The engine is the design of R. E. Olds, whose Oldsmobile car is already a well-known type. It is of the air cooled type and is mounted in such a way as to give the least possible vibration. Canadian Machinery saw several letters written by users stating their satisfaction with these machines, and it is hoped to interest all cemeteries, golf clubs, city park authorities, private estate owners, in fact any person having considerable acreage to cut. A list was supplied us stating a number of Canadian users at the present time.

The standard machine shown cuts a swath 30 inches wide and has a speed of 2¾ miles per hour.

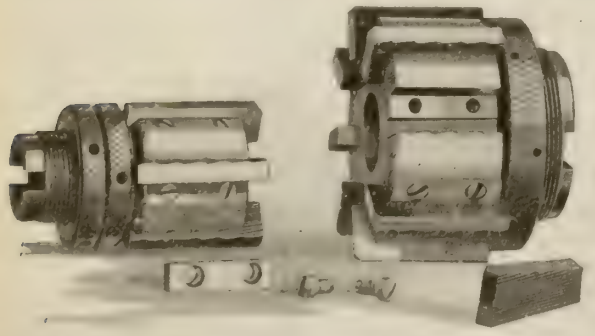
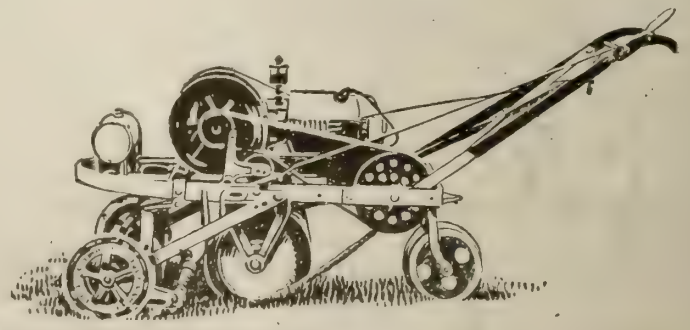


FIG. 3—SHOWING THE ADJUSTABLE TYPE OF REAMER.



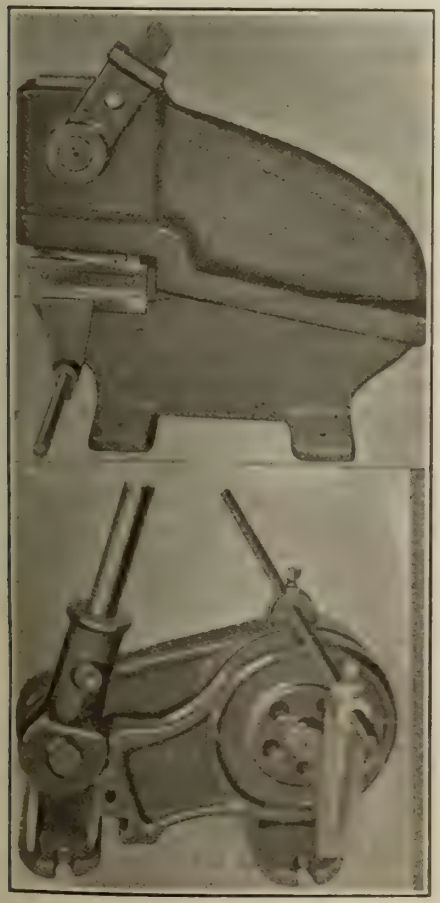
AN OUTLINE VIEW OF THE POWER MOWER.

### TWO NEW MACHINES

The Brantford Machine Tool Co., Brantford, Ont., have placed on the market two new machines, both of which are illustrated herewith. Let us first consider the shear. As will be noted this machine is of rugged construction and is made from the best of materials. It has ample leverage for the work it is intended to perform, and the shear is operated from the front. The frame is offset so that the metal will not bend in cutting sheets of any length or width.

The shear blades are reversible, so that the four edges can be used without regrinding. They are also adjustable. The machine is also equipped with a guide stop, and the hold down on the other side is adjustable to thickness, and is reversible, this allowing it to get close to the blade. Such a shear is claimed to be particularly useful in machine shops, sheet iron works, warehouses, tin shops, blacksmith shops, etc. The capacity is quarter plate, the bottom blade 7 inches long, the top one 6 inches, and the weight 240 lbs. Legs are supplied if necessary.

The rod cutter as shown in the other illustration has a capacity up to ⅝-inch diameter. The cutter blades are made of the best grade of steel, properly tempered. These blades are adjustable and may be ground when dull. A stop can be set to cut any number of pieces the same length, and this machine can be used in any shops using rods or wire.



VIEWS SHOWING THE SHEAR AND ROD CUTTER.

# NEW THINGS IN MACHINE TOOLS

### FLEXIBLE-SHAFT MACHINE

The R. G. Haskins Company, of Chicago, Ill., has recently made some improvements to their flexible-shaft grinding machines for die-sinking. By means of a swivel base the machine can be rotated through a complete circle. This feature, in addition to a special leaf spring support at the motor end of the shaft, assists in eliminating unnecessary bending of the shaft. Trouble is generally developed at the inner end of the shaft, where it connects with the motor shaft, and the added protection prolongs its life.

### GRINDING AND BUFFING MACHINE

In the combination grinding and buffing machine brought out by the Cincinnati Electric Tool Company, provision is made for the alternate grinding and buffing of the work without the removal of the wheels, these being fitted to opposite ends of the spindle. The driving motor forms the body of the machine and the motor windings are fully enclosed. Annular ball bearings are fitted to both ends of the armature spindle and also at the extreme end of the extension spindle. All bearings are amply protected from flying dust. The machine can be obtained either with or without the floor stand.

### DIE-FILING MACHINE

A new line of die-filing machines, especially adapted for work of a heavy character, has been placed on the market by W. D. Rearwin, of 716 Monroe Ave., Grand Rapids, Mich. The machine is adjustable to a maximum stroke of 7 inches. The table has a surface of 20 by 24 inches and is located 30 inches from the floor. Arms are fitted to the machine for carrying hack saws and heavy sawing can be performed. Filing can be accomplished where the bottom of the work has a shoulder or is closed entirely. The machine can be obtained either for belt drive or fitted with an individual motor. The weight of the machine is about 650 lbs.

### NEW STYLE TOOLHOLDER

The Brooke Tool Manufacturing Company, of Birmingham, England, are now making a new tool holder that does not require a set screw for the holding of the small tool bits. The tool-post screw serves the two functions of securing the holder and gripping the tool bit. The holder is self-contained and is so designed that either end may be placed through the tool post. The tool holder is made in two pieces, the clamping portion being retained in position by means of a small pin at the forward end. The tool is made in three sizes.

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# CANADIAN MACHINERY
## AND MANUFACTURING NEWS

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## The Uncertain Steel Market

THE steel market is not in a healthy state, either in Canada or United States, and no good purpose is to be served by claiming anything to the contrary.

The reason is not hard to find—it is, as a matter of fact, lying right on the surface. Neither the buyers, the steel merchants or the steel makers have any confidence in the present situation, particularly in the present price schedule.

We are right in the middle of a sagging market. A careful scrutiny of the markets week after week generally brings to the surface some item that has been more or less whittled and hacked at in order to bring a purchaser to the point where he will place his business.

The steel merchant who wants to liquidate has a peculiar position in the present non-buying market. Even if he is prepared to cut his prices in order to clear out his high-cost material, regardless of whether he breaks even or takes his loss, he has to face the condition of only hand-to-mouth business coming into the market. In plain English, although he wants to liquidate, he can't do it.

One can go over almost the whole run of the iron, steel and metal market to-day, and he will find that there is a feeling of uncertainty as to whether the bottom of the market has been reached. Whether that is really the reason for the attitude of the buyers is open to doubt. Were they in need of iron or steel they would buy and make the best of the price.

The United States Steel Corporation, by adherence to its schedule, has done more than any other agency to keep the steel market both in United States and Canada from running away and losing itself entirely. It has yet to be shown that the raids of the price-cutters have brought an extra ton of business to the books of any of the mills.

## Canada's Iron Ore Again

THE Dominion Government spent a couple of hours the other day listening to addresses telling the members how Canada should go ahead and develop her natural resources, make use of her native iron ores, pay bounties for the production of iron ore, pig iron, etc.

There is nothing particularly new in the idea—in fact, it is old and nothing was added to the sum total of what has been said before by the debates at Ottawa this week.

The trouble with this matter is that those who bring it up from time to time have nothing concrete and definite to offer. It is all very well to carry along agitations in certain directions, but unless something tangible is brought out, the agitation will totter and fall from its own weight.

The work of research requires a tremendous amount of patience and persistence, and the Research Council has done splendid work in its first stages. It must be prepared right from the start to go up against popular indifference because the majority of the people in this and any other country are very fond of working along the lines of least resistance, and that is one of the reasons why we are bringing iron ore to our blast furnaces from United States instead of using our own.

The fact that Canadian furnaces and steel mills have to compete with United States mills makes it commercially necessary for them to obtain their raw materials at the point where they can be secured with the greatest degree of commercial advantage. In doing this they have had to ignore Canadian iron ore to a large extent because it would not be possible to treat it and make it fit for use, and then sell the finished product in competition with Buffalo or Pittsburgh.

Let the Government provide facilities and money for experimenters with various processes for treating our refractory iron ores. It takes a great deal of money to carry on this work properly, and few men can afford to do it. For the present the big work of the Government should be toward perfecting a commercial method of using iron ore rather than tossing out temporary sops in the way of bonuses for a tonnage of Canadian ore used or pig iron produced. Once the method is perfected and shown to be workable on a commercial basis, the other matters will take care of themselves.

## The Condition of Germany

ON another page Canadian Machinery presents the opinions of several Canadian manufacturers regarding the matter of dealing with Germany. Canadian mails are carrying an increasingly large volume of catalogues and sales literature from Germany, and there is a persistent and well-organized effort being made to push German goods in the markets of the world.

One fairly keen student of German conditions has been looking over the pages of some of the German engineering papers, and in one copy of the *Zeitschrift*, of the German Society of Engineers, has found over thirteen pages of advertisements seeking engineering help. Less than a page is occupied with the ads. of those seeking positions.

Among the advertisers are such well-known firms as the General Electric Co. of Germany, Fried. Krupp, Gutehoffnungshütte, Brown, Boveri & Co. (Mannheim branch), the Deutz gas engine works near Cologne, Ehrhardt & Sehmer at Saarbrucken (now, of course, in French control), the Humboldt Works near Cologne and numbers of foundries. The Gasmoteren-Fabrik Deutz includes in its advertisement the request for an engineering representative in Mexico and engineers for the export department.

The whole thing goes to show that there is no special call for this, or any other country, to spill over with sympathy for the bleeding-to-death industrial Germany.



# MARKET DEVELOPMENTS



## The Markets All Over Lacking Stability

### Buyers Are Not Coming in Yet and so it is Hard to Carry on the Programme of Liquidation—New York Has Only a Few Inquiries, While Steel Mills Are Running Low

A SURVEY of the leading markets for the week shows that machine tools, iron, steel and metals are quiet and weaker in price. Just to what extent the price has weakened is impossible to state because in several instances the word "price" indicates now what the buyer thinks he should pay rather than what the seller is asking.

Machine tool sales are limited to single orders, and large installations are not being made. Many factories have taken advantage of the quiet season to go over their mechanical equipment and put in improvements to existing equipment, but this has only led to small buying. Some price shading is reported in the sale of small tools, such as taps, dies, reamers, cutters, drills, etc.

The steel market is in a peculiar position. Warehouses have for some weeks been making an effort to liquidate their stocks to as great an extent as possible, and in an effort to do this, existing selling schedules have not been allowed to stand in the way. It is a difficult matter to liquidate when the buyer is not coming into the market, and as a result progress in this direction has been rather slow. Shipments into this territory from the mills of the U.S. Steel Corporation have been large during the week, and most of this material goes direct to the manufacturers of Canada, and not to the warehouses of the steel merchants. The Corporation has given no sign of any intention to meet the price-cutting practice of the independents.

The scrap metal market remains in a bad way, and a number of the smaller dealers are able to stay in the business only because of their ability to reduce their overhead, and wait until things turn for the better. None of the yards are making money now, and the pressure on some of the less fortunate ones must be getting rather severe.

## MONTREAL AGAIN WONDERING WHAT WILL HAPPEN WHEN MAY 1 COMES

Special to CANADIAN MACHINERY.

MONTREAL, March 17.—The agitation now on for an adjustment in the rate of wages paid to railroad employees may result in a settlement that will have a far-reaching effect upon industrial activity. It is possible that some concerted effort on the part of labor may be made to prevent any serious cut in wages, but even among certain classes of labor there is a feeling that some satisfactory arrangement must be made before a general return to industrial activity can take place. However, many are looking forward to May Day with feelings of nervousness, uncertain as to what attitude labor will assume regarding universal reductions. The situation in this district does not carry that degree of tension so marked in other places, but there is always that undertone of restlessness which is more or less evident at this period of the year, and this year a little more emphasized than in the past. The likelihood of the early opening of navigation has relieved the pressure somewhat, as the Montreal Harbor Board is making preparations for early activity; this will gradually absorb many of the unemployed in this district.

**Steel Situation a Problem**

The many problems involved in working out a solution to the existing steel problem makes the answer a very uncertain one, and the seeming elimination of one factor only brings out another in a different form, so that the final equation, though slightly changed, still contains that unknown quantity—uncertainty. As outlined by one dealer here the question is one of labor and transportation. "The prices quoted by many independent mills," it was stated, "represent figures at which it is virtually impossible to manufacture the material at the present time. This cutting into prices has not stimulated buying to any extent, and it is a question whether many of these mills could accept much business at prices now quoted. There is the possibility that it is an effort to get the U. S. Steel Corporation to make a definite move at price and wage adjustment, but if this is the reason, the move so far has not succeeded, for the Corporation continues to quote the old figures and to pay the high rate of wages of busier times. These wages, in many instances, show an increase of 150 per cent. over those of 1915, and freight charges are fully 100 per cent. above the pre-war rates. For the larger interests, handling every detail of production, from smelting the ore to turning out the finished product, it might be possible to maintain a fairly high wage scale and yet reduce selling prices, but in the case of the smaller mills the haulage charges are items of expense that influence the final selling price." The buying locally shows little or no improvement and dealers are generally optimistic in tone but not in fact. The cheerful outlook of most dealers is for some indefinite period ahead and not for the immediate future. One steel merchant here remarked that a slight betterment was noted in last week's total, but had nothing to say as to steady improvement. "One thing is certain," was one remark made, "and that is, that to get business you have to go after it. Buyers today are only taking what they need today. If they think they will require some article next week, they will wait until next week to buy it."

**What Does the Future Hold?**

Movement of machine tools and shop equipment is of a quiet character. Buying is confined to single tools or small

quantities of supplies. Manufacturers' needs are few and wherever possible they try to manage with what they have on hand. Running at part capacity, as many of them are doing, they have the advantage of utilizing equipment which under normal conditions would not be available, so that the necessity for spare or stock supplies is not so essential. The remark of one dealer was to the effect that he "would not be surprised to see this dull period extend throughout the entire year," but he also stated that his past week's sales showed a slight increase over previous weeks. The future seems to be anyone's guess, but even if the average "guess" is realized, business may be expected to show improvement before the summer months.

### Prices Do Not Effect Sales

Little encouragement has been given to old material dealers by the trend of business during the past week. The situation is much the same as it has been since the beginning of the year, the movement being restricted to purchases sufficient only to tide them over the immediate period, and the volume required for this purpose is relatively light when compared with normal times. Dealers here are getting a little nervous at the extended period of dullness. In the opinion of dealers, consumers would find this a good time to buy, as the former state that prices cannot go much lower. However, demand from users of scrap does not reflect this attitude of the dealer, so that activity in old materials must remain as it is until the reaction of present dullness takes place. "It does not matter much what price is quoted, as buyers apparently are not interested. Those quoted are nominally correct, but we regulate the price for each sale transacted." This remark by a dealer reflects the listless condition of the market and trading will probably continue quiet for a month or six weeks.

## KEEN SELLING IN SEVERAL LINES

### Business Going to Those Keenest to Get It, and Price Quite a Consideration

TORONTO.—February showed an improvement over January in nearly all lines of business in this district, and in a good many this improvement is being maintained in March. From this it is not to be concluded hurriedly that business is quickly on the up-grade, or anything approaching it, but there is a better showing in several places, and in no place that Canadian Machinery inquired was there any retrograde movement.

Machine tool houses are not getting any large orders. There are some machines going out, and there is quite a list of inquiries in the market, in fact this list is growing to very fair proportions. One dealer recently was preparing a number of propositions to be sent out on prospects that he was definitely sure would come into the market within a reasonable length of time.

Firms handling used machinery are having a fair demand for odd pieces of equipment, and one house reports the sale of quite a number of chucks, chain blocks, etc.

It is safe to say that the whole territory is being more thoroughly worked than for some time past. As stated in previous reports, the buying that is being done is all more or less small.

### Number of Small Orders

Small tools are being bought sparingly, and there is particularly keen competition. As is generally the case when competition gets very keen, there are plenty of rumors in the market of prices that have been shaved when it looked as though business were going to slip by if strict adherence to a price were insisted upon. "It is hard to say where this is being done," remarked one dealer, "but there is a very clear feeling in the trade that there is quite a bit of it going on just now. No one claims that it brings out any more business, and it all works out to the advantage of the buyer. Of course it is a buyer's market just now, and the latter is taking advantage of it."

Then there are a number of resales of small tools being made in this district. Firms bought some months ago rather heavily, feeling that in order to keep their plants running they should have a good stock of all sizes, and they also feared that they might not be able to get them readily were the demand to keep up as it was at that time. This material was taken in at a figure quite a little higher than that prevailing now. So when they get a chance to unload any of their material they are ready to do so. In this way they are turning a certain amount of their stock into cash, even if they have to accept a loss when present selling prices are put over against the price at which they bought in the first place.

Another report has it that one railroad order of fairly large dimensions brought down a figure that was considerably lower than anything that has been named for some time. These reports of price shading must not be taken to indicate that they are the general practice of the market. Prices have not been officially altered for some months, and the great bulk of business is being done at these figures.

### Steel Market Quiet

The improvement which seemed apparent in the steel business a couple of weeks ago is not being particularly well maintained, and business is quiet this week.

"We have been making an effort to liquidate our stock," remarked one merchant recently. "We believe that it is the right and proper thing to do, and we are making an honest attempt to do it, but will you tell me this, how are we going to liquidate when people are not buying? All the yards around here have the same idea just now. They want to get rid of their stocks, and are willing to meet the buyer half way in order to do it. What happens? Every little order that comes along now is peddled around until it can't walk any farther. Then it is taken in at a price, and one yard only gets a chance to make the sale and reduce stock to that extent. If some one will come along and tell us how to liquidate when there is very little buying being done, they will settle for

## POINTS IN WEEK'S MARKETING NOTES

**Production at the steel mills remains at about the same rate as last week. Unfilled tonnage continues to recede, and business booked is not keeping up with production.**

**It seems to be fairly well established that $25 is going to be the recognized price for pig iron in most of the leading points in the United States.**

**Canadian steel mills are not running more than half capacity. One furnace is likely to keep on making pig iron and stacking it.**

**Machine tool builders in Canada are not getting much business at present. The buying of the Canadian railroads, counted upon some time ago, to help out, has been rather small all through.**

**Scrap metal prices are simply nominal, and the volume of business being done continues very small. There is nothing in sight to indicate that better times are coming soon for this business.**

**Some pretty keen selling is being done in the small tool business, and some of the dealers claim that prices are going by the board in several cases in order to land orders.**

**Only a limited inquiry has come to the New York machine tool markets lately, and business continues dull there.**

**A number of Canadian machine tool dealers report that they have more inquiries on hand now than for some time past, and most of them represent legitimate prospects.**

us the biggest problem we have to face just now."

Competition is very keen for anything that shows up. Buffalo warehouses are after anything they can get from the power development in the Niagara district, offering in many cases to meet and go one better on any price offered by the home firms.

Mills are looking for business harder than for some time past. In many cases it would seem that the mills are competing with the warehouses, as they are taking in orders of a size that were formerly regarded as the property of the warehouses, and so small that the mills did not consider them worth while.

There is a fair business going in tubes. Since the first of the year about 75 per cent. of the business done in this line has been for marine work, and there has been very little coming in from industrial plants. According to seasons there should be orders arriving now for industrial plants. Then there are construction firms that must get their equipment —especially that used in field work—in shape for the season. There are some orders going through for reinforcing material. Contracts for buildings are slow in being closed, and some hold that the amount of floor space available in the city now for industrial purposes is making it unnecessary for other firms to build, although it is also a fact, according to real estate men, that these vacant places are being held at a good figure, showing little, if any, recession from last year's high figures.

### Prices Are the Same

There is nothing to indicate that the steel market, in spite of the keenness for business, is out of hand, or that it is running away. The attitude of the Steel Corporation is still the controlling factor in the situation, and they have so far stood pat on their schedule. Canadian mills are not well employed at present, some of them not operating at half their capacity. Some of the furnaces, it is understood, are still operating without many orders, it being the intention to go ahead and stack a certain amount of pig iron against the time when business conditions shall improve. The price of $39.25 remains as the quotation for No. 1 foundry.

### The Scrap Metal Market

There is nothing better for the scrap metal trade this week, and they are simply marking time, and hoping for a better break soon. Some of the smaller men in the business are being badly pinched just now. Present prices are so low that it hardly pays them to keep operating on any scale. The larger dealers to whom they are accustomed to sell are not taking on stock. The fact that they can get down to little or nothing in the way of overhead expenses is helping to keep a number of the little fellows alive in the scrap metal business.

# NO INDICATION THAT CORPORATION IS GOING TO BREAK FROM ITS PRICES

Special to CANADIAN MACHINERY.

PITTSBURGH, March 17.—There is a distinct, though small, increase in the volume of buying of some steel commodities, this improvement being most marked in the case of sheets. The improvement was predicted at the beginning of the year, being based chiefly on the progress of the season, as demand always becomes more active on the approach of spring. In January, however, a greater improvement was expected than now seems likely to develop.

Improvement, however, does not make the steel market active by any means, since it was entirely stagnant. The increased buying is in miscellaneous quarters, there being no large projects. Some of the business received, and counting as part of the improved demand, is in the form of releases to shipments formerly suspended. The strictly new buying is still conspicuously light, though not altogether as light as two or three weeks ago.

### Production

The process continues of old orders running out, and accordingly the increase in buying and the releases against suspensions are not sufficient to arrest the decline in actual production. The monthly report of the American Iron and Steel Institute, giving the steel ingot output of the thirty steel companies that make monthly reports, indicates that steel ingot production during February was at the rate of about 25,150,000 gross tons a year. The Steel Corporation produced at 76 per cent. of its capacity and the independents at 26 or 27 per cent. of their capacity, making a total for the industry as a whole of about 48 per cent. The percentage is not nearly as bad as it seems, for it does not mean 48 per cent. of any actual production that has been realized. The steel industry has not been able to operate at capacity since 1916, there being either shortage of orders or physical difficulties. In the first nine months of 1920, when steel was scarce, the average operation was only about 80 per cent.

Production at the present time is lower than the average rate of February, being approximately at the rate of 21,000,000 tons a year, or just one-half the rate during the first nine months of last year. Considering how active the demand then seemed to be, and how completely absent demand now seems to be, this really looks like a high rate. Although the independents started cutting prices early in February while the Steel Corporation has maintained its prices, the production rates now are about 13,500,000 tons by the corporation and 7,500,000 tons by the independents, so that the corporation is making about 65 per cent. of the steel although it has only about 43 per cent. of the capacity.

### Steel Corporation Orders

The Steel Corporation's unfilled obligations decreased during February by 639,297 tons, against decreases of 574,958 tons in January, 873,359 tons in December and 815,371 tons in November. The February decrease represented 51 per cent. of the month's capacity, and as shipments may be estimated at 75 per cent. of capacity the net bookings in the month appear to have been about 24 per cent. of capacity. The net bookings are, of course, the total bookings minus cancellations, of which there were few in February or January. In November and December there was a very considerable quantity of cancellations, some of the cancelling being by initiative of the corporation of orders that seemed unlikely to represent actual shipments within a reasonable time. That the Steel Corporation should book any business at all when the independents were cutting prices shows that the corporation's customers are quite willing to stay with it, expecting they will profit in the long run, as in the past, by doing so.

### Prices

Bars, shapes and plates are quotable at the same prices as a week or two ago, 2c for bars and 2.10c for plates or shapes. Generally a very ordinary sized order can be placed at these prices, but the specifications have to be fairly attractive. Plates and shapes are no stronger than a week or two ago, but bars are apparently a shade stronger, since an extreme concession from the 2c price would be $1 or $2 a ton, for a very attractive order, while three or four weeks ago it appeared that 1.85c could probably be done on a large order.

Sheets, on the other hand, are easier. Ten days ago the market on fair-sized lots with reasonably definite specifications was about 3.20c for blue annealed, 4.10c for black and 5.20c or 5.25c for galvanized. Now it is possible to do 3c, 4c and 5c respectively, and in some quarters it is believed that the 4c price on black could be shaded. The spread between black and galvanized is narrowed down to about $1 per 100 pounds, when the Industrial Board spread was $1.35. The decrease is attributable largely to the low price of zinc, which is 4.80c, St. Louis, or lower than the average price in any calendar year since 1902 with the exception of 1908.

Tin plate remains at the old price of $7 per base box, 100-pound, all efforts of buyers to break the market having failed. The mills hold together because they realize that if any accident should happen to the regular price there would probably be a decline that would prevent the mills from realizing cost out of their high-priced tin bought before

the decline to the present remarkably low price and might make them experience a loss beyond that.

Standard steel pipe also remains at the old price, the market still being quotable at a basing discount of 57½ per cent. Demand has held up better for pipe than for any other finished steel commodity, although by this time even pipe demand is rather light. There is shading on some other descriptions of tubular goods, particularly on line pipe.

### Pig Iron

Another 50-cent decline is recorded in the foundry pig iron market, as the Standard Sanitary Manufacturing Company has bought 1,000 tons of valley foundry iron on the basis of $26, furnace, for its New Brighton plant, near Pittsburgh. At the same time this interest bought 1,000 tons for its plant at Louisville, Ky., taking half from Virginia furnaces at $26, furnace, and half from Birmingham furnaces at $25, furnace, the last named price being $1 under the Birmingham market as previously quoted.

Basic iron remains nominally quotable at $25, valley, and Bessemer at $27. These are quotations of merchant furnaces. It is thought probable that some steel works would sell from their surplus stocks of basic at about $23. A careful canvass of the situation made by a producer shows that just now there is no real price issue as between producer and consumers, the consumers stating that they have no inclination to buy. Some have no orders against which they could use iron, while others have a few orders but have considerable tonnage of pig iron due them on old purchases, some of this iron being at as high as $40. A 500-ton lot of basic iron has just been sold by a broker at approximately $23, valley, but such a sale would not be representative of the market.

## FEW REDUCTIONS MADE IN NEW YORK

**But for the Most Part the Makers Are Taking No Action in Price Reduction**

Special to CANADIAN MACHINERY.

NEW YORK, March 17.—While the machine-tool markets are still dull, there is a trifle more life to some of the inquiries now being received. The principal inquiry before the trade is that of the American Sugar Refining Company, New York, which will buy about fifty tools for its maintenance shop at the Baltimore, Md., refinery. The New York Central Railroad is in the market for four large tools and the Virginian Railroad is inquiring for ten or twelve tools. The Santa Fe Railroad, which recently purchased about $125,000 worth of machine tools for its shops at Albuquerque, New Mexico, is now in the market for four cranes, including one of 250 tons capacity.

### A Few Reductions

A few price reductions have been reported within the past two weeks, but the majority of leading manufacturers are taking no action toward reducing prices, believing that reductions at this time would not stimulate buying. The general opinion in the trade is that no activity of importance in the machine-tool trade may be expected within the next two or three months; hence the trade is simply marking time until business conditions have improved sufficiently to bring buyers back into the market in sufficient numbers to insure at least a moderate amount of buying.

Railroads are expected to come into the market some time this year, but it is known that there will be little buying until the roads are in better financial condition. One step in that direction is the reduction in wages now going on. Some of the roads haven't enough money to pay their bills, and when payments are received from the Government under the terms of the Winslow Bill, recently passed by Congress, it will go out mostly in liquidation of debts which have been on the books for periods ranging from a few months to a year. Just as credit and transportation brought about the crisis less than a year ago, so to-day the situation as to credit and transportation must show considerable improvement before there can be stable business conditions again.

## Pig Iron Market

Pig iron prices have again receded whenever tested, and Southern iron is down to a basis of $25, or $1.50 lower than the prevailing quotation of the preceding week. Some furnaces unable to obtain shipping orders on iron sold some time ago are willing to sell additional tonnages at low prices in the hope of speeding up deliveries on old orders and striking a fair average price on new and old business.

On the Pittsburg market one company recently closed for about 2,000 tons of foundry iron, for its plants at New Brighton, Pa., and Louisville, Ky., about 1,000 tons going to each plant. This is the only important business which has taken place during the week and is important because it brings out lower prices than have recently prevailed. The iron for delivery immediately was placed at $26, valley furnace.

The condition of the Chicago market is unstable to a marked degree. A sale of 200 tons of No. 2 foundry was closed last week at $27, Chicago furnace, while early this week a carload of No. 1 material changed hands at $26, Chicago, or the equivalent of $24.75 for No. 2 foundry.

An inquiry on the New York market for 500 tons of No. 2 plain pig iron for prompt delivery brought keen competition among a number of buyers, and the business was placed by a large machinery company at $26, delivered, or $24.46 furnace.

The Cleveland market shows a little improvement in the demand for prompt shipment foundry iron from consumers who have no iron coming under contracts, and who are buying in small lots as needed. These orders are mostly for car lots. Prices have declined and No. 2 foundry is now freely quoted at $26 by a valley furnace.

Philadelphia reports a sale of 500 tons of No. 2 plain by an Eastern furnace at $24.50 furnace, or $26.04, delivered to a plant at Phillipsburg, N.J. Special considerations were involved in this sale. Otherwise the foundry iron market may be quoted at $26 for No. 2 plain and $27 for No. 2X, f.o.b. furnace, these prices ruling on nearly all of the transactions of the past week.

## Scrap Metal Market

The tendency of the scrap market is still downward and consumers are remaining out of the market. On the Chicago market railroads are offering fairly large lots on which they are receiving extremely low bids, but their present need of money is causing them to accept these prices. The scrap is going into yards and dealers figure they can obtain a profit by holding it.

Prices on many grades at Boston are only nominal, as transactions have been so few during the past two weeks.

Philadelphia market shows a slightly improved market as regards buying, but of a hand-to-mouth character. The total was comparatively small, and production of scrap continues greater than consumption, despite the belief that was prevalent among dealers that prices were at the bottom.

Speculators on the Buffalo market who purchased scrap freely a short time ago are facing a loss, due to the further weakening of the market and a new bottom to prices. A local mill is picking up a few choice shipments of No. 1 heavy melting steel at $13.50. Dealers are not anxious to sell, but some tonnages are available.

Buying is at a standstill at Cleveland, in the scrap metal grades, and the only movement of material is on old contracts and in limited tonnage. Prices are unchanged, but indications point to lower quotations.

The Southern scrap iron and steel market is still inactive. A slightly encouraging feature is that the rolling mill at East Birmingham has been getting in orders for bar iron. The plant operates almost entirely on old material. Consumers of heavy melting steel are out of the market, and other melters are buying sparingly.

# LeBLOND
## HEAVY DUTY
## Universal Millers

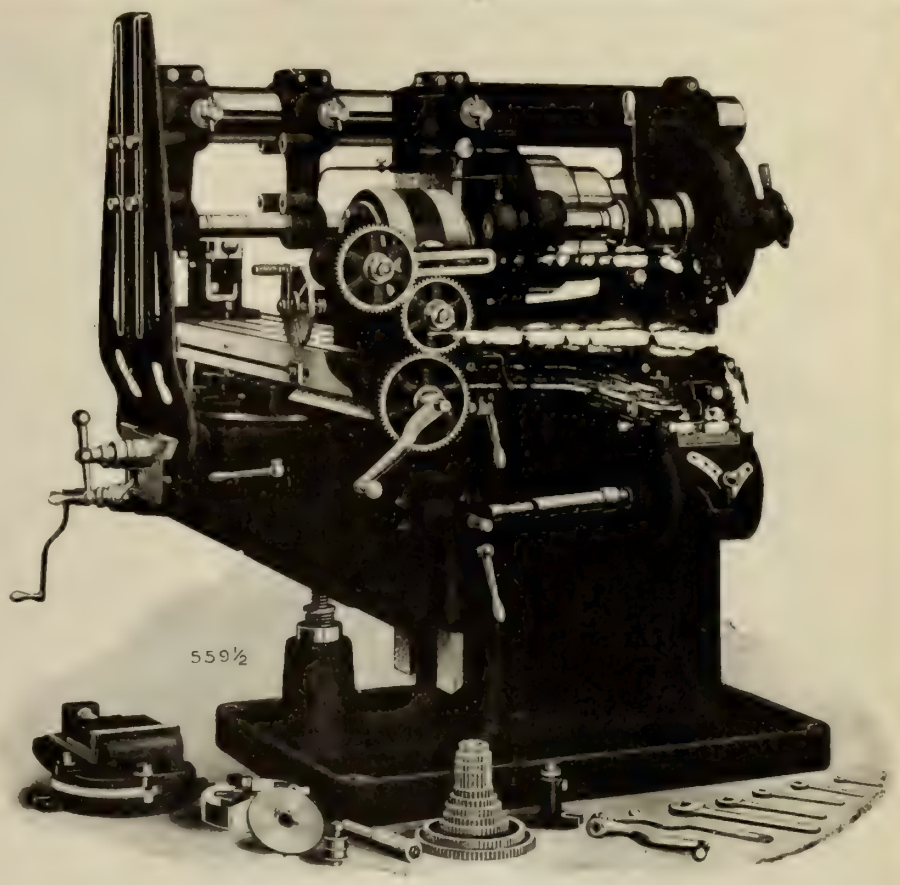
Are not only Tool Room Machines, but as a manufacturing proposition appeal to the careful buyer.

Their long life insures ample returns for the investment made.

May we explain to you their many advantages and the convenience of their control?

**Carried in stock by**

**The A. R. Williams Machinery Co.**
LIMITED
TORONTO




# THE

TRADE K–T MARK

# FOUNDRY
# GALT, ONT.

## Do Your Castings Cost Too Much?

A rearrangement of your patterns might cut their cost 25 per cent.; a different method of molding them might double your production at no increase in molding cost. We can advise you and we have expert metal and wood patternmakers who are able to make any changes that may commend themselves to you.

### If you need some new Patterns

send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.

We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us. **Ask us.**

***We have for our and your requirements, a large stock of assorted White Iron Stars, suitable for light agricultural to medium weight machinery castings, while they last, at 8 cents per lb. F. O. B. Galt.***

When Writing Advertisers Please Mention This Paper

# SELECTED MARKET QUOTATIONS

**Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.**

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $26 00 |
| Lake Superior, charcoal, Chicago | 40 50 |
| Standard low phos., Philadelphia | 41 50 |
| Bessemer, Pittsburgh | 28 96 |
| Basic, Valley furnace | 26 00 |
| Toronto price:— | |
| Silicon, 2.25% to 2.75% | 39 25 |

## IRON AND STEEL

| Per lb. to Large Buyers | Cents |
|---|---|
| Iron bars, base, Toronto | $ 4 50 |
| Steel bars, base, Toronto | 4 50 |
| Iron bars, base, Montreal | 4 25 |
| Steel bars, base, Montreal | 4 25 |
| Reinforcing bars, base | 4 50 |
| Steel hoops | 6 00 |
| Tire steel | 5 00 |
| Spring steel | 8 00 |
| Band steel, No. 10 gauge and 3-16 in. base | 5 50 |
| Chequered floor plate 3-16 and heavier | 7 50 |
| Bessemer rails, heavy, at mill | 2 35 |
| Steel bars, Pittsburgh | 2 10-2 25 |
| Tank plates, Pittsburgh | 2 65 |
| Structural shapes, Pittsburgh | 2 45 |
| Steel hoops, Pittsburgh | 3 05 |
| F.O.B., Toronto Warehouse | |
| Small shapes | 4 50 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 3 48 |
| Structural shapes | 3 58 |
| Plates | 3 78 |
| Small shapes under 3-in. | 3 48 |

## FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

| | C.L. | L.C.L. |
|---|---|---|
| Montreal | 58½ | 73 |
| St. John, N.B. | 84½ | 106½ |
| Halifax | 86 | 108 |
| Toronto | 38 | 54 |
| Guelph | 38 | 54 |
| London | 38 | 54 |
| Windsor | 35 | 50½ |

Current surcharge, 9 per cent.

## METALS

| | Gross. Montreal | Toronto |
|---|---|---|
| Lake copper | $18 00 | $17 50 |
| Electric copper | 17 50 | 17 50 |
| Castings, copper | 17 25 | 18 00 |
| Tin | 37 00 | 40 00 |
| Spelter | 7 75 | 7 50 |
| Lead | 6 50 | 7 50 |
| Antimony | 8 00 | 8 25 |
| Aluminum | 34 50 | 30 00 |

Prices per 100 lbs.

## PLATES

| | | |
|---|---|---|
| Plates, 3-16 in. | $5 25 | $5 25 |
| Plates, ¼ up | 4 75 | 4 75 |

## PIPE—WROUGHT

**Standard Buttweld Pipe**

Per 100 Ft.

| | Steel Blk. | Steel Galv. | Gen. Wrought Iron Blk. | Gen. Wrought Iron Galv. |
|---|---|---|---|---|
| ⅛ | $ 6 50 | $ 8 50 | $..... | $..... |
| ¼ | 5 31 | 7 41 | 5 91 | 8 01 |
| ⅜ | 5 31 | 7 41 | 5 91 | 8 01 |
| ½ | 7 10 | 8 63 | 7 95 | 9 48 |
| ¾ | 8 80 | 10 87 | 9 95 | 12 02 |
| 1 | 13 91 | 16 07 | 14 71 | 17 77 |
| 1¼ | 17 60 | 21 74 | 19 90 | 24 04 |
| 1½ | 21 04 | 25 99 | 23 79 | 27 84 |
| 2 | 28 31 | 34 97 | 32 01 | 38 67 |
| 2½ | 41 75 | 55 28 | .... | .... |
| 3 | 58 52 | 72 29 | .... | .... |
| 3½ | 74 06 | 90 62 | .... | .... |
| 4 | 87 75 | 107 37 | .... | .... |

**Standard Lapweld Pipe**

Per 100 Ft.

| | Steel Blk. | Steel Galv. | Gen. Wrought Iron Blk. | Gen. Wrought Iron Galv. |
|---|---|---|---|---|
| 2 | $32 01 | $ 38 67 | $35 71 | $42 37 |
| 2½ | 48 26 | 58 79 | 54 11 | 64 64 |
| 3 | 63 11 | 76 88 | 70 76 | 84 53 |
| 3½ | 75 90 | 92 46 | 85 10 | 101 66 |
| 4 | 89 93 | 107 55 | 100 83 | 120 45 |
| 4½ | 1 05 | 1 29 | 1 30 | 1 54 |
| 5 | 1 22 | 1 50 | 1 52 | 1 80 |
| 6 | 1 58 | 1 95 | 1 97 | 2 33 |
| 7 | 2 06 | 2 53 | 2 53 | 3 01 |
| 8L | 2 16 | 2 66 | 2 66 | 3 16 |
| 8 | 2 49 | 3 07 | 3 07 | 3 64 |
| 9 | 2 98 | 3 67 | 3 67 | 4 36 |
| 10L | 2 77 | 3 41 | 3 41 | 4 05 |
| 10 | 3 56 | 4 39 | 4 39 | 5 21 |

**Prices—Ontario, Quebec and Maritime Provinces**

## WROUGHT NIPPLES

4-in. and under, 50 per cent.
4½-in. and larger, 40 per cent.
4-in. and under, running thread, 20%.
Standard couplings, 4-in. and under, 20%
Dd., 4½-in. and larger, net.

## OLD MATERIAL

Dealers' Average Buying Prices

| | Per 100 Pounds. Montreal | Toronto |
|---|---|---|
| Copper, light | $ 9 50 | $ 9 00 |
| Copper, crucible | 11 50 | 11 00 |
| Copper, heavy | 11 00 | 11 00 |
| Copper wire | 11 00 | 11 00 |
| No. 1 machine composition | 10 00 | 9 75 |
| New brass cuttings | 7 00 | 8 00 |
| Red brass turnings | 8 00 | 8 00 |
| Yellow brass turnings | 6 00 | 6 00 |
| Light brass | 5 00 | 5 00 |
| Medium brass | 6 00 | 6 00 |
| Scrap zinc | 4 00 | 4 00 |
| Heavy lead | 4 50 | 4 00 |
| Tea lead | 2 00 | 2 00 |
| Aluminum | 12 00 | 10 00 |

| | Per Ton | Gross |
|---|---|---|
| Boiler plate | $11 00 | $12 00 |
| Heavy melting steel | 15 00 | 14 00 |
| Axles (wrought iron) | 25 00 | 20 00 |
| Rails (scrap) | 15 00 | 14 00 |
| Malleable scrap | 20 00 | 20 00 |
| No. 1 machine cast iron | 30 00 | 25 00 |
| Pipe, wrought | 8 50 | 8 00 |
| Car wheel | 30 00 | 25 00 |
| Steel axles | 20 00 | 18 00 |
| Mach. shop turnings | 8 00 | 6 00 |
| Stove plate | 23 00 | 20 00 |
| Cast boring | 5 00 | 7 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, 7-16 and up | Net list |
| Carriage bolts, ⅜" and less | 15 |
| Coach and lag screws | —20 |
| Stove bolts | 55 |
| Wrought washers | —25 |
| Elevator bolts | Net |
| Machine bolts, 7-16 and over | —5 |
| Machine bolts, ⅜-in. and less | —30 |
| Blank bolts | Net |
| Bolt ends | —5 |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | +25 |
| Machine screws, fl. and rd. hd., brass | Net |
| Machine screws, o. and fil. hd., brass | Net |
| Nuts, square, blank | +25 add $2 00 |
| Nuts, square, tapped | add 2 25 |
| Nuts, hex., blank | add 2 25 |
| Nuts, hex., tapped | add 2 75 |
| Copper rivets and burrs, list less | 27½ |
| Burrs only, list plus | 10 |
| Iron rivets and burrs | 37½ and 5 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, bright | 67½ |
| Wood screws, flat, brass | 55 |
| Wood screws, O. & R., brass | 55½ |
| Wood screws, flat, bronze | 50 |
| Wood screws, O. & R., bronze | 47½ |

## MILLED PRODUCTS

(Prices on unbroken packages)

| | Per Cent |
|---|---|
| Set screws | Less 40% |
| Square and hexagon head cap screws | Less 30% |
| Round head cap screws | Plus 10% |
| Fillister head cap screws | Less 10% |
| Flat head cap screws | Net list |
| Button head cap screws | Plus 10% |
| Studs | Less 20% |
| Semi-finished nuts up to and including 1-in. | Less 35% |
| Semi-finished nuts 1⅛ to 1½" | Less 30% |
| Semi-finished nuts 1⅝ to 2 in. | Net list |
| Coupling bolts | Plus 10% |
| Taper pins | Less 40% |
| Planer bolts without fillet | Plus 40% |
| Planer bolts with fillet | Pus 50% |
| Patch bolts | Plus 80% |
| Hollow set screws | Plus 20% |
| Thumb screws | Less 35% |
| Thumb nuts | Less 65% |

## BILLETS

F.O.B. Pittsburgh.

| | Per gross ton |
|---|---|
| Bessemer billets | $43 50 |
| Open-hearth billets | 43 50 |
| O.H. sheet bars | 47 00 |
| Forging billets | 48 50 |
| Wire rods | 57 00 |

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails, base | $5 10 |
| Cut nails, base | 5 75 |
| Miscellaneous wire nails | 50% |

## ROPE AND PACKING

| | |
|---|---|
| Plumbers' oakum, per lb. | 0 10¼ |
| Packing, square braided | 0 38 |
| Packing, No. 1 Italian | 0 44 |
| Packing, No. 2 Italian | 0 36 |
| Pure Manila rope | 0 26 |
| British Manila rope | 0 20 |
| New Zealand hemp | 0 20 |

## POLISHED DRILL ROD

Discount off list, Montreal and Toronto Net

# OUR FRIENDS

## THE GREAT POPULARITY OF GEOMETRIC SCREW CUTTING TOOLS HAS BROUGHT THEM TO US

Thousands of Screw Machine users have come to know The Geometric Tool Company through the perfect work performed by the Geometric Automatic Adjustable Die Heads and Collapsing Taps.



**Connecticut Section of the A.S.M.E., Guests at the Works of The Geometric Tool Company**

A demonstration of the efficiency of Geometric Tools was made. You can make a like demonstration right in your own shop. Let screw thread cutting be the most satisfactory operation there.

## THE GEOMETRIC TOOL COMPANY
**NEW HAVEN CONNECTICUT**

***Canadian Agents:***

Williams & Wilson Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B., Halifax, N.S.
Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

*If interested tear out this page and place with letters to be answered.*

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | $ 0 25 |
| Solder, guaranteed | 0 27 |
| Soldering coppers, lb. | 0 62½ |
| White lead, pure, cwt. | 17 00 |
| Red dry lead, 100-lb. kegs, per cwt. | 13 00 |
| Linseed oil, boiled, single bbls. | 1 03 |
| Wood alcohol, per gal. | 2 75 |
| Whiting, plain, per 100 lbs. | 3 00 |

### CARBON DRILLS AND REAMERS

| | |
|---|---|
| S.S. drills, wire size | 40 and 5 |
| Can. carbon cutters, plus | 10 |
| Standard drills, all sizes | 40 and 5 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 and 5 |
| Bit stock | 50 |
| Ratchet drills | 10 |
| Pure turp., single bbls., gal. | 1 20 |
| Linseed oil, raw, single bbls. | 1 00 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 50 |
| Sleeves | 50 |
| Taper pin reamers | 25 off |
| Drills and countersinks | Net |
| Bridge reamers, carbon | 50 |
| Centre reamers | 5 |
| Gasoline, per gal., bulk | 0 42 |
| Chucking reamers | Net |
| Hand reamers | 10 |
| High speed drills, list net to plus | 20 |
| Can. high speed cutters, net to plus | 10 |
| American | plus 40 |

### COLD ROLLED STEEL

[At Warehouse]

| | |
|---|---|
| Rounds and squares | $7.00 base |
| Hexagons and flats | 7.00 base |

### IRON PIPE FITTINGS

| | Black | Galv. |
|---|---|---|
| Class A | 60 | 75 |
| Class B | 26 | 36 |
| Class C | 17 | 26 |

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 8 00 | $ 6 50 |
| Sheets, blue ann., No. 10 | 6 50 | 6 00 |
| Canada plates, dull, 52 sheets | 12 00 | 13 00 |
| Can. plates, all bright | 14 00 | ..... |
| Apollo brand, 10¾ oz., galvanized | .... | ..... |
| Queen's Head, 28 B.W.G. | 11 50 | ..... |
| Fleur-de-Lis, 28 B.W.G. | 10 50 | ..... |
| Gorbal's Best, No. 28 | .... | ..... |
| Colborne Crown, No. 28. | .... | ..... |
| Premier, No. 28, U.S. | 10 00 | 9 00 |
| Premier, 10¾-oz. | 10 50 | 9 40 |
| Zinc sheets | 13 00 | 20 00 |

### PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13; 5-16, $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

### ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13; 5-16 in., $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

**Prices per 100 lbs.**

### FILES AND RASPS

| | Per Cent. |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 32½ |
| Black Diamond | 27½ |
| J. Barton Smith, Eagle | 50 |
| McClennand, Globe | 50 |
| Delta Files | 20 |
| Disston | 40 |
| Whitman & Barnes | 50 |
| Great Western-American | 50 |
| Kearney & Foot, Arcade | 50 |

### BOILER TUBES

| Size | Seamless | Lapweld |
|---|---|---|
| 1 in. | $26 00 | $ |
| 1¼ in. | 27 25 | ..... |
| 1½ in. | 26 25 | 29 50 |
| 1¾ in. | 29 75 | 27 00 |
| 2 in. | 29 25 | 25 50 |
| 2¼ in. | 33 00 | 28 50 |
| 2½ in. | 44 75 | 31 50 |
| 3 in. | 49 25 | 40 00 |
| 3¼ in. | | 48 50 |
| 3½ in. | 63 50 | 43 50 |
| 4 in. | 85 00 | 55 50 |

Prices per 100 ft., Montreal and Toronto

### OILS AND COMPOUNDS

| | |
|---|---|
| Castor oil, per lb. | — |
| Royalite, per gal., bulk | 28 |
| Palacine | 31 |
| Machine oil, per gal. | 58 |
| Black oil, per gal. | 27 |
| Cylinder oil, Capital | 1.01 |
| Petroleum fuel oil, bbls., net | 11.2 |

### BELTING—No. 1 OAK TANNED

| | |
|---|---|
| Extra heavy, single and double | 15% |
| Standard | 15 and 10% |
| Cut leather lacing, No. 1 | 2 00 |
| Leather in side | 2 40 3 00 |

### TAPES

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES

| | |
|---|---|
| Polishing wheels, felt | $4 50 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, Turkish | 8¾ |
| Pumice, ground | 06 |
| Emery glue | 30 |
| Tripoli composition | 9½ |
| Crocus composition | 12 |
| Emery composition | 11 |
| Rouge, silver | 64 |
| Rouge, powder, nickel | 38 |

**Prices per lb.**

### ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | 8½ |
| Grits, 80 and finer | 6 |

### BRASS—Warehouse Price

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 30 |
| Brass sheets, 24 gauge and heavier, base | 38 |
| Brass tubing, seamless | 42 |
| Copper tubing, seamless | 44 |
| XXX Extra | 21 |
| Peerless | 22 |
| Grand | 21½ |
| Superior | 21½ |
| X L C R | 16½ |
| Atlas | 19 |
| X Empire | 15 |
| Ideal | 18 |
| X Press | 13½ |

### WASTE

**Colored**

| | | | |
|---|---|---|---|
| Lion | 13½ | Popular | 10½ |
| Standard | 12 | Keen | 9 |
| No. 1 | 14 | | |

**Wool Packing**

| | | | |
|---|---|---|---|
| Arrow | 35 | Anvil | 22 |
| Axle | 28 | Anchor | 17 |

**Washed Wipers**

| | | | |
|---|---|---|---|
| Select White | 20 | Dark colored | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

### RUBBER BELTING

| | | | |
|---|---|---|---|
| Standard | 10% | Best grades | 15% |

### ANODES

| | |
|---|---|
| Nickel | .55 to .60 |
| Copper | .38 to .40 |
| Tin | .70 to .70 |
| Zinc | .16 to .17 |

**Prices per lb.**

### COPPER PRODUCTS

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | $30 00 | $34 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 32 00 | 38 00 |
| Copper sheet, tinned, 14 x 60, 14 oz. | 38 00 | 42 00 |
| Copper sheet, planished, 16 oz. base | 44 00 | 48 00 |
| Braziers', in sheets, 6 x 4 base | 36 00 | 41 00 |

### LEAD SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $ 9 50 | $14 50 |
| Sheets, 3½ lbs. sq. ft. | 9 25 | 14 00 |
| Sheets, 4 to 6 lbs. sq. ft. | 9 00 | 13 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS

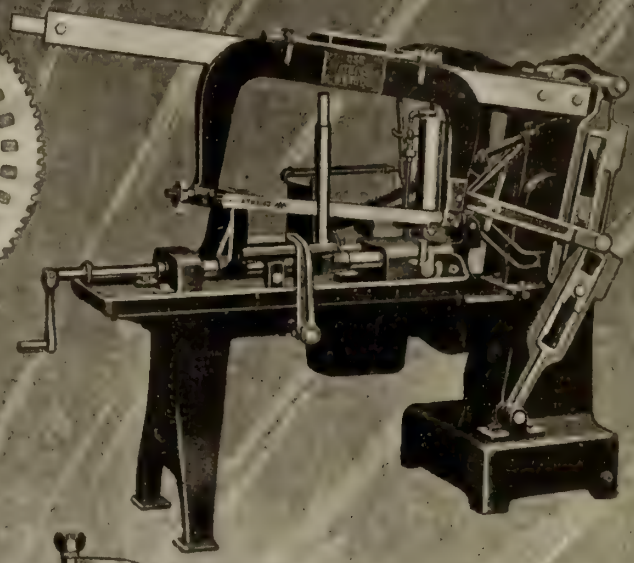
| | |
|---|---|
| Acid, boracic | $ .25 |
| Acid, hydrochloric | .03¾ |
| Acid, nitric | .10¼ |
| Acid, sulphuric | .03¾ |
| Ammonia, aqua | .20 |
| Ammonium, carbonate | .23 |
| Ammonium, chloride | .22 |
| Ammonium, hydrosulphuret | .75 |
| Ammonium sulphate | .30 |
| Arsenic, white | .18 |
| Copper, carbonate, annhy. | .35 |
| Copper, sulphate | .10 |
| Cobalt, sulphate | .20 |
| Iron perchloride | .62 |
| Lead acetate | .30 |
| Nickel ammonium sulphate | 16½ |
| Nickel carbonate | .30 |
| Nickel sulphate | .17½ |
| Potassium sulphide (substitute) | .40 |
| Silver Chloride (per oz.) | 1.15 |
| Silver nitrate (per oz.) | 1.10 |
| Sodium bisulphate | .13 |
| Sodium carbonate crystals | .04 |
| Sodium cyanide, 127-130% | .39 |
| Sodium hyposulphite per 100 lb. | 6.50 |
| Sodium phosphate | .15 |
| Tin chloride | .80 |
| Zinc chloride, C.P. | .30 |
| Zinc sulphate | .08 |

**Prices per lb. unless otherwise stated**

# ATKINS STERLING QUALITY SAWS







## O'er Land and Sea
North South East West

## Atkins Sterling Quality Saws

are noted for their efficiency. Their use will increase your production.

Ask for new literature describing Atkins Kwik Kut Power Hack Saw and Metal Cutting Band Saw Machines, Circular Metal Cutting Saws, AAA Hack Saw Blades and Frames, etc.

*"A Better Saw For Every Use"*

*Write for Catalog*

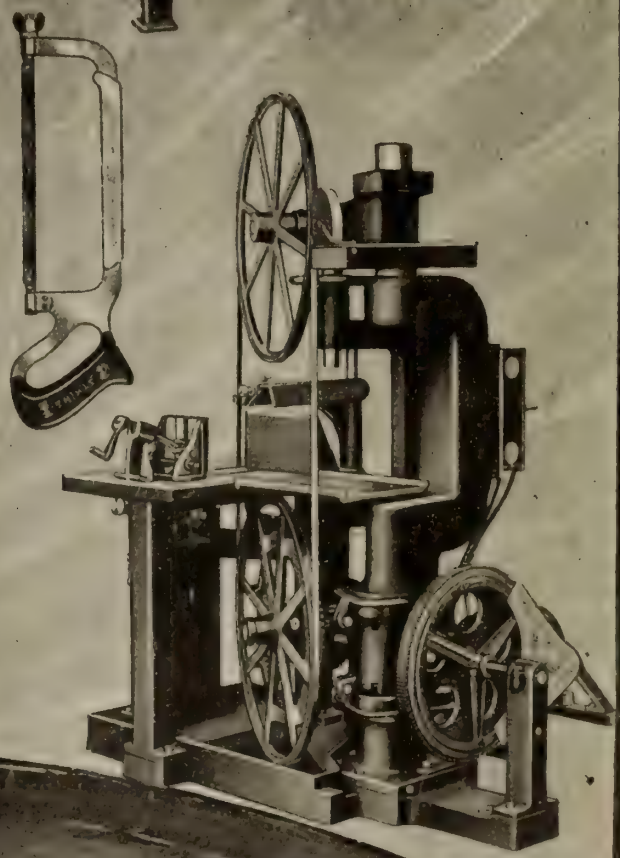
## E. C. Atkins & Co.

Established 1857

*"The Sterling Quality Saw People"*

*Factory:* HAMILTON, ONT.

*Branch:* VANCOUVER, B. C.

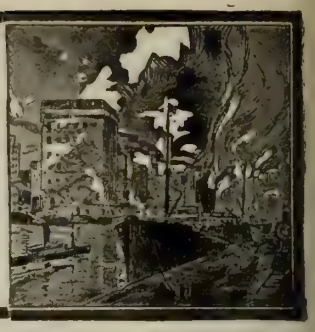






# INDUSTRIAL NEWS

## NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES



## Engineering

A sash and door factory will be built by the Lord Bros. at St. Norbert, Man.

A garage and workshop are being planned by Thomas McNeil, Tyron, P.E.I.

Plans are being prepared for a workshop costing $60,000 for the city of Ottawa. Tenders will be called shortly.

The Winnipeg Supply & Fuel Company, 405 Canada Building, are planning the erection of a warehouse at cost or $60,000.

The Gove Motor Car Company, Tilbury, Ont., are contemplating construcethe erection of a warehouse at cost of $50,000.

Work will be started in the near future on the erection of a foundry for the National Castings, Limited, Belleville, Ont.

A direct street car line to link up the southern sections of Windsor, Walkerville and Ford with main service is suggested.

An athletic stadium is to be erected on the corner of King Edward Avenue and York Street, Ottawa, at a cost of $350,000.

The Southern Ontario Gas Company have announced recently that they are planning to erect a large artificial gas plant at Dutton, Ont.

A warehouse is contemplated at a cost of $5,000 by Chas. Fitzpatrick, of St. Louis Grain & Feed Company, 2105 St. Lawrence Boulevard, Montreal, Que.

A permit has been issued for a building on St. Joseph Street, Quebec city, to be occupied by the Woolworth Company's stores, at a cost of $125,000.

The McIlroy Belting & Hose Company, Hammond, Ind., are opening up a branch office at Kingsville, Ont., and will instal equipment to cost about $20,000.

Construction of the $75,000 garage and repair shop for the Consolidated Motors Company, Toronto, will be commenced about April 1. Thomas Sharpe has the contract.

Bremner Norris, 65 McGill College Avenue, Montreal, has been awarded the contract for alterations and addition to factory costing $20,000 for Arlington Company of Canada, Limited, 120 St. James Street.

## WILL DOUBLE PLANT CAPACITY

**Smiths Falls Concern Has Had Substantial Growth and Plans for More Capacity**

Smiths Falls.—The recent re-incorporation of the Smiths Falls Malleable Castings, Limited, the second oldest malleable castings concern in Canada, is in line with a proposed broadening out policy and programme of expansion.

The company was started in 1878 by Wm. H. Frost and Chas. Jones with a capital of $2,500. Six years later the latter partner sold his interests to Mr. Frost, who with J. Edwin Frost, the present secretary and director, carried on under the name of the Smiths Falls Malleable Iron Works until 1902, when the Smiths Falls Malleable Castings Company was incorporated.

The business had grown from a mere infant with a cupola and a one-ton annealing oven to two plants covering the better part of two acres with an annual capacity of 8,000 tons and employing 250 men.

In 1906 the Rideau Malleable & Foundry Company, Limited, was organized by local citizens of the north end of the town and when the slump and business depression of 1907 came on, this plant was absorbed by the Smiths Falls Malleable Castings Company, Limited, thereby increasing the capacity by 3,000 tons annually.

Since the original incorporation in 1903 the company has operated on a capital of $150,000, but with the rising cost of manufacture it was found inadequate and also since they suffered the loss of three of their active firm members, viz., Wm. H. Frost and his two sons, Burton H. and E. Theodore, they felt the necessity of a reorganization and therefore incorporated a new company now known as Smiths Falls Malleable Castings, Limited, with an authorized capital of $750,000, which company bought out assets, goodwill, etc., of the old company.

The company contemplates doubling the capacity of plant No. 2 and have made provision in the charter for the manufacture of steel castings and will instal an up-to-date machine shop to be in a position to handle anything offered.

The present officials of the company are Geo. B. Frost, president and general manager; Dr. C. A. Patterson, vice-president and treasurer; J. E. Frost, secretary and sales manager, all three directors and constituting a managing board.

## Personal

Gordon Perry, president of National Iron Corporation, of Toronto, has been appointed chairman of the board of the English Electric Company, one of the largest makers of electrical equipment in Great Britain.

F. W. Evans, manager of the Toronto branch of the Canadian Fairbanks-Morse Company, has returned to the city after a six weeks' vacation. Mr. Evans' health is much improved as a result of the trip.

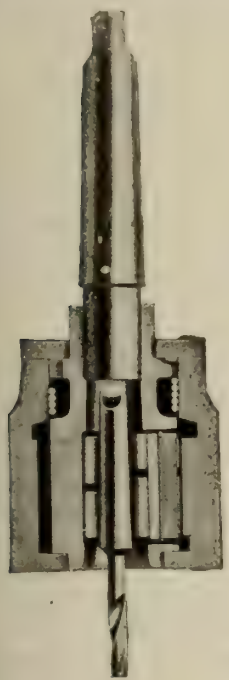
Alexander Johnston, former deputy minister of marine and fisheries, will be reappointed to this old post in the department. Mr. Johnston resigned his position after ten years of capable service to join the British Empire Steel Corporation, as assistant to Roy M. Wolvin, general manager.

**Safety League.**—The monthly meeting of the executive committee of the Ontorio Safety League was held at the King Edward Hotel on March 8. Among other matters the meeting received a report of the sub-committee, on the annual meeting. This report calls for a two-day safety convention, to be held in Toronto on April 27 and 28. The subcommittee on papers has arranged to have papers presented on Traffic, How to Interest the Employee in Safety, Workmen's Compensation, Falls and Falling Objects, Safeguarding Machinery and School Safety.

**Bought Leaside Plant.**—The Leaside Munitions Company, Limited, have completed the purchase from the United States Government of the large plant erected at Leaside during the latter months of the war. This plant was built for the American Government by the Leaside Munitions Company for the manufacture of twelve-inch shells for the United States artillery, but the plant and its equipment had only been completed a few days when the armistice was signed, with the result that it was never put to its intended use. It will be used by the present purchasers for manufacturing purposes.

# Aikenhead's

## "Everything in Tools"



## The Wahlstrom Automatic Drill Chuck

Do you discard, or salvage and repair, your tools when the tangs break? Neither is necessary if you use a Wahlstrom Automatic Drill Chuck. Good tangs or broken tangs, it makes no difference, for the Wahlstrom will hold tools whether they have tangs or not! The jaws grip on the **side** of the shank. The reduction in your tool upkeep cost, when you use these chucks, is governed entirely by the number of Wahlstroms operating in your plant.

There's no time lost in waste motion with the Wahlstrom Chuck. It is automatic and instantaneous in action. It enables the operator to make **tool changes in just two seconds,** without stopping the spindle of the machine.

Made in two different styles. One style holds No. 1, 2 or 3 Morse Taper Shank Drills—with or without a tang. The other style is made in three sizes, which hold all sizes of straight shank tools from ¼ to 1 inch.

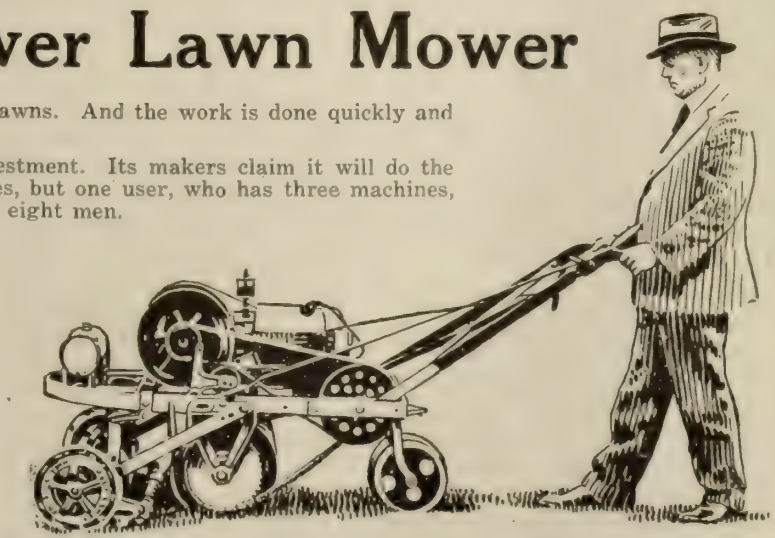
## The Ideal Power Lawn Mower

Ideal Mowers insure close-clipped, velvety lawns. And the work is done quickly and cheaply in a clean, easy way.

Ideal Mowers are a real money-saving investment. Its makers claim it will do the work of five men with hand power machines, but one user, who has three machines, claims that each machine does as much as eight men.

An important feature of the Ideal Mower is that the power drive is separate from the cutting unit, so that if a stone or other obstacle gets in the way, the cutting unit will automatically stop until the obstacle is removed. Those who have used a mower to any extent will appreciate what this feature will do to prolong the life of the machine.

A booklet describing the Ideal Power Lawn Mower more fully will gladly be sent you.



## Aikenhead Hardware, Limited

**17 Temperance Street, Toronto, Ont.**


*If interested tear out this page and place with letters to be answered.*

# Shall Canada Trade With Germany?

ARE we going to trade with Germany? If so, upon what grounds and terms? The matter of German trade is coming up for discussion in many places. Not long since the Canadian Association of British Manufacturers had a fairly pointed argument over the problem, some holding that members had no right to act as agents for what they termed enemy lines in Canada. Others in the association held it would not be fair to restrict members in this way, as it would simply toss business over to others.

And so it goes. Nor can it be said that Germany is standing back while Canadians are making up their minds. Every week seems to show an increase in the volume of German catalogues reaching this country. Nor are they starved-looking publications one might expect to receive from a country that has gone through the experiences of the past few years.

Canadian Machinery asked some of the leading manufacturers to give their views on the matter. Our letter drew attention to the amount of business Germany was already doing here, and to the oft-repeated claim that Germany must be allowed to trade with the world in order to pay off her debts.

### Menace of Cheap Labor

B. H. Neill, sales manager of Canada Machinery Corporation, Galt, holds that the Canadian plant has a right to consideration and protection before the position of Germany is considered. He says:—

"It is our opinion that German goods should not come into the country unless at a heavy surtax sufficient to offset the difference in labor costs as well as the depreciation in German currency.

"If we have to trade with Germany in order to assist her to pay her war indemnity, and by so doing have our country flooded with cheap goods while our own factories and workmen remain idle, better forget the indemnity and put an embargo against goods from a discredited nation. It is not long since every good Canadian was solemnly declaring he would never again buy German goods. How quickly these declarations are forgotten when the dollar is involved!

"Our Customs Department is already assisting German exporters by appraising values on basis of exchange on day of entry. For instance, the other day the German mark was valued at 1 7-10 cents. What protection does this afford the Canadian manufacturer who is helping to pay our own war debts?

We are directly opposed to your suggestion."

### Short, But Very Pointed

Canada Foundries & Forgings, Ltd., Welland, do not mince words in stating the case as they see it. Simply this, in a letter from B. J. McCormick, general sales manager of the company:—

"Replying to your letter of March 8th on the subject of re-establishing German connections, we wish to say that we have no desire to either buy or sell any articles of commerce with these people."

### Not Particularly Interested

The Mason Regulator & Engineering Co., Montreal, have not gone very fully into the matter, as it is one that does not concern them in their business relations. H. L. Peiler, general manager, writes as follows:—

"I am in receipt of your letter of the 8th instant, contents of which are noted, and with reference to which I may state that this company is not interested in products of German origin and I have, therefore, so far not been called upon to form an opinion in the matter.

"There appears to be no doubt that if we as individuals or collectively, should refuse definitely to trade with Germany, it would simply make it increasingly difficult for that country to meet her foreign obligations, and it would, therefore, appear to be a question of our general interests not to base trade relations upon prejudices aroused during the past conflict.

"However, as I have stated above, the question is one that does not directly affect this company's business."

### Straight Talk Here

When J. M. Taylor, president of the Taylor-Forbes Co., Guelph, has anything to say, people generally know exactly where he stands. So in the present case, when Canadian Machinery asked the opinion of the aggressive J. M. about trading with Germany, it was not surprised at the warmth and directness of the answer it drew:—

"Your letter dated March 4th received, and we were very much surprised to learn of the volume of importation from Germany during 1920.

"Our view is we do not want to any business with Germany directly or indirectly. We are just warm-blooded enough to refrain from wanting to do business with the murderers. We are not built on the lines of some people who have no memories and can forgive and forget over night.

"The very thought of doing business with Germany is torture enough, without actually doing business with them.

"We grant you that the war indemnity must be paid, but let Germany swelter in paying it. If it will torture them and make them bleed mentally to pay the indemnity we hope those in power will keep up the good work of torture."

### Don't Penalize Canada

A. M. Kerr, secretary-treasurer of the Preston Woodworking Machinery Co., holds that Canadian manufacturers need some consideration, as well as Germany, and that there should be protection against cheap German goods. "Trading with Germany," says Mr. Kerr, "is a matter to which we have not given much attention since German competition does not concern us a great deal. We agree with what you say that if Germany is going to pay the huge war indemnity, we must be prepared to go ahead and trade with her as formerly, but Canadian manufacturers should have a chance, which they will not have if Germany, at the low price of the mark, can underbid her all along the line.

"If they are able to ship goods in here and prevent us from manufacturing them it looks to me as if it would be Canada that would pay her indemnity. We don't think that Canadian manufacturers should be penalized because the German mark is worth so little and selling so much below par that they are able to ship goods into Canada so easily in competition with Canadian industries. The value of her money eliminates competition almost altogether, and we would all suffer while she pays off her indemnity. Let our country put up a tariff barrier sufficiently large to make it a competitive proposition, and then I would say it would be more nearly as it should be."

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# INGERSOLL

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**(MADE IN CANADA)**

DRINKING CUPS ARE UNSANITARY but the "Puro" delivers clean, fresh water at a reduction of 15 per cent. to 35 per cent in water bill.

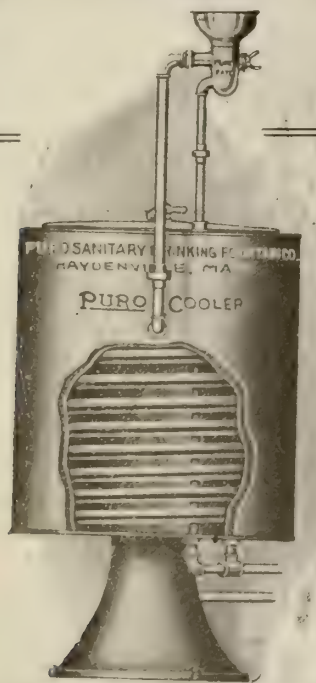
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# MONTREAL NOTES

Capt. B. G. Grant, general manager and Canadian director of Armstrong-Whitworth of Canada, who has been absent on a business trip to England for the past six weeks, during which time he attended a director's meeting of the company, is expected back in Montreal about the 18th of the month.

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The water is now being emptied from the Lachine Canal preparatory to the annual cleaning and inspection that is always done before the opening of navigation. Special examination will be given to all the lock sills, owing to the fact that some of them were subjected to severe strains last season by large and heavy-laden vessels. This spring inspection is a very important part of the year's work, as it minimizes the possibility of serious tie-up at a busy period of the season.

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It is expected that an early opening of navigation of the St. Lawrence will take place this spring owing to the mild spell of weather that has prevailed during the past several weeks. The Government anticipate putting the ice-breakers into service this week and should the weather continue as at present there is every hope that shipping will be moving on the river about two weeks earlier than for some years back. The fact that both the Government ice-breakers will be on duty in the river this year adds to the possibility of clearing the ice at an early date.

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At the regular monthly meeting of the Canadian Railway Club, held in the Windsor Hotel, Montreal, on March 8, one of the largest gatherings of the year was favored with several special features of interest. Before the regular business of the evening was commenced, a presentation was made to Gordon W. Dunn, a member of the club, this being in the form of a bronze medal of the Canadian Royal Humane Society, for the rescue of Miss Schoenart, of Philadelphia, from the Niagara River, on the 15th of September last. The paper of the evening was prepared and read by Samuel Lynn, general master car builder of the Pittsburg and Lake Erie Railroad, the title being: "Repairs and Maintenance of Steel Freight Cars." The paper was highly interesting and instructive and was illustrated by lantern slides.

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Operations will soon be started on the dismantling of the Old Knox Church, at the corner of Mansfield and Dorchester Streets, in Montreal, to make room for the large addition that the Sun Life Insurance Company intend making to their present building. This property was acquired at the time of the original purchase, but up until the present the additional office space was not required. It is expected that operations will have advanced sufficiently far enough to lay the corner stone of the new building some time in May, this year being the jubilee of the company. The cost of the new addition will be approximately $1,250,000 and it is expected that it will be completed in 1923. The building will, in every respect, be identical with the large one now used by the company. The architects are Darling and Pearson, designers of the new Government buildings.

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### NOVEL FORM OF WARNING

The possibility of using stenches as a warning in mines was recently investigated by the Bureau of Mines, U.S.A., and forms the subject of a special report. It is stated that stenches as a warning have a decided action; they exert a positive effect because of their offensiveness. When miners smell a disagreeable stench they instinctively desire to obtain pure air at once. The velocity of air through compressed air lines in metal mines is usually hundreds or even thousands of feet a minute, so that transmission of a stench is rapid. Warning by stenches is particularly adapted to mines equipped with compressed air. In coal mines, where only the ventilating current is available for carrying a stench the average velocity is low, of the order of 200 feet a minute or less. If the velocity of the air in a compressed air line is rapid, a small quantity of material would give more effective warnings than the same quantity in a ventilating current, because of being liberated in concentration at the points where most needed, and being less diluted with air. However, the method may be useful in some mechanically ventilated mines where compressed air lines are unavailable. Of the chemicals tried, it would appear that compounds of mutyl mercaptan are the best adapted for the purpose in view.

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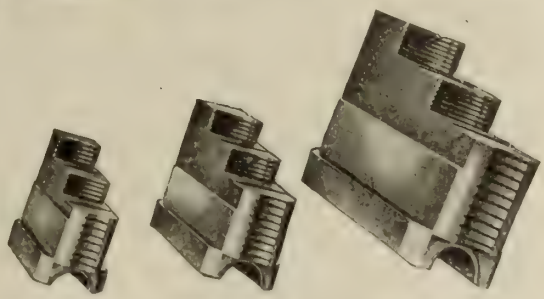
### MICRO-GAGE SET

The Van Keuren Company, of Boston, Mass., are now offering to the trade a set of micro-gages which give dimensions in any desired thousandth of an inch from 0.4 to over 5 inches by combining two or more of the various gages. The set is very serviceable for both tool-room and production work. The set consists of only sixteen separate gages. The gages are cylindrical and made of tool steel, heat treated and seasoned, faces being ground and lapped to a mirror finish. It is stated that the working faces are held within a few millionths of an inch for parallelism and flatness of faces. At the standard temperature of 68 degrees it is claimed that the size of any block is correct to 0.000025 of an inch.




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## New Catalogue

The Elk Fire Brick Company of Canada, Ltd., Sun Life Building, Hamilton, have issued a bulletin describing their products. This company manufacture refractory brick in all shapes, for furnace linigs, blast furnaces, cupolas, fire brick arches, checker brick, etc. The catalogue illustrates every different shape, and gives information on the sizes available, and the guarantees given, also the deviations from specifications allowed. The shapes shown have been adopted by the Refractories Manufacturers' Association as standard. In addition to the foregoing there are a number of tables showing numbers of bricks required of various shapes to make certain size linings. Other useful tables are fusion points of different materials, and comparison of the different thermometer scales, circumference and areas of circles, and weights of various materials.

## Marine Engineering

It has been announced by Admiral Benson, chairman of the Shipping Board, after hearing claims of coast shipping representatives, that fifteen vessels will soon be allocated to service between Pacific coast ports and the Orient.

The death occurred at Sarnia on March 6 of Capt. Walter E. Linton, a well-known resident of Mooretown. The late Capt. Linton was one of the best-known sailors in this district, and had been sailing out of great lake ports for the past 26 years.

The steamer Dougald Mac, formerly the Columbia, well-known on the River St. Lawrence as a coal carrying steamer, is being converted into a tow barge by the Sincennes McNaughton Company. The vessel will ply during the coming season between Montreal and Oswego in the coal trade.

A shipbuilding correspondent of The Morning Post, London, England, writes that almost 20 per cent. of the shipbuilding berths in England are vacant, and shipbuilders have no contracts on hand for ships to be laid down. In a short time, as the ships under construction are completed, the number of vacant berths will be increased. Within the last twelve months twice as many orders have been cancelled as have been placed. While costs remain at the existing high level there is no chance of British shipbuilders getting new orders in any quantity, and more particularly is this true when there is so much German tonnage being offered for sale on behalf of the Government. Shipping and shipbuilding have outstripped the needs of commerce.

# Classified Opportunities

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BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

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FOR SALE — COMPLETE EQUIPMENT FOR the manufacture of Bench and Machine Vises, including patterns, jigs, templates, special tools, etc. Going out of the manufacturing business on account of ill health. Bargain for quick sale. This is a production proposition, specially suitable for plant with foundry and wishing to add profitable additional line with well established connection. Apply Box No. 756, Canadian Machinery.

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Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

**Grey Iron Castings**

Light and Medium-Bench and Floor Repetition Castings; Capacity 15 tons per day. Expert Metal and Wood Pattern Work. Our advice and estimates will save you money. Semi-finishing operations on Lathe or Grill on Castings supplied if required.

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6—20" x 8' C.M.C. Lathes.
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1—D-1 H. D. Colburn Drill.
2—No. 24 H. D. Foote-Burt Drills.
1—28" B. G. Barnes Drill.
1—22" B. G. Barnes Drill.
1—D.C. Compound Wound Generator. 110 Volts, 125 Amp.
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2—2" x 26" Pratt & Whitney Turrets.
1—10" x 52" Plain Landis Grinder.

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Canadian Machinery

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## LETTERS PATENT

The proprietor of Letters Patent M. R. Matti No. 137772, relating to "Arrangement for changing the moment of fuel injection into the combustion chamber during the run of the motor and for regulating the quantity of fuel," desires to dispose of the patent or to grant license to Interested Parties at reasonable terms with a view to the adequate working of the Patent in Canada.

Enquiries to be addressed to the patentees, Svenska Aktiebolaget Nobel-Diesel, Nynashamn, Sweden.

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CANADIAN MACHINERY

# Classified Opportunities


## ATTENTION!
## JOBBERS and DEALERS
### Engineering Supplies

There is absolutely no reason for paying exchange on your purchases of asbestos packings, gaskets and tape. We manufacture a line that is equal to any imported article and sold to jobbers at a price that allows a good margin of profit with protection. If you are not handling our line you are working at a disadvantage. Write us for set of samples, circulars and prices.

**OUR LINE INCLUDES :**

Tiger Superheat Metallic Piston Packing
Tiger High Pressure Piston Packing
Flax Packings
Asbestos Gaskets
Asbestos Tape




**GUILDFORD & SONS LIMITED**
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## THIS IS THE TIME TO FILL IN THE GAPS IN YOUR EQUIPMENT WITH MY SPECIALS

**1 24″ Cincinnati Shaper, B.G., practically new.**

**1 No. 4 Greenard Arbor Press.**

**1 26″ x 12′ G. M. C. Lathe, 3 step cone, D.B.G., Q.C.G., compound rest and hollow spindle, with extra tool post turrets and quick return now under belt.**

*Name the amount of money you wish to spend on any type of machine and perhaps we can get together.*

**My stock contains a large number of tools. It will pay you to communicate with me. Open to buy, sell or exchange.**

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# FIREBRICK
### That Will Give You This Kind of Service

Firebrick is made in a great variety of brands and burns, each brand being better than any other brand for some particular class of work.
Firebrick of a quality second to none.
Firebrick always kept in stock and prompt deliveries assured.
Firebrick that sells at moderate prices.

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Firebrick will give you these results—and more. We take a keen interest in seeing that you get the kind of firebrick you need. We never recommend a high-priced brick where a lower-priced one is better. Bricks in all standard sizes and shapes. Well stocked warehouse at Hamilton. Specify Elk in your next order.

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**Sun Life Building - Hamilton, Ontario**

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| 18 ga. | 30″ x 96″ |
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| 22 ga. | 30″ x 96″ |
| 24 ga. | 30″ x 96″ |
| 26 ga. | 30″ x 96″ |
| 28 ga. | 30″ x 96″ |
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## GALVANIZED SHEETS

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| 24 ga. | 30″ x 96″ |
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| 26 ga. | 36″ x 96″ |
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| 28 ga. | 36″ x 96″ |
| 29 ga. | 30″ x 96″ |
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## AUTO BODY STEEL SHEETS
## COLD ROLLED STRIP STEEL
STEEL BRASS COPPER
TUBES SHEETS RODS
*Your Enquiries Solicited.*
## ONTARIO METAL PRODUCTS
CO., LIMITED
237 Dufferin St., TORONTO, Canada

ON THE LISTS OF ADMIRALTY, WAR OFFICE, CROWN AGENTS FOR COLONIES, ETC.

Manufacturers of EXTRUDED BRASS and BRONZE RODS and SECTIONS.

HOT BRASS and BRONZE STAMPINGS and PRESSINGS.

GUN METAL, PHOSPHOR BRONZE, BRASS and WHITE METAL INGOTS.

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COPPER SMELTERS

BRASS ROD, STAMPINGS AND METAL MANUFACTURERS

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We stock in Montreal Free Turning Brass and Bronze Rods, suitable for high speed Turning both in Round and Hexagon.

We shall also be pleased to quote for shipments direct from Birmingham, shipping in two weeks' time.

**Sole Canadian Agents:**

**Thomas Moore & Son**

**224 Lemoine Street, Montreal**

*We excel in quantity production*

## Don't Keep It--Sell It!

If you have a lathe
a drill
a milling machine
a planer
a chain block
a chuck
a motor
a crane
a stock of belting
an engine
a compressor

or any other machine shop equipment for which you really have no further use, why not turn it into *cash?*

Someone may be looking for just the machine you may want to sell. Let us bring you together.

A "classified" ad. in CANADIAN MACHINERY, costing a few cents per issue, has done wonders for others. Why not try it?

Turn to the "Classified" section in this issue and see what is being offered and what is wanted at present.

**CANADIAN MACHINERY**

*Classified Advertising Section*

**143-153 University Avenue TORONTO, ONT.**

# GARLOCK-WALKER LIST

## If You Want Machine Equipment, Send Us Your Enquiries

**We have one of the largest stocks of new and used metal and woodworking machines in Canada.**
**Many machines only very slightly used and all absolutely guaranteed.**
**A few machines from our Toronto stock at exceptionally attractive prices are:**

**LATHES**

1—30" x 12' "Blaisdell" (used).
1—30" x 14' "Niles-Bement-Pond" (used).
1—26" x 14' "Niles-Bement-Pond" (used).
1—24" x 10' "Milwaukee" (new).
1—18" x 8' "Rae" (new).
1—16" x 6' "Reed" (used).
1—12" x 8' "LeBlond" Tool Room (used).
1—8" "Rivett" Cabinet Type, full attachments (used).
1—7" "Cataract" Precision (new).

**GAP LATHES**

1—38" x 54" x 12' Bertram (used).
1—22" x 40" x 16' McDougall (used).
1—21" x 30" x 7' South Bend (used).
1—20" x 38" x 12' C.M.C. (used).

**TURRET LATHES**

No. 4 Millhollands, capacity 1⅝" (used).
Several Davis Turrets and other makes. Various capacities.

**SHAPERS**

1—16" "MacKenzie" B.G. Crank Shaper, (new).
1—16" "Rae" B.G. Crank Shaper (slightly used).
1—24" "McGregor-Gurley" B.G. Crank Shaper (used).

**PLANERS**

1—42" x 42" x 20' Putnam, 1 head (used).
1—30" x 30" x 10' Pond, 1 head (used).
1—24" x 24" x 6' Powell, 1 head (new).

**MILLING MACHINES**

1—Briggs High Duty Type "A" 22" Traverse (new).
1—Briggs High Duty Type "B" 42" Traverse (new).
1—Whitney Hand Miller, 18" x 6" table (used).
1—No. 3 Ford-Smith Plain (used).
1—No. 3 Ford-Smith Universal (used).
1—No. 4 Cincinnati Plain (used).

**DRILLS**

2—10" Burke Sensitive (Bench type) (new)
1—15" Barnes (used).
20" "Sibley," "Champions," "Rockwell" and "Silver" (new) and (used).
1—36" C.M.C. Heavy Duty (used).
1—3-spindle 20" Silver Gang Drill (used).
1—4-spindle W. & R. Sensitive (used).

**BORING MACHINES**

1—66" Bement-Niles Vertical, 2 heads, 24" under rail (used).
1—Universal No. 2½ Horizontal Table, 42" x 22" (used).
1—Bullard "New Era" Vertical Turret, 36", complete equipment (new).

**POWER HACK SAWS**

1—No. 10 Racine 8" x 8" Cap. (new).
1—No. 7 Watkins 9" Cap., 18" Blade (used).
1—6" x 6" Racine (used).

**AIR COMPRESSORS**

1—12" x 12" Bury, Class "L," Belt driven (used).
1—8" x 8" Sullivan, Class W.G.-3, Belt driven (used).
1—8 x 10 x 8 Bury, Steam driven (used).

**GRINDING MACHINES**

1—Landis No. 4 Universal (used).
1—Landis Plain, self-contained, 36" x 12" (used).
1—Norton Plain, No. 434 (used).
1—Fitchburg Cylindrical 8" x 36" (new).
Several Tool and Cutter Grinders (new) and (used). "Globe," "Stevens," "LeBlond" and "Cincinnati."

**MISCELLANEOUS**

2—No. 4 Jno. Hall Pipe Machines (1 used) (1 new).
1—Lennox Rotary Bevel Shear, 1" Cap. (new).
1—"High Speed" Hammer, No. 3A (used).
1—Beaudry Champion Power Hammer, No. 9 (used).
1—"Grant" Riveting Machine, No. 80A (used).
1—"Grant" Riveting Machine, No. 80B (new).
1—Arbor Press, No. 4 "Greenerd" (new).

**GARLOCK-WALKER MACHINERY CO., LIMITED**

MONTREAL, 337 St. James St. TORONTO, 32 Front St. W. WINNIPEG, 567 Banning Ave.
Warehouse: 163 Dufferin Street, Toronto

# TOOL GRINDING CHART

Showing clearance and rake angles for cutting tools. 17 x 27½ inches, printed in two colors on heavy manilla stock.

A splendid thing for any tool room. One large engineering firm, in acknowledging this chart, stated that they would like two additional copies as they intended adopting it as standard in their tool room.

We would like these charts placed in every shop in the Dominion and if there is not one in YOUR tool room, write for your copy at once. IT'S FREE.

CANADIAN MACHINERY,
153 University Avenue, Toronto.

Please send me us free, one of your tool grinding charts.

Signed .....

Firm Name .....

St. Address .....

City .....

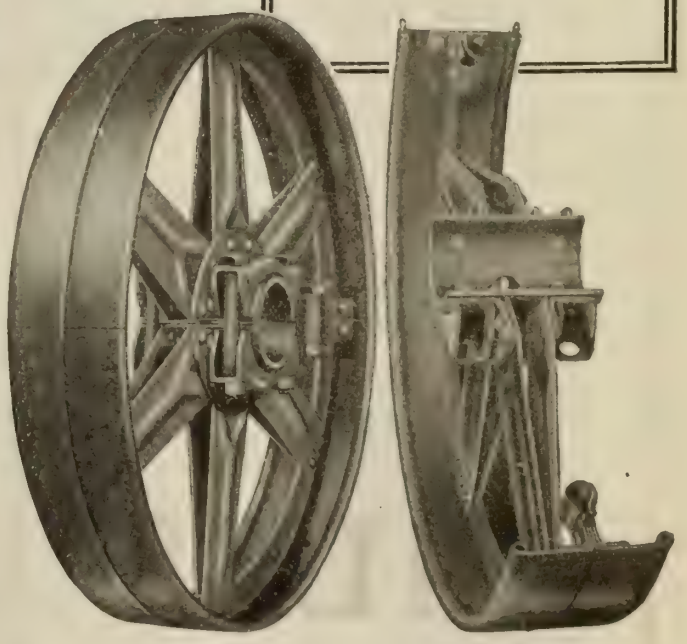
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*"Getting Maximum Pulley Efficiency"* is a booklet showing many unusual points about power transmission. It is yours for the asking.

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Philadelphia, Pa.

The AMERICAN PULLEY


*If interested tear out this page and place with letters to be answered.*

## You Can't Sharpen A Dull File

Throw it away, therefore, and buy a new one.

It is folly to allow workmen to keep on working with files that have become the least bit dull.

You waste their time and energy and spoil the work.

Specify one of the following brands when ordering and get maximum service:

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**Great Western**
**American**
**Arcade**
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**Nicholson File Company**

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**BEST BECAUSE**
**ALL STEEL HARDENED**

Spindle, Nut and Screw made of Bar Steel. Body drop-forged. Long lasting under hardest use.
Write for free catalogue.

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KELLER-MASTER
ROTARY GRINDER

**Ten pounds lighter, yet more rugged than other types with same power and speed—free from vibration, which insures endurance in operator and tool—ample power to sustain speed under load—are the salient features of the NEW Keller-Master Rotary Grinder.**

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## A New and Improved
# UNIVERSAL BEVEL PROTRACTOR

To meet the demand for a tool of more-than-ordinary convenience, absolute accuracy and a wide range of service, we have placed on the market this new Starrett Protractor.



The dial is graduated to degrees around the entire circle, is equipped with a single vernier and has encased a positive method for fine adjustments. All the adjustments are controlled from the center on the front side of the tool. Some mighty valuable features of this tool described in the new Starrett Catalog No. 22 "3"

**THE L. S. STARRETT COMPANY**
*The World's Greatest Toolmakers*
*Manufacturers of Hack Saws Unexcelled*
**ATHOL, MASS.**

42-159

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# One Advantage Gained

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## CUTTERS, REAMERS, TAPS AND DIES

*You are Guaranteed ACCURACY*




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## The SHERMAN DRESSER



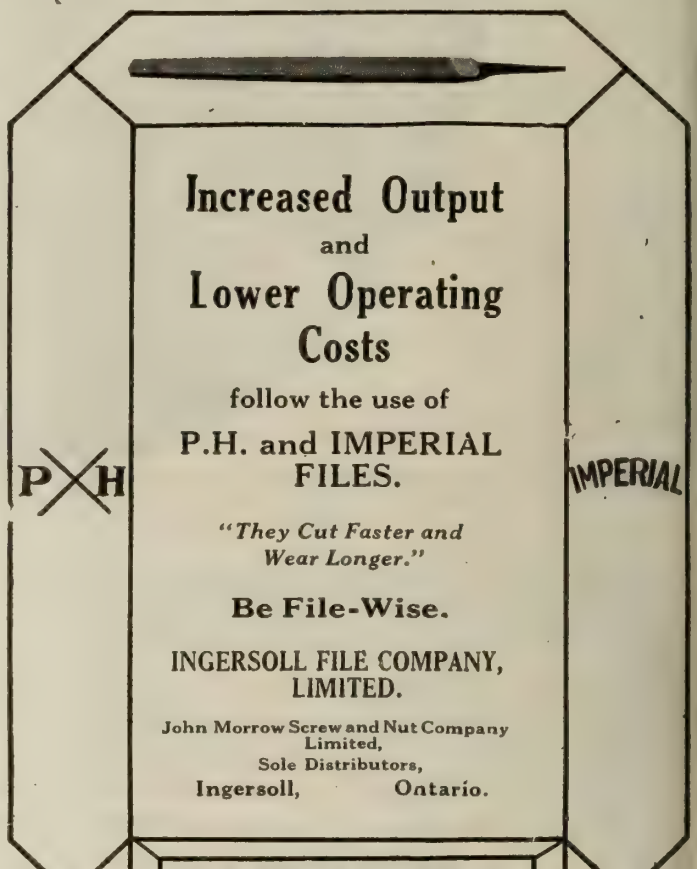
This is a tool particularly designed for use on hard, coarse or large wheels upon which a Diamond could not be used or upon which the Diamo-Carbo would not be economical.

It is provided with a protection hood which effectually protects the eyes of the user from flying particles. This protection hood is along the "Safety First" lines and is rapidly being adopted by all shops where the employee's safety is of first importance.

Write for complete catalog of our various dressers.

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P.H. and IMPERIAL FILES.

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We are prepared to give expert advice on the selection of tubing for various purposes. This service costs you nothing and may save you a lot of expense.

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**FOR ANTI-CORROSIVE AND SUPERHEAT SERVICE**

*Made in Canada by*

## CANADIAN DRIVER-HARRIS CO.

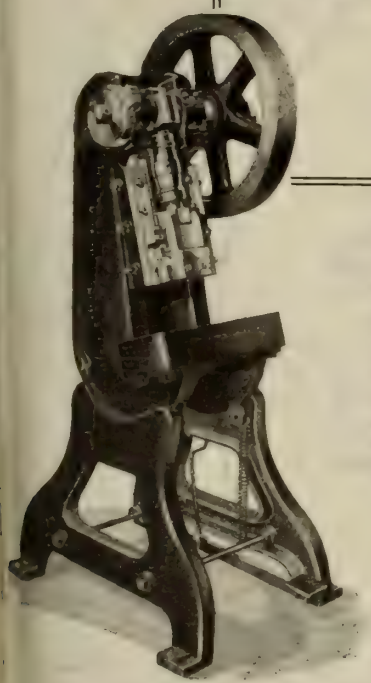
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American Office and Works

Chicago-Detroit Harrison, N. J. England-France

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**IN choosing a Power Press you look for strength, operating efficiency and quick adjustability. The Hepburn Press has all these features. The cranks are made from solid forgings and give long strokes. Well proportioned throughout with no inherent weaknesses. Write for specifications.**

*Lowest prices quoted on Vertical Engines, Compressors, Winches, Derricks, Steam Pumps, Blacksmith Work and Acetylene Welding.*

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*Engineers and Iron Founders*

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are universally recognized as the most practical type for use on machine tools.

Low speed — long life; large capacity; forceful stream without pulsation: operate in either direction against high pressure.

Let us send a sample pump for trial in your factory.

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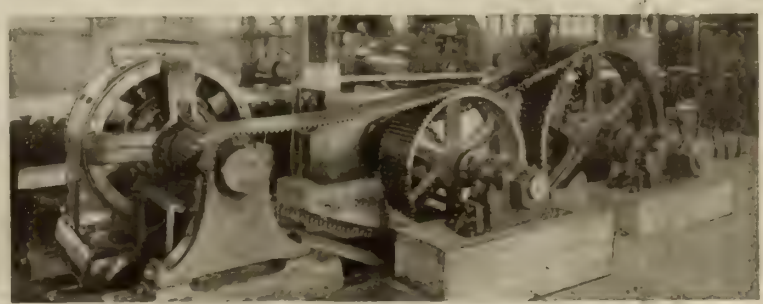
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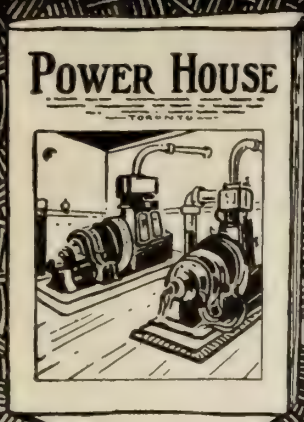
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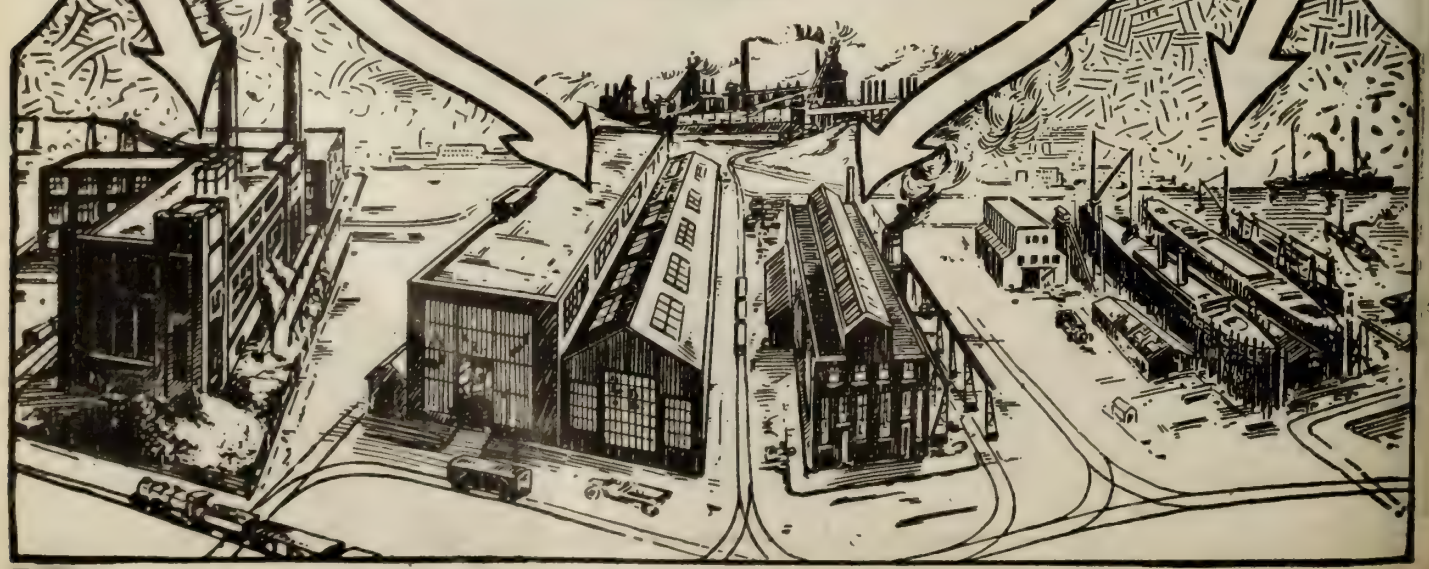
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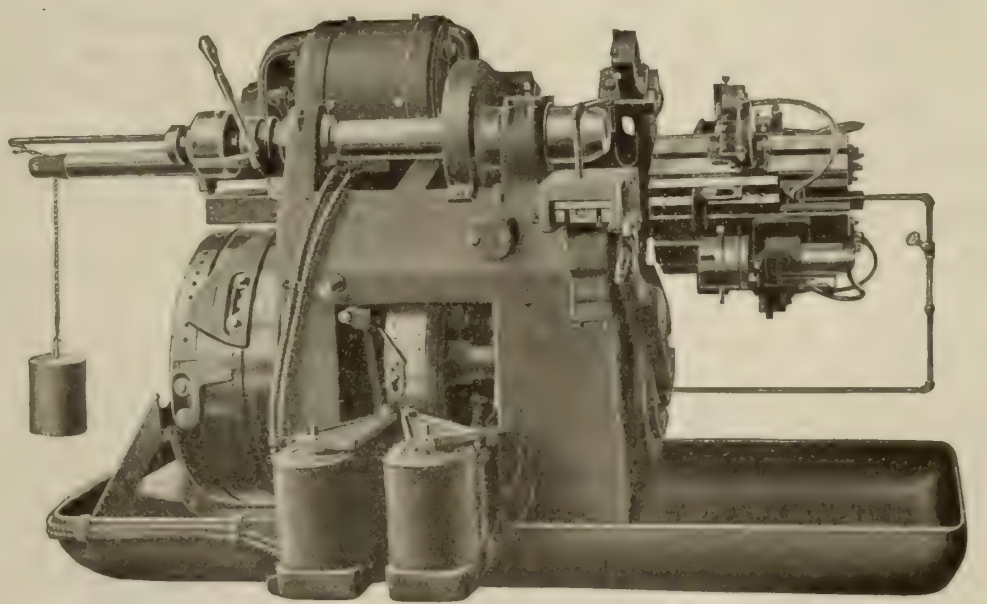
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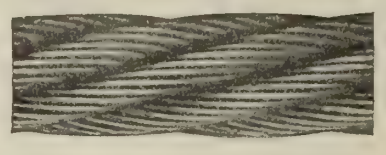
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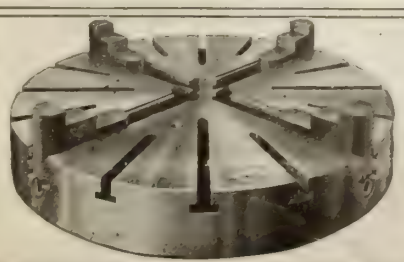
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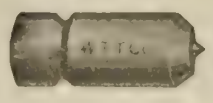
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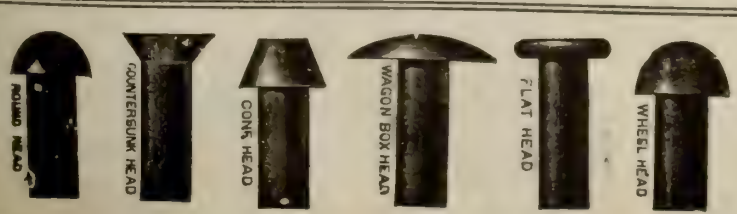
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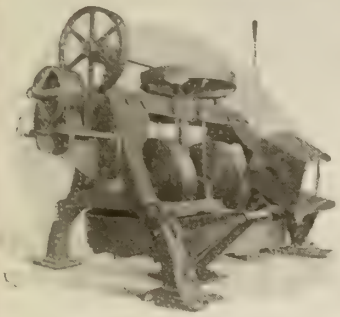
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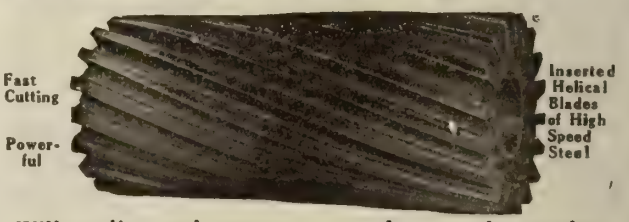
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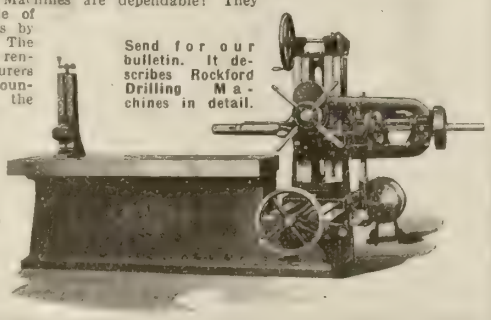



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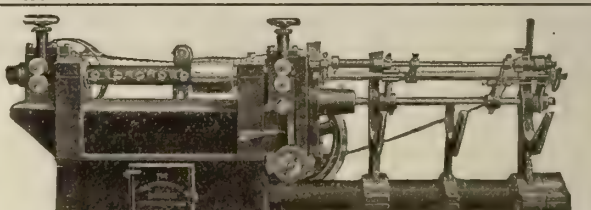
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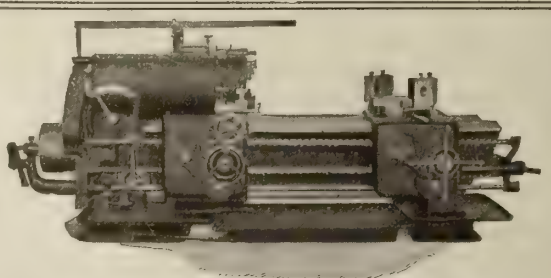
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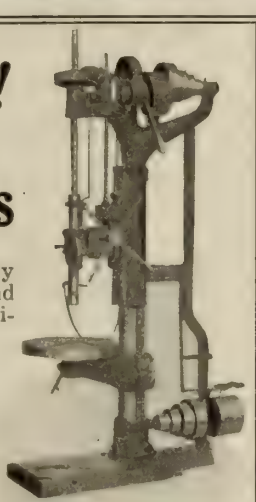
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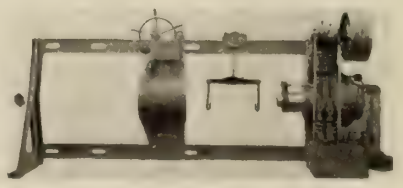
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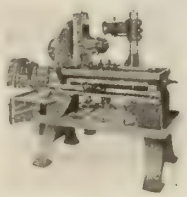
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Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Hyd. Press**
Can. Steel Foundries, Montreal, Que.

**Castings, Monel Metal**
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

**Castings, Naval Bronze**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Nichrome**
Can. Driver-Harris Co., Walkerville, Ont.

**Castings, Nickel**
Can. Hanson & Van Winkle Co., Toronto, Ont.

**Castings, Semi-Steel**
Davidson Mfg. Co., Thos., Montreal, Que.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

**Castings, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

**Cements, Iron**
Smooth Mfg. Co., Jersey City, N.J.

**Centering Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Chains (See Sprockets and Chains)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chains, Driving**
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chasers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chemists**
Toronto Testing Laboratory, Toronto, Ont.

**Chucking Machines**
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Chucks, Drill**
Jacobs Mfg. Co., Hartford, Conn.

**Chucks, Drill and Tap**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Lathe**
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Magnetic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**
Columbia Hdwe. Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

**Cleaners, Metal, Waste, General**
Oakley Chemical Co., New York, N.Y.

**Clocks, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Clutches, Friction**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**
Can. Link-Belt Co., Toronto, Ont.

**Collars, Shaft or Set**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

**Collets**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compressors, Air**
Curtis Pneumatic Machinery Co., St. Louis, Mo.

**Compressors, Air and Gas**
Can. Fairbanks-Morse Co., Ltd., Montreal
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**
Ford-Smith Machine Co., Hamilton, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Conveyor Belt Joiners**
Flexible Steel Lacing Co., Chicago, Ill.

**Copper**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Cored Bronze Bars**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Cotter Pins**
Morrow Screw & Nut Co., Ltd., Jonn, Ingersoll, Ont.

**Counterbores**
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Countershafts**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Couplers, Car and Locomotive**
Can. Steel Foundries, Montreal, Que.

**Couplings, Flexible**
Holden Co., Ltd., Montreal, Que.

**Couplings, Rigid**
Bernard Industrial Co., A., Fortierville, Que.

**Couplings, Shaft**
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

**Cranes, Electric**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.

**Cranes, Hand (See Hoists, Hand)**
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

**Cranes, Locomotive**
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Cranes, Traveling**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Crank Pin Turning Machines**
Garlock-Walker Mchy Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia, Pa.

**Cutters, Flue**
Holden Co., Ltd., Montreal, Que.

**Cutters, Gear**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Milling**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Machine Co., Cleveland.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.

**Cutters, Stay Bolt**
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Thread**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.

**Cutting-Off Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Cutting-Off Machines, Pipe (See Pipe-Cutting and Threading Machines)**
Landis Machine Co., Inc., Waynesboro, Pa.
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Cutting-Off Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Pilot Steel & Tool Co., Montreal, Que.

**Cutting Oil Filters (See Oil Filtering Systems)**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Cataract Refining Co., Toronto, Ont.

**Cutting, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

**Cutting, Oxy-Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Dealers, Machinery (See Searchlight Section)**
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Deckle Straps**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Diamonds, Black and Rough**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond, Carbon and Bortz**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Desmond-Stephan Co., Hamilton, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Wheel Trueing Tool Co., Detroit, Mich.

**Diamond Crossings**
Can. Steel Foundries, Montreal, Que.

**Die-Castings**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Dies, Pipe-Threading**
Jones & Lamson Machine Co., Springfield, Vt.

**Die Sinking Machines, Automatic**
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

**Die Sinkers**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Screw and Thread Cutting**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

# BUYERS' DIRECTORY

**Dies, Forging**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

**Dies, Hammer**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Self-Opening, Adjustable**
Can. Fairbanks-Morse Co., Ltd., Montreal
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Dies, Threading-Opening**
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Disc Cement**
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Dividing Heads**
Ackworthie, Ltd., John, Birmingham, Eng.
Dickow, Fred. C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Dogs, Lathe and Milling Machine**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drafting Boards and Tables**
Darling Bros., Ltd., Montreal, Que
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Drafting Materials**
American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Dressers, Grinding Wheel**
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Drill Holders**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drill Rods**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Drill Speeders**
Canada Machinery Corp., Galt, Ont.

**Drilling Machine Heads**
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

**Drilling Machines, Automatic**
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

**Drilling Machines, Bench**
Beacon Engineering Co., Tipton, England.
Can Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Electric and Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks Morse Co., Ltd., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Gang**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drilling Machines, Heavy Duty**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Holly R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill

**Drilling Machines, Multiple Spindle**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

**Drilling Machines, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Drilling Machines, Portable**
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Radial**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Drilling Machines, Sensitive**
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Turret**
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

**Drilling Machines, Vertical**
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng.
Standinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Drills, Center**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drills, High Speed Twist**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Drills, Twist and Flat**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.

**Dust Handling Equipment**
Can. Blower & Forge Co., Ltd., Kitchener.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Electrical Instruments**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Electrical Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O.

**Elevating Trucks (See Trucks)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Elevators and Conveyors**
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que
Mathews Gravity Carrier Co., Port Hope, Ont.

**Emery Wheels (See Grinding Wheels)**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Hart Products, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Engines, Capstan**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Engineers, Mechanical**
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.

**Expanders, Tube**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Eyeglasses, Safety (See Goggles, Safety)**
Prest-O-Lite Co. of Can., Toronto, Ont.
Willson Goggles, Inc., Reading, Pa.

**Fans, Electric**
Can. Blower & Forge Co., Ltd., Kitchener
Can. Fairbanks-Morse Co., Ltd., Montreal.
Northern Electric Co., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Exhaust**
Can. Blower & Forge Co., Ltd., Kitchener.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Sturtevant Co., B. F., Boston, Mass.

**Fans, Ventilating**
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Sturtevant Co., B. F., Boston, Mass.

**Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**File Handles**
Ingersoll File Co., Ltd., Ingersoll, Ont.

**Files and Rasps**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Filing Machines**
Garlock-Walker Mchy. Co., Toronto, Ont
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Filler, Iron (See Cements, Iron)**
Smooth Mfg. Co., Jersey City, N.J.

**Fire Extinguishers**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Fittings, Pipe**
International Malleable Iron Co., Guelph, Ont

**Flexible Shafts**
Aikenhead Hardware Ltd., Toronto, Ont.

**Flux, Galvanizing**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Fluxes, Welding**
L'Air Liquide Society, Toronto, Ont.

**Forging Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.

**Forgings, Drop**
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd Toronto, Ont.

**Forgings, Hammer**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Foundry Equipment**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Foundry Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Frogs, Spring or Rigid**
Can. Steel Foundries, Montreal, Que.

**Fuel Oil Burning System**
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Heat Treating Coal**
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Oil and Gas**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bellevue Industrial Furnace Co., Detroit.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces and Ovens, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd Hiram, Walkerville, Ont.

**Furnaces, Tempering and Annealing**
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furniture, Machine Shop**
Garlock-Walker Mchy. Co., Toronto, Ont.

**Gages, Comparator**
Jones & Lamson Machine Co., Springfield, Vt.
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont.
Perdue, W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass.

**Gages, Measuring (See Tool Work)**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Q.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont
Starrett Co., L. S., Athol, Mass.

**Gages, Recording**
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.

# BUYERS' DIRECTORY

**Gages, Snap, Thread and Cylindrical**
Ackworthie, Ltd., John, Birmingham, Eng.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks Morse Co., Ltd., Montreal
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Standard**
Armstrong Whitworth Co. of Can., Lt Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis,
Johansson Inc., C. E., Windsor, Ont.

**Gages, Thread**
Ackworthie, Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Garnet, Emery and Flint Paper and Cloth**
Ritchey Supply Co., Toronto, Ont.

**Gas, Coal Compressed**
L'Air Liquide Society, Toronto, Ont.

**Gas, Compressed**
Prest-O-Lite Co. of Can., Toronto, Ont.

**Gaskets**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

**Gear Blanks**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario
Philadelphia Gear Works, Philadelphia, Pa.

**Gear-Cutting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

**Gear Testing Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Gears, Cast**
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que

**Gears, Cut**
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hamilton Gear & Machine Co., Toronto, Ontario.
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Gears, Dressed**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Gears, Forged**
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Gears, Herringbone**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

**Gears, Machine Moulded**
Can. Steel Foundries, Montreal, Que

**Gears, Rawhide (See Gears, Cut)**
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear, Silent Chain**
Gardner & Son, Robt., Montreal, Que
Morse Chain Co., Ithaca, N.Y.
Can. Link-Belt Co., Ltd., Toronto, Can.
Hans Renold of Canada, Ltd., Montreal, Quebec.

**Gears, Worm**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.

**Generators, Acetylene**
L'Air Liquide Society, Toronto, Ont

**Generators, Electric**
Holden Co., Ltd., Montreal, Que
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Goggles, Safety**
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

**Grab Buckets**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Grease Cups, Pressed Steel and Brass**
Can. Winkley Co., Ltd., Windsor, Ont.

**Greases, Lubricating**
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

**Grinding Discs**
Ritchey Supply Co., Toronto, Ont.

**Grinding Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**Grinding Machines, Abrasive Belt**
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Automatic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Bench**
Aikenhead Hardware Ltd., Toronto, Ont.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Grinding Machines, Center**
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines Chaser**
Jones & Lamson Machine Co., Springfield, Vt.

**Grinding Machines, Cutter and Reamer**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Cylindrical**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Die**
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

**Grinding Machines, Disc**
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Drill**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Face**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Floor and Tool**
Beacon Engineering Co., Tipton, England.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Grinding Machines, Internal**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Portable**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wisconsin Electric Co., Racine, Wis

**Grinding Machines, Power Oscillating Tool**
Herbert Ltd., Alfred, Toronto, Ont.

**Grinding Machines, Ring Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Snagging**
Blount Co., J. G., Everett, Mass.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Surface**
Garlock-Walker Mchy. Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machinery, Tool Post**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Universal**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.

**Grinding Wheels**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Guards, Machinery and Window**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Guards, Electric Lamp**
Flexible Steel Lacing Co., Chicago, Ill.

**Gun-Barrel Machinery**
Steinle Turret Machine Co., Madison, Wis.

**Hack Saws, Power**
Ackworthie, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Hamilton, Canada.
Garlock-Walker Mchy. Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hammers, Chipping**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hammers, Drop**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

**Hammers, Electric**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Hammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Hammers, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hammers, Riveting**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hangers, Shafting**
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Terry & Co., John C., Birmingham, Eng.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hardening, Case-Hardening and Tempering**
Hamilton Gear & Machine Co., Toronto, Ont.

**Hardness Testing Apparatus**
Shore Instrument Co., Jamaica, N.Y.

**Heating**
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.

**Hobbing Machines**
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hobs**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Hoists, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

**Hoists, Hand**
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Hoists, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Holders-On, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Hose, Flexible Steel**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Hose, Industrial**
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Hose, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Foamite Firefoam Co., Hamilton, Ont.

**Hydraulic Leather**
Graton & Knight Mfg. Co., Worcester, Mass.

**Hydraulic Machinery**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.

**Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Index Centers**
Dickow, Fred. C., Machinery Co., Chicago, Ill.

**Igniters, Gas Engine**
Canada Foundries & Forgings Co., Welland, Ont.

**Indicators, Speed and Test**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.

**Insulation**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Jacks, Hydraulic**
Norton, A. O., Boston, Mass.

**Jacks, Planer**
Armstrong Bros. Tool Co., Chicago, Ill
Starrett Co., L. S., Athol, Mass.

Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que.
Crescent Machine Co., Ltd., Montreal, Q.

# BUYERS' DIRECTORY

**Jigs and Fixtures (See Tool Work)**
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Keyseating Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Keys, Machine**
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

**Knives, Machine**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Simonds Canada Saw Co., Montreal, Que.

**Knurl Holders**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lacing Leather**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

**Lamps, Electric**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**Lathe Attachments**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ort.

**Lathe Pans, Portable**
Canada Machinery Corp., Galt, Ont.

**Lathe Tools**
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

**Lathes, Automatic and Semi-Automatic**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Bench**
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lathes, Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)**
Acme Machine Tool Co., Cincinnati, Ohio
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
McDougall Co., Ltd., R., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Engine**
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hartlinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Sidney Machine Tool Co., Sidney, Ohio.
Strobinger Co of Can., Ltd., Chas. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Extension and Gap**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Lathes, Heavy Duty Projectile Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blashill Wire Machy Co., Ltd., Montreal
Sidney Machine Tool Co., Sidney, Ohio.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Polishing (See Polishing and Buffing Machines)**
Ford-Smith Machine Co., Hamilton, Ont.

**Lathes, Relieving**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Lathe, Universal Hand**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Lathes, Screw-Cutting**
Jones & Lamson Machine Co., Springfield, Vt.

**Lathe, Speed and Hand**
Blount Co., J. G., Everett, Mass.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Lathes, Spinning**
Terry & Co., John C., Birmingham, Eng.

**Lathes, Threading**
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

**Lathes, Vertical Turret**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

**Lathes, Wood Turning**
Blount Co., J. G., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Lead Pipe**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Lighting Fixtures**
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

**Linoleum Mill Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Liquid Air Plants**
L'Air Liquide Society, Toronto, Ont.

**Lockers, Clothes**
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

**Lubricants**
Cateract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Lubricating Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Machinists' Small Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal Q
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strobinger Co of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Mandrels, Expanding**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Mandrels, Solid**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Measuring Machines**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Metals, Alloy**
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Tallman Brass & Metal, Ltd., Hamilton, Ontario.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Metalite Cloth**
Ritchey Supply Co., Toronto, Ont.

**Micrometer Calipers**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Milling Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Milling Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**Milling Machines, Automatic**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Bench**
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Hand**
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

**Milling Machines, Horizontal and Planer Type**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal Q
Cleveland Milling Machine Co., Cleveland
Ford-Smith Machine Co., Hamilton, Ont
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Milling Machines, Plain**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cleveland Milling Machine Co., Cleveland
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng

**Milling Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Milling Machines, Universal**
Armstrong-Whitworth, of Canada, Ltd., Montreal, Canada.
Cincinnati Milling Machine Co., Cincinnati, Ohio
Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Mchy. Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Milling Machines, Vertical**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

**Monel Metal**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Motors, Electric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Moulded Rubber Goods**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Nail Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Nails and Staples**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Nickel, Bars, Sheets, Wire, Etc.**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Nickel Plating Outfits**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Nickel Silver**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Nitrogen**
L'Air Liquide Society, Toronto, Ont.

**Nut Tappers (See Bolt and Nut Machinery)**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

**Nuts, Finished and Semi-finished**
Galt Machine Screw Co., Galt, Ont.

**Nuts, S.A.E., Plain and Castellated**
Galt Machine Screw Co., Galt, Ont.

**Oil Filtering and Storage Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oil Storage Engineers**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oils**
Canadian Oil Companies, Ltd., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Hole Covers**
Can. Winkley Co., Ltd., Windsor, Ont.

**Oils, Soluble**
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oxygen**
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont
L'Air Liquide Society, Toronto, Ont.

**Oxy-Acetylene Apparatus**
L'Air Liquide Society, Toronto, Ont.

**Packing, Hydraulic**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg Co., Worcester, Mass
Guildford & Sons, Ltd., Halifax, N.S.

**Packing, Steam**
Can. Consolidated Rubber Co., Ltd., Montreal Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Graton & Knight Mfg. Co., Worcester, Mass
Guildford & Sons, Ltd., Halifax, N.S.

**Paper Mill Conveyors**
Bertrams Ltd., Edinburgh, Scotland.

**Patents**
Fetherstonhaugh & Co., Ottawa, Ont.
Marion & Marion, Montreal, Que.

**Pans, Wet and Dry**
Frost Mfg Co., Chicago, Ill.

**Pattern-Shop Machinery (See Woodworking Machinery)**
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Patterns, Wood and Metal**
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Wraggis Pattern Works, Galt, Ont.

**Penstocks, Steel**
MacKinnon Steel Co., Sherbrooke, Que

# BUYERS' DIRECTORY

**Phosphor Tin**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Photographic Duplicating Machines**
Commercial Camera Co., Providence, R.I.

**Pig Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Bending Machines**
American Pipe Bending Machine Co., Boston, Mass
Can. Fairbanks-Morse Co., Ltd., Montreal.
Underwood Corp., H. B., Philadelphia, Pa
Williams Machinery Co., A. R., Toronto, Ont.

**Pipe Couplings**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Cutting and Threading Machines**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**
Landis Machine Co., Inc., Waynesboro, Pa.

**Pipe Fitters' Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa.

**Piston-Ring Machines**
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Planers, Parallels**
L. & P. Mfg. Co., Niagara Falls, Ont.

**Planing Machines**
Bertram & Son Co., Ltd., The John Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Planing Machines, Rotary**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Pneumatic Tools**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Blount Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Pots, Steel**
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Pressed Steel Parts**
Ackworthie, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich
Can. Fairbanks-Morse Co., Ltd., Montreal.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strellinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Presses, Drop and Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Toledo Machine & Tool Co., Toledo, Ohio

**Presses, Foot and Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

**Presses, Forcing**
Atlas Press Co., Kalamazoo, Mich.
Stewart & Co., Duncan, Glasgow, Scot.

**Presses, Hydraulic**
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

**Presses, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Protractors**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Propellers**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Pulleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal and Fibre**
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Pulp and Paper Mill Equipment**
MacKinnon Steel Co., Sherbrooke, Que.

**Pumps, Automobile Tire**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Pumps, Barrel and Boiler-feed**
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coalant**
Trahern Pump Co., Rockford, Ill.

**Pumps, Geared and Hand**
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

**Pumps, Lubricant and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Jardine & Co., A. B., Hespeler, Ont.

**Punches, Power**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

**Punching Machines, Horizontal**
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Racks, Cut**
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**
Holden Co., Ltd., Montreal, Que.

**Reamer Holders**
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

**Reamers, Expanding**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Reamers, Solid**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Reamers, Taper**
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Recorders, Temperature**
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Recorders, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Rheostats**
Northern Electric Co., Montreal, Que.

**Resistance Materials**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Respirators**
Willson Goggles, Inc., Reading, Pa.

**Rivets**
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Rivet Heaters**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.

**Riveting Machines**
Bilton Machine Co., Bridgeport, Conn.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**
Stewart & Co., Duncan, Glasgow, Scot.

**Rolls (Rubber Covered)**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rudder Frames, Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Rubber Goods, Mechanical**
Quaker City Rubber Co., Philadelphia, Pa.

**Rules, Steel**
Chesterman & Co., Ltd., J., Sheffield, Eng.

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R.I

**Rust Preventatives**
Oakley Chemical Co., New York, N.Y.

**Sand Equipment**
Can. Link-Belt Co., Toronto, Ont.

**Sand Mills**
Frost Mfg. Co., Chicago, Ill.

**Sanding Machinery**
Oliver Machy. Co., Grand Rapids, Mich.

**Sand Rammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Saw Frames and Blades, Hack**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Sawing Machines, Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Sawing Machines, Power Hack**
Ackworthie, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Saw Sharpening Machines**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saw Tables, Universal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Hot and Cold**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Saws, High Speed Steel**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Metal Band**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saws, Metal, Power**
Clemson Bros., Inc., Hamilton, Ont.

**Saws, Metal Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

**Saws, Milling**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Saws, Screw Slotting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Swing Cut-off**
Oliver Machinery Co., Grand Rapids, Mich.

**Scales**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal. Q.

**Screens**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Screw Driving Machine**
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Screw Extractors**
Cleveland Twist Drill Co., Cleveland, O.

**Screw Machine Work**
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
Tallman Brass & Metal Co., Hamilton, Ont.

# BUYERS' DIRECTORY

**Screw Machinery, Wood and Lag**
Cook Co., Asa S., Hartford, Conn.

**Screw Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Screw Machines, Automatic**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

**Screw Machines, Plain or Hand**
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio.

**Screw Plates**
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

**Screws, Cap and Set**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Screws, Machine**
Barnes Co., Wallace, Bristol, Conn.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Screws, Safety Set**
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Second-Hand Machinery**
**( See Searchlight Section)**
Petrie, Ltd., H. W., Toronto, Ont.

**Separators, Moisture and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Separators, Oil and Waste**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Shafting**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Shapes, Cold-Drawn Special Steel**
Union Drawn Steel Co., Hamilton, Ont.

**Shaping Machines**
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Walcott Lathe Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Shapers, Wood**
Oliver Machinery Co., Grand Rapids, Mich.

**Shears, Hand**
Can. Blower & Forge Co., Ltd., Kitchener.

**Shears, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y.
Smart & Co., Duncan, Glasgow, Scot.
Toledo Machine & Tool Co., Toledo, Ohio
Williams Machinery Co., A. R., Toronto, Ont.

**Shearing Machines, Angle, Iron Bar and Gate**
Bertrams Ltd., Edinburgh, Scotland.

**Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio.

**Sheets, Nickel, Resist, Alloy**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Sheets, Nickel, Monel and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Side Frames, Locomotive**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Slotting Attachments**
Ford-Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

**Slotting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

**Solders**
British Smelting & Refining Co., Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Canada.

**Snap Flasks**
Oliver Machy. Co., Grand Rapids, Mich.

**Special Machinery and Tools**
Brown Engineering Corp., Ltd., Toronto
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Spectacles, Industrial**
Willson Goggles, Inc., Reading, Pa.

**Springs**
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

**Spring-making Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Sprockets and Chains**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Squares**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Stamping, Metal**
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Stamps, Steel**
Diamond Saw & Stamping Works, Buffalo, N.Y.

**Stairways, Wrought Iron**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Steam Specialties**
Crane Ltd., Montreal, Que.

**Steel Plate**
Dom. Foundries & Steel, Hamilton, Ont.

**Steels, Tool**
Can Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa

**Steel Blooms and Billets**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steel, Cold-Rolled Strip**
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont

**Steel Castings**
Dom. Foundries & Steel, Hamilton, Ont.

**Steel Forgings**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Steel, Shafting and Free Cutting Screw**
Barnes Co., Wallace, Bristol, Conn.
Can Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont

**Steel, Sheet**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

**Steel, Tanks**
Can. John Wood Mfg. Co., Toronto, Ont.

**Steel, Stainless**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel Wire Rods**
Steel Co. of Canada, Ltd., Hamilton, Ont

**Steels, Alloy, Open Hearth and Electric**
United Alloy Steel Corp., Canton, Ohio.

**Steels, Alloy and Carbon**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Dominion Foundries & Steel, Ltd., Hamilton, Ont
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont
Steel Co. of Can., Ltd., Hamilton, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steels, High-Speed**
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel, Magnet**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel, Structural**
MacKinnon Steel Co., Sherbrooke, Que.

**Steel Tubing, Close Joint and Welded**
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

**Stern Frames, Cast Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Straightening Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Studs**
Galt Machine Screw Co., Galt, Ont.

**Surface Plates**
Bilton Machine Co., Bridgeport, Conn.

**Swaging Machines**
Atkins & Co., Inc., E. C., Indianapolis, I

**Switches, Railway**
Can. Steel Foundries, Montreal, Que.

**Switches and Switchboards**
Northern Electric Co., Montreal, Que.

**Tablets, Bronze, Memorial**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Tachometers**
Aikenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

**Tanks, Steel**
MacKinnon Steel Co., Sherbrooke, Que.

**Tanks and Pumps, Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

**Taper Cutting Dies**
Jones & Lamson Machine Co., Springfield, Vt

**Tap Holders**
Greenfield Tap & Die Corp., Galt, Ont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taper Pins**
Galt Machine Screw Co., Galt, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Tapes, Measuring**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass

**Tapping Machines and Attachments**
Ackworthle, Ltd., John, Birmingham, Eng
Archibald & Co., Chas P., Montreal, Q
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Taps and Dies**
Ackworthle, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que
Can. Fairbanks Morse Co., Ltd., Montreal
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
International Machinery & Supply Co., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taps, Collapsing**
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont.
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Teeth, Dredge Bucket**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Testing Metals and Materials**
Toronto Testing Laboratory, Toronto, Ont.

**Thermometers**
Bristol Co., Waterbury, Conn.

**Thread-Cutting Tools**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Thread Cutting Machines**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa.

**Threading Machines**
Acme Machinery Co., Cleveland, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Thread Lead Testing Machines**
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Thread-Rolling Machines**
Bliss Co., E. W., Brooklyn, N.Y.

**Tongs**
Hepburn Ltd., John T., Toronto, Ont.

**Tool Cases**
Rice Lewis & Son, Ltd., Toronto, Ont.

**Tool Holders**
Armstrong Bros. Tool Co., Chicago, Ill.
Bilton Machine Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Markers, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Tool Posts, Lathe**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Steels for all Purposes**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Tools, Small (See Machinists' Small Tools)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Bertrams Ltd., Edinburgh, Scotland.
Burgess & Marchand, Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Chesterman & Co., Ltd., J., Sheffield, Eng.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.
National Machine Tool Co., Racine, Wis
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
**Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.**
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Tool Work**
Brown Engineering Corp., Ltd., Toronto.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.

**Torches, Blow**
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Trackwork, Railway**
Can. Steel Foundries, Montreal, Que.

**Trackwork, Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Transformers**
Northern Electric Co., Montreal, Que.

**Transmission Machinery**
Bernard Industrial Co., A., Fortierville Que.
Can Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy Co., Toronto, Ont
Jones & Glassco, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Toronto, Ont.
Renold (Hans) of Canada, Ltd., Montreal, Que.

# BUYERS' DIRECTORY

**Transportation Systems (See Trucks)**
Mathews Gravity Carrier Co., Port Hope, Ont.

**Treated Bits**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Trolleys and Tramways**
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Trucks**
Can. Fairbanks-Morse Ltd., Montreal, Q.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Maple Leaf Mfg Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Trucks, Industrial Motor**
Maple Leaf Mfg. Co., Montreal, Que.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Tube, Products**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Electric Welded or Oxy-Acetylene Welded**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Flexible**
Dunlop Tire & Rubber Goods Co., Ltd Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Tubing, Seamless Steel**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Seamless Steel, Brass and Copper and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Steel Products Co., Brantford, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Tubing, Welded**
International Nickel Co. of Can., Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Tubing, Welded Steel**
Tube Co. of Canada, Toronto, Ont.

**Turbines, Water**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Turret Heads**
Ackworthie, Ltd., John, Birmingham, Eng.
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Turret Machines (See Lathes, Horizontal Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Cook Co., Asa S., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Turrets, Tool Post**
Gisholt Machine Co., Madison, Wis.

**Unions, Pipe**
Crane Ltd., Montreal, Que.

**Universal Joints**
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Valves**
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Crane Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Vises, Drilling Machine**
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.

**Vises, Metal Workers'**
Aikenhead Hardware, Ltd., Toronto, Ont.
Columbia Hdwe. Division, Cleveland, O.

**Vises, Milling Machine**
Brown & Sharpe Mfg. Co., Providence, R.I.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.

**Vises, Pipe**
Columbia Hdwe. Division, Cleveland, O.
Greenfield Tap & Die Corp., Galt, Ont.

**Vises, Planer and Shaper**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Superior Machine Co., London, Ont.

**Vises, Wood Workers'**
Columbia Hdwe. Division, Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Oliver Machy. Co., Grand Rapids, Mich.
Victor Tool Co., Waynesboro, Pa.
Parmenter & Bulloch Co., Gananoque, Ont.

**Voltmeters**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Wagon Loaders**
Can. Link-Belt Co., Toronto, Ont.

**Washers**
Barnes Co., Wallace, Bristol, Conn.
Diamond State Fibre Co., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Washers, Rubber**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Welding Apparatus, Oxy-Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Welding, Electric**
All Weld Company, Toronto, Ont.
Carter Welding Co., Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.

**Welding Filler Rods**
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

**Welding Machines, Oxy-Acetylene**
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

**Welding, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Prest-O-Lite Co. of Can., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

**Welding Rod, Tobin, Manganese Bronze and Aluminum**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Welding Supplies**
British Smelting & Refining Co., Ltd., Montreal, Que.
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Canada, Ltd., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

**Wheels, Cast, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Wheels, Industrial**
American Pulley Co., Philadelphia, Pa.
Hull Iron & Steel Foundries, Hull, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.

**Winches, Electric**
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

**Winches, Headgate**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Winches, Stoplog**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Wire**
Barnes Co., Wallace, Bristol, Conn.
Canada Metal Co., Ltd., Toronto, Ont.
Dennis Wire & Iron Works, London, Ont.
Greening Wire Co., B., Hamilton, Ont.
Northern Electric Co., Montreal, Que.

**Wire Cloth**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Wire Coiling Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Wire Rope**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Wire Straightening and Cutting Machinery**
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Schuster Co., F. B., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

**Wire, Welding**
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Wires, Special**
Dennis Wire & Iron Works, London, Ont.
Greening Wire Co., B., Hamilton, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Woodworking Machinery**
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Wrenches, Drop Forged**
Armstrong Bros. Tool Co., Chicago, Ill.
Canada Foundries & Forgings Co., Welland, Ont.

**Wrenches, Machinists'**
Armstrong Bros. Tool Co., Chicago, Ill.
Canada Foundries & Forgings Co., Welland, Ont.

**Wrenches, Pipe**
Canada Foundries & Forgings Co., Welland, Ont.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.

**Wrenches, Tap**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.

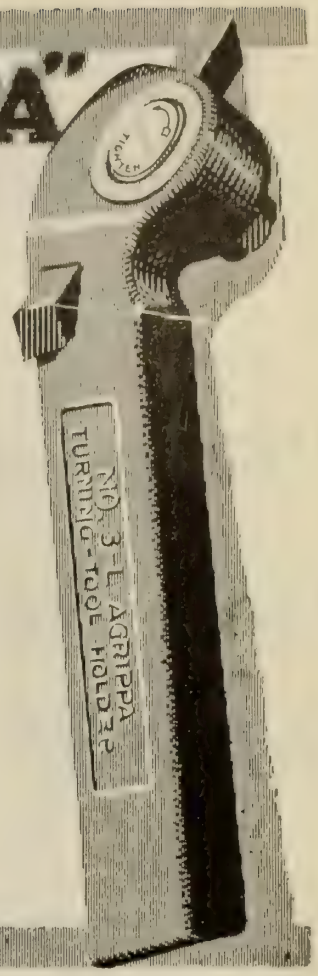
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## And there are no better tools than Williams'

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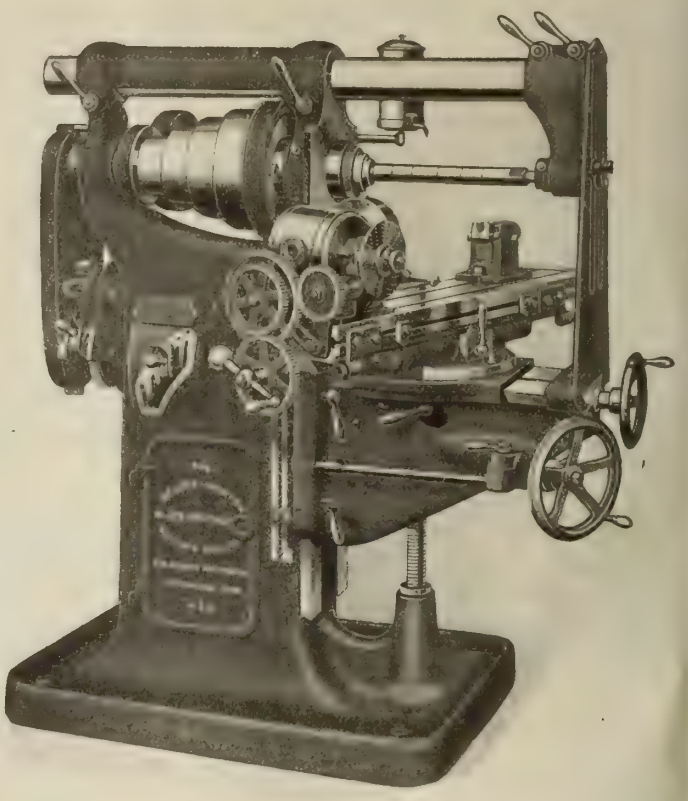
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## *"Hendey Millers Give No Trouble At All"*



This is what the foreman of the plant of H. G. Sall Company says. And he is in a good position to know, for much of the work must be done within limits .0005 inch.

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Easily set to exact sizes—rigid and dependable—economical to maintain—adaptable to different sizes and changed limits—this gage helps to reduce gaging costs.

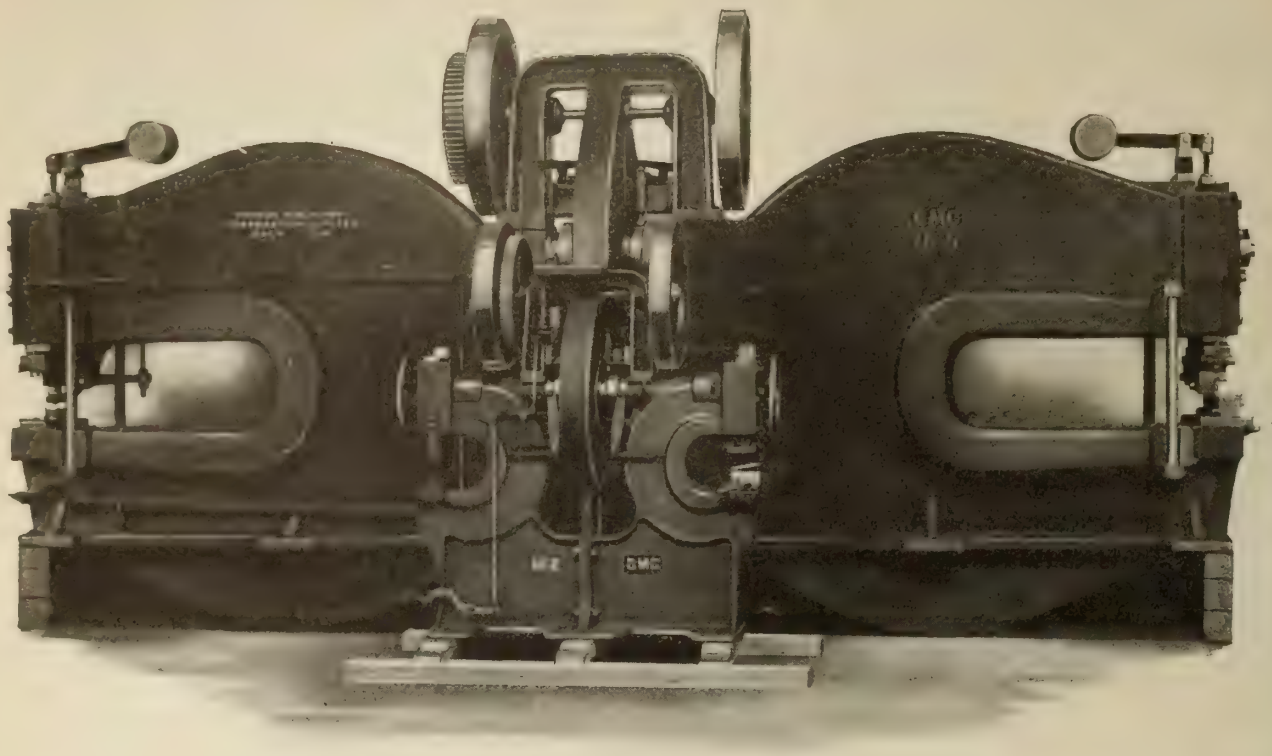
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Vol. XXV., No. 12 | Published by the MacLean Publishing Company, Limited, Toronto | March 24, 1921 | $4.00 a Year Subscription Price


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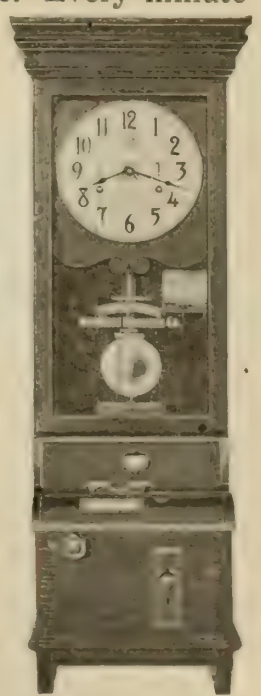



## "Seventy Minutes to the Hour From Now On"

No—we don't mean that an employee is to work 10 minutes for nothing.

But we do mean that 50 minutes working time to the hour "doesn't go" any more. Lost minutes must be paid for by those who lose them.

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# The BERTRAM Page

## MACHINE TOOLS

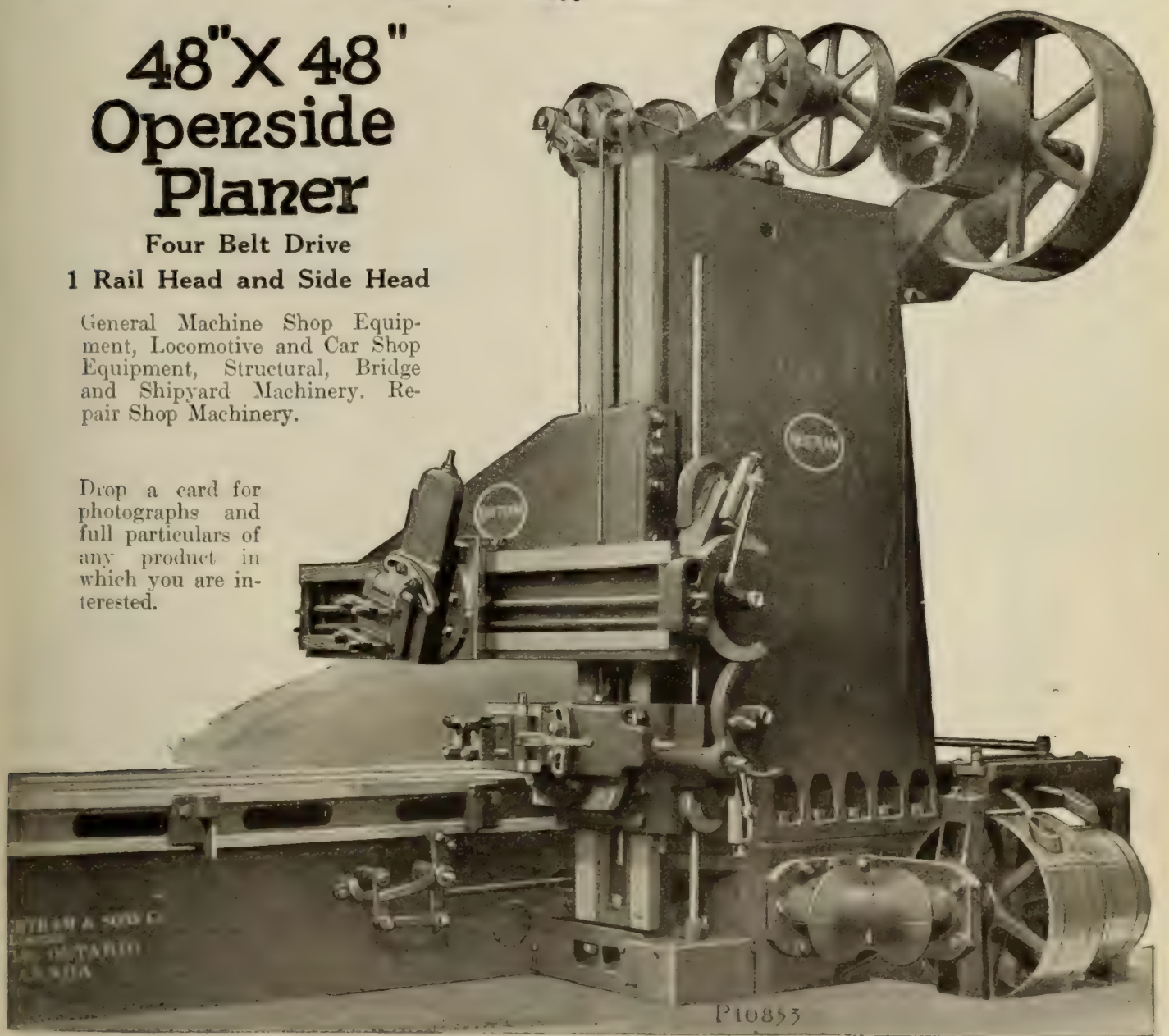
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**Four Belt Drive**

**1 Rail Head and Side Head**

General Machine Shop Equipment, Locomotive and Car Shop Equipment, Structural, Bridge and Shipyard Machinery. Repair Shop Machinery.

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42-1.2

Starrett Tools



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## Drills, Reamers, Milling Cutters, Taps and Dies




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BUTTERFIELD Tools have longer life and require less regrindings.

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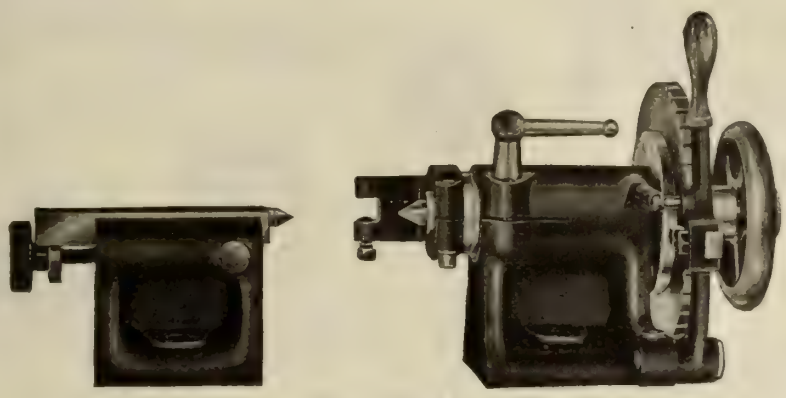
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**Union Twist Drill Company**
**Rock Island Que., Canada**

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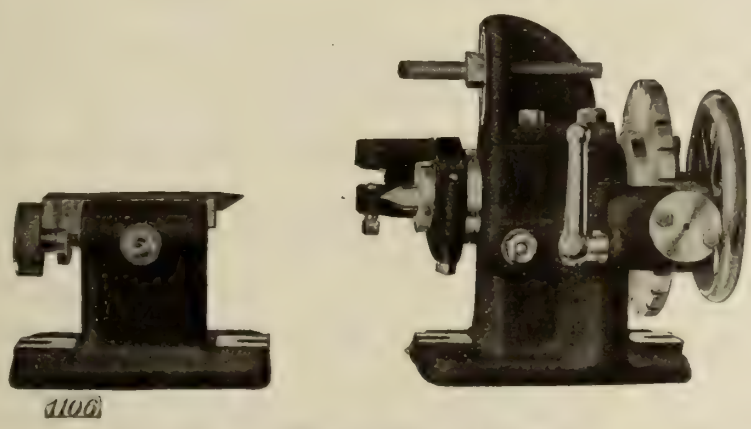
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Style M.O.

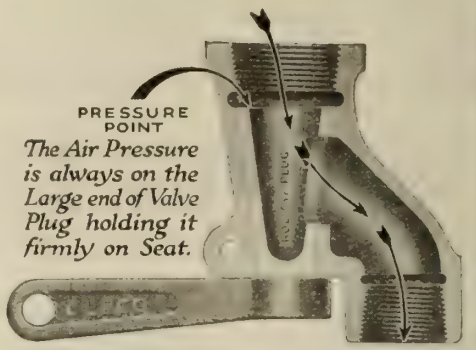
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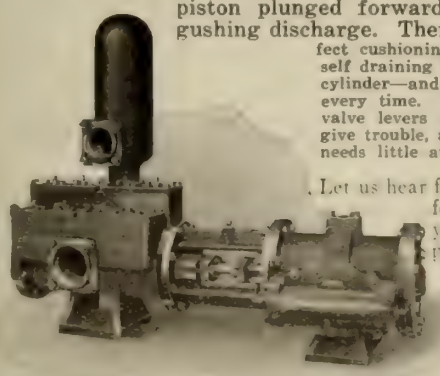
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*A Pump That Will Pump*

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Let us hear from you before you order your next pump.

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*Engineers and Iron Founders*

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American Drill Grinder For Wet or Dry Drill Grinding 1/8" to 2¼". Also 1/8" to 3½" dia.

## LA SALLE TOOL CO.

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Represented in Canada by

## A. R. Williams Machinery Co., Ltd.

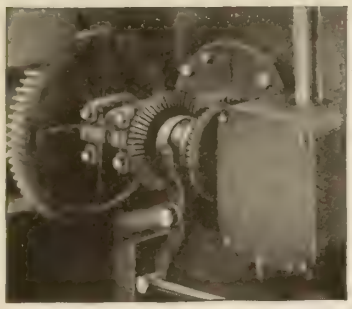
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# THE JOHNSON FRICTION CLUTCH

## Clutches for Reversing Functions



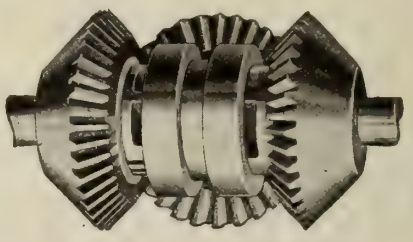
Johnson Clutch Installation on Newton Milling Machine

A reversing clutch is a very common requirement on machinery, and one which is encountered in many different forms. Whatever the situation may be, a Johnson Clutch offers the best method of handling it.

The bevel gear assembly shown here is one of the ways in which a Johnson Double Clutch is frequently applied for reversing functions. Many of the best machine tools are equipped in this manner.

**Write for our Yellow Catalog and Booklet,**

**"Clutches As Applied To Machine Building."**



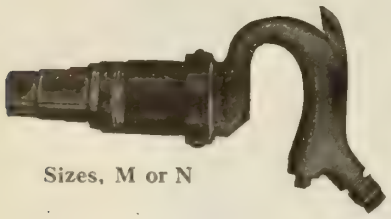
Double Clutch in Nest of Bevel Gears

CANADIAN AGENTS:

WILLIAMS & WILSON, LTD., 84 Inspector St., Montreal

CANADIAN FAIRBANKS-MORSE CO., LIMITED, Montreal, Toronto, Winnipeg

**THE CARLYLE JOHNSON MACHINE CO.** MANCHESTER, CONN.



Sizes, M or N

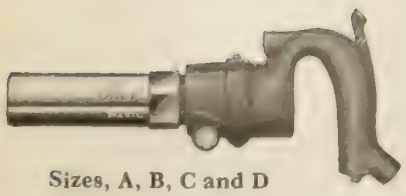
# Thor tools for Your Plant

## SCALING HAMMERS

Sizes M and N, suitable for very light chipping, scaling, cleaning rust and paint, and calking around rivets.

## CHIPPING HAMMERS and LIGHT RIVETERS

In every plant and foundry where there is chipping, calking, flue beading and light riveting to be done you will find THORS. They have a single valve construction with a wearing surface covering nearly the entire valve block. THOR Hammers, while simple in construction, develop the maximum power.



Sizes, A, B, C and D

**INDEPENDENT PNEUMATIC TOOL CO.**

**600 W. Jackson Blvd., Chicago**

334 St. James St., Montreal
32 Front St. W., Toronto
123 Bannatyne Ave. E., Winnipeg
1142 Homer St., Vancouver


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# CANADIAN STEEL FOUNDRIES LIMITED

## AMONG OUR PRODUCTS

**O. H. STEEL**
- Bolsters
- Couplers
- Draft Arms
- Locomotive Side Frames
- Machinery Castings
- Marine Castings
- Rolling Mill Rolls
- Wheel Centres

**FERRO-ALLOYS**

**MANGANESE-STEEL**
- Bucket Lips
- Crusher Jaws
- Dipper Teeth
- Mixer Teeth
- Special Trackwork

**OTHER ALLOYS**
- Crank Pins
- Crank Shafts
- Locomotive Frames
- Rolls
- Roll Shells

**TRACKWORK**
- Diamond Crossings
- Crosses
- Frogs
- Mates
- Switches
- Rail Braces
- Guard Rail Clamps
- Complete Intersection

This list is merely an indication

General Offices:
Transportation Building, Montreal

## WE CAN SUPPLY

# STEEL PLATE

—IN—

**Universal Edge** - up to 40 in. wide

**Sheared Edge** - up to 60 in. wide

**Any Thickness** **Any Lengths**

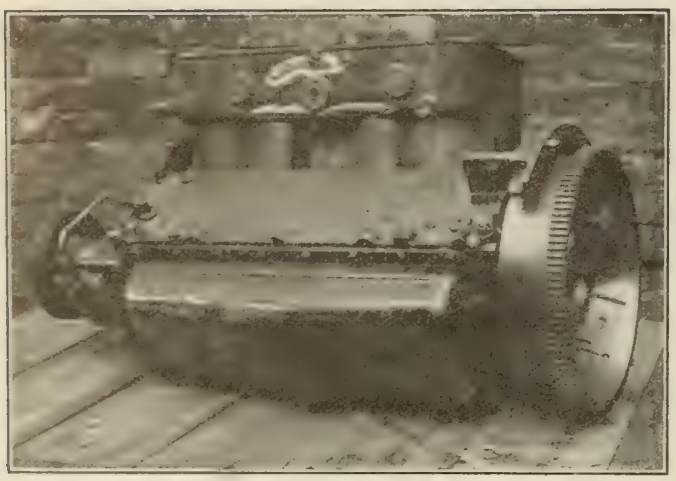
*Send Us Your Enquiries.*

## Dominion Foundries & Steel, Limited
HAMILTON, ONTARIO

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# LINCOLN ARC WELDER

## *Successfully Applied to Cast Iron*



Welded cold—by old methods it would have been necessary to heat this entire block.



Air Compressor Cylinder with the electric weld completed and tested against water pressure.

ON the left is an illustration of a Cole Aero-8 Motor. The chalk marks indicate where the cylinder wall was cracked.

By means of a special electrode Lincoln Electric Welding made this repair without preheating.

This repair cost the owner less than 10% of the replacement cost.

Lincoln Electric Welding is the proper process for such work—just as it is for making repairs to Air Compressor Cylinders similar to the one shown in the lower picture in this advertisement.

Lincoln Electric Welding has vast possibilities. Let a Lincoln Engineer explain them to you. Get in touch with us to-day.

*"Link Up with Lincoln for Performance and Service"*

**The Lincoln Electric Co.**
**OF CANADA, LIMITED**

**Head Office and Works: John St., Toronto**
**Montreal Branch: Coristine Building**

Emblem of Integrity

LIQUID AIR Co

Standard of Excellence

# OXYGEN
# ACETYLENE
## BLOWPIPES-REGULATORS
## FILLING RODS - FLUXES
## ACCESSORIES

## THE LIQUID AIR Co

SOCIÉTÉ L'AIR LIQUIDE

FACTORIES FOR SERVICE

HALIFAX, THREE RIVERS, MONTREAL, TORONTO,
LONDON, SUDBURY, WINNIPEG, CALGARY, VANCOUVER.

OPERATED IN CONJUNCTION WITH A CONTINENT WIDE NET-WORK OF DISTRIBUTION STATIONS



**"Liquid Air" Oxygen Means a Saving in Transportation**

With a network of Factories, not only planned but in actual operation, and a number of Distribution Stations situated at all large centres all over Canada, Purchasers of Oxygen can obtain their supplies at a point very near to the point of consumption. This completely obviates heavy freight charges on cylinders and assures an immediate supply at any time within a few hours and even minutes after the orders are placed.

All cylinders conform to the specifications of the Canadian Railroad Board and are made to ensure safety without unnecessary weight. When purchasing "Liquid Air" Oxygen you not only save on freight, but in very many cases this expense is almost eliminated.





# OXYGEN AND HYDROGEN
## (ELECTROLYTIC)



National Electro Products Limited is the largest manufacturer of Electrolytic (pure) Oxygen and Hydrogen in Canada.

WE PRODUCE GASES EXCLUSIVELY BY ELECTROLYTIC DECOMPOSITION OF WATER

We are, therefore, in a position to furnish Oxygen and Hydrogen far superior to like gases made by any other process.

After Exhaustive Tests We Have Decided to Handle the Well-Known

The Torch for Welders PUROX (OXYGEN / HYDROGEN) Who Want the Best!

## WELDING AND CUTTING TORCHES

Our entire organization—technical and sales—is always at your service.

## NATIONAL ELECTRO PRODUCTS
LIMITED

HEAD OFFICE: 87 CHURCH STREET, TORONTO

| TORONTO SALES OFFICE | MONTREAL SALES OFFICE AND FACTORY | TORONTO FACTORY |
|---|---|---|
| 87 Church Street | 149 Moreau Street | 295 Dufferin Street |
| Main 881 and 1626 | Lasalle 508 | Park 7656 |





# IMPERIAL CARBIDE




**For Weding Cutting and Lighting**

HIGHEST GAS YIELD — IMPERIAL CARBIDE — MADE IN CANADA

It insures **effectiveness** and **economy** by **invariably** producing acetylene gas of **unusual purity.**

Manufactured by

**Union Carbide Co. of Canada, Ltd.**

WELLAND, ONTARIO

**Large Stocks maintained at convenient distributing centres throughout Canada**

# Buying a Pig in a Poke

The buying of advertising space used to be buying "a pig in a poke." The quantity and quality of circulation was shrouded in mystery and often the bag was tied against investigation.

That day has passed. The advertiser no longer depends upon "mere claims." The Audit Bureau of Circulations has untied the strings to the sack and the circulation of the better class of publications is thrown open for the most searching scrutiny.

In buying advertising space in the Canadian Machinery you are not buying "a pig in a poke." Our A. B. C. statements will stand the analysis of the most exacting investigator.

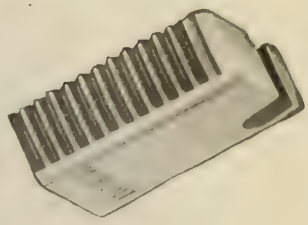
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# MURCHEY TOOLS



*The Secret of Good Threading Lies in the Chasers*

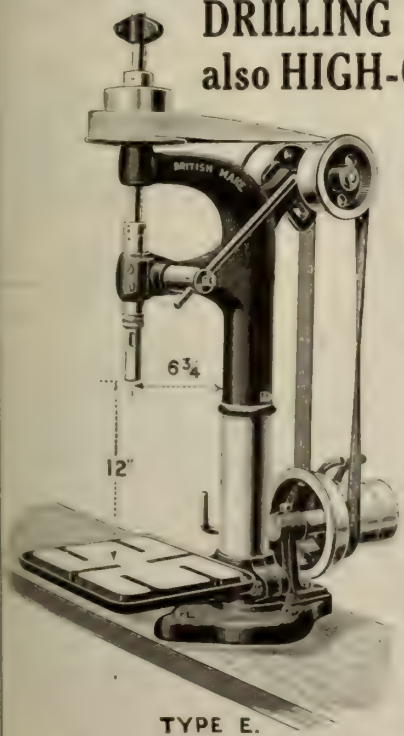
It's the chasers that bear the brunt of your work. Upon their sharpness, strength, and interchangeability depend the speed and accuracy of your output. You will find Murchey Chasers strong and accurately designed. When one set wears down it's a simple matter to put in new ones. We give special service in supplying them. This is one of the reasons why Murchey Taps and Dies will actually boost your production fifty per cent.



Murchey Tools belong to the advanced method of production. They are simple and convenient to operate and are strong and durable. You are assured of 100 per cent. satisfaction from every Murchey Tap or Die. Let us prove it. A sample Tap and Die will cheerfully be sent on approval.

**MURCHEY**
**Machine and Tool Company**
75 Porter Street
DETROIT, MICH., U.S.A.
THE COATS MACHINE TOOL COMPANY LIMITED
14 Palmer St., Westminster, London, S.W., England
FENWICK FRERES & COMPANY
8 Rue de Rocroy, Paris, France

## SENSITIVE BENCH and PILLAR DRILLING MACHINES also HIGH-CLASS BALL BEARING DISC and TOOL GRINDERS



TYPE E.

TEN DIFFERENT TYPES, ALL FROM STOCK

Telegrams:—
"BEACO TIPTON"
ENGLAND

Telephone:—
90 TIPTON

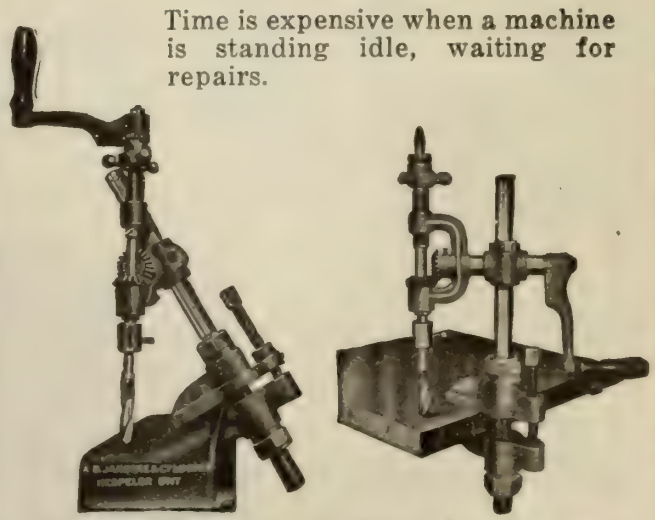
Code used:—
ABC 5th EDITION

*AGENTS WANTED*

**Beacon Engineering Co.**
**TIPTON, ENGLAND**

## Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

**Weight, 40 lbs. Price, $26.50 net.**
**Sold by all Machinery and Supply Houses.**

**A. B. JARDINE & CO., Limited**
**HESPELER, ONTARIO**


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# Buffalo "Armor Plate"

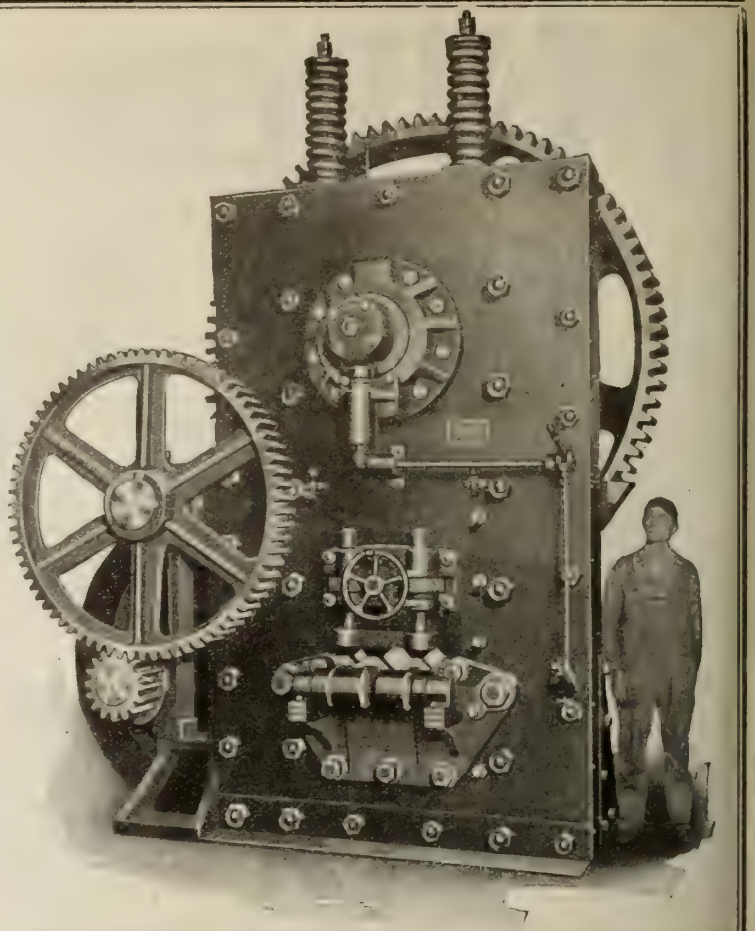
## Punches and Shears

These machines have frames made of tough, unbreakable rolled steel plates—bolted and doweled together to form one solid integral whole that will withstand continuous maximum capacity service.

Yet, capacity for capacity, "Armor Plate" machines are lighter and occupy less floor space than any cast-iron or steel machine.

**Our catalogs tell why. Write Dept. 16 for a copy.**

**Canadian Blower & Forge Co., Ltd.**
KITCHENER, ONT.



# STEEL *for*

## Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

**We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.**

**Nova Scotia Steel and Coal Co., Limited**

*Head Offices:*
**New Glasgow, N.S.**

Sales Offices:
Western Room 14 Windsor Hotel
MONTREAL

**Steel Ingots**
*by the*
**HARMET**
**Liquid Process**






# LINK-BELT



## Chains-Wheels-Buckets



THE high standard of quality of all Link-Belt products and the service we maintain by carrying large stocks at our plant and distributing points are good reasons why you should always specify "Link-Belt Equipment."

We solicit your business on the basis of quality and service. This trade mark identifies genuine Link-Belt products.

*Send for Catalog*

**CANADIAN LINK-BELT CO., LTD.**

TORONTO - - - - - - WELLINGTON AND PETER STS.
MONTREAL - - - - - - - - 10 ST. MICHAEL'S LANE

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# 30 Times Faster Than Ordinary Vises

THIS Columbian Quick-Acting Vise, with a jaw opening of 6 inches, can be opened the full length of the screw in ½ of a second. It takes *30 times as long* to rotate the handle and open an ordinary vise of the same size.

This new vise is an addition to the many other types of machinists' vises already included in the Columbian line. It is extremely simple, there are no complicated parts to get out of adjustment. A slight pressure of the trigger with the forefinger releases the screw and allows the beam to slide freely in either direction. Made in stationary and swivel base types; 7 sizes from 3 to 7 inch jaws, opening from 4½ to 12 inches. The jaw faces are removable and may be replaced with specially shaped jaw faces.

The new Quick-Acting Vise, however, is a highly specialized vise designed for machine shops in which a great many similar pieces pass continuously through the same operation. On such work as this, in an accurately timed test, an operation requiring two settings in the vise was done in an ordinary vise in 24 seconds. With a Columbian Quick-Acting Vise the same operation was done in 15 seconds.

This is a saving of 37½ per cent.

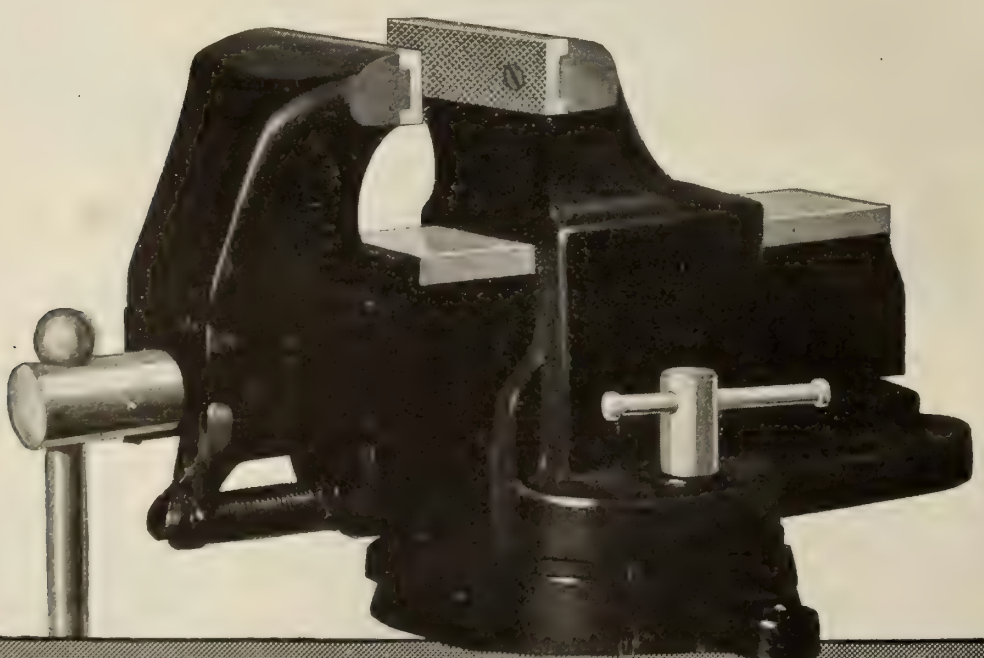
Like all Columbian machinists' vises this Quick-Acting Vise is made of malleable iron and is twice as strong as any cast iron vise of the same rating. The famous Columbian Sledge-Test proves this conclusively.

## Columbian Hardware Division

**of The Consolidated Iron-Steel Mfg. Co.**

*World's Largest Makers of vises and anvils*

**CLEVELAND**



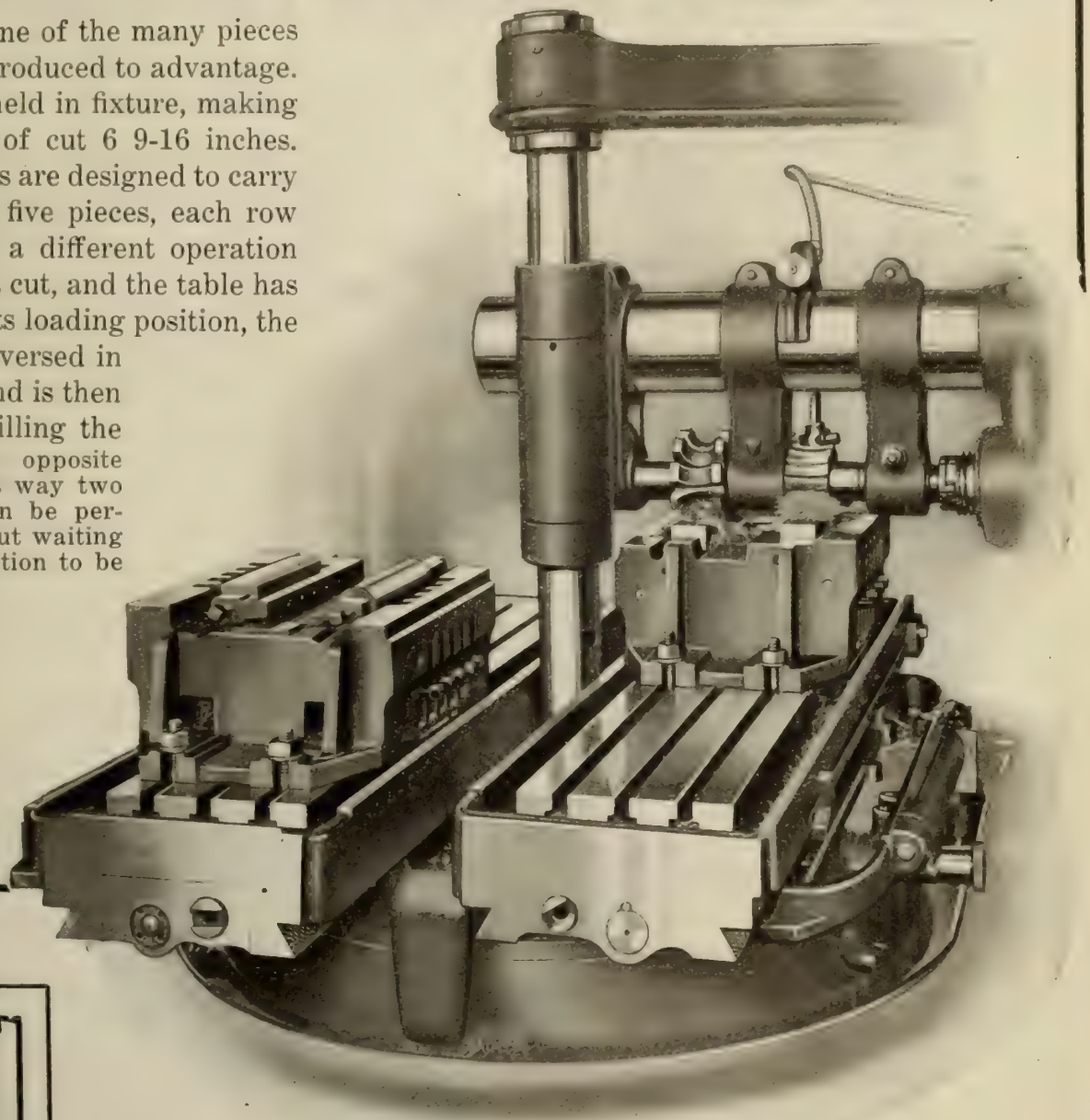
**COLUMBIAN**

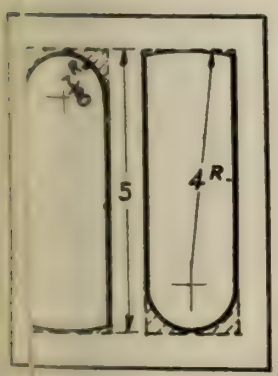
**Sledge-Tested VISES**

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# Two Operations
## at the same time

Here is one of the many pieces that can be produced to advantage. Five pieces held in fixture, making total length of cut 6 9-16 inches. These fixtures are designed to carry two rows of five pieces, each row representing a different operation after the first cut, and the table has revolved to its loading position, the pieces are reversed in the fixture and is then ready for milling the radii on the opposite ends. In this way two operations can be performed without waiting for one operation to be completed.






**Compare this with your work and investigate this manufacturing proposition.**

*Canadian Offices:* POTTER & JOHNSTON MACHINE CO.

# ROELOFSON MACHINE & TOOL CO., LIMITED

*Head Office and Showrooms:*

*11 Wellington St. East, Toronto, Canada*

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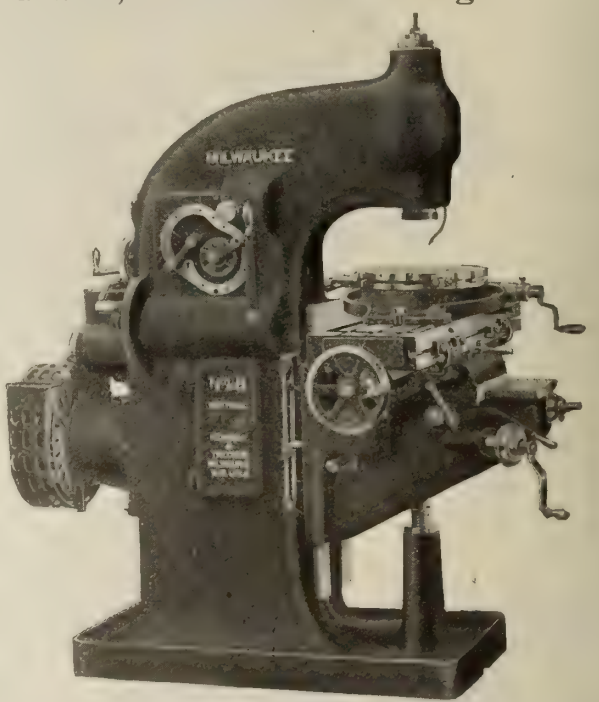
# MILWAUKEE MILLING MACHINES

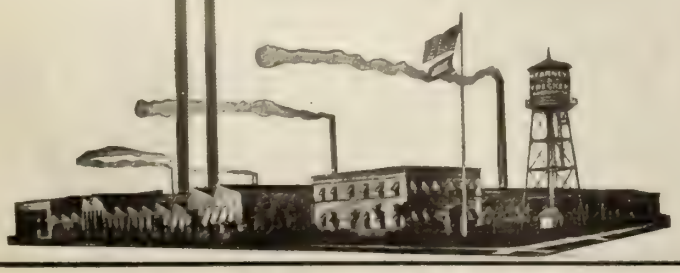
## *Vertical Milling*

THE main construction principles of the Milwaukee Vertical Milling Machine do not differ from our horizontal type—i.e., the heavily-ribbed, box-section column; the solid top, box-section knee; the constant speed drive; the automatic flooded lubrication system—these are embodied as being characteristics of Milwaukee Milling Machines in general.

On our Vertical Milling Machines, the spindle is non-adjustable, except for wear. All adjustments for practical purposes can be made by the knee alone, the same as on horizontal milling machines. The non-adjustable spindle construction is decidedly rigid and will maintain alignment through many years of service.

For complete details, write for our catalogue.



KEARNEY & TRECKER
CORPORATION
MILWAUKEE, WIS., U.S.A.

*Canadian Representatives:*
Williams & Wilson, Ltd., Montreal
F. F. Barber Machy. Co., Toronto
A. R. Williams Machy. Co., Vancouver and Winnipeg

# NUTS

## S·A·E and A·L·A·M

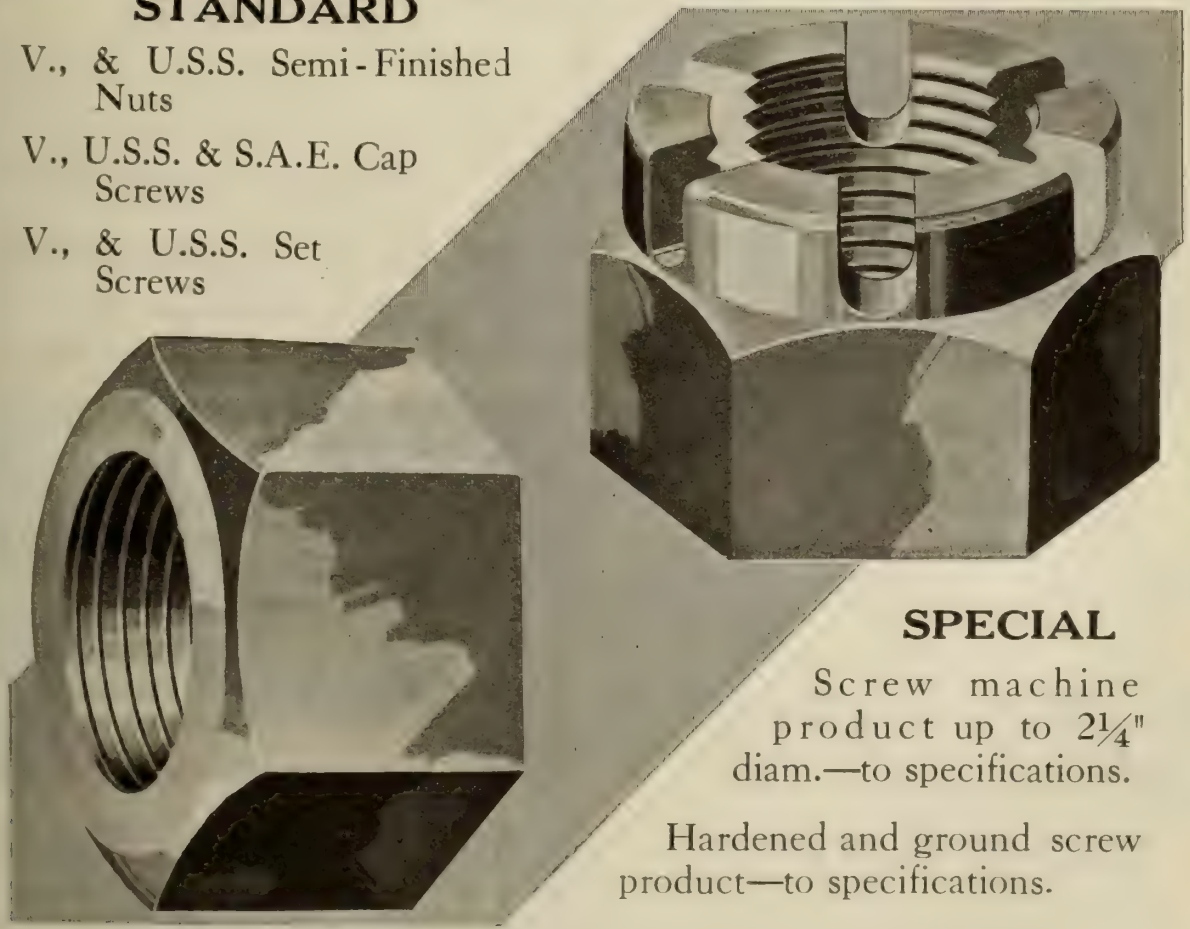
## PLAIN OR CASTELLATED

**STANDARD**

V., & U.S.S. Semi-Finished Nuts

V., U.S.S. & S.A.E. Cap Screws

V., & U.S.S. Set Screws



**SPECIAL**

Screw machine product up to 2¼" diam.—to specifications.

Hardened and ground screw product—to specifications.

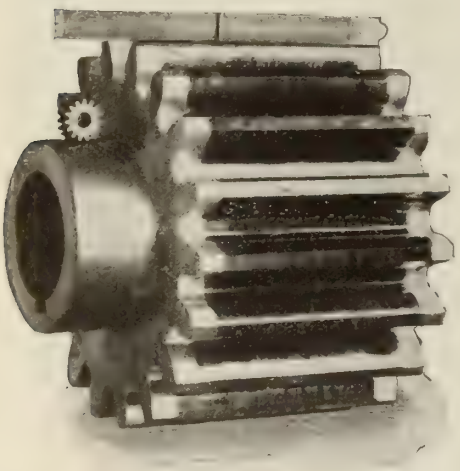
## THE NATIONAL ACME COMPANY

**MONTREAL, P.Q.**

**De Courcelles** **G.T.R.R.**

CUT GEARS

Write for
Data Sheet No. 32
on
Raw Hide Pinions



This Engineering Data is valuable to Gear Users.

May we send it?

Hamilton Gear & Machine Co.

Van Horne St. Toronto

STEEL CASTINGS

*QUICK DELIVERIES*

**High Carbon Steel**
**Manganese Steel**
**Chrome Steel**
**Mild Steel**

*QUALITY GUARANTEED*

Sizes—½ lb. to 5,000 lbs. each

THE WILLIAM KENNEDY & SONS, *LIMITED*
OWEN SOUND, ONTARIO
ESTABLISHED 1860

CANADIAN ATLAS CRUCIBLE STEEL Co. LIMITED

Made in Canada

L-XX HIGH-SPEED
ATLAS TOOL STEELS
ATLAS ALLOY STEELS

Hot Rolled, Forged Blocks and Discs
Cold Drawn Steel and Drill Rod

GENERAL SALES OFFICE:
133 Eastern Avenue, TORONTO, ONT.
Works: WELLAND, ONT.
Sales Offices and Warehouses:
TORONTO, ONT. MONTREAL, QUE. WINNIPEG, MAN.

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## STRENGTH

Strength is a very essential quality in a wrench, but it does not depend entirely upon bulk or weight of metal. The strength and long-lasting qualities of Armstrong Wrenches are the result of skilled combination of the Best Steel, Expert Design, Accurate Machining, and Heat Treatment. All kinds and sizes.

*Write for free Catalogue.*

**Armstrong Bros. Tool Co.**
"The Tool Holder People"
335 N. Francisco Ave., Chicago, U. S. A.

# KELLER-MASTER



KELLER-MASTER
ROTARY GRINDER

**Ten pounds lighter, yet more rugged than other types with same power and speed—free from vibration, which insures endurance in operator and tool—ample power to sustain speed under load—are the salient features of the NEW Keller-Master Rotary Grinder.**

KELLER-MADE
MASTER-BUILT

**KELLER**
**PNEUMATIC TOOL COMPANY**
**GRAND HAVEN, MICHIGAN**
BANK OF NOVA SCOTIA BLDG., MONTREAL

Diamond-F

# PRODUCTS

## are worthy of a place in your establishment

In addition to supplying the manufacturing industries with a better and cheaper raw material in the forms of sheets, rods and tubes, we also manufacture several well-known lines of Diamond-F products, which are giving universal satisfaction under widely different conditions of service.



## DIAMOND F
# RECEPTACLES

Here, for instance, is one of our lines comprising trucks, barrels, cans, cases, boxes, roving cars, doffing cars and waste baskets. Again and again they have proved to be unequalled for service and high quality. And don't forget that Diamond-F Products, although a little better than other products for most purposes, do not cost any more.

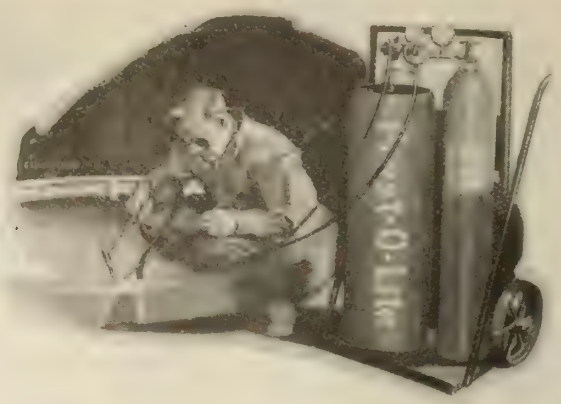
Among the numerous and diverse uses for Diamond Fibre raw material or Diamond-F products, there must be one that will be of interest to you.

*Write us for our book "Diamond Fibre and its Uses," or better still, visit the showroom in our new Building if possible, and size up Diamond Fibre and its uses from your own point of view.*

## Diamond State Fibre Company
### of Canada, Limited

Wrigley Building Carlaw Ave., Toronto, Canada


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# *The ambulance of industry*

THE oxy-acetylene welder's hand truck is the ambulance of the modern machine shop.

Instantly accessible, quickly and easily wheeled to any part of the shop, wherever the job may be—the oxy-acetylene outfit saves thousands of dollars by eliminating delay and reclaiming broken parts.

Prest-O-Lite Dissolved Acetylene has made possible the use of a highly pure gas in an easily portable and economical form.

A chain of plants and warehouses *insures* a neverfailing and prompt supply of this most useful of gases in any quantity anywhere.

Prest-O-Lite
DISSOLVED ACETYLENE

**PREST-O-LITE COMPANY OF CANADA, LIMITED**
HILLCREST PARK, TORONTO

*Branches at :* Montreal Toronto Winnipeg
*Plants at :* Toronto, Ont. St. Boniface, Man. Merritton, Ont. Shawinigan Falls, P.Q.

P.W.C. 537

# Would You Like to make some Extra Money?

Of course you would. Well then, why not do so? Canadian Machinery is always on the lookout for well-worth-while ideas, and are willing to pay a good price for them..

We are often asked, "What sort of ideas do you want?" Briefly, what we are desirous of obtaining is this, "Any idea that has proved of value in the machine shop, drafting room, or tool room." Think of how you got over some difficulty, a ticklish piece to hold in the lathe, or perhaps how you increased production on some particular piece. Any idea that saves time or money in the machine industry will appeal to us. Never mind the style. Write it as best you know how. We will put the finishing touches to both the wording and the sketch. Start in **NOW** and send us something of such a nature.

*Address it to*

**The Editor, Canadian Machinery**
**143 University Ave., Toronto, Can.**

# NOVO-SUPERIOR

HIGH SPEED STEEL
INTRA STEEL GIBRALTAR STEEL
Tool Steel for Every Purpose
Swedish Lancashire Iron

Twist Drills, Taps, Hack Saw Blades, Milling Cutters, Files, Etc.; Music Wire for Springs, Steel Balls, Cold Rolled Tool Steel in Strips and Sheets, Circular Saws, Machine Knives.

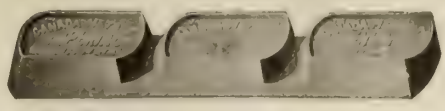
**PILOT STEEL & TOOL COMPANY,**
LIMITED
332 St. James Street, Montreal

*Sole Agents for*

JONAS & COLVER, LIMITED
Novo and Continental Steel Works, Sheffield, Eng.

H. BOKER & CO., Inc.
New York, N.Y.

# WHY EXPERIMENT ?
## WE DID IT FOR YOU YEARS AGO



IMPERIAL GENUINE




For Heavy Engines and Extraordinary Hard Work

**HARRIS HEAVY PRESSURE**

THE COPPER COATED CAKE

For Donkey Engines, Saw Carriages, Small Motors, Transmission Line Shafting and all steady heavy pressure duty.

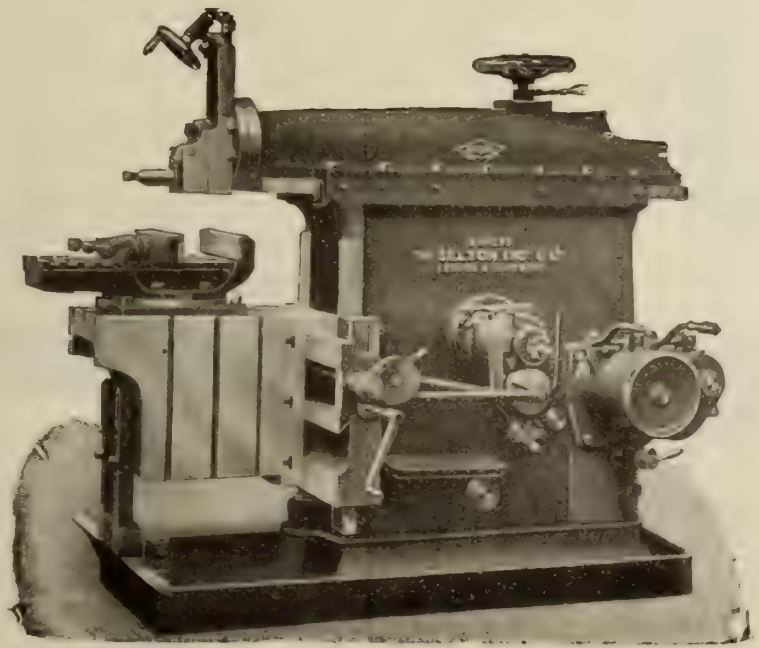


**Matchless**

Suitable For Slow-Moving Bearings
Write For Prices

**THE CANADA METAL CO., LIMITED**
TORONTO HAMILTON MONTREAL
WINNIPEG VANCOUVER

# The "SELSON" Shaping Machines



*High Speed*
*and*
*Heavy Cut*

Sizes
10, 13, 17, 25, and 30"

If you want the finest Shaper ask Selson for full particulars.

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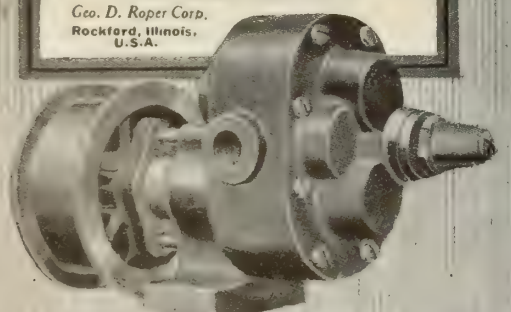
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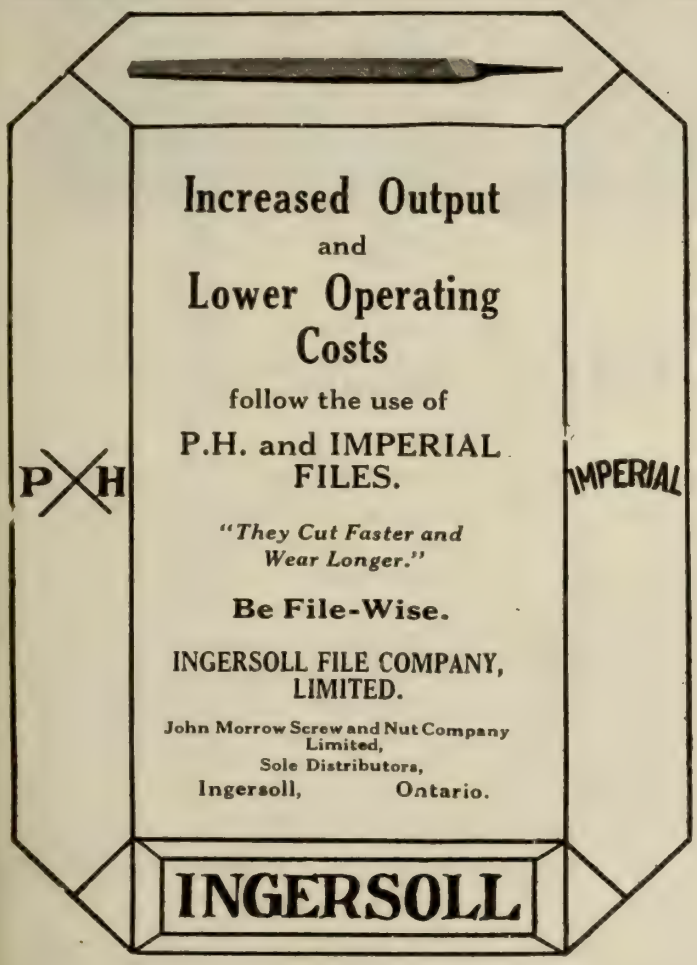
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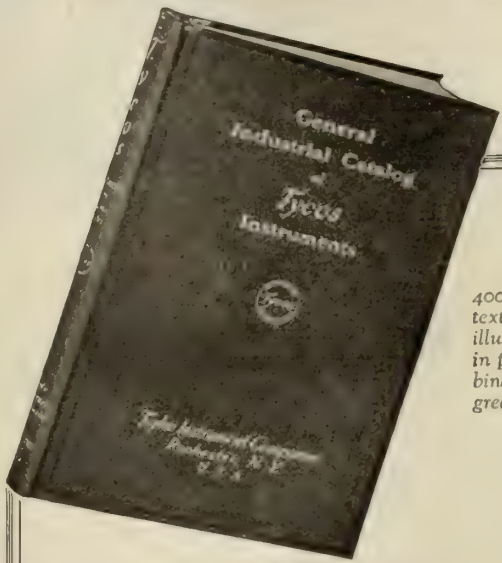
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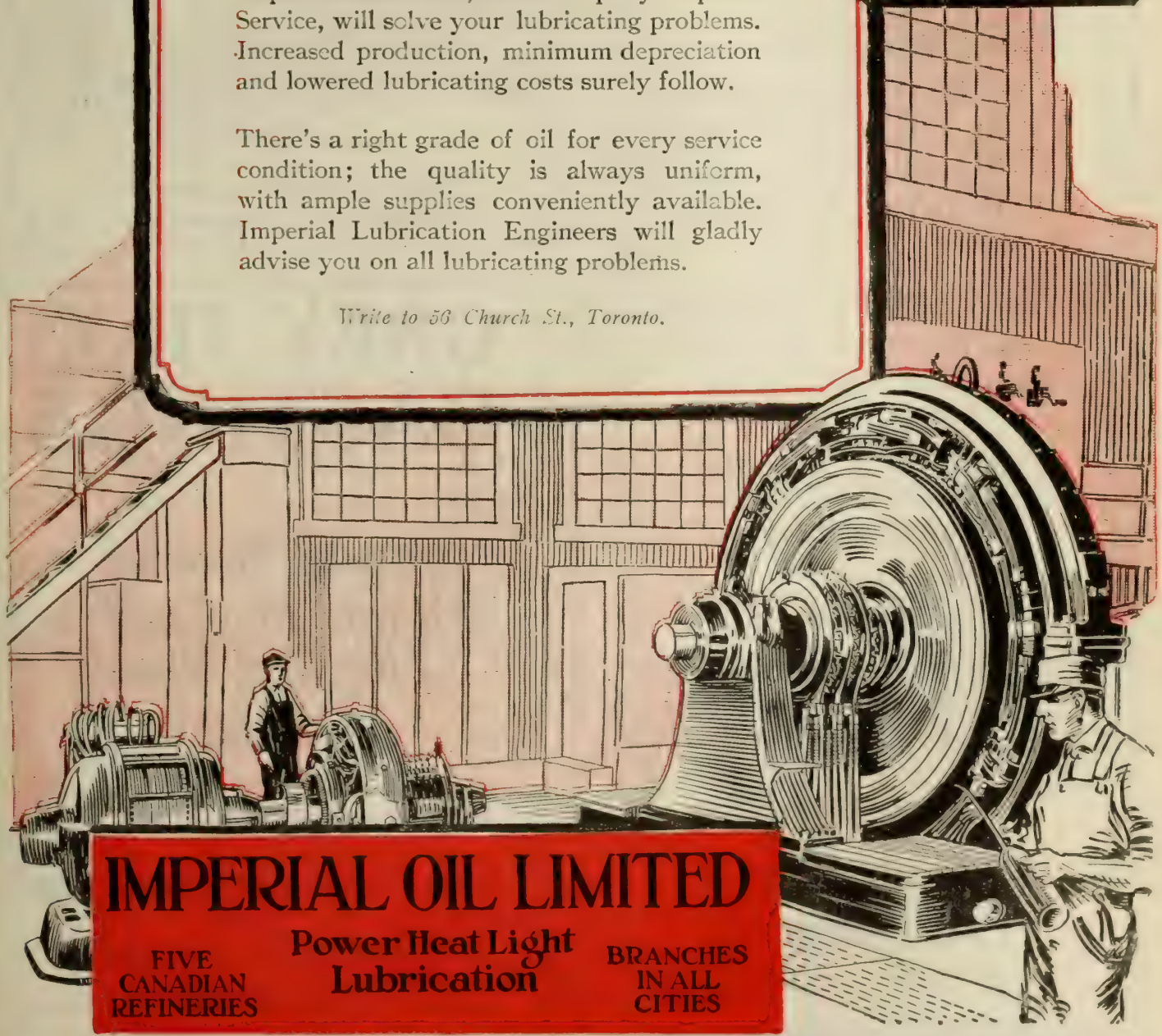
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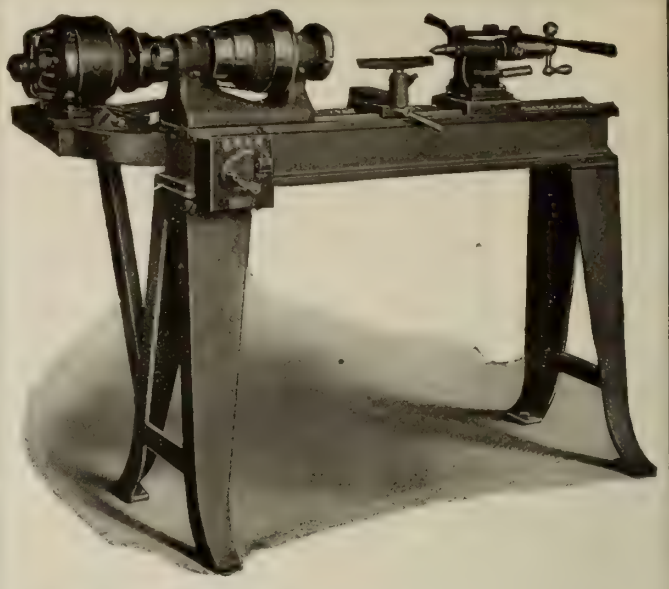
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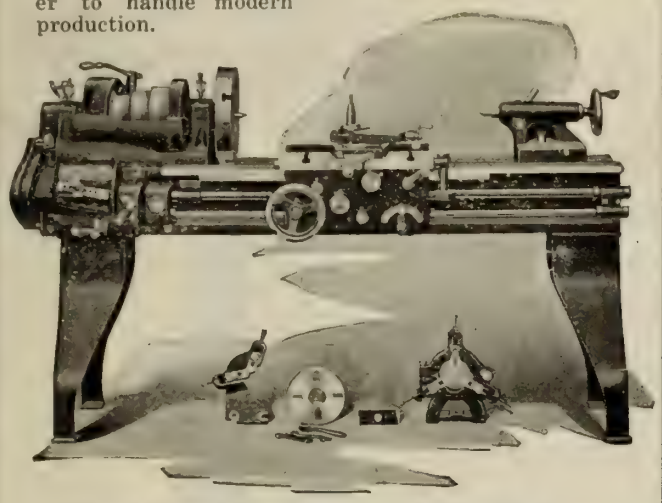
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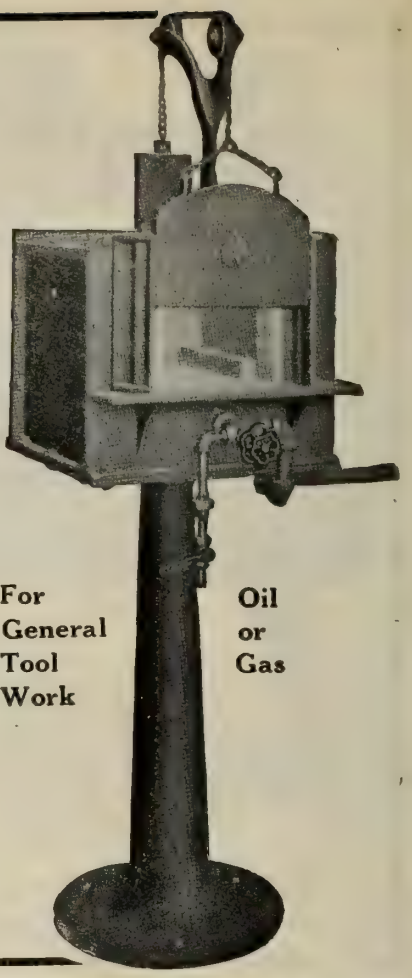
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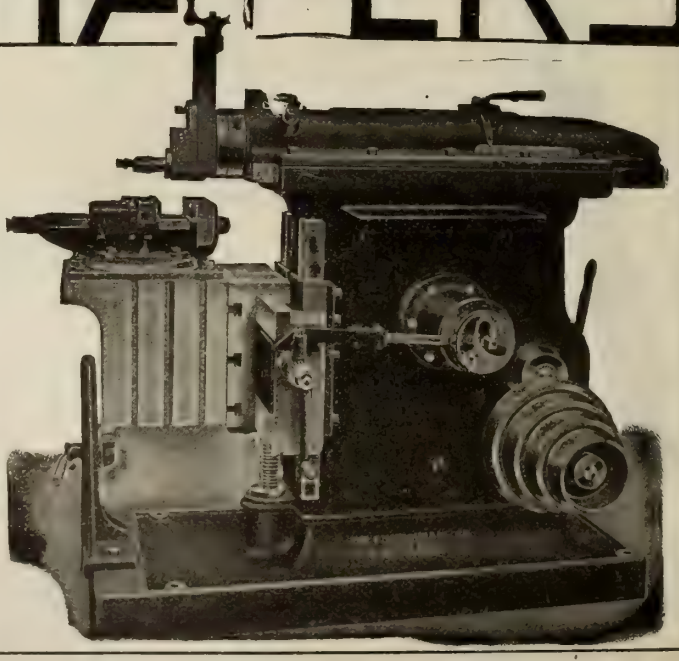
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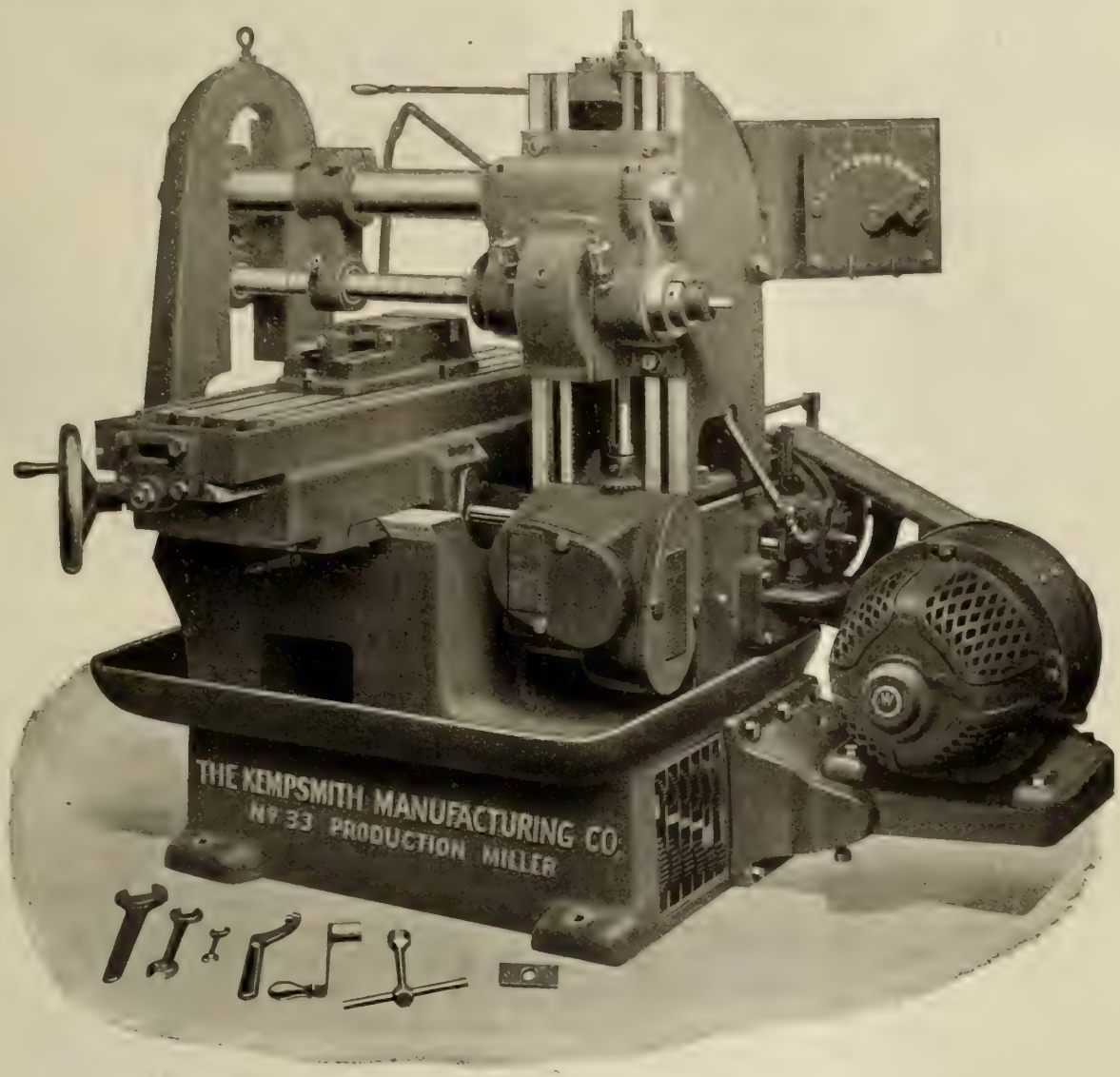
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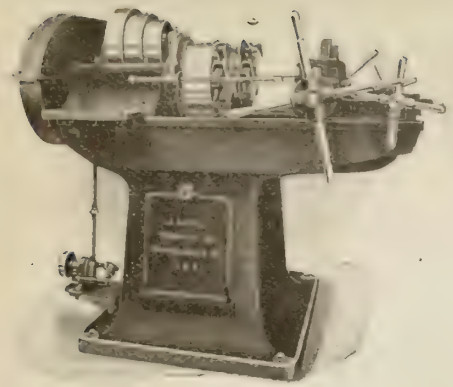
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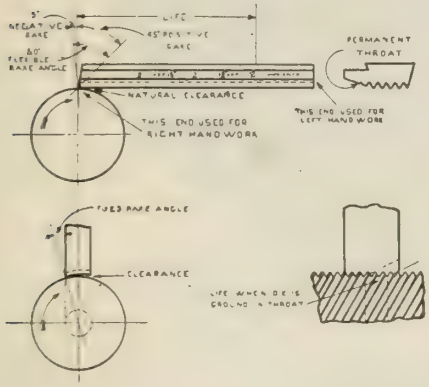


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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

VOL. XXV. No. 12 March 24, 1921

# Tooling the Modern Turret Lathe

## Machining magneto cam case—Use of special jaws — holding concentricity of work — Machining gun-metal bush—Automatic threading tool—Machining flywheel for motorcycle.

*By A. H. Lloyd B. Sc., M.B.E.*

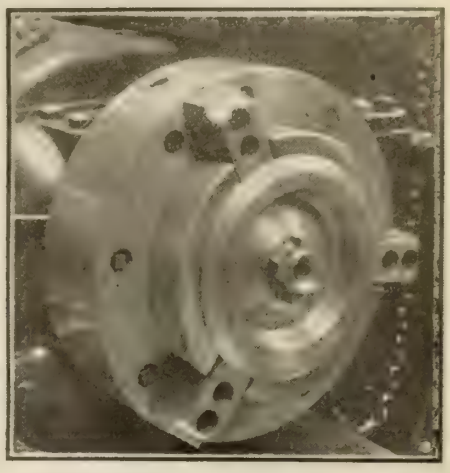


FIG. 11—CHUCKING MOTOR-CYCLE FLYWHEEL

HAVING dealt with chucking and fixtures in a previous article in Feb. 17th issue of Canadian Machinery, let us next consider some interesting examples of tooling.

The first example shown at Fig. 1 illustrates the method of machining a magneto cam case on a Herbert No. 4 capstan lathe. This piece is made from a brass stamping from which there is a comparatively small amount of metal to be removed, but the tolerances, as is usual in magneto work, are very fine.

Fig. 12 illustrates the first operation. On looking at the piece in the chuck you will see that there is an interesting set of special chuck jaws which are shown in greater detail in the lay-out at Fig. 13. The tools are numbered on this lay-out in the order in which they are applied to the work, and at the top you have a front view of the special jaws. These are made with a short shoulder, so that they square up the flange and provide a definite end location.

Tool No. 1 is a facing tool for the end, which is used in the square turret. No. 2 is a flat drill. No. 3 is a standard knee-turning tool carrying a cutter for turning the outside diameter, and a special boring bar carrying a flat cutter for rough boring and facing the bottom of the large bore. No. 4 is similar and finishes the surfaces corresponding to those machined by No. 3. There is, however, an additional cutter for cutting the groove at the bottom of the large hole. No. 5 is a single point boring bar for sizing the bore, whilst No. 6 is a boring bar carrying a cutter head which finishes the small bore, forms the radius at the mouth of the small bore, and forms the external radius on the end of the casting. It will be noted that tools 3, 4, 5 and 6 are all piloted in the chuck steady bush. It is good practice to make these steady bushes taper on the outside and fit them into a liner with a taper bore which is left in the chuck. This taper is approximately the same included angle as a Morse taper, and facilitates



FIG. 1—FIRST OPERATION ON MAGNETO CAM CASE.

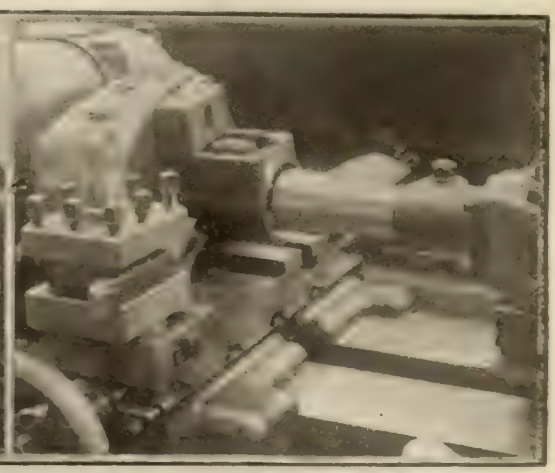


FIG. 4 BORING YOKES FOR LIGHTING DYNAMOS.

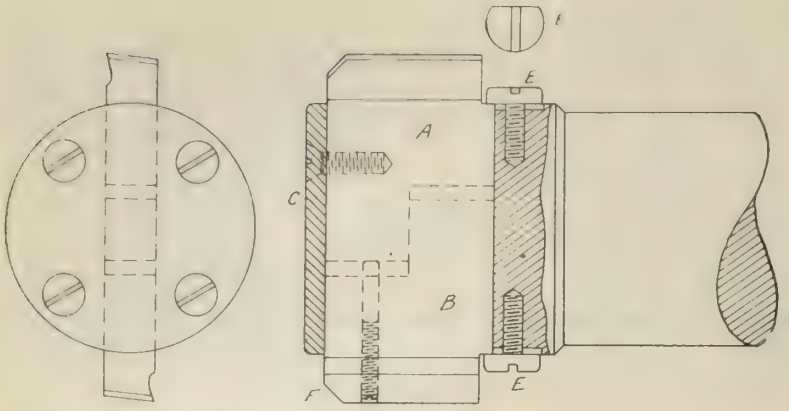



FIG. 5—DETAIL OF FLOATING CUTTER BAR.

removing the steady bushes from the chuck.

### Second Operation

In the second operation shown at Fig. 3 the method of chucking deserves some attention, as it illustrates how the concentricity of the work accomplished at the second operation is obtained in relation to the first operation. The steady bush in this case is made a sliding fit in the large bore finished at the first operation and on this the work locates. Gripping and driving are done by the soft jaws, which are bored out true, but it is important to note that concentricity is not dependent upon the truth of the soft jaws, but upon the locating plug. Tool No. 1 in the square turret faces the flange and the end, 1A being used for the finishing operation on the same surfaces. No. 2 is a standard knee-turning tool carrying a rough turning cutter and a piloted four-flute reamer for rough boring and bottoming. No. 3 is a similar combination to No. 2, but takes a second cut. No. 4 is a boring bar carrying an undercutting tool, which produces the groove at the bottom of the bore. No. 5 is a sizing boring tool. No. 6 is a knee-turning tool for sizing the spigot, and uses one of the first operation boring bars as a pilot, but without cutters. No. 7 is a boring bar for forming the radius in the small bore, and carries cutters for forming the internal and external radii.

The next photograph, Fig. 4, shows the lay-out for boring a yoke for motor car lighting dynamos. Whilst it is quite an ordinary tool lay-out it has one point of interest in showing a method of sizing holes, which is, to my mind, rapidly replacing adjustable reamers. In sizing holes 1 in. and upwards our firm recommend the use of boring bars with adjustable floating cutters, which produce a very smooth and accurate hole with a minimum of trouble. In the illustration shown the floating cutter bar is in position in front of the work, and at Fig. 5 is given the details of construction.

The cutter is made in two parts, "A" and "B," which are a sliding fit in a slot across the end of the bar. In this slot the cutter is retained by the front plate "C," and the amount of transverse movement or "float" is limited by the screws "E," which overlap the slot. The flat on the head of the screws allows the cutters to be withdrawn when either of them is partly turned. The two parts of the cutter are separated by the screwed pin "F," which also provides the diameter adjustment. When screwed in the diameter produced by the cutters is increased and vice versa. Each size of bar will take several sizes of cutter, and each cutter may be adjusted from 1-16 in. above to 1-16 in. below nominal size. The previous boring bar should preferably be of the single point type and should leave about 0.005 in. to 0.007 in. for the sizing bar to remove. These tools have been standardized for holes from 1 in. to 5 in., and have been made for bores as large as 10 in., with satisfactory results.

### Machining Gunmetal Bush

Next example, Fig. 6, shows the lay-out for machining a gunmetal bush, a detail of which is given in the right-hand corner. This is a very good example of a capstan lathe lay-out, which is tooled up with a view to eliminating all unproductive operations. The tolerances are not particularly fine, .0015 in. up and down being allowed on the bores, the same on the threads and the small diameter. The large external diameter is not important. Chucking is done in a Coventry chuck by gripping with special jaws on the hexagon head, and whilst the jaws are being tightened the tapered plug 1 is brought into position and centres the core. No. 2 is a standard knee-turning tool, carrying a special turning holder with two cutters for dealing with the two external diameters simultaneously, and a boring bar with three boring cutters and one chamfering cutter. The design of this rough boring bar embodies one feature which is well worth noticing. It will be realized that with two turning cutters and three boring cutters operating on the casting simultaneously, there is a very strong tendency for the work to move in the chuck jaws in view of the overhang and the consequent leverage. The first cutter to reach the work is the second boring cutter from the front, which starts to bore and traverses about 3-8 in. before any of the other cutters come on. The diameter behind the second cutter is made a few thousandths less than the size of the rough bore, so that when the bar enters the bore it acts as a steady as the turning cutters and remaining boring cutters come on. By this means a coarse feed can be used without any danger of the work moving in the chuck.

No. 3 is a similar tool for the finishing operations, but in this case the boring bar does not fit the hole. No. 4 is a revolving steady peg, which is

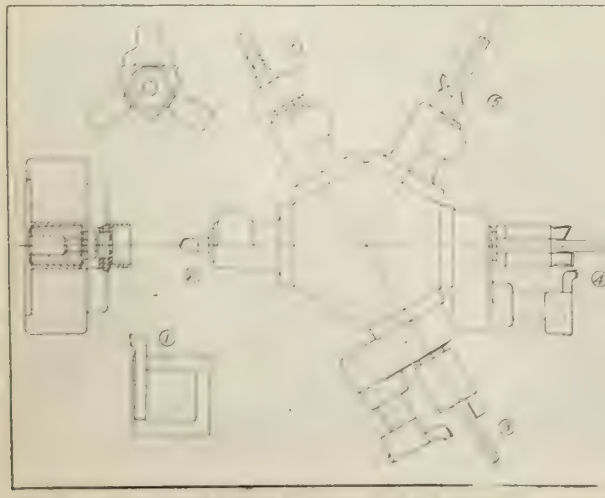


FIG. 2—FIRST OPERATION LAYOUT ON MAGNETO CAM CASE.

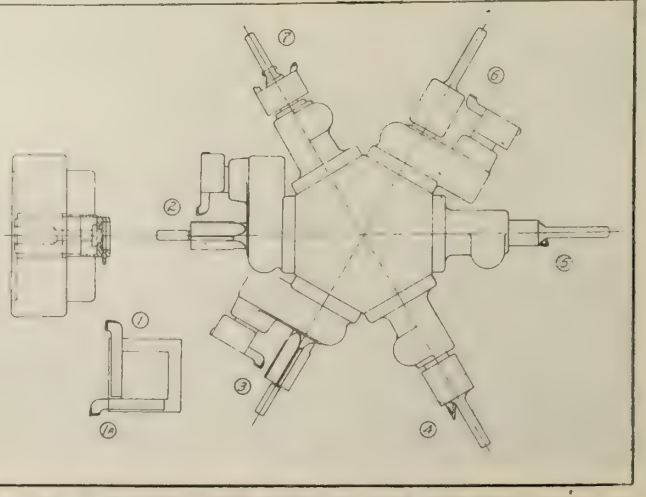


FIG. 3—SECOND OPERATION ON THE MAGNETO CAM CASE.

brought into the work when applying the form tool holder 5, carried on the back of the cross slide. The form tool holder carries a chamfering cutter, chamfering and facing tool, a grooving cutter, and a chamfering and facing tool for the end. Tool No. 6 provides the means for cutting the external threads, and is the "Coventry" patent automatic threading tool. In this there are six chasers, the threads of which are in pitch with each other, but each chaser cuts a thread a little deeper than the one which precedes it, the last chaser forming the full thread. The cross slide is set in to a stop, and the chasing mechanism engaged. The chasers then come successively on to the work until the first chaser has reached the groove.

By this time the bar at the rear of the tool holder has come in contact with an adjustable stop on the bed, for arresting the bar which now slides through the holder. This bar is stepped and successively the chasers pass over the step and are withdrawn from the work. It will be noted that the first chaser has actually tripped. During the chasing operation the work is still supported by the revolving steady. The actual time for cutting the external thread, which is done at one traverse, is 4 seconds. Tool No. 7 is an eccentric recessing tool for cutting the groove at the back of the internal thread. This type of tool is better for this particular job than the ordinary recessing tool slide, since it is tied up to the work by a revolving bush running on the tool itself. No. 8 is a "Coventry" collapsing tap which cuts the internal thread in three seconds. The machining time for the complete lathe operation is two minutes.

Fig. 7 illustrates the machine set up on the operation just described and gives a good view of the automatic threading tool, the collapsing tap, the form tool holder, and the knee-turning tools. A detail of the construction of the automatic threading tool is given at Fig. 8, which is a plan view with the cover removed. The stepped bar which retains the chasers is clearly seen in the cutting position; three of the chasers have been withdrawn and the fourth is about to trip. Withdrawing is effected by spring detents, one of which lies above each chaser. They project through the rear of the tool holder, and a pivoted lever is provided to push them into the cutting position before commencing the next piece of work. Spring return is provided for the stepped former bar, so that when the chasers are pushed forward into the cutting position the former bar shoots from right to left.

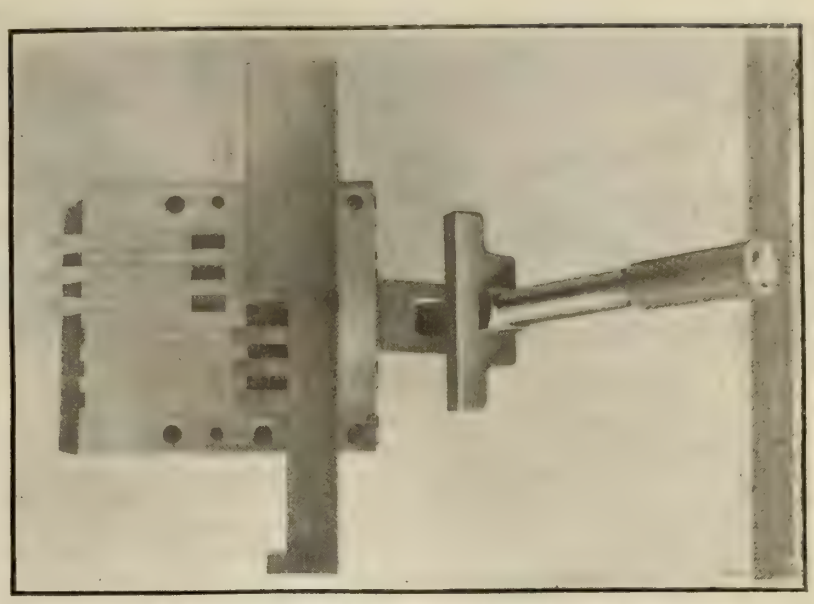


FIG. 8 DETAIL OF THE AUTOMATIC THREADING TOOL.

### Machining Flywheel

Coming to some larger work we will next consider a lay-out of tools for machining the motorcycle flywheel shown at Fig. 9. This is a component of the Scott motorcycle and is made from a mild steel drop forging. The outside diameter is 9 in., and the overall length about 2 3-16 in. It requires to be machined over all, except for a fluted portion on the boss, which is, of course, inaccessible as a lathe operation. The boss is counterbored from either side and tapered, the tapers meeting in the middle. There is also a small spigot on the boss, which requires to be accurately sized. Generally speaking, the machining on the two sides of the flywheel is identical, except that in one case the dished web is concave, and in the other convex. It is, however, important that the machining on both sides should be concentric and one of the inspection tests is to mount the flywheel on its cranks, which fit in the two taper portions, and run the whole arrangement between centres. The outside and the sides of the flywheel must then run true within very close limits.

Fig. 9 illustrates the first operation, in which the stamping is chucked by gripping under the rim. This method of chucking has the advantage that the outside diameter can be machined right across without the necessity of matching up. In the choice of a chuck for turret lathes it is important to choose

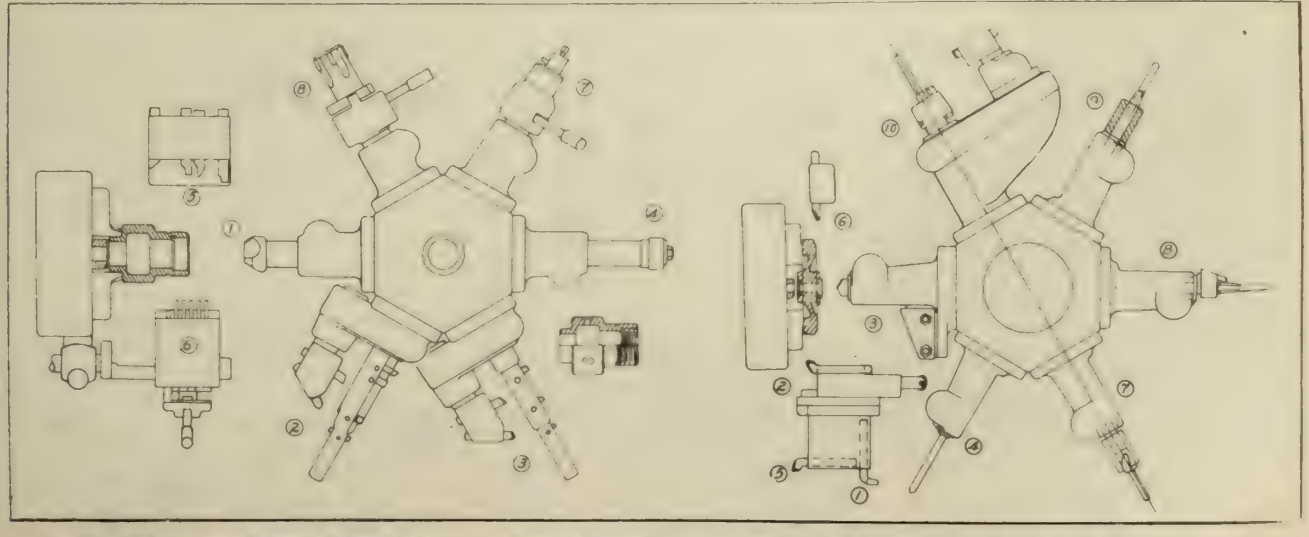


FIG. 6—LAYOUT OF TOOLS FOR MACHINING GUN-METAL DISTRIBUTOR BUSH.

FIG. 10—LAYOUT OF TOOLS ON FIRST OPERATION OF MOTOR CYCLE FLYWHEEL.

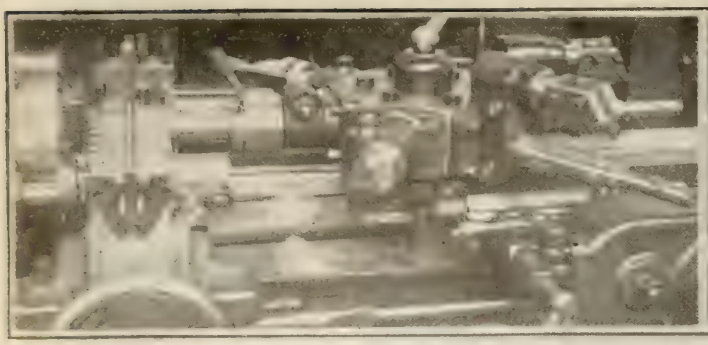


FIG. 7—SET UP FOR MACHINING GUN METAL DISTRIBUTOR BUSH.

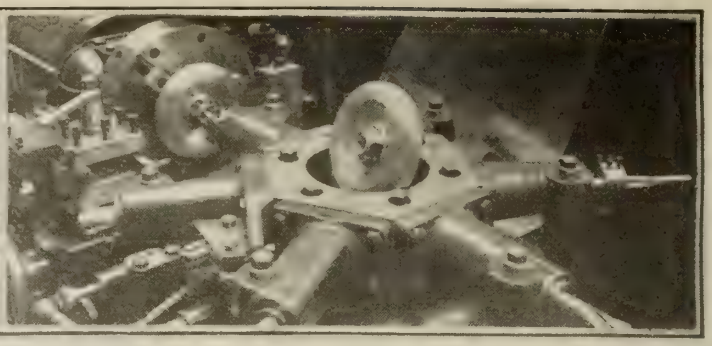


FIG. 9—FIRST OPERATION ON THE SCOTT MOTOR CYCLE FLYWHEEL.

one which is equally powerful in gripping outward or inward.

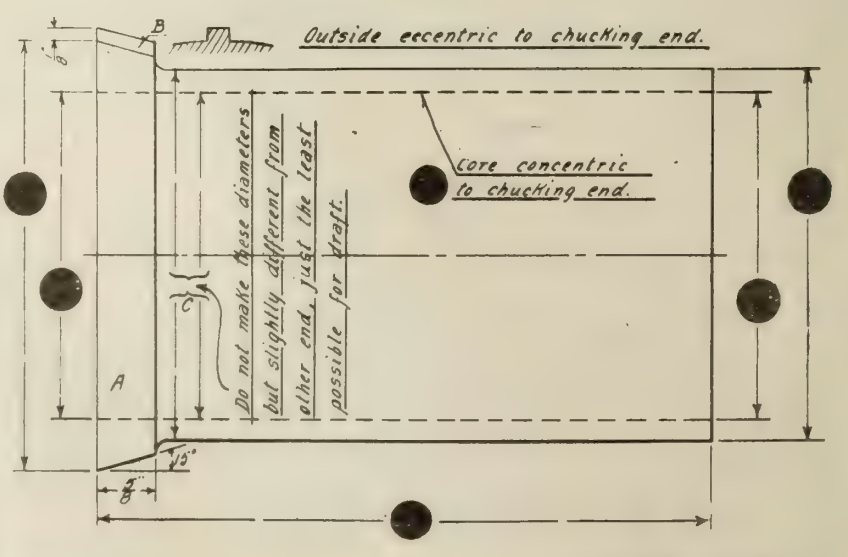
The lay-out for the machining of this piece is shown at Fig. 10. No. 1 is a tool for rough facing the side, rough turning the exterior and boss. No. 2 illustrates the method of machining a bevelled face with a single point traversing cut. This is a case where it would be bad practice to bring a broad form tool on to the scale, and the method of profiling used in this case is one which is recommended for either straight or curved bevelled faces. The cutting tool is carried in a slide which can move parallel with the axis of the lathe, this slide being fixed in the square turret. At the right-hand end is a copy roller, which, when engaged with the cam on tool holder No. 3, causes the cutting tool to move in a patch governed by the former when the transverse feed is set into motion. In the slide there is a spring which acts in the same direction as the pressure of the cut and keeps the roller in contact with the former. No. 3 is a flat centering tool for starting the drill.

The boring bar holder in this case is special, as it is arranged to carry the former for profiling, since there is no vacant turret face. No. 4 is a twist drill; No. 5 a finish turning and facing tool for the side, the exterior and the spigot; No. 6 a chamfer form tool carried in the back tool post; No. 7 a counterboring tool for the recess in the boss. The depth of this has to be very accurate, and is therefore determined by a stop collar mounted on the tool itself, which comes up against the boss. In a case such as this it is a more accurate method of working than from the turret slide stops. No. 8 is a roughing taper reamer on which is mounted a cutter for forming the radius in the mouth of the counterbore. No. 9 is a finishing taper reamer which is also provided with a stop collar to ensure accurate plug depth. No. 10 is an adjustable knee-turning tool piloted and carrying sizing cutters for the spigot and the exterior. The object of sizing the exterior is to provide a convenient location for the second operation. While on the subject of turning to size it is important to note that when this is done from the turret it is good practice to have the cutter vertically over the work, so that any slight inaccuracy in the indexing of the turret does not materially affect the size produced.

The machining at the second operation is practically identical with the first, and the interest lies in the method of chucking, this being shown at Fig. 11. This special method of chucking is adopted to obtain the concentricity which has already been mentioned. Bolted to the chuck face is a special faceplate; this is hardened and the bore ground out perfectly true. At the first operation the outside diameter of the flywheel is made so that it is a nice sliding fit in the faceplate. The gripping and driving is done by soft jaws, which are admitted by three slots cut in the faceplate, but these jaws have no influence on the centering of the work, which is done entirely by the faceplate. Flywheels machined by this method face the concentricity test satisfactorily, and the production time is in the neighborhood of an hour apiece. In a later article we will consider some further lay-outs.

**Will Need Equipment.**—T. & N. O. shops at North Bay have completed plans for the remodelling of their machine shop and will be installing some new equipment.

## *Cutting Piston Rings*




*By G. H.*

*Canadian Machinery.*

CHARTS OF SIMILAR NATURE TO THIS WILL APPEAR EVERY WEEK.

# Machine Tool Builders New Accounting Plan

## Job Order Costs—Burden Distribution—Fixing the Burden Rate —Rate to Use—Separate Kinds of Business—Supplies, Small Tools, Repairs, and Depreciation

DURING the recent meeting of the Machine Tool Builders at Cleveland, Ohio, Mr. Scovell gave a report of an investigation by the Scovell-Wellington Co. This paper covered a very wide range, and although we cannot find space to print the material in its entirety, here are a few of the points brought out. As far back as December, 1920, this concern was instructed to hold a series of regional meetings. This was done in Chicago, Cincinnati, Cleveland, Worcester and New York, between Jan. 11 and Jan. 20, with the result that valuable information was secured, some of which follows. It is, of course, understood that we have picked out only the points that, in our estimation, will interest our readers.

### Job Order Costs

There is no doubt that good cost accounting for the machine tool industry requires the operation of what is known as a job-order cost system, that is, a system which shall show the cost of the jobs which are issued to the shop—material, direct labor and a proper amount of overhead or burden. According to the information collected from the questionnaires, a large majority of the machine tool builders are already handling material and labor in a reasonably satisfactory way, so that any discussion of better or more uniform methods of accounting in the industry will be concerned almost entirely with the development, distribution and application of overhead or burden.

### Burden Distribution

The chart, Fig. 1, shows in graphic form the approved plan of collecting costs, particularly in respect to burden. A study of the chart will show that the aim is to allocate to each department or operating center of the business all the charges which belong there, and which should therefore be absorbed in the normal work done in that department or operating center.

One feature of this burden distribution which may be new to some is the plan for adding a portion of the burden on to material as it goes into the work-in-process. This idea is indicated on the chart by the lines which run from rectangles 37 and 38 to rectangle 43, and a somewhat similar charge on the cost of finished stock, storage and shipping is indicated by the line running from rectangle 39 to Selling Expense, rectangle 56. It should be clearly understood that this is a burden charge on material used. There is no suggestion of increasing the value of the unused inventories. Furthermore, only one calculation is required for all the material used on the job during the month; so that although it is a desirable refinement in accounting, it adds nothing to amount to anything in the way of additional clerical work.

### Interest on Investment

After a thorough consideration of the matter, the executive committee has decided unanimously to recommend to the industry that interest on investment be included in calculating the cost of manufacture. Without this accounting device the overhead or burden of different departments, or of different machine tools, will not be correctly stated, particularly that large and costly tools will otherwise have an insufficient burden rate, as there will be nothing to measure the cost of tying up capital in such equipment in comparison with light and relatively inexpensive machines. There is everything to gain and nothing to lose by carrying interest on investment as a factor in the fixed charges, rectangles 20 to 29 inclusive, and taking it up as a credit, under miscellaneous income, rectangle 54.

As to details of this practice, it should be explained that interest will be reckoned on all the assets employed in manufacture—land, buildings, equipment and inventories. The immediate effect is to increase the burden of that work which is done with large and costly machines in comparison with that work which is done with a smaller capital investment. As the product will include this element of cost, the stated value of the inventory of finished and partly finished work will be, to that extent, increased; but a reserve for the amount of interest included may, if desired, be deducted from the inventory assets in stating the balance sheet at the end of the year. There is some additional incentive to do this if there is an increase in the actual volume of such inventory during the year.

It should be further noted that only by charging interest on investment can the cost accounting in plants that are wholly or in part rented be made uniform with plants that are wholly owned. What is more important in this industry, it is only when interest on investment is reckoned on the assets that are utilized in the business that correct costs can be figured on patterns made in the company's pattern shop in comparison with patterns bought outside, or castings produced in the company's own foundry in comparison with castings purchased from others. Considerations like this are very important in a plan for uniform cost accounting.

A similar situation arises in respect to an auxiliary department like a power house. When members buy power, they necessarily get into their costs all such fixed charges on the capital used, and certainly no one would think of making a comparison between the cost of power purchased and the cost of power generated on the premises without reckoning into the latter the fixed charges of every kind on the capital required as well as the current operating expenses.

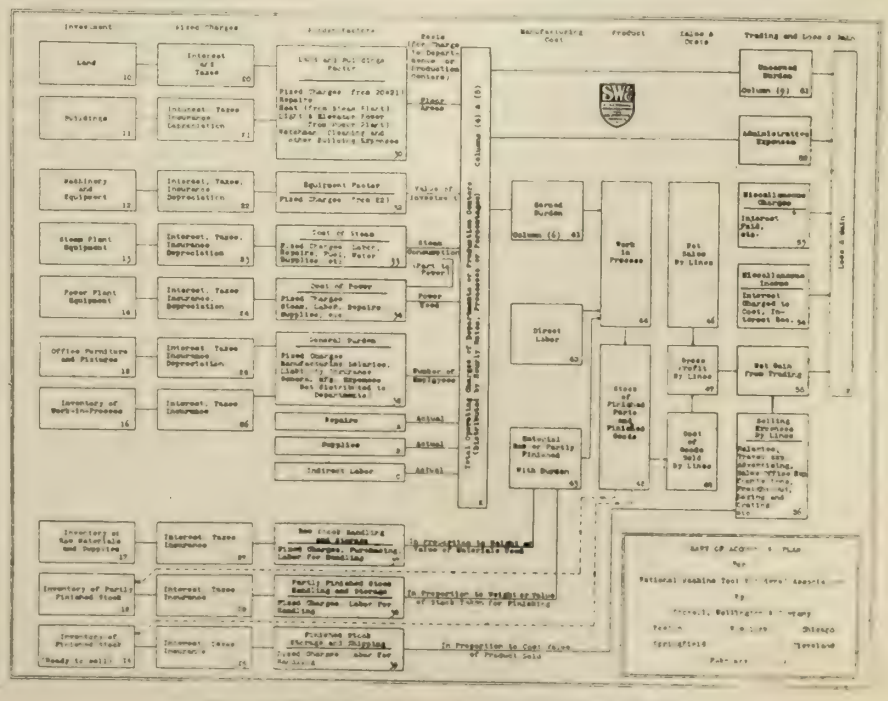


FIG. 1—CHART SHOWING ACCOUNTING PLAN.

Finally there is a marked disposition to reckon into costs interest on borrowed money, or interest on bonded debt; and whereas charges of this kind are incorrect in principle, and most objectionable in practice, they do reflect a sentiment which is well nigh universal in the business world that the use of capital is cost, which should be recognized before anything like a profit is calculated for the business.

**Fixing Burden Rate—The Normal Rate**

All of the overhead or burden of an operating department is represented by the long vertical bar, rectangle K, in the middle of the chart. This total, as the chart shows, is made up of (a) Land and Buildings Factor, rectangle 30, distributed to the several departments on the basis of the area occupied by each; (b) Equipment Factor, rectangle 32, apportioned according to the value of the equipment used in the several departments; (c) Steam and (d) Power costs, rectangles 33 and 34, distributed pro rata to the steam and power consumption; (e) General Burden, rectangle 35, distributed in proportion to the number of employees; and finally (f) Repairs, Supplies and Indirect Labor, rectangles A, B and C, charged to the several departments as actually incurred.

The idea of distributing or apportioning burden to "departments" or "production centers" is applicable particularly to the larger shops. For the small shop the idea is to develop or recognize all the burden that exists, and make plans to have it added to the cost of production as nearly as possible in accordance with the facts in that shop. In a very small shop, particularly if it is making only one product, there would be no serious inaccuracy in having one rate for the whole shop, or possibly two or three rates; but if there are varied working conditions, or if there is a great variety of product, distinctions must be made to get accurate costs.

A correct burden rate in any department will be determined by dividing the overhead or burden of the department by the normal number of operating units, that is, the normal man-hour or machine-hour capacity of the department or production center.

Great care should be taken to see that the calculation of a burden rate is made on the basis of operating units that can be realized with ordinary good management, if a shop has a steady volume of business, but not considering a night shift or overtime. It is not easy to say just what per cent. of the theoretical hours should be taken as the standard for the purpose of setting burden rates, but allowance should be made for those shut-downs of a department (or a particular tool) repairs, absent workmen, etc., which occur under normal conditions. At this point in the calculation no allowance should be made for shut-downs resulting from lack of orders.

All of the work done in the shop should uniformly carry the normal rate of burden, not more when the shop is partly idle, and not less when it is unusually busy. This arrangement gives costs which are comparable at all times and which vary only in proportion to operating efficiency. This idea of a normal rate of burden is fundamental to good cost accounting, and is particularly important in an industry subject to such ups and downs of production as the manufacture of machine tools.

According to this plan, when the shop is busy all of this burden will be "earned," as indicated by rectangle 41, and thus be carried into work-in-process, rectangle 44. When the shop is operating on part time, a corresponding portion of the burden will be unearned or unabsorbed, and will therefore go directly to loss and gain, as indicated by rectangle 51.

*POINTS BROUGHT OUT*

*That a proper job order system, showing the cost of the work, material, direct labor, and a proper amount of overhead is necessary.*

*That interest on investment should be included in calculating the cost of manufacture.*

*That the correct burden rate in any department can be determined by dividing the overhead by the normal number of operating units, that is, the normal man-hour or machine-hour capacity*

*That spoiled work should be handled in two ways. First—let the spoiled work all stand as part of the cost of the job, and to let the good pieces absorb this cost. Second—to subtract all the material, labor, and burden cost on the spoiled pieces from the cost of the job, and charge this total, less any salvage value of scrap as a factor of overhead.*

**What Kind of Rate to Use**

A rate-per-cent.-on-wage-cost as a method of distributing burden is acceptable only when the wages of all the operatives are very uniform, and when the facilities at their disposal are likewise uniform. As these conditions are rarely present in a machine shop, the rate-per-cent.-on-wage-cost is not a satisfactory method of distributing burden in this industry.

The use of a man-hour-rate removes the inequalities which arise by reason of varying earnings on the part of the operatives, and recognizes the fact that burden corresponds much more nearly to the number of people employed than it does to the wages which they earn.

Under some conditions the man-hour rate will be a satisfactory method of distributing shop burden, but generally the facilities with which the men work will vary so greatly that thoroughly accurate costs cannot be secured without the use of a machine-hour rate, which will be greater or less for different machines (a) according to their size, and therefore the space they occupy; (b) according to their value, and therefore the fixed charges which they should carry (interest, taxes, insurance and depreciation), and (c) according to the power which they use, and therefore the amount of power cost which should be included in the burden rate.

The comparison of actual hours with standard hours may be made a very important factor in securing economical administration. For many years past, shops with the strongest management have had daily operation reports, summarized at frequent and regular intervals, accounting for all idle time of their machines. Some of this idleness will be recognized as inevitable; but in order to fix the standard hours a record of this kind needs to be kept, and in order to reduce to a minimum the loss resulting from idleness, this record needs to have consistent executive attention. If this is done, the management frequently gets an important reflection of the efficiency of the various departments in advancing a job from one operation to the next, not to mention the efficiency of the purchasing agent, storekeeper, employment department or planning department who may have to do with material being on hand in the first place, or men being on hand and at the right time to take care of it. This is a very good example of the kind of analysis which, if correctly made and correctly used, puts money into the pocket of the management.

**Separate Kinds of Business**

Some members are engaged in other kinds of business in addition to the manufacture of machine tools, in which case the idea of a separate statement of gross profits applied to different lines (of machine tools) should be extended to apply with even greater emphasis to the different kinds of product manufactured. One member, for example, is making agricultural implements as well as machine tools, and several members are doing more or less business in the manufacture of automatic machinery parts.

Distinctions of this kind will be recognized and agreed to as soon as they are stated, and the same idea applies to the operation of a foundry or to a pattern shop if either one is run in connection with a machine shop; for many machine tool manufacturers get along without either of these departments. If a foundry is operated, the castings should be charged to the machine shop at a fair commercial price; so that the executives may know whether they are making or losing on the foundry, and so that the cost of the machine tools may not appear to be greater or less on that account.

**Spoiled Work**

Spoiled work will always be a subject on which there will be a considerable division of opinion as to how it should be treated. In general, the two plans for spoiled work are (1) to let it all stand as

part of the cost of the job which is being done, and to let the good pieces absorb all this cost; or (2) to subtract all the (a) material, (b) labor, and (c) burden cost on the spoiled pieces from the cost of the job, and charge this total, less any salvage value of scrap, as a factor of overhead or burden.

The first plan would properly be followed in an industry like drop forging or custom stamping, where the successive pieces are individual, and might have such peculiarities of design as would make more spoiled work in some cases than in others; for certainly it would be fair to treat any spoiled work which was a peculiarity of the pattern, in that way. In an industry where spoiled work is not a factor of design in any way, but merely reflects careless workmanship or other errors in the shop, and is, therefore, about as likely to occur on one piece as another, it is better to adopt the second plan and set up the net cost of spoiled work as a burden factor where it occurs.

In either case, the importance of spoiled work should be recognized, and spoiled work reports should be required showing all the particulars, including among other things the exact point at which the damage was done, if that can be determined, whatever details the management wants in the way of administration or discipline, and of course the cost of the spoilage.

The objection to letting the good pieces, however few they may be, take up all the cost of the work done on the job is that when this is done the factor of spoiled work is introduced into cost comparisons, so that if a part is made three or four times during the year, the comparison which is naturally desirable as to material, labor and burden cost on the part is to a considerable extent disturbed, and may be entirely destroyed, if the spoiled work factor is not eliminated.

### Drawings, Patterns, Jigs and Fixtures

During the discussion of the accounting practice to be recommended for the industry great emphasis was laid on the accounting for drawings, patterns and jigs and fixtures; and we understand that the executive committee is unanimous in recommending (a) that everything in the nature of repairs to restore worn or damaged pieces should in all cases be charged as an expense, (b) that the cost of new drawings, patterns and jigs and fixtures, not replacement, should be carefully separated from all other costs and (c) that these outlays should preferably be immediately charged as an expense in the year in which they occur; but under no circumstances should the expense be spread over a longer period than three years. The idea is to recognize these items unqualifiedly as an expense, and if they are not charged out currently as they occur, they should be considered like other deferred charges to operating.

### Supplies, Small Tools, Etc.

Considering miscellaneous shop expenses, it was thought desirable to emphasize the fact that such items as oil, waste, emery cloth, sand paper, emery wheels, paint brushes, oil cans, brooms, casehardening compound, hardening pots, hack saws, small drills, etc., should be treated as supplies and charged to expense as issued.

Perishable tools, including hammers, wrenches, screw drivers, chisels, reamers, larger drills, taps and dies, hobs, milling cutters, counter-borers, slitting saws, cut-off saws (both band and circular), broaches, and tools with a cutting point, etc., came in for a good deal of discussion. The best practice seems to be to charge these items to expense as issued, exactly like supplies; but many companies carry an asset for items of this kind intended to represent in a conservative way the investment which they have in such articles, and this asset should never be increased, except possibly in connection with a marked expansion of the business. Plans of inventorying perishable tools at regular intervals on a very conservative basis, or any systematic plan of depreciation at a high rate (50 per cent. was suggested) are acceptable, provided anybody feels that the plan of writing off the cost of these items as issued makes the charge to operating too uneven.

Belting was discussed at the same time with perishable tools, and it is recommended that charges for belting be handled on a plan in all respects similar to that recommended for perishable tools. Even where belting is given a steady care it should not be expected to have a life of more than four or five years; and if treated as an asset and subject to depreciation, a rate of 25 per cent. is recommended.

More permanent tools such as micrometers, calipers, test plugs, gauges, boring bars, vises, milling machine arbors, electric drills, pneumatic hammers, etc., may perhaps deserve a different treatment, but if set up as an asset should be depreciated so as to be written off over a period not to exceed three years.

Regarding supplies, perishable tools and permanent tools, it should be understood that these are to be set up as an asset when purchased, carried as an asset so long as they remain in the storeroom, but charged out to expense or otherwise when issued. This practice operates to distribute the cost of these items to correspond with the way they are put into use, and under most conditions will make a satisfactorily even spread of this item of expense.

### Repairs

Before considering the depreciation of other assets used in the machine tool industry, it should be understood that repairs of every kind are to be charged to expense as incurred. In this connection it may be well to note that whenever men are engaged on repair work, whether regular machinists, diverted to repairs instead of production work, or men from the regular repair crew, the charge for the repair work they do should include not only the wage rate of the men concerned but also an overhead or burden rate on a man-hour basis. Only when repairs are calculated at full cost in this way do the repair charges of the respective departments and production centers appear correctly; and as repairs are frequently an important factor in fixing a burden rate, it is highly desirable that they be stated correctly.

This idea of a full and correct statement of repairs is also important as applied to the costs of separate departments, like a foundry or pattern shop, which may exist in connection with some machine tool plants, but be entirely absent from others. It is also important in connection with an auxiliary department, like the boiler house or the power house, where repairs are likely to be heavy; or a storeroom, hospital or some other department which correct accounting requires should have its charges separately and fully stated, that the total may be distributed correctly over the departments served.

### Depreciation and Obsolescence

Proceeding from this general statement regarding repairs to a consideration of depreciation, the next point to consider is that depreciation rates may and should take into account obsolescence; that is, a charge in addition to wear and tear, in the expectation that the asset may not continue to serve its intended purpose until it is worn out, but (a) that it may be outgrown by the size of the business, or (b) by the need for moving to another location, or maybe (c) superseded by a design that is more economical and efficient, so that the business cannot afford to continue to use the original assets.

With this explanatory statement in regard to repairs, and the basis for calculating depreciation, the minimum rates recommended by the executive committee are as follows: Concrete buildings 2½ per cent., brick buildings (mill construction) 4 per cent., wooden buildings 6 per cent., machine tools 10 per cent., transmission (line shafting, hangers, pulleys) 15 per cent., electric motors 10 per cent., overhead travelling cranes 10 per cent., all other boiler house, power house, electrical, plumbing, heating, lighting and ventilating equipment 10 per cent., motor trucks—heavy 20 per cent, light 30 per cent., passenger cars 30 per cent., office furniture 15 per cent., office mechanical equipment 25 per cent., shop furniture, such as racks, bins, benches and trucks 25 per cent.

These rates are to be calculated upon the first cost of the asset, and set up annually in Reserve for Depreciation account. It is recognized that in the present deflating movement, assets may suffer marked declined value through price recession. Such a revaluation would have to be taken care of in a special way.

# Information Wanted on the Subject of Fits

IN July, 1920, the journal of Mechanical Engineering announced the organization and personnel of the Sectional Committee on Plain Limit Gages for General Engineering Work, a Sectional Committee which is working under the Rules of Procedure of the American Engineering Standards Committee and is sponsored by the American Society of Mechanical Engineers. After a preliminary canvass of the gaging situation carried on during the summer months, the committee subdivided itself into three working sub-committees. To these sub-committees have been assigned the three subdivisions of the subject, viz., (a) standards and tolerances for manufactured material; (b) methods of gaging manufactured material; and (c) gages and their limits, manufacture and use.

The Sub-Committee on Standards and Tolerances for Manufactured Material, to which has been assigned the task of preparing a set of standard allowances and tolerances for mating parts in interchangeable manufacture, has after considerable discussion and consultation with manufacturers prepared a questionnaire, full and complete, answers to which it earnestly requests. Since by the method of its organization the report of the full committee when approved by the A.E.S.C. will establish American standard practice, it is very desirable that everyone interested in any way in this set of standards should know of this activity and should have a part in it, if he so desires. Canadian Machinery therefore takes pleasure in reprinting this questionnaire in full and invites its readers to send their replies to our editor, who will in turn forward them to the committee. It is only by relating our experiences that we can help others.

For the purpose of clearness and after very careful consideration, the committee has subdivided all machined fits into four classes. These are listed below with the kinds of work which seem to fall in each class.

### Class No. 1—Loose Fits

Machined fits of agricultural, domestic and other machinery of similar grade (wagons excepted).

Mining machinery.

Controlling apparatus for marine work, etc.

Textile and rubber machinery, candy and bread machinery and others of similar grade.

Some parts of ordnance.

General machinery for manufacturing.

Question 1.—What allowances do you make in this class?

### Class No. 2—Medium Fits (Moving Parts)

2a. High Speeds (over 600 r.p.m.) and Heavy Pressures.

Electrical machinery.

High-speed parts of woodworking machines.

Sewing machines.

Machine tools.

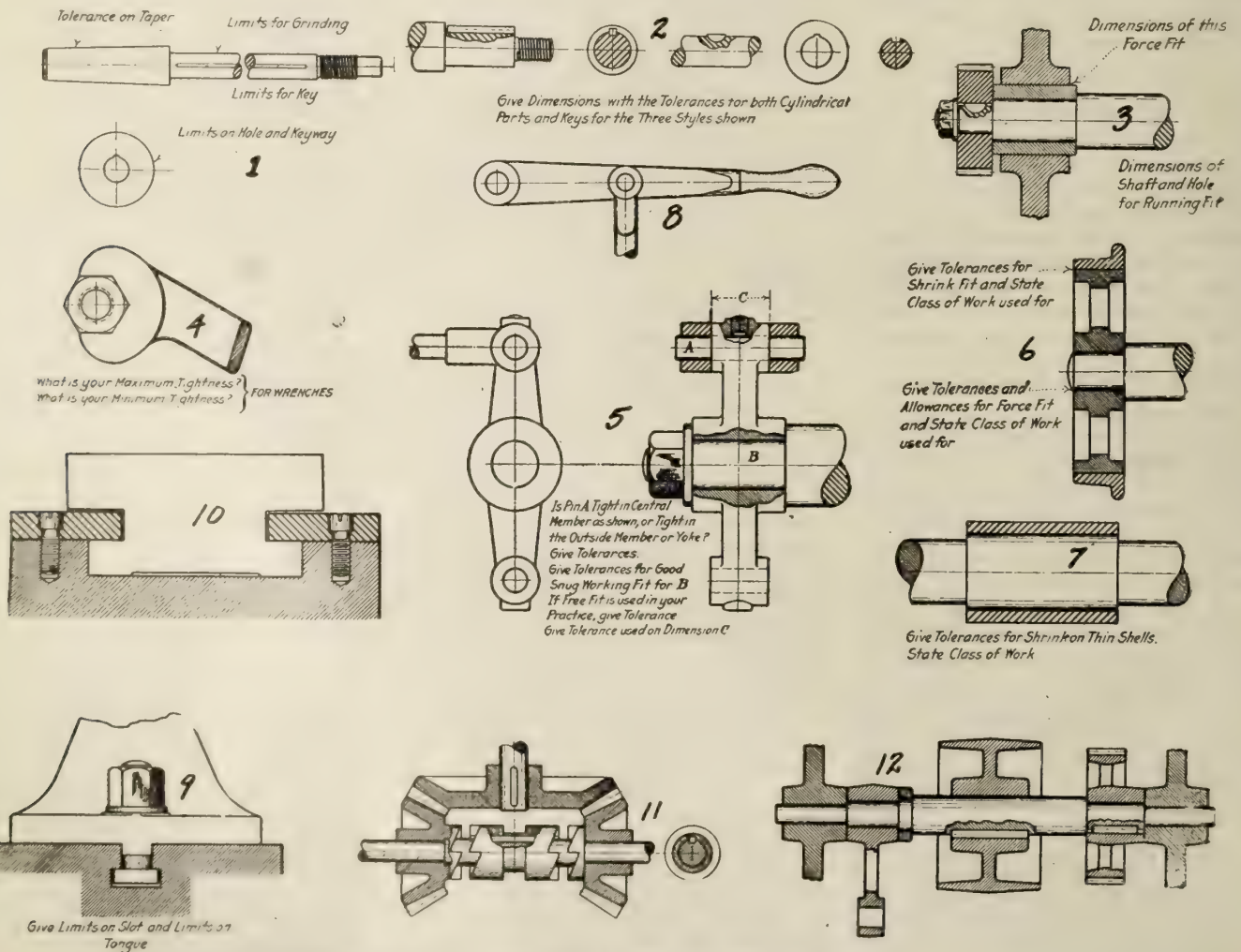
Locomotives.

Printing machinery.

Automotive.

Ordnance.

General machinery for manufacturing.




LET US HEAR FROM YOU REGARDING THE VARIOUS QUESTIONS ASKED.

A well-known firm uses allowances of 0.0005-0.004 inch up to 6 inches for work of this class.

Question 2.—How does this compare with your practice?

**Class No. 2—Medium Fits**

2b. Ordinary Speeds (under 600 r.p.m) and Light Pressures.
Machine tools.
Printing presses and machinery.
Typewriters, calculating machines, etc.
Locomotives.
Automotive—general parts.
Textiles, rubber machinery.
Ordnance.
General machinery for manufacturing.

A well-known firm uses allowance of 0.0005-0.0025 inch up to 6 inches for work of this class.

Question 3.—How does this compare with your practice?

**Class No. 3—Snug Fits**

(Designated as the closest fit that can be assembled by hand.)

3a. Slight Allowance (0.00025 to 0.00075 inch.)
Gear trains and change gears for general work.

Mating parts, fixed or not, moving on each other, such as studs for gears and levers, keys.

General machinery for manufacturing.

Question 4.—Do these allowances agree with your practice?

3b. Close Fit (commonly known as wringing fit, no allowance, not considered interchangeable manufacturing but selective assembling).

Crankshafts.

Precision-ground machine spindles.

Gears in index train of precision gear-cutting machines.

Slots and tongues such as are used for grinding machines, milling machines, etc.

Surveying and scientific dental instruments, etc.

General machinery for manufacturing.

Question 5.—Should no allowance be made in machining the fits in this class?

**Class No. 4—Tight Fits**

4a. Drive Fits for Light Sections.
Automotive.
Ordnance.
General machinery for manufacturing.

A well-known firm uses negative allowance from 0.00025 to 0.001 inch up to 6 inches.

Question 6.—How does this compare with your practice?

4b. Force Fits for Heavy Sections.
Locomotive and car wheels.
Crank discs, armatures, flywheels.
Automotive.
Ordnance.
General machinery for manufacturing.

A well-known firm uses negative allowance from 0.00075 to 0.005 inch up to 6 inches.

Question 7.—How does this compare with your practice?

4c. Shrink Fits.
Locomotive tires and similar work.
Ordnance.

A well-known concern's practice is as follows: Where thickness exceeds ⅜ inch, 0.0005 to 0.005 inch up to 6 inches diameter. Where thickness is less than ⅜ inch, up to 6 inches in diameter, 0.00025 inch to 0.0015 inch.

Question 8.—How does this practice compare with yours?

The committee would greatly appreciate having your full answers also to the three following general questions with as much explanatory information as possible:

Question 9.—How many of the four kinds of fits previously mentioned apply to your work?

Question 10.—Will you send the committee blueprints or other data showing your practice in as many of these cases as possible?

Question 11.—How do you specify both allowance and tolerance for mating parts—such as a solid 2-inch bearing and the shaft which runs into it?

The following sketches show some of the problems. Will you kindly give the committee as much information as possible regarding your practice in such cases.

Question 12.—What allowance and what tolerance would you give on such a piece as shown in Fig. 1: (a) for a milling-cutter arbor, (b) for a work-holding mandrel?

Question 13.—What allowance and what tolerance would you give on the keys and keyways shown in Fig. 2, where

(a) Keys are tight in both shaft and hub;

(b) Keys are tight in shaft—sliding in hub;

(c) Keys are tight in hub—sliding in shaft?

Question 14.—What difference in allowances and tolerances would you give on the bearing and gear fit shown in Fig. 3?

The fit of a wrench is shown in Fig. 4.

Question 15.—What is your practice as to allowance and tolerance for maximum looseness and maximum tightness?

The rocker arm shown in Fig. 5 contains several kinds of fits.

Question 16.—What allowance and tolerance would you give at A, B and C?

Two shrink fits are shown in Figs. 6 and 7, one a thin shell, the other a locomotive tire. The latter also has a press fit.

Question 17.—What is your practice on work of this or a similar character?

In multiplying movements the lost motion often plays an important part.

Question 18.—What is your practice in such cases as shown in Fig. 8—for both allowance and tolerance?

Fig. 9 shows a light sliding fit for accurate grinding or simialr work. Fig. 10 illustrates a working slide fit for turret slide or for similar purposes.

Question 19.—What are your allowances and tolerances in such cases?

Question 20.—Do they vary with the length of the slide?

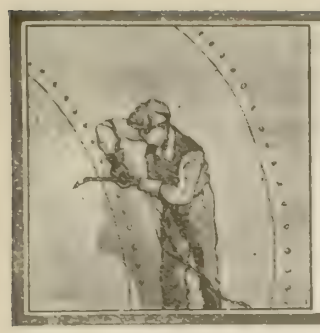
The two remaining sketches, Figs. 11 and 12, show combinations which occur frequently in machine design.

Question 21.—Will you kindly give your practice in such cases?

Please bear in mind that this committee has no desire that its report shall impose arbitrary standards in any case. Its first work consists in securing data as to the best present practice in this country, with the sole aim of aiding interchangeable manufacture in every way possible. Your co-operation will aid greatly in reducing manufacturing costs in many places and in improving our already high standards of manufacture.

## PAINT FILLERS FOR CAST IRON WORK

Where castings have to be painted and varnished to give them a smooth and glossy finish, it is necessary to give one or more filling coats of thick paint made with some inert mineral and a drying oil medium such as a double-boiled linseed oil and turpentine plus the required driers for the quantity of oil used. Finely-ground slate or other soft and cheap mineral body answers very well, and gives a thick hard substance when dry, and one which will take the finishing paint well. Applied in a warm place, the first coat should be dry in a couple of days, when it should be rubbed level with glass paper and a second coat put on. When this is dry and hard it should have the surface rubbed smooth with fairly fine glass-paper, and after all dust has been carefully removed the finishing coat should be put on, for preference this being a hard-drying enamel paint which does not require varnishing. If, however, remarks Practical Engineer, an ordinary paint is used, it should be allowed to become thoroughly dry and hard, and then, after rubbing down with fine glass-paper, it should have a good coat of hard and tough copal varnish put on, this giving a glassy surface when dry and hard. All painting and varnishing should be done in a dry place free from dust, where the temperature can be kept at anywhere between 60 deg. and 75 deg. Fah., while proper time must be allowed for the work, it being very undesirable to apply paint or varnish until the preceding coat is thoroughly dry and fairly hard. All grease should be cleaned off metal before paint is put on, and where strong alkaline washes are used for this purpose the work should be rinsed off with an acidulated water to fully neutralize the alkali.



# WELDING AND CUTTING



## Oxy-Acetylene Welding of Iron and Steels

### Preparation of Parts--Selection of Blowpipe Tip—Preheating—Welding Rods and Flux—Execution of Welds, and Treatment After Welding

THE welding of iron and steels is at all times an interesting study. By iron and steels we mean commercial wrought iron, and mild or low carbon steel.

The operator will be able to work more intelligently if he knows something of the composition and nature of these metals. Iron, as a material of construction, is no longer used. Practically all of the so-called "wrought" iron on the market to-day is in reality a mild steel. For this reason wrought iron and mild steel metals are discussed as one. "Low carbon" or mild steel is quite ductile and malleable, but has a lower tensile strength and lower elastic limit than the "high carbon" or hard steels. No close distinction can be made between high and low carbon steel, but in general anything below 25 point carbon (0.25 per cent.) may be designated as mild steel, while those containing more than this amount are either half hard or hard. Most of the steels that the operator will be called upon to weld are mild.

#### Preparation of Parts

Mild steel parts are prepared in the manner described in February 24 issue. Several methods of preparing various parts to be welded are shown in the accompanying illustrations.

Fig 1 shows a section of one side of a steel cylinder and a convex head which is to be welded on. The weld should be made in the straight portion of the cylinder as shown, and not directly at the bend. Fig. 2 depicts the method of accomplishing the same result in the case of a concave end. If the parts are bevelled as shown, the joint will be a strong one.

Fig. 3 illustrates the proper method of preparing shafting up to two inches in diameter for welding. Note that this is bevelled to a chisel edge and not pointed. If the shaft is pointed (see Fig. 4), the molten metal will fall upon the cold part of the shaft and adhesion will result, which means that the new metal is merely "plastered" on at certain points and is not "fused."

Fig. 5 shows the proper method of bevelling a shaft over two inches in diameter. At the bottom of the bevel, the angle is large enough to insure a good weld. It is unnecessary to continue this wide angle clear to the top, however. The opening at the top should be approximately equal to the radius of the shaft.

In welding two plates it is necessary that the edges to be welded diverge as shown in Fig. 6. The amount of this divergence is dependent to some extent upon the thickness and nature of the metal. It is safe to say, however, that this divergence must not be over six per cent., nor less than 2½ per cent. of the length of the weld. Some operators stick by the hard and fast rule of ¼ inch

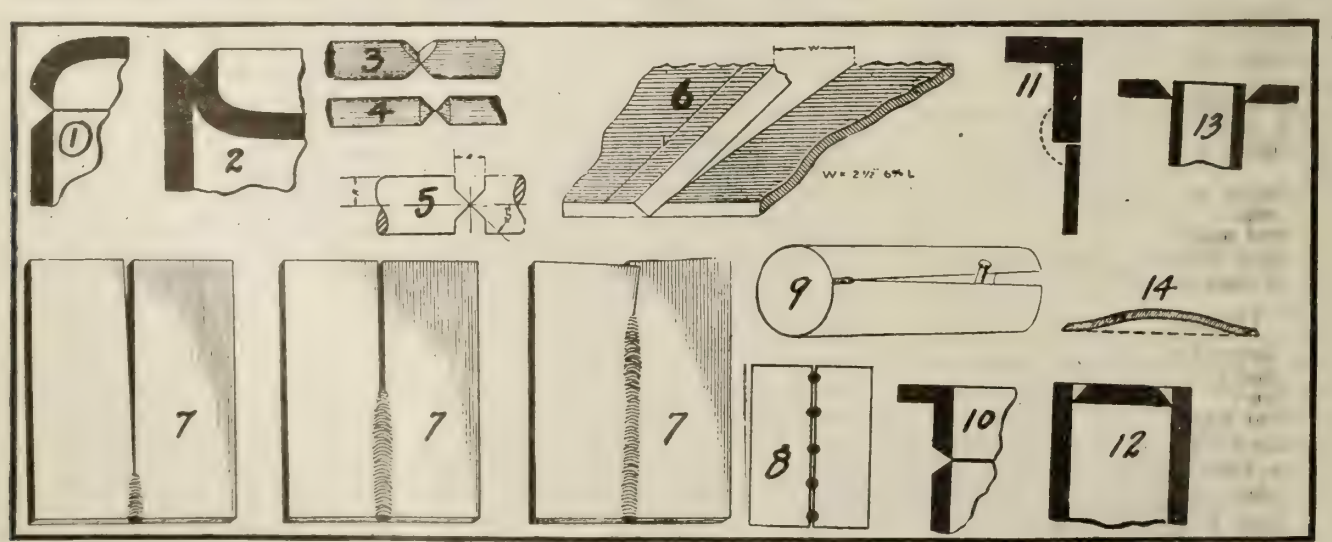



Fig. 1—Joint for convex end on cylinder. Fig. 2—Joint for concave end. Fig. 3—Correct method of preparing shaft for welding. Fig. 4—Incorrect method. Fig. 5—Method of beveling shaft over 2" diameter. Fig. 6—Sheets spread for welding to allow for draw. Fig. 7—Effects of not spreading sheets. First they spread, about the middle they close again, and beyond the middle they draw and lap.

Fig. 8.—Sheets tacked before welding. Fig. 9.—Wedge inserted between edges to prevent overlapping. Fig. 10—Joint for angle iron and sheet of the same thickness. Fig. 11—Joint for angle iron and thinner sheet. Fig. 12—Joint for flat end in tube. Fig. 13—Joint for flange in tube. Fig. 14—Patch plate bellied, and edges beveled.

per foot. This is a fairly good figure. Yet, to obtain the best results, certain deviations from this proportion should be made. In making a butt weld of two plates, the edges of which have been placed in contact with each other for their entire length, they diverge at first and then gradually come together until after about half of the weld has been made, when they will be parallel again. From this point on they will start to converge until there is an overlapping, as shown in Fig. 7.

There are two methods of overcoming this. First, by diverging the plates the proper amount. Second, by tacking or spot welding the joint at various points, Fig. 8. The second method has the disadvantage of causing warping or buckling under certain conditions. In a number of cases the warping or buckling can be eliminated by rolling or hammering after the piece has been welded. The first method is by far the most satisfactory, and after the welder has had practice he can accurately calculate the amount of divergence that the plates will need in order to bring the edges of the weld exactly together at its completion.

Another method of preventing overlapping of the plates, in the case of cylinders, is to insert a wedge a short distance ahead of the weld, moving the wedge as the weld progresses. This is shown in Fig. 9. When welding angle iron rings to cylinders where the thicknesses are the same, both edges should be set up as shown in Fig. 10. When the angle to be welded to the plate is thicker than the plate (Fig. 11) apply the flame more on the angle than on the plate. This will tend to bring the parts to the fusion point at the same time. Metal must be added as shown by the dotted line.

When welding a flat end into a tube, prepare the end as shown in Fig. 12, making a driving fit. The welding of flat flanges to tubes is an operation that requires care, as the flange is usually considerably thicker than the tube and has to stand a good deal of strain. The flange and tube are best prepared as shown in Fig. 13. The welding flame should play more on the flange than on the tube.

When repairing cracks in plates, always see that the crack is bevelled through its entire thickness. The plate being welded should be free to move. If it is impossible to provide for this, instead of attempting to repair the crack use a patch. A patch piece should always be slightly bellied and have edges bevelled as indicated in Fig. 14.

The size of tip to use for welding iron and steel depends upon the thickness of the metal, but do not forget that the flame should be neutral at all times.

### Preheating

Preheating is usually unnecessary since iron and steel are elastic enough to take up expansion and contraction without breaking. However, in welding heavy sections, preheating will save 30 to 50 per cent. in gas consumption and labor, as the welds can be made faster on previously heated metal. For filling material in the case of work that is not under tension, use pure iron wire of the first quality to get the best results. This is free from slag, sulphur, phosphorus and other impurities. It should be remembered that pure iron has a comparatively low tensile strength. However, it is very ductile (elastic) and hence is very suitable for welding. Welding rods used on iron or steel should never exceed ⅜ inch in thickness. For thin work never use a rod thicker than the metal to be welded. The use of a flux is not necessary in welding wrought iron or steel. The general instructions already given apply in the welding of wrought iron and steel. The end of the small white cone should be allowed to just touch the metal.

Annealing or hammering, or both, will improve the quality of steel welds. Welds preferably should be treated in this manner wherever great strength is desired. The hammering should be done with the metal at a yellow white heat. Hammering at a dull red heat is likely to produce cracks or fissures in the welded portion. Before hammering, it is necessary to reheat the work thoroughly to the proper color. The welded part may then be annealed by heating to a cherry red heat and allowing to cool naturally.

### Special Steels

There are many special or alloy steels used in the metal industry. The operator is often called upon to weld these. Many automobile and locomotive parts are made from special alloy high carbon steels, and these castings or forgings undergo, during manufacture, special heat treatments which are in many cases more or less of a secret process. It will be appreciated that welding with a high temperature flame must necessarily counteract the effects that were produced by the heat treatment, consequently to make the part 100 per cent. efficient it is essential that after welding the piece be properly heat treated by an operator skilled in such work. The services of such a man are rarely available, therefore the results obtained when welding high carbon alloy steels will be uncertain. Fortunately, however, many of the alloy steels used in practice are not high carbon and can be welded satisfactorily. Manganese steel (low carbon) is welded quite readily. The manganese acts as a deoxidizing agent, that is, it counteracts the effect of burning the metal. If possible, use a filling material of the same composition as the part welded. If this cannot be obtained use pure iron.

Nickel steel (low carbon) can be welded without difficulty in exactly the same way as mild steel, but nickel steel welding rods must be used. Vanadium steel (low carbon) is probably the most commonly used steel alloy. Very fortunately it is extremely easy to weld, and flows much more readily than ordinary mild steel. Weld as mild steel, but use vanadium steel welding rods.

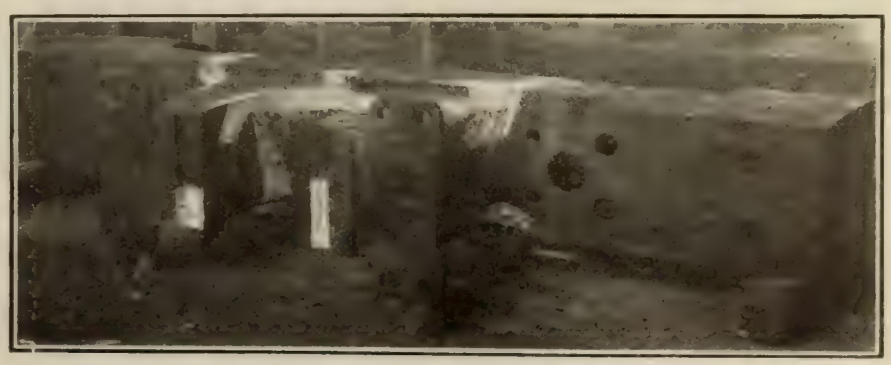
Chrome steel, if in the class of mild or low carbon steel, can be welded readily. Weld as mild steel. Use a nickel or vanadium steel welding rod. Many chrome steels, however, are in the high carbon or hard steel class and the general remarks on "special steels" apply.

*This information will be continued in later issues, and we will take up the subjects of irons and steels, pipe welding, cast iron, etc. We are indebted to the Oxweld Acetylene Co. for the use of this material.*—EDITOR.

## STEAM SHOVEL REPAIR

It is a well-known fact that a steam shovel is subjected to severe working stresses. For this reason, if for no other, the illustration and description should be of interest.

The end sill casting of one of these shovels gave way. It cracked in a dozen or more places and some of the pieces were small fragments that broke out and were lost. To replace the broken casting with a new one would have kept the equipment idle for several weeks. However, a new casting was out of the question, as the work had to proceed, so the cracked and broken casting was shipped to the Oxweld Setelyene Co., Newark, N.J., and was repaired, as shown, in short order. The saving in time alone is said to have replaced the repair expense.



VIEW SHOWING THE WORK COMPLETED.

# Have You Tried This Contest Yet? If not--- Do so Now

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.




The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

## What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

George Land, 567 Patterson St., Peterborough, Ont., is the prize-winner for March 3rd issue. All his answers were correct. Other readers came mighty close to a correct list—but—there was only one perfect list. This is the second scale George has landed, so it's up to the other contestants to dig in and show him he can't get them all.

**CONTEST FOR MARCH 24TH ISSUE**

**Contestants are required to write us, stating to which advertisements we refer in this number.**

1—Something which uses up double energy and which you are advised not to use.

2—Something of interest to gear users, that can be obtained free.

3—How to secure increased production, and minimum depreciation.

4—Something said to have exceptional fitness.

5—That it is possible to do two things at the same time.

6—Something you can procure without obligation.

7—How to make sure you are getting full value for every cent you spend.

8—Something that is always under air pressure.

9—Certain points in construction that are embodied as characteristics to a particular line of machine.

10—A product designed to give rapid accurate production.

11—Something that uses no electricity, and has perfect constancy.

12—A product that will operate against 100-lb. pressure.

**These are Correct Answers for List from March 3rd Issue:**

1—Northern Electric Co.

2—Hans Renold of Canada Ltd.

3—American Lead Pencil Co.

4—Nicholson File Co.

5—W. S. Rockwell Co.

6—Wisconsin Electric Co.

7—The Bristol Co.

8—S. F. Bowser Co., Ltd.

9—The Acme Machine Tool Co.

10—The Royal Bank of Canada.

11—Landis Machine Co.

12—The Burke Machine Tool Co.

## Closing Date for This Contest is April 14th.

# Proper Heat Treatment Means Quality Work

STEEL TREATERS and mechanical engineers of the Toronto district were given a distinct treat on the evening of March 18th, when G. W. Tall, Jr., of the Leeds & Northrup Co., Philadelphia, spoke on the Hump method of heat treatment. Mr. Tall proved a very very capable speaker, and brought out some valuable points to all interested in heat treatment of steels. His lecture was well illustrated, some 60 slides being shown, many of these covering intricate forms of dies that were treated by the Hump process.

As he so aptly put it, "Steel treatment is demanding and receiving more attention lately than at any time in our industrial life—and yet there is a great chance for improvement. The larger shops realize the advantage of using some proven method of heat treatment, but unfortunately many small shops have yet to be convinced. The initial cost is sometimes the stumbling-block, then again the excuse may be that the hardener is getting along well enough with his present system, which unfortunately is usually the guess and guess again method."

He blamed steel treaters themselves for a lot of their trouble. "Can you imagine a good toolmaker using some old broken-down lathe to produce first class work?" asked Mr. Tall. "Of course not, for he would tell his foreman it couldn't be done. Then again, give a toolmaker a pair of calipers and a micrometer, and a number of similar pieces to make. Will he get them as accurate with the calipers as he could by using the micrometer? Again the answer is no. Well then, how can a steel treater expect to get the best and most accurate results if he does not use proper equipment. The trouble lies chiefly in the fact that the steel treater in general belittles his calling by trying to use some makeshift apparatus, the result being that he has showers of abuse poured upon him on occasions when he is not at fault. Of course he has no excuse for he has no record to prove what he has been doing. Thus, he is continually in trouble, although indirectly he himself is responsible for that trouble."

To those readers who are not familiar with the Hump method of heat treating we append the following:—Briefly, this system gives unmistakable indications when the work has reached the critical or transformation point, this being used as a reference point for quenching. The system also insures uniform temperature at all points of the work. Distortion due to unequal expansion is practically eliminated, and spoiled work is almost unknown. It also gives accurate control of, and information regarding the rate of heating, and permits of a maximum rate of heating without injury to the work. A record of each work charge is made and preserved for future reference. In other words, guess work is eliminated, and scientific control substituted.

Heating is done by electric furnaces, and one advantage, as pointed out by Mr. Tall, is the fact that owing to low radiation externally, the heat treating equipment can be installed right in the manufacturing plant without discomfort to surrounding workers. This feature also eliminates extra trucking, and allows a better system of routing. The space occupied is comparatively small, this also being of considerable importance. Of course, there is no smoke or noise, as the electric system is both clean and noiseless.

The number of furnaces that can be handled by one man, varies according to the system installed. Usually one attendant can handle three furnaces, but if the volume of the work warrants it, a central station is aranged, and all furnaces, no mater what the quantity, are brought under the control of one man. He cannot make a mistake if he is a capable workman, for his charts tell him all he needs to know. The advantages of scientific control were, as the speaker pointed out, "High Quality, uniform and accurate results. Not only that, but the same results were duplicated every day for the preceding records were a guide, while on the other hand, the recording chart in connecting with each furnace guaranteed results."

**THINGS TO REMEMBER**

*Steel treaters are often responsible for their own trouble. The best of work cannot be secured with poor equipment.*

*Scientific control of the heat means high quality, uniformity, and accurate results.*

*That a good method to harden taps is by means of a special circular holder.*

*That the rate of expansion and contraction is very important.*

Some interesting examples of installations were shown on the screen, some of these being large automotive plants who used both the hardening and drawing furnaces, for gears, shafts, etc. To explain the system in its entirely would take considerable space, but we have arranged at a later date to present in full this method of heat treatment. The story which will be presented will be well illustrated with examples of work performed, and we shall show a sectional view of the furnace explaining the principal features of design.

After the lecture, the speaker was the target of a bombardment of questions. He was able to answer satisfactorily all queries however, and here are a few which are worth repeating.

In hardening files, a good method is to make special holders to accommodate a number of files at one time, quenching these in a vertical position.

In hardening taps and reamers, a good plan has been adopted. A circular form of pipe is arranged with a series of holes on the top, into which are placed the taps or reamers. In this position they are lowered into the furnace, also quenched.

A small outfit, that is for a small average shop would cost approximately $600, and larger equipment would run proportionately. This figure includes everything, even to service.

Large die blocks, up to the capacity of the furnace are handled with equal ease and with the same uniform results as pieces of light section. This statement was proved by a slide which showed the rate of expansion of the thick and thin sections of a piece being heated, and these rates were practically similar. In other words, there were no stresses conflicting in the piece, owing to one part expanding, while another was trying to contract.

In summing up his talk, Mr. Tall emphasized the need of education of employers as well as employees as to the value of proper heat treatment. Let steel treaters get together for the sake of the art and show the trade generally the benefits of scientific control of heating. Prove that uniform heating means better dies, which in turn means added production, and you've started the ball rolling in the right direction. Do not let the matter rest because the results you are obtaining seem splendid. Make sure they are the best you can secure. To prove the latter mentioned point, he quoted the story of one firm who were well satisfied with results obtained by ordinary methods, but since adopting the Hump method had increased the efficiency of their dies, not 100 per cent.—but 1,000 per cent. Naturally figures like these give us cause for thought, for after all we are all willing to invest our money if it is returned in such proportions as the above case.

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Fitzgerald & Kent, 232 King Street East, Hamilton, Ont., are contemplating the erection of a storehouse on Young Street.



# DEVELOPMENTS IN SHOP EQUIPMENT



## NINE-INCH SHAPER

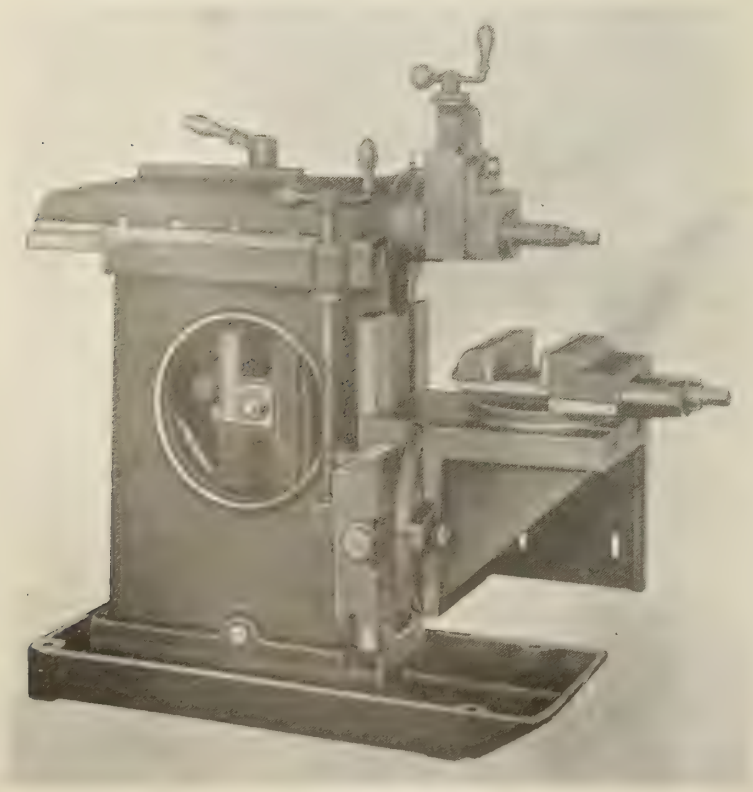
Carl Pletz & Sons, Cincinnati, Ohio, have placed on the market a 9-inch shaper as illustrated.

This machine has been designed to meet the demand for a sturdy and accurate tool with the necessary range and extra features to handle the general run of shaper work in the tool room, die shop and experimental shop. Due to its sturdy construction, it also has its field as a manufacturing tool on small work and is said to be able to handle most of the work now being done on larger shapers with more speed and less power consumption.

The ram is heavily constructed with extra wide and long bearing surface. It can be set to any length stroke within its range. The graduated scale on the rocker arm shows the stroke at a glance. Bearings are fitted with felt oilers, insuring constant lubrication. The column is rigid, with an extra heavy wall of metal all around and is flanged out at the bottom where it bolts on the base. The ram-way is fitted with taper gib, adjustable for wear. The cross rail slides on a wide bearing on the column, is gibbed securely, with provisions made to take up the wear.

The swivel table is of the box section, bolted to the saddle with four bolts and swivels at any angle. It is graduated in degrees, the graduations being large enough to set at fraction of a degree. A dowel pin locates the table at zero. The automatic feed is in either direction and can be varied to suit.

The drive is by cone pulley, which runs on a sleeve taking the belt pull off the pinion shaft. Gears are accurately cut and the main bearing is bronze bushed with oil reservoir, insuring constant lubrication. The vise is heavily constructed with hardened steel jaws. The base is graduated and can be swiveled at any angle. Standard equipment includes universal table, two wrenches and countershaft. Pedestal can be furnished if desired.



GENERAL VIEW OF THE SHAPER.

## HEAVY DUTY LATHE

The Oliver Machinery Co., Grand Rapids, Mich., have placed on the market a 16-inch heavy duty lathe that is simplified to the greatest possible extent so that it can be used as a production lathe. A three-step cone is provided in the headstock, this being of large diameter, with each step wide in face. A large lever in front of headstock operates both starting and stopping of clutch.

The headstock can be supplied with single or double back gears, and four feeds to the lathe are obtained through a quick change gear box. The tool post on the carriage is also of very rugged design. Provision is made for a continuous flow of cutting compound, and the machine throughout is said to be of massive proportions.

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## COLLAPSIBLE TAP

The Rickert-Shafer Co., 612 W. 12th St., Erie, Pa., has added to its line of threading machines and tools a new collapsible tap. The original and outstanding feature of this tool is the method of withdrawing the chasers when the work is tapped to the required depth. The manufacturers claim that the tap is "positive acting" and cannot stick. This is a decided advantage in all cases of tapping, but will be found especially useful where the work has to be tapped close to the bottom of the hole, as the chasers will be released at exactly the right point.

At the point of release the force of the cut pulls the head from the locking pins and revolves it. This action causes the cams on the core to act and pull the core back, drawing the chasers into the head and clearing them from the work. No dependence is placed upon springs for the purpose of collapsing. The method of making adjustments allows adjustments to be made to thousandths of an inch.

The company guarantees that these taps will hold to size within the most exacting limits, and that sizing hand taps can absolutely be dispensed with when this collapsing tap is used. These taps have hardened and ground wearing parts, accurate chasers, and are chip-proof. They are manufactured in sizes from 1 to 10 inches, or larger, and can also be specially combined with boring, reaming, or chamfering tools, thus greatly increasing production by eliminating additional operations and set-ups.

# NEW THINGS IN MACHINE TOOLS

### STRAIGHT-SIDE TRIMMING PRESS

The redesigned straight-side trimming press of the Williams, White & Company, of Moline, Ill., adds considerably to the efficiency of the machine. While primarily intended for the trimming operations on drop forgings, the large area of the table and ram face makes it particularly suitable for a large variety of stamping, drawing and other work. The gears are exceptionally large, made of steel and having cut teeth. The automatic-stop jaw clutch has six jaws and is 21 inches in diameter. The thrust end of the pitman operates in a bronze-lined steel thrust block. The press can be furnished either with a belt or motor drive. For the latter the motor is located on a special stand at the left of the machine. Variations from standard dimensions may be made when required.

### SPECIAL FURNACE WITH MOVING FLOOR

An automatic feed furnace, specially designed for heat treating purposes, has been constructed by the Advance Furnace and Engineering Company, of Springfield, Mass. The feeding device is operated intermittently, power being supplied at stated intervals either by hydraulic or pneumatic pressure. The movement of the floor is obtained through an electric timing device, and power is required only at the moment the movement is taking place. Furnaces may be made any desired length and the movement of the floor may be long or short as desired. The movement of the work is obtained by means of a horizontal and a vertical cylinder in conjunction with levers and other mechanism. The long rails that carry the work forward are below the level of the floor when in a neutral position. When movement takes place the rails are first elevated by means of a vertical cylinder, this raising the work from the floor of the furnace. When this is accomplished the horizontal cylinder comes into action and the work is moved forward a certain distance, and then lowered again, after which the rails are returned to their former position, until the time for the next movement. The timing device is operated by a small electric motor not more than ⅛ horsepower. The furnace may be adapted to the use of either gas or fuel oil.

### SHAFTING CLEANER

A specially designed ring for the cleaning of shafting has been placed on the market by the American Metal Products Company, of Chicago, Ill. The device consists of a number of duplicate pieces of heavy grade nickel-plated sheet zinc, in the form of quarter-circles, four duplicate pieces being used in the construction of each ring, the joints being placed 90 degrees apart, the sections being joined together by means of special staples made of the same material. The cleaners can be placed on shafting already installed, and may be easily removed. A pocket is provided on the inner circumference that is filled with felt that assists in distributing any oil on the shaft.

### BABBITT-LINING MACHINE

A special machine for the lining of bronze bushings with babbitt has been placed on the market by the Ideal Tool and Manufacturing Company, of Chicago, Ill. The machine is particularly adapted for use on automobile crank cases and electric motor bearings. A feature of the design is the rapid rotation of the bearing while the metal is cooling, the speed of the spindle being about 1,800 r.p.m. The machine has an approximate capacity of 700 bearings per day. The centrifugal action is said to counteract the contracting action of the metal. The machine is of the triplex type, so that ample time is allowed for cooling each bearing while the operator is charging the others. The machine is fitted with S.K.F. ball bearings, and chuck may be provided to suit the bearing being babbitted. Each spindle is independently operated.

### CHAMFERING AND THREADING MACHINES

The Grant Mfg. & Machine Co., of Bridgeport, Conn., have recently added to their line of double spindle automatic chamfering and threading machines, type No. 183, as shown in the following illustrations. The illustration depicts the front of machine, showing the cutter spindles, magazine, work holding and feeding table, etc. The spindle bushings have a lateral adjustment of approximately 2 in., by means of hardened collars shown at A, and are fed to the work by fulcrum levers B, operated by face cams within the body of the machine. The automatic movements are controlled by the lever C.

An oil tank and gear driven pump is provided which feeds suitable cutting lubricant to the tools through pipes shown.

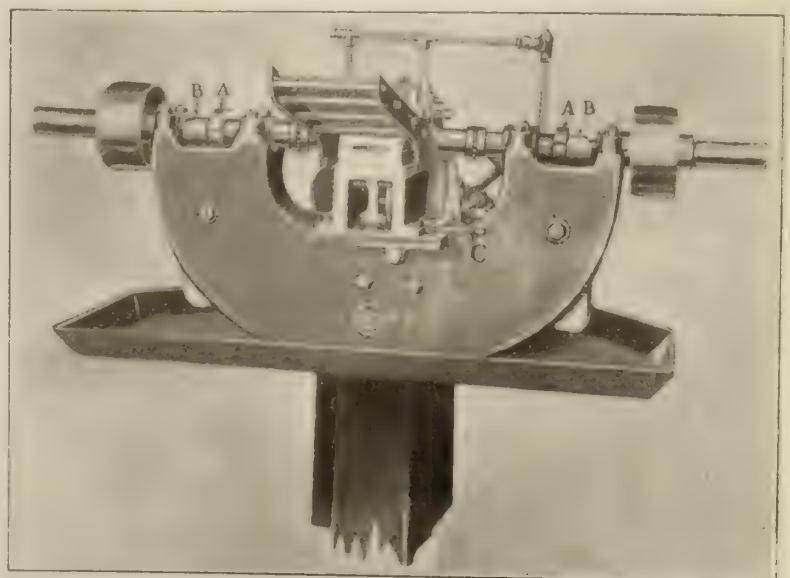
With slight modification the above machine, which is shown equipped for double end chamfering, can be readily adapted for threading both ends of small rods automatically. It can also be equipped with tools to drill and counterbore or countersink both ends at one time.

Ordinarily the work is placed in the inclined hopper or magazine shown, where it is fed by a slide mechanism to the proper machining position. There it is clamped and rigidly held while the work is being done. The finished pieces are then automatically ejected.

The hopper or magazine and feeding mechanism may be modified to suit various kinds of work, such as square, hexagon or other irregular shapes where an operation is to be done on both ends.

### ROTARY EMBOSSING MACHINE

Julius Merey, 2842 N. Maplewood Ave., Chicago, Ill., has placed on the market a special machine for the embossing of sheet metal, either in the flat or when formed into cylindrical shape. The machine consists of two heads mounted upon a horizontal bed, one of the heads carrying the embossing rolls and the other head used for the holding of the articles to be embossed. The rolls or the dies are made interchangeable, and the gearing is so constructed that the dies are automatically separated at the completion of the revolution. Provision is made for chucking different sizes of work; the chuck is rotated by means of power derived from the embossing head




GENERAL VIEW OF CHAMFERING AND THREADING MACHINE.



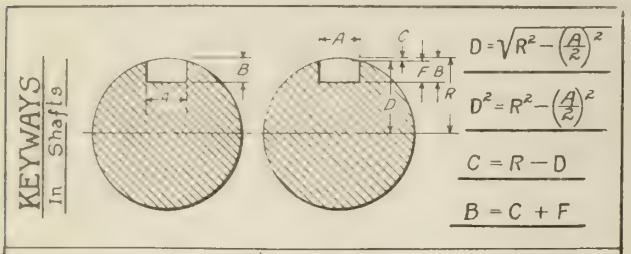
# WHAT OUR READERS THINK AND DO



## HANDY TABLE FOR CUTTING KEYWAYS

By R. MAWSON

The difference of opinion that many mechanics have in regard to the measurements of keyways in shafts and pulleys is the reason for the compilation of the accompanying table. A specific case of inconvenience was brought to our attention just recently. We were called upon to construct a certain machine, but owing to the pressure of business we were forced to have a large part of the machining done in outside shops, the various parts coming back to the factory for final assembly. On the drawing the designers, following the usual practice, had specified the keyways as follows: ⅜ inch by 3-16 inch, for example. The outside shops interpreted

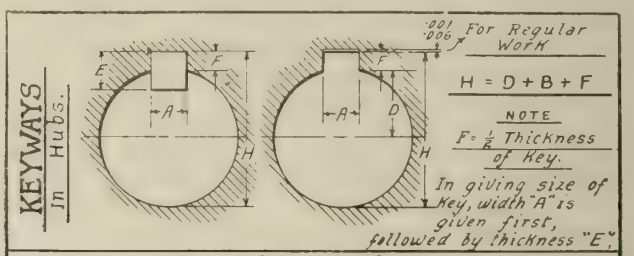



Size of Key.

DEPTH (B)

Size of shaft.

| | 3/32 | 1/8 | 3/16 | 1/4 | 5/16 | 3/8 | 7/16 | 1/2 | 9/16 | 5/8 | 11/16 | 3/4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/8 | .0527 | .073 | | | | | | | | | | |
| 7/16 | .0518 | .071 | .115 | | | | | | | | | |
| 1/2 | .0513 | .070 | .112 | .158 | | | | | | | | |
| 9/16 | .0499 | .068 | .106 | .146 | | | | | | | | |
| 5/8 | .0494 | .0670 | .104 | .143 | .185 | | | | | | | |
| 11/16 | .0491 | .0664 | .103 | .141 | .181 | | | | | | | |
| 3/4 | .0489 | .066 | .102 | .139 | .178 | | | | | | | |
| 13/16 | .0487 | .0656 | .1009 | .138 | .176 | .216 | | | | | | |
| 7/8 | .0485 | .0654 | .1003 | .137 | .174 | .214 | | | | | | |
| 15/16 | .0484 | .0651 | .0997 | .136 | .173 | .211 | | | | | | |
| 1 | .0482 | .0649 | .0992 | .135 | .171 | .209 | .218 | | | | | |
| 1 1/16 | .0482 | .0647 | .0989 | .134 | .170 | .208 | .215 | .255 | | | | |
| 1 1/8 | .0480 | .0646 | .0985 | .1334 | .1694 | .207 | .213 | .253 | | | | |
| 1 3/16 | .0479 | .0645 | .0982 | .1328 | .1686 | .205 | .212 | .251 | .290 | | | |
| 1 1/4 | .0477 | .0643 | .098 | .1323 | .1678 | .204 | .210 | .249 | .288 | | | |
| 1 5/16 | .0479 | .0642 | .0977 | .1320 | .1672 | .203 | .209 | .247 | .286 | .326 | | |
| 1 3/8 | .0478 | .0641 | .0975 | .1316 | .1666 | .2024 | .208 | .245 | .284 | .323 | .363 | |
| 1 7/16 | .0477 | .064 | .0974 | .1313 | .1661 | .2017 | .207 | .244 | .282 | .321 | .361 | |
| 1 1/2 | | .0639 | .0972 | .1310 | .1657 | .2003 | .205 | .242 | .279 | .317 | .356 | |
| 1 9/16 | | .0638 | .0970 | .1307 | .1653 | .1998 | .2042 | .2407 | .278 | .316 | .354 | |
| 1 5/8 | | .0637 | .0968 | .1304 | .1645 | .1992 | .2035 | .2398 | .277 | .314 | .352 | |
| 1 11/16 | | | .0967 | .1301 | .1641 | .1987 | .2028 | .2389 | .276 | .313 | .351 | |
| 1 3/4 | | | .0965 | .1298 | .1637 | .1982 | .2023 | .2382 | .275 | .312 | .350 | |
| 1 13/16 | | | .0965 | .1297 | .16 | .19 | .2018 | .2375 | .274 | .311 | .348 | |
| 1 7/8 | | | .0964 | .1295 | .1634 | .19 | .2012 | .2368 | .273 | .310 | .347 | |
| 1 15/16 | | | | .1293 | .1630 | .1912 | .2007 | .2361 | .272 | .308 | .345 | |
| 2 | | | | .1292 | .1629 | .1910 | .2004 | .2356 | .271 | .308 | .344 | |
| 2 1/16 | | | | .1292 | .1627 | .1908 | .200 | .2351 | .271 | .307 | .343 | |
| 2 1/8 | | | | .1288 | .1623 | .1903 | .19 | .2345 | .270 | .306 | .342 | |




Size of Key.

DEPTH (H)

Size of shaft.

| | 3/32 | 1/8 | 3/16 | 1/4 | 5/16 | 3/8 | 7/16 | 1/2 | 9/16 | 5/8 | 11/16 | 3/4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/8 | .416 | .427 | | | | | | | | | | |
| 7/16 | .479 | .491 | .510 | | | | | | | | | |
| 1/2 | .543 | .555 | .576 | .592 | | | | | | | | |
| 3/4 | .794 | .807 | .832 | .854 | | | | | | | | |
| 7/8 | .919 | .933 | .959 | 1.003 | | | | | | | | |
| 1 | 1.045 | 1.059 | 1.085 | 1.109 | 1.131 | | | | | | | |
| 1 1/8 | 1.170 | 1.184 | 1.211 | 1.236 | 1.259 | | | | | | | |
| 1 1/4 | 1.295 | 1.309 | 1.337 | 1.362 | 1.386 | 1.409 | | | | | | |
| 1 3/8 | 1.420 | 1.435 | 1.462 | 1.489 | 1.513 | 1.536 | | | | | | |
| 1 1/2 | 1.545 | 1.560 | 1.588 | 1.615 | 1.640 | 1.664 | | | | | | |
| 1 5/8 | 1.671 | 1.685 | 1.713 | 1.740 | 1.766 | 1.791 | 1.783 | | | | | |
| 1 3/4 | 1.796 | 1.810 | 1.839 | 1.866 | 1.892 | 1.917 | 1.910 | 1.932 | | | | |
| 1 7/8 | 1.921 | 1.935 | 1.964 | 1.992 | 2.018 | 2.044 | 2.037 | 2.060 | | | | |
| 2 | 2.046 | 2.061 | 2.089 | 2.117 | 2.144 | 2.170 | 2.163 | 2.187 | 2.210 | | | |
| 2 1/8 | 2.171 | 2.186 | 2.215 | 2.243 | 2.270 | 2.296 | 2.290 | 2.314 | 2.337 | | | |
| 2 1/4 | 2.296 | 2.311 | 2.340 | 2.368 | 2.395 | 2.422 | 2.416 | 2.441 | 2.464 | 2.487 | | |
| 2 3/8 | 2.421 | 2.436 | 2.465 | 2.493 | 2.521 | 2.548 | 2.542 | 2.567 | 2.591 | 2.614 | 2.637 | |
| 2 1/2 | 2.546 | 2.561 | 2.590 | 2.619 | 2.647 | 2.673 | 2.668 | 2.694 | 2.718 | 2.742 | 2.764 | |
| 2 3/4 | | 2.811 | 2.841 | 2.869 | 2.898 | 2.925 | 2.920 | 2.946 | 2.971 | 2.995 | 3.019 | |
| 2 7/8 | | 2.936 | 2.966 | 2.995 | 3.023 | 3.050 | 3.046 | 3.072 | 3.097 | 3.122 | 3.146 | |
| 3 | | 3.061 | 3.091 | 3.120 | 3.148 | 3.176 | 3.171 | 3.198 | 3.223 | 3.248 | 3.273 | |
| 3 1/8 | | | 3.216 | 3.245 | 3.274 | 3.301 | 3.297 | 3.324 | 3.350 | 3.375 | 3.399 | |
| 3 1/4 | | | 3.341 | 3.370 | 3.398 | 3.427 | 3.423 | 3.449 | 3.476 | 3.501 | 3.525 | |
| 3 3/8 | | | 3.466 | 3.495 | 3.524 | 3.552 | 3.548 | 3.575 | 3.601 | 3.627 | 3.652 | |
| 3 1/2 | | | 3.591 | 3.621 | 3.649 | 3.677 | 3.674 | 3.701 | 3.727 | 3.753 | 3.778 | |
| 3 5/8 | | | | 3.746 | 3.775 | 3.803 | 3.799 | 3.827 | 3.853 | 3.879 | 3.905 | |
| 3 3/4 | | | | 3.871 | 3.900 | 3.928 | 3.925 | 3.952 | 3.979 | 4.005 | 4.031 | |
| 3 7/8 | | | | 3.996 | 4.025 | 4.053 | 4.050 | 4.078 | 4.104 | 4.131 | 4.157 | |
| 4 | | | | 4.121 | 4.150 | 4.179 | 4.176 | 4.203 | 4.230 | 4.257 | 4.283 | |

PRESERVE THESE TABLES, AS THEY WILL PROVE A READY REFERENCE WELL WORTH WHILE.

this in various ways, some measuring the depth from the corner of the keyway, others from the center of the shaft, and still others taking a mean dimension between these two points.

The correct way is to machine the keyway slightly deeper than the section projecting above the shaft. The key will then fit on the sides and thus drive more efficiently. If the key fits tightly on the top there is the danger of straining, or even breaking, the hub of the wheel or pulley. The type of key referred to here is the square or rectangular one. One of the tables gives the dimensions for shaft keyways, and the other for hubs of gears, pulleys, etc. The table for shafts gives the sizes of shafts from ⅜ inch to 4 inches, varying by eighths of an inch. If it is desired to find the dimension for a shaft not specified the formulae given at the top will be found very convenient. The radial clearance to insure side fitting is given as .001 to .006 of an inch; this relief we have found to be very satisfactory.

# Lathe Work—John Receives Some Pointers

*By J. Davies*

"WELL, John, are you having any interesting experiences in your lathe work at the shop?"

"Yes, father, I certainly am. The other day I had a gear to bore out a driving fit for a shaft on the foundry crane. I couldn't try it on without taking the gear out of the chuck, and we didn't have any plug and ring to fit the gear and the shaft, so I was left to my own resources. I remembered you had told me 'that a plug and ring gauge would have to fit each other loose to make a tight fit between a shaft and a wheel,' and I knew that all our plug and ring gauges would not pass over each other, so they would have been of no use anyhow. I went after the foreman for a little information on the subject and here is what he told me:

"To be able to correctly turn a shaft the right size for a working or running fit, or bore out a wheel or bush a running fit, or bore out a wheel or bush a running fit with the aid of calipers only, depends entirely upon the skill and judgment of the workman. Generally speaking, the swing of the calipers should be about ¾ in. to the foot.

"The allowance for driving fits depends upon a number of circumstances such as the length of the hole. In a long hole there is more bearing surface than in a short one, consequently the outside diameter of the driven piece can be made a little less. The diameter of the work, the smoothness of the surface, the nature of the metal, and the thickness to resist bursting must all be taken into consideration, so that it is impossible to lay down a definite rule. It is in this class of work that experience counts. Generally speaking, if the hole and the shaft are made exactly the same size up to about six inches you will have a pretty snug driving fit. Always oil the surfaces, as it may happen that the fit is a little too tight and if you want to take it out to ease it a little after you have been driving two dry surfaces together it may give you a lot of trouble.

### Allowance For Fits

"The allowance for forced fits is a little more than for driving fits, the main points to take into consideration being the same as those mentioned for driving fits. One firm of engine builders allow for forcing on crank pins one-quarter of a thousandth for every inch in diameter up to eight inches.

"In fitting car wheels and axles it is generally specified that they shall go together with a certain pressure from twenty to thirty tons. Most firms specify exactly the amount to be allowed on their particular class of work. A twenty to thirty ton fit on a wheel and axle requires an allowance of about .008 in.

"In calipering shafts or axles the amount of difference is not always measured, a snap or limit gauge being sometimes used, or the calipers may be set; the insides to the exact size of the hole, and the outsides to the exact size of the insides. Then, by letting the outside drag over the work a fairly accurate estimate can be made of the force required to make the fit according to the length of the drag on the outsides. To find the amount in thousandths of the swing, or drag of a pair of calipers the following rule is often used:

"Let A in Fig. 1 equal side play of calipers or end measuring rod in sixteenths of an inch. B equal dimensions to which calipers are set, or length of measuring rod in inches. C equals difference between diameter of hole and length of B in thousandths of an inch.

Then C equals $\frac{A^2}{2B}$ within a very small limit.

For example, a standard rod 5½ in. long has ⅜ in. side play, what is the size of the hole?

$$C = \frac{6 \times 6}{11} = 3.27 \text{ thousandths or } .00327 \text{ in.}$$

"This method will be found to be correct within a limit of about .002 inch if the amount of side play is not more than one-eighth of the diameter of the hole. For holes up to six inches in diameter: with 0.0005 in. for holes from six inches up to twelve inches; and within 0.001 in. for holes from 12 inches to 24 inches.

"A shrink fit refers to the method of putting two pieces together, usually by heating the metal around the hole, thereby causing it to expand; then putting the piece that has to be shrunk on to it through the hole, allowing it to cool and contract on the axle, or shaft, or what-

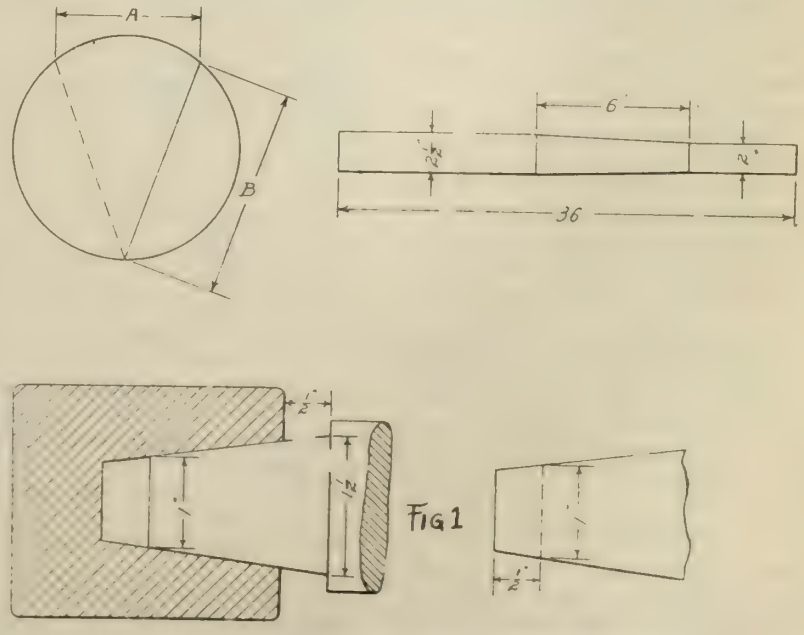



FIG 1

REFER TO TEXT FOR DESCRIPTION OF VIEWS SHOWN.

ever it may be. A good rule is to allow .003 inch for the first inch and 1½ in. thousandths more for every inch up to 20 in. diameter.

"The amount of shrinkage for locomotive tires adopted by the American Railroad Master Mechanics' Association is as follows: 38 hole amount of allowance, .040 in.; 50 hole, .053 in.; 56 hole, .060 in.; 62 hole, .066 in.; 66 hole, .070 in.

"Speaking of good fits reminds me of a story I heard the other day of a machinist who was sent to an outside repair job. The job was turning a new piston for an engine in a small factory. He was sent to the factory to measure up the cylinder, then it was his duty to turn up the piston to fit.

"The piston was duly finished and delivered, but it was found to be impossible to get it into the cylinder. Complaint was made to the shop and the machinist in question was asked to give an account of his workmanship. He asked the engineer who had charge of putting the engine together if he had oiled the cylinder. The engineer replied, 'Yes, I thoroughly cleaned and oiled the cylinder.'

"'Oh,' replied the machinist, 'that accounts for it. That's why the piston wouldn't go into the cylinder. I didn't allow for oil.'

"Of course, that is only a joke, but this actually happened. In a machine shop near Toronto during the war they were making 18 pound shrapnel shells, and when they first started out they used aluminum gauges, that is, aluminum bodies with hardened steel tips. Later on the aluminum bodies were discarded and cast iron used instead. It was found that the cast iron did not spring as much as the aluminum, and one day a shell operator, engaged in turning bodies, came into the tool room with a cast iron gauge in his hand. He threw it on the bench and said he wasn't going to use that thing, as it was no good. The tool maker asked, 'What's the matter with it?'

"'Matter with it,' replied the workman, 'why there is no spring to it; I can't shove it over the job.'

"You see, his trouble was that he had no idea of the sense of touch. If you get the inside and outside micrometers and leave the hole about .002 smaller than the shaft it will be a pretty tight fit."

The next job John had was to turn a shaft partly parallel, and partly taper, and as he had no experience in taper turning he promptly consulted the lathe hand next to him, who happened to be an experienced old veteran. This is what John was told:

### Turning Tapers

"There are at least three different ways of turning taper work between the centres of a lathe. Each method has its advantages and disadvantages, while to a great extent the choice of one or the other of the methods depends upon the work in hand. The first method is by setting the tail stock spindle or dead centre out of line with the live centre. There are usually graduations on the back of the tailstock with a zero mark indicating when the lathe is cutting parallel. If there are no graduations, make one with a fine chisel, then the amount that the tailstock is set over can be measured with a scale.

"In order to use this method it is necessary to figure out the amount of taper per ft., or per inch, whichever is the most convenient. Compare this with the length of the job, or else assume that the work is one continuous taper from end to end. Suppose, for example, we had to turn a taper according to sketch shown.

"In this case the taper is ½ in. in six inches, or 1 inch per ft., but the total length of the job is three feet. This means that there would be three inches of taper in the complete piece. In other words we would have to set the tailstock over 1½ inches, which is half the amount, because, when the tool cuts into the work, say ¼ in., it makes the job ½ in. less in diameter. Setting over the tailstock is most convenient when the job is a long one and the taper is slight.

"The objection to setting over the tailstock, however, is this, that the centres are not in line, therefore they wear unequal and uneven, and the part to be tapered is very apt not to run true with the part that is parallel. If a number of pieces of different lengths were to be turned the same taper the lathe would have to be reset for each piece; and even if they were the same length if the centers were not all drilled to the same depth it would make an appreciable difference. Another way in which the lathe may be set for turning tapers is to turn a small portion at one end of the taper to the small size, and another portion at the other end of the taper to the large size. Then run the tool backward and forward between the narrow strips that are turned and adjust the center until the tool exactly touches both ends.

"This method is equally adaptable for setting over the tailstock or the compound rest. Tapers can be turned by hand by swinging round the top slide of the compound rest. This is the best method for short, abrupt tapers, and it would greatly facilitate matters for the lathe hand if draughtsmen would give tapers in degrees and state amount per ft. in addition to giving the dimensions, as the lathe hand could then put his rest round to the degrees indicated on the drawing. A table of tapers and angles will be found useful in connection with lathe work, and these can be found in almost every machinist text book.

"No matter what method is used it is important to set the tool exactly level with the centre, and this can be done quite readily by using the mark on the tailstock. If the tool is set on the centre of the work and a cut taken, then the tool removed and not put back at the same height, the taper of the work will be altered. Should we put the tool either too high or too low it will take too much off the large end.

"This fact can sometimes be used to advantage. The work in hand might be slightly big at the large end, so, instead of moving the taper attachment, merely raise the tool a little.

"After roughing a tapered piece it should be tried in the place it is intended to fix, taking care to leave it sufficiently above the size to allow for fitting. If one end is much too small it can be detected by rocking the work in the hole. After fitting till there is no perceptible play in the hole, give it a turn round by hand. The marks will be rubbed off the high spots and the taper should be adjusted until these marks show a full bearing along the surface of the taper. After fitting satisfactorily, measure how much further the taper needs to go into the hole to be in its correct place. Suppose Fig. 1 is fitted correctly, but requires to go in ½ in. further to be in its correct place. Measure with calipers very carefully the diameter of the taper at the small end of the shaft, then take a fine cut and test with the calipers until the work is the same size as the calipers ½ in. from the end. By this means, after getting the taper a good fit, you can make it the correct size at the next trial. It is better to err a little on the full size, as you can then give it a rub or two with a file, but if too small there is no remedy."

## PALM OIL AS A FUEL

The world's supply of mineral oil is limited. At least, so say geologists, so that the experiments with vegetable oil as a motor fuel should be of decided interest. The oil used in these experiments has been palm oil, well known in the commercial markets as one of the most desirable ingredients of the nut-margarines. The tests have been carried on in Brussels, with a view of making use of palm oil, if practicable, as a motor fuel in the Kongo. The difficulty of transporting mineral oil to the Kongo, and its high cost when delivered —about $1.40 per gallon—made the finding of a substitute a great desideratum. And, as palm oil was one of the products of the Kongo, and could be had there for about 20 cents a gallon, the reward for its successful adaptation was alluring.

The calorific value of palm oil varies from 75 to 80 per cent. of that of mineral oil; therefore, from one-fourth to one-third more must be burned to get the same power.

The experiments have proved that palm oil will work perfectly in a certain form of motor of a semi-Diesel type without any change, in the ordinary Kongo temperatures. In Belgium, how-

ever, where the winter temperatures are below the solidifying point of palm oil, an accessory is necessary to liquefy the oil. Further, in Belgian winter temperatures it has been advisable to start the motor with petroleum, and when it is well warmed up to substitute the palm oil.

The experiments have shown that palm oil burns completely, leaving no residue. So far the trials have been made chiefly on motor boats, but they are being extended to tractors and industrial motors. In July, 1920, the Belgian Ministry of Colonies initiated a prize contest for tractors operated on any of the vegetable oils produced in the Kongo. Only one contestant appeared—an evidence of the lack of research along this line.

With the passing of petroleum, an eventuality already being discounted by the geologists, the practically unlimited production of vegetable motor oils may easily become one of the important industries of the near future.

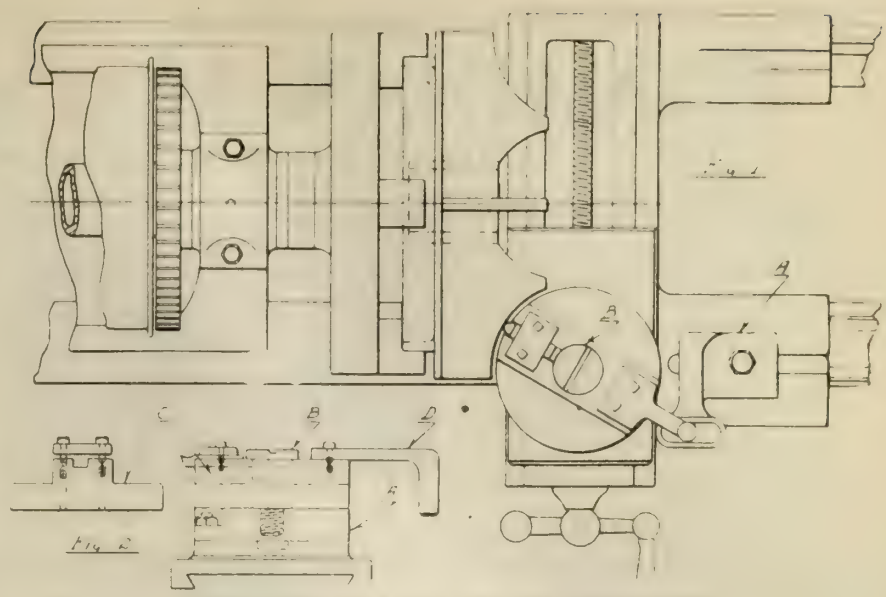
## RADIUS TURNING ATTACHMENT

By G. Barrett

The accompanying sketch illustrates a radius turning attachment for use on a lathe, and may be adapted for a wide range of work. Fig. 1 shows a plain view of the device, set up to turn the radius on an impeller, this operation requiring considerable accuracy to provide the suction required. The attachment consists of a swivel casting A, Fig. 2, turned to fit the lower portion of the cross slide of the lathe. This casting is secured by bolts in the usual manner, and the top surface carries a revolving tool block C, held in position by the central bolt B. The link D is securely fastened to the upper face of the tool block, a tongue being provided to prevent shifting. The pin portion of the link D fits into the elongated slot in the bracket A, which is bolted to the carriage of the lathe.

When the cutting tool is set, and the link and bracket in position, the movement of the cross slide will cause the tool block to revolve and the tool point will cut the desired radius on the work. It should be mentioned that the tool point should be set at the horizontal lathe centre, otherwise the result will not be a true radius. This attachment has the advantage of being self-contained, and once set will produce uniform work without the use of a cam, weight or springs, and is very simple to operate.

More than 5,000 men employed by the Canadian Pacific Railway will be taking a compulsory holiday from March 23 to April 4, owing to the closing down of the Angus shops in Montreal. This is being done because the work has been caught up, thus affording a method of reducing expenses.



DETAILS OF THE RADIUS TURNING ATTACHMENT.

## LEAD AND SHEET IRON

A reinforcement of lead with perforated iron sheet has been found to increase the elastic limit four to five-fold, and the tensile strength from two to three-fold, the variations being due to differences in gauge of wire and mesh used. Lateral extensions of 20 per cent. and elongation of 20 per cent. have been obtained. Sheets 4 ft. 6 in. by 5 ft. 6in. have been made. These reinforced sheets may be bent or shaped almost at will, as the lead does not fracture when bent. The sheets may be cut and joints burned together as in ordinary sheet lead. A pipe, 8 inches in diameter, made up of reinforced lead 0.2 inches thick, when tested for strength, collapsed under a pressure of 85 lbs. per square inch.

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# CANADIAN MACHINERY
## AND MANUFACTURING NEWS

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## Stocks Are Running Low

BUYERS may wake up some day to find out they have stayed out of the market too long.

When people cease to buy, or when they cut their purchases to the bone, and then trim the bones down, they must know that manufacturers are going to ease off in their schedule of production. It is poor business to stack up great heaps of material against the day when the buyers may flock back again to the markets.

The buyers of steel and iron have been taking on just as little as they could stand. For some time this has been true all through, including warehouses and manufacturing interests. They have thought of hardly any other thing except liquidation of stock.

The result is that stocks are getting low, in some lines so low that certain yards are out and have to send their orders direct to the mills.

There is every prospect of a railway strike in the United States. The one last year is still fresh in the minds of the people. There were Canadian industrial concerns spending thousands of dollars in order to get supplies of raw and semi-finished material through.

Is it not worth considering what will happen if there is another strike, with stocks getting well thinned out in many lines in Canada? How long, under such circumstances, would prices remain at present levels?

## Making Use of The Time

GOING through a period such as the present, it is very easy for a salesman to sit back and wait for things to turn better. He has not closed much business, and perhaps believes that when the corner is turned things are going to come better.

Here is another way—not imaginary, but real. It is the experience of a practical man who knows how to sell machine tools on their merits, and who understands the various operations that his machine tools are put in to perform.

He finds that right now is a splendid time to do effective missionary work for his firm. The superintendent in most cases is not very busy. It is possible also to get to the executives higher up for the same reason. Were things humming around the plant he could not get as much time from the prospects to lay his proposals before them. There are many fine points that would never be brought out, and many prejudices that would be allowed to ride because there had been no opportunity to meet them and correct them.

It works both ways. The average superintendent or purchasing agent is anxious to be well informed. If a salesman goes to him prepared to impart real information on any given subject of interest, he is going to give him a hearing.

The plant executive, if he is a real one, will be open to suggestions concerning the improving of any operation carried on in his plant. He should count it a good day's work in this rather dull season if he can bring out one good idea that will make for better and more efficient production methods when operations start at full blast again.

## Standardization Up Again

STANDARDIZING farm implements was brought up in the Dominion House a few days ago. Those who urge this might be well advised to go to some good shop superintendent, or designer, and talk the whole thing over. Once they were possessed of all the facts they would see where their very good intentions were quite impracticable and equally undesirable.

Speaking of this move, George Wedlake, manager of the Cockshutt Plow Co., states that "nothing could be gained by it, as it is not practical. It has been brought before implement manufacturers at other times, and it has been decided that there was nothing for the customer to gain by it." Mr. Wedlake also believes that beyond the standardizing of nuts and bolts and the use of standard plows, no more progress can be made.

Implement makers do not change designs simply for the sake of piling up various designs. They do not change patterns unless they see a very decided advantage, for every change in design means added expense, and the only chance to recover is in the selling power coming from the added quality put into the machine.

Standardization is not desirable from another point of view. It smells musty and smacks of smug contentment with present accomplishments.

If implement makers had standardized on the old reaper we would not to-day have the self-binder.

If we had standardized on coal oil lamps we would not be using electricity.

If we had standardized on certain faces of type and a Washington press, we would not have our linotype and rotary presses of to-day.

If the navigators of old had standardized on certain types of sailing vessels, we would not to-day be crossing the Atlantic in a day or so under a week.

Standardization is not going to solve the problem of the use of our own iron ores. It is going to be done by research, by persistent hard work, by reaching out after things we have not yet attained, but never by thinking that what we have is the last word in design and practice and therefore not open to improvement or alteration.

This question apparently has to have its little fling in the Dominion House every year. It is just another case of a member of the House trying to make himself strong with his constituents by talking about matters on which his technical knowledge is limited.

# *Shall Canada Trade With Germany?*

ON WHAT grounds shall Canadian firms go ahead and re-establish trading conditions with Germany?

Canadian Machinery readers are evidently very much interested in this matter, knowing as they do that each week sees more evidence of the coming of the German-made article. Their catalogues also are coming in increasing numbers, and although there may be a disposition at first hand to drop them over into the waste-paper basket, many of them are being read and studied.

**Not After German Business**

P. Ford-Smith, president and general manager of the Ford-Smith Machine Co., Hamilton, cannot bring himself to welcome German trade with open arms. The war days and the memories of German war methods have not been blotted out as far as he is concerned. Mr. Ford-Smith says:

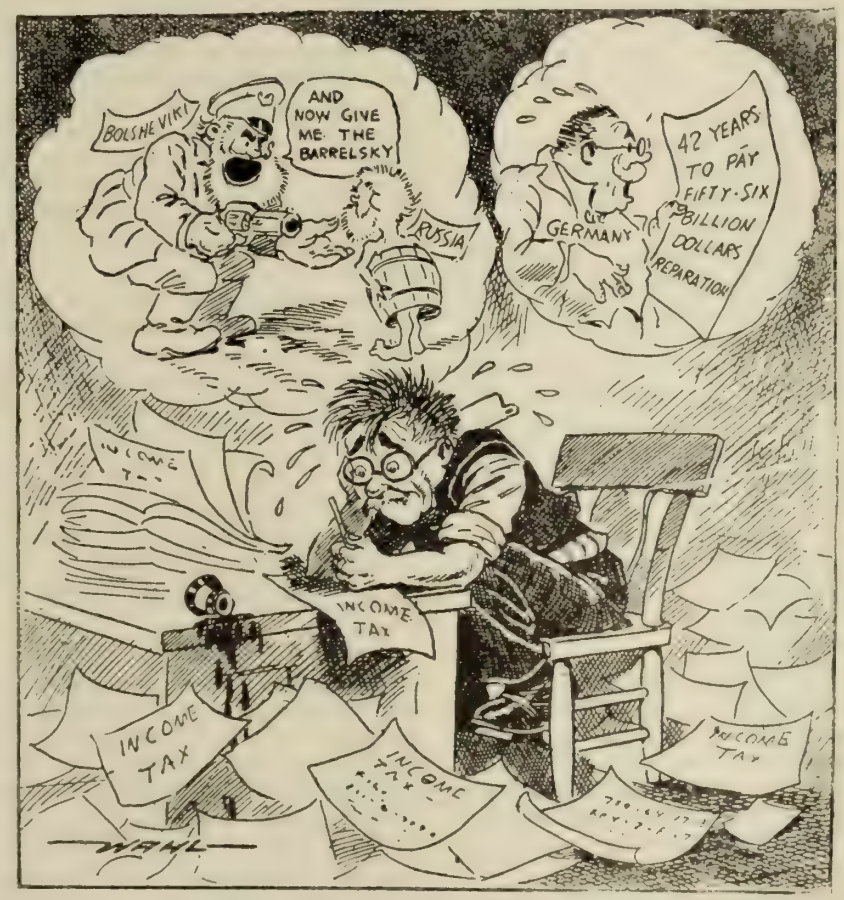
"We appreciate that if the Allies are to collect a huge war indemnity from Germany they will have to be allowed to do business. However, as far as this firm is concerned we will not trade with Germany, either by buying or selling to that country. It is probably nearly a year ago now that we were offered German small tools and machine tools, and we wrote to the firm, replying to their letter, and told them that we would not consider any business relations whatever with them, that we had no desire to meet or to deal with any German people. As a matter of fact, we told them to go to h—.

"I do not say that this should be the attitude for everybody to adopt, because no doubt there are certain things that Germany can make that we cannot make, and that she may have a genius for, and it would be ridiculous not to take advantage of this. But in the main, where goods can be purchased either in Canada first, or afterwards in any of the Allied countries, that is where the business ought to go.

"There is a great tendency to forget nowadays German atrocities in the war, and there is also a tendency to forget how Germany would have treated us, if we had lost the war. True to form, she is now whining like the cowardly bully she has proved herself to be, and we want to take anything that we are told about the desperate condition Germany is in, and how she must have business with the Allies, or go absolutely under, with a grain of salt, in fact, quite a large portion of salt. We also want to remember in regard to this helping her on her feet again, that if she ever gets in a position to turn the tables on France or Great Britain, she will do it, as she has declared.

"If it had been any other country than Germany, we could look at this matter in a different light, and I think that Canadian buyers in all lines should make it a principle not to buy German goods except where they cannot possibly get them from anybody else."

CAN'T GERMANY PAY?




—Wahl in "Sacramento Bee."

**Policy Not Decided on Yet**

Butterfield & Co., of Rock Island, Quebec, have not reopened trading with Germany since the war, the exchange, of course, making it almost impossible to sell anything to that country. F. S. Laythe, assistant treasurer of the company, answering a question from this paper on the point, says:

"We are in receipt of your favor of the 8th, asking us what our position is with reference to trading with Germany. Up to the present time we have given this matter very little conssideration, as we have not been approached by German interests either to buy or sell.

"We never made any purchases in Germany, but for about 15 years previous to the war we had an agency in Germany, and while we never made large shipments, we had a nice little trade and our business connection with our agent were entirely satisfactory. Of course, when the war broke out this connection was broken and, naturally, we have done nothing with them since.

"Under the present conditions of exchange, naturally, we are not in a position to do anything with them now. What the future will bring forth, we do not know, and we are not prepared to say at this time what action we would take in the event that the opportunity of again resuming business relations with them should come up."

**Two Sides to the Question**

There are a good many manufacturers who are caught between sentiment and commercial necessity in this matter. They are not keen to open up accounts with Germany again for sentimental reasons, but over against that they consider the impossibility of trying to isolate Germany from the rest of the world and at the same time collect a large amount of money from her.

G. C. McAvity, of T. McAvity & Sons, Ltd., St. John, N.B., brings this point out in his letter:

"This particular question seems to be very prominent in all parts of the world, and there appear to be a great many different opinions regarding the outcome of same.

"It seems to me that if Germany is to pay its indemnity to the allied nations, that it is going to be necessary to trade with her in order for her to get the necessary money to make this payment. Again, on the other hand, a great many people look at this from a sentimental point of view, while others look at it from the different phase of business only. It is a pretty well recognized fact that Germany, with her low-wage scale, long hours and other manufacturing conditions, is in a position to manufacture much cheaper than we in Canada are able to do, and with the great discount on German money still in their favor, how are the Canadian manufacturers going to live if German goods are to come into this country, and be purchased? Still, if we do not buy their goods, how are they going to pay their indemnity?

"From the sentimental point of view, I, personally, do not wish to see a German article. For the other reasons, as outlined, I feel that we must buy from them. However, I am very interested to learn the different expressions of opinion from other sources."

Here is a manufacturer from Brantford who goes into some pretty sound facts regarding the turning of German goods loose on the markets of Canada. Looking at it in a broad, general way, he says:

"Personally the writer does not for a moment see how it is possible to expect payment of the German debt to the Allies unless trade intercourse is continued. Germany can never pay unless she is traded with, and I believe that all the nations should do all possible so as to enable the Germans to pay to the limit, and then take the money away from them, but Germany should be very carefully watched and her business transactions thoroughly inspected, so that any competition which comes into any line of business is a competition by fair means only.

"This has not been true in the past, and the German Government have subsidized many industries and the industries itself have sold goods at an absolute loss, and have received their profit as a bounty from the German Government. This, of course, is not fair competition.

"Again, there is the question that there are certain commodities which Germany can produce for the benefit of the world cheaper than it is possible for any other country to produce the same commodity, and she should be allowed to produce these goods and sell them, and she should also be allowed to buy from Canada or any other country such goods as these countries can produce and deliver cheaper than she can produce them.

"This letter is not written because the writer has any love for the Germans, and is written largely from the idea of benefit to the opposite side of the question, and in our own interests here in Canada."

### Requires Careful Study

That we should regard Canada first in our dealing with Germany or any other country is the contention of one of the largest firms manufacturing in the iron and steel lines. A scientific study of tariff conditions should be made, and there should be a determination to get away from any hit-and-miss policy in framing our future trading relations with Germany. Protection for the consumer is also urged.

This firm's views follow: "If Germany is to be expected to pay the war indemnity, Canada, along with the other allies, must forget to a certain extent their antipathy to trading with Germany, and must be prepared to do business with them, the same as with any other foreign country. From Canada's point of view, it would seem to me that our general policy should be to invite Germany and other foreign countries to compete in Canada for the sale of goods which we cannot manufacture at all, or cannot manufacture to advantage, and that the imports into Canada, whether from Germany or elsewhere, of goods which we can and do manufacture in Canada should be discouraged. In other words, in order to build up our country we should not buy from Germany or any other country anything that we can manufacture ourselves.

"You will perhaps remember that some time before the war a commission from Canada made a tour of Germany to study manufacturing conditions, and Government policies in Germany in connection with the building up of their export trade. At the present time we cannot recall the names of the gentlemen who composed that commission, but I believe that G. M. Murray, of Toronto, who was with the Canadian Manufacturers' Association at that time, accompanied the commission, and could, we think, give you some very valuable pointers on what the commission saw and heard in Germany.

"At the present time, when our fiscal policy seems to be paramount in everybody's mind, it would be timely to consider what Germany did in building up her industries and export trade, and instead of the haphazard kind of tariff which applies at present, we should have a scientific revision of our tariff by means of a capable tariff board, which would provide the necessary protection for growing industries, as well as protection for the consumers, and make it possible for us to do business in lines in which we ought to do business with Germany, and eliminate ruinous competition with her in lines which we can manufacture ourselves to market at reasonable prices.

"We cannot afford to treat the matter of trade with Germany sentimentally, if we expect Germany to meet her obligations, and we must be prepared to do business with her on a fair and equitable basis for such goods of her manufacture as we will require."

---

## The Use of Ball Bearings

When thinking about the installation of ball bearings, it does not pay to do **too much thinking**. After you have decided to use such bearings, do not puzzle over how you shall apply them. Leave that to those who have made a life study of the subject.

Many cases are existent at the present time where ball bearings are applied, yet not delivering 100 per cent. service. The proper application of ball bearings is a special study. There are numerous factors entering into the problem—for example, the danger of dust and dirt. This is only one of many, so why not leave the actual planning to someone who knows.

Many machine tool designers may consider this a reflection on their ability, but such is not the intention. Unless they have had practical experience in this line of work, consultation should be held with some reputable concern making such bearings as they **think** they require. We say think because in many cases the bearing they believe ideal for the purpose is not the correct type to use at all. As service of this nature is free, why not take the benefit of it?

Here is a typical case of what actually happened a short time ago. A certain manufacturer called up a ball bearing company on the phone, and this conversation ensued:

"I'm developing a new machine, and I want some advice regarding ball bearings. Will you come up right away?"

"I'll be out there within an hour," was the reply.

Soon the chief designer, the manufacturer and the ball bearing expert were delving into the problem, with the result that everybody was satisfied. The manufacturer knew he had secured the best of advice, the designer had learned something fresh, while the expert had stated what in his opinion would suit the machine. Even the ultimate user of the machine got better value for his money, for he received the benefit of an ideal installation.



# MARKET DEVELOPMENTS



## Slight Improvement Noticed in Markets

### Pittsburgh Says The Demand for Steel is a Little Better, While in New York Tools Are Being Inquired For—Toronto Business Shows Small Improvement in Some Lines

THE general tone of business in the machine tool, steel and iron markets is slightly better this week. This does not mean that any great amount of bookings are being made, but it does mean that more orders are being received by several lines, and that in others inquiries of a perfectly reliable sort are being received.

In a good many lines it is still true that prices are not allowed to stand in the way of orders not being placed. Small tools and some lines in the steel warehouses are going out under these circumstances. Here is a peculiar situation, though, which is developing. Warehouses have not been buying for some time. They have been busy liquidating the stock they had in hand, depending on the mills to give them quick delivery on lines they were running short of. During the past week it has developed that some warehouses have lines in demand, while others have not, with the result that there is no more losing liquidation on the part of the firms that have the wanted lines. They are able to sell at a profit.

Nothing definite is heard in regard to prices in the steel market coming down any farther. The Corporation schedule still stands, and its selling agencies in Canada are working on that basis, but the independents are coming pretty well under the market. It is doubtful, though, if much real tonnage has been brought into the market by any of the price slashing that has taken place.

The scrap metal market does not improve. Any movement at all would probably be for the better, for dealers feel that it has about run its limit as far as low prices are concerned. Some of the railroads and industrials in United States continue to offer their sortings at lower prices, preferring to turn them into cash. The result is that, although prices are very low, there is no guarantee that they have yet touched bottom.

## MONTREAL LOOKING FORWARD TO THE OPENING UP OF NAVIGATION

Special to CANADIAN MACHINERY.

MONTREAL, March 24.—The continued mild weather, accompanied by wind and rain, has served a good purpose in the way of clearing the ice from the River St. Lawrence, and it looks as if it is only a question of a few days before the harbor will be open. Officials anticipate the first of April at the latest. What effect the opening of navigation will have upon business in this district is, as yet, uncertain, but, in former years, it has always aided in relieving the tension that has been more or less marked at an ocean port during the closed season. The opening of Montreal port has always created a spirit of enthusiasm amongst merchants and should do likewise this year; in fact, some state that business will improve with the commencement of navigation. While some of the railroad shops here are contemplating further curtailment or shut downs for short periods, there is increased activity in other directions. The Dominion Engineering Company across the river are commencing operations and other engineering firms are reporting steady activity, but seldom of a brisk character. Manufacturers, as well as dealers, are apparently waiting for something to break.

### No Demand For Steel

"It would be going beyond the bounds of good judgment to say that a change for the better has taken place, but our business for the past week has been larger than for some weeks back. Of course, we may be faced with lesser business this week, which would counteract last week's good sales. However, we have been cheered up a little, and even though the betterment is of a passing nature, the thought alone keeps us optimistic." This statement by a steel merchant here might imply that conditions are improving, but when one takes into consideration the poor business that has been going, any improvement over previous weeks, unless it be of a considerable character, would give little encouragement to the average merchant. When asked as to the probable duration of present depression, this dealer was reluctant to make a statement, as he said he had hoped, earlier in the year, to see things picking up before this date, and that here we were with the prospects almost as obscure, if not more so, than at the beginning of the year. The conservative attitude that dominates all phases of the steel business is very pronounced. Consumers buy in small lots for present requirements, and dealers carry as light a warehouse stock as is consistent with the needs of the trade. The general report from dealers is that there is "little doing." As stated in one instance: "We are just sitting here waiting—how long this wait will be we cannot tell, as the slight fluctuation in demand shows no signs of steady improvement; it is up a little today and down again tomorrow."

### Supplies Selling Best

Little more can be said of the machine tool trade than that many of the dealers are carrying on, seemingly content to keep things going during this period of pronounced depression. The sale of equipment now is a hard proposition, and it is a clear case of need when the manufacturer buys machinery or material. Although the sale of equipment is proportionately light the keen competition amongst salesmen to get business of any kind, makes it possible for users to get their needs supplied at surprisingly low figures, particularly if they can afford to take the time to get the varied quotations from the different dealers. An inquiry

that does not net business makes the dealer feel that some other fellow has under-quoted him, and the possibility is that the next inquiry will result in a lower price. This cannot be done in all cases, but on many lines this attitude is followed in getting business. The market on the surface seems quite clear but closer contact, when actually buying, indicates the presence of air holes into which the customer is drawn by the current of the trade. The "heavy" business at present is being done in the lighter supplies.

### Prospects Little Brighter

The light movement of old material continues to keep the market in a depressive mood. The demand for scrap of all kinds is practically nil, and it is generally only regular customers that are buying at the present time, and then in such small volume that other than passive interest is not aroused. The situation just now is not one that is controlled by price, as quotations are little guide to actual sales figures. "Supplies we have on hand just now," said a dealer, "were acquired at prices higher than are now quoted, and we are endeavoring to dispose of much of this before we take on any more material. This, however, is subject to trade requirements and with buyers virtually out of the market, it looks as if it would be some time before we can expect a stable condition." There is not the same hopeful spirit that there was a couple of months ago, and instead of looking for a betterment in the early spring, the general opinion seems to indicate an extended period of existing dullness. Prices are unchanged but the trend is weaker.

## BETTER REPORTS ABOUT BUSINESS

### Firms Have Reason to Believe That Corner Has Been Turned Toward Better Days

TORONTO.—No one seems prepared to stand up yet and admit that he is getting any more business than he can conveniently handle with his present staff, but there are a number of firms quite willing to admit that they can see an improvement in business, and that last week was by far the best one this year.

Inquiries continue to come into the market, and although they do not represent a great deal in the way of closed business, they are accepted as good working material by the firms interested.

Collections continue to be fairly slow in some lines, while other firms report that they are having very little trouble with this matter, apparently indicating that firms that make collecting a real job are finding now that their well-organized department is coming in very handy, and making financing much easier for them than would otherwise be the case.

### The Machine-Tool Market

Machine-tool dealers are closing a fair amount of business, most of it pretty well scattered, and in the shape of additions to existing plants, rather than new installations.

One dealer, who has covered quite a wide range of territory during the past few weeks, reports that while he did not close much actual business he is more than ever satisfied that the corner has been turned, and we are on the way back to better days.

Business in the East, he claims, is slow, there being little to accelerate buying there. In much of the country it all depends on the steel and coal business, and in the former there is little activity just now. Around Halifax things were quiet, too, and with the exception of a couple of Government ships in the yards there, there was nothing in the ship yards but repair work.

### Railroads Not Buying

There was some expectation, apparently not very well founded, that the railroads would be doing a lot of buying about this time of year. One of the officials, discussing this matter just a few days ago, explained that it was not likely that extensive buying would be done now, although some of the shops were in need of equipment. The weather had been very kind to transportation during the winter months. The absence of snow had made it an easy matter to keep the rolling stock in very good shape, and so there was no call for additional machine tools now. Then there are the Government roads, this same dealer went on. If a private concern were as hopelessly in debt as these roads are we would not look upon them as very good prospects for placing equipment. It may be that a great deal of reorganization is necessary in the case of the latter, he continued, and this reorganization might find it very advantageous to have much better equipment than many of the Government shops boast at the present time.

### Prices of Tools

Old country machine tools have stayed up pretty well in price, but there are indications of a change in this attitude, and the buyer can sit in now and talk price to them and they are disposed to listen. Machine tools are not moving out very rapidly in England now, and in some cases the larger makers have accumulated quite a supply, something that is rather unusual in their history. In quotations that have been made in several pieces of special equipment recently prices put in by British firms are lower than those submitted by the makers in other countries.

### The Steel Market

"There were days last week when it seemed almost like dipping in on the

## POINTS IN WEEK'S MARKETING NOTES

**Pittsburgh reports that the Steel Corporation during the past week has not been operating much more than fifty per cent. capacity.**

—

**The price for pig iron in some of the U. S. districts shows a tendency to go even lower, although $25 is still recognized as the bottom figure.**

—

**There has been a fair demand for sheets during the week in Toronto warehouses, industries connected with the pulp and paper business and with some of the northern mines doing the buying.**

—

**According to advices there may be a drop in the price of some British machine tools before very long.**

—

**Boiler tubes are being sold in fair quantities, the bulk of the sales apparently being for the smaller sizes.**

—

**Bar mill material, especially for reinforcing purposes, is not selling as freely as it should be at this time of the year. Slowness in getting building operations under way is responsible for this.**

—

**Several large makers of machine tools in United States have sent out notices of reductions in their selling prices, generally running from ten to fifteen per cent.**

—

**The past season has been a very light one on railroad upkeep work, and for that reason the shops have not found it necessary to purchase the amount of equipment expected.**

—

**Small tools are being sold in very small lots, and some of the dealers are complaining that prices are being cut to secure the little business that is offered. According to some reports business is being done at as low as five per cent. profit.**

—

**The directors of the Dominion Steel Corporation and the Nova Scotia Steel and Coal Company met at Montreal on March 21st to discuss the proposed amalgamation of the two companies with the Halifax Shipyards in the British Empire Steel Corporation. After the meeting it was announced that both boards had approved of the contracts covering the consolidation and that special meetings of both the Steel Corporation and Scotia common shareholders would be called for April 7th next**

1920 business again," stated one of the steel merchants this week. "We are not interpreting this as meaning that things have turned all at once for the better, but there can be no denying the fact that we find a gradual improvement."

Sheets were good last week, and still are, and a fair tonnage has moved out. Black (28) gauge is quoted at 6.50, while blue annealed is sold at 6c. A variety of interests contributed to the business that came in during the week. Warehouses are not taking on very much material now, in fact some of them prefer to turn their orders direct to the mills, and for this district very direct motor delivery service is being made from Hamilton. This lets the warehouse out of loading up with a very heavy stock, and it must also have the effect of holding quite a lot of trade in Canada that would otherwise go over the border.

### Some Lines Are Short

The warehousing situation is getting to an interesting stage just now. The buying that is being done by the merchants is small, and can more correctly be referred to as releasing material rather than purchasing it. In some lines where there has been a decided effort toward liquidation, stocks are getting fairly low, with the result that business has to be directed to the places carrying these lines, if quick shipment is desired. The result is that merchants having well-assorted stocks are able again to get their price without having to slash away at a rate where no money was made. Of course this is not a general condition, but it has taken place, and is taking place. Warehouses are not minded yet to do much buying, claiming that they can get very prompt mill delivery, and that mills are encouraging them to send in much smaller amounts than formerly.

### The Sale of Tubes

Tubular goods are moving out fairly well, and in this the small sizes are perhaps leading, tending to show that small industrial concerns are overhauling their plants while in the case of the larger power plants things are being passed up for the season as far as repairs are concerned.

There is a fair demand for reinforcing material, although the demand is hardly indicative of a very active season's work in the building trades. Industries that have work from the pulp and paper mills are buying a fair amount, while some of the mines are also taking on a few carloads. There is perhaps nothing unusual about any of this business, as in ordinary times the buying would be still larger, but any kind of business is welcome in the market under present circumstances.

There have been some disputes over shipments sent in here from some of the United States mills, and a number of cars have been sent back.

### Small Tools Are Slow

Small tools are moving slowly, and firms requiring these are buying what they need for right now. "In fact, you would think they were all going to close to-morrow by the way they are buying to-day," remarked one dealer who was complaining of the smallness of the orders, particularly during the present month.

One also hears a good many reports of price cutting that is being done in the small tool market. "They all get together, and decide to play the game square and sell on the quality of goods and ability to make deliveries by the consumer, and all goes well for a short time. But once things get scarce, believe me the prices begin to fly. I am certain there are jobbers right in this district now that are doing business on a 5 per cent. basis. Ten per cent. is the proper basis, and it is not possible to operate below that, especially when the volume of trade going is smaller than usual."

# PITTSBURGH REPORTS A BETTER TONE IN THE MARKET WITH SOME ORDERS

Special to CANADIAN MACHINERY.

PITTSBURGH, March 24.—There has been a further increase in the volume of steel business over that noted in last report, and in addition a little inquiry has appeared from steel works for basic pig iron. The beginning of improvement is very modest, but there is at least a beginning. It requires close scrutiny to discern any change, but business has been so bad that everyone is willing to make the effort necessary to see even a small improvement.

The improvement does not mark the beginning of a spring buying movement according to those who analyze the orders that come in. The buying is the beginning of a reaction from the extreme stagnation of the past few weeks, a stagnation that could not continue indefinitely, for the buying was far below the amount needed to keep operations going even on the limited scale that characterizes a period of hard times. That is, after every period of great activity there is a special period of stagnation during which time old orders are worked out and stocks are consumed. Then, if ultimate consumption does not increase, there must nevertheless be hand-to-mouth buying, and that is what is now starting.

A spring buying movement is to be expected, but it is not discerned yet. When it comes it will simply add to the activity, and it is certain to come very shortly. For the general and widespread improvement, from the long range viewpoint, one must still wait. That is in the uncertain future.

### Production and Demand

While production of pig iron and steel products has been constantly declining, it has been far above the quantity of expressed demand. The latter is increasing, but for the two to meet the one must decline further and the other increase. The meeting will now occur in a very few weeks.

The independent steel interests are not operating any better than a few weeks ago, and indeed hardly as well. Previous records have indicated that the independents as a whole ran at nearer 30 per cent. than 25 per cent. in January and at nearer 25 per cent. than 30 per cent. in February. For the present rate, some estimates are 25 per cent. but others only accord the independents 15 or 20 per cent.

The Steel Corporation's operations have decreased more sharply in the past week than in former weeks, the Corporation's highest production having been in December and up to the middle of January, whereas the independents had already reached a point of curtailing operations. Generally speaking, it may be said that the Steel Corporation's declining operations have come just above four months later than was the case with the independents, this being the sequel to the Steel Corporation's holding its prices down late in 1919 and in 1920 while all the independents advanced their prices.

The Carnegie Steel Company, which was the highest operating subsidiary of the Corporation outside of the National Tube Company, has had the greatest decline. In the past week or ten days the Carnegie Steel Company has made a new record, by blowing out 13 blast furnaces in that short period, reducing the active number from 38 to 25. The company's high point was 48 furnaces active, for a time last January. Last week's ingot production by the Carnegie Company was about 45 per cent. of actual capacity, against about 60 per cent. the previous week. The ingot production by the Steel Corporation as a whole was about 45 per cent. last week against about 55 per cent. the previous week.

### Prices

Except in sheets there has been no noticeable decline in the past week in steel prices done by independents. The Steel Corporation continues to maintain its prices and shows no signs of contemplating any reduction in the very near future. While it may not be clear to outsiders who have publicly suggested that the Steel Corporation ought to reduce its prices, it is plain to those in the trade that there would be no stimulus given to business by such action. The Steel Corporation's customers as a body do not desire that the Corporation reduce its prices at this time, and indeed not a few of them have placed them-

selves on record as fully approving the Steel Corporation's policy of price maintenance. It is a plain matter of business. These customers have stocks of steel or of finished wares or both, which they want to dispose of to the best advantage, and a reduction in the official steel prices would simply depreciate the value of this material. If the customers wanted to buy large quantities of steel the case would be different, but they do not.

Sheets can now be done in carload lots at 3.85c for black, when a week ago it required a larger order to bring out a price under 4c. Galvanized sheets are easy at 5c for carloads, with possibilities of shading this on larger lots. Blue annealed sheets are quite neglected, 3c. being commonly regarded as the market, but possibly a buyer with a fair-sized order might develop something less. The heavy gauges can, of course, be bought for considerably less, on the plate mill schedule.

Bars remain quotable at 2c and shapes and plates at 2.10c. These prices can now be done on single carloads, if the specifications are satisfactory, and that may represent a slight easing off, since a fortnight ago one would probably have to offer more than a carload to get such quotations. The minimum done on plates seems to be 1.90c, this being on a very attractive order.

### Pig Iron

Inquiry for basic pig iron is small but it is easily the best seen for many weeks, there being live inquiry for 3,000 tons from a consumer west of Pittsburgh and inquiries for 1,000 tons each from a steel interest in the Shenango valley and a steel works in the Allegheny valley. The tone of the market is a shade better. The merchant furnaces will not budge a cent on these inquiries from their regular quotation of $25, valley. It looks now as though the steel works that had accumulated some iron by not slowing down their blast furnace operations as rapidly as they did their steel works will not dump the iron accumulated on the market but will keep it for their own use. There remain the brokers, who have some iron, and who will probably get the orders now going by shading $25, but the merchant furnaces feel that the iron will have to be gotten out of the situation some time and now is the best time.

Bessemer iron remains quotable at $27, valley, and foundry at $26, with no inquiry worth mentioning.

The offical report of pig iron production in 1920 has just been made, the total being 39,925,987 gross tons, against 31,015,364 tons in 1919 and the record of 39,434,797 tons in 1916. Capacity is about 45,000,000 tons, while production in the past week or so has crossed under the 20,000,000-ton line.

## FEW MORE CUTS IN N. Y. MARKET

**Railroads Are Not Buying Until the Talk of Strike Has Been Settled**

Special to CANADIAN MACHINERY.

NEW YORK, March 24.—There is a little more life in the machine-tool trade, but it is confined mostly to inquiries. Actual orders in some lines, notably milling, grinding machines and punches and shears, are being placed somewhat more freely, but there is still much to be desired even in these lines.

The tendency of prices continues downward. A leading manufacturer of lathes and milling machines has reduced prices on milling machines about 15 per cent. and is expected to announce a 10 per cent. reduction on lathes also. Some other lathe manufacturers have made reductions.

The most important inquiry of the past week was from the General Electric Co., Schenectady, N.Y., for about thirty machines. When the slump in machine-tool buying occurred last fall, the General Electric Co. stayed in the market for a considerable time, but finally stopped all buying before taking final action on several fairly large lists it had issued for its various plants. The inquiry received here last week is the first indication that this non-buying policy has been changed. No orders have been placed yet by the American Sugar Refining Co., New York, or the Batavia Car Works, Batavia, N.Y., whose inquiries were reported a week ago, but it is expected that the business will be placed soon.

The trade lacks snap, but the improvement in inquiry has created a better tone among sellers in some lines, while in other lines things remain as dull as they have been at any time during the past few months.

Except for more prospective buying by the Japanese Government and an inquiry from a Porto Rican sugar company there is scarcely a sign of life in the export machine-tool trade.

The railroads have a number of small inquiries out, but it is doubted that orders will be placed until the present controversy between the roads and their employees over the wage question has been settled.

### KEEPING UP THE GOOD WORK

It is said that rapid progress is being made with the special process of electric welding which was successfully employed by the British Admiralty during the war in the construction of a "riveteless" 1,000-ton steel barge for transport purposes.

The peculiarity of this process is the use of special electrodes covered with flux, which prevents the oxidation of the welding metal. Further, by using electrodes and fluxes of special composition steel of any particular character —mild steel, nickel steel, high-tensile steel, vanadium steel, and so on—can be deposited direct. Cast-iron of good quality can also be obtained by this system of welding. Extensive repairs are being carried out in worn tramway tracks, cracked omnibus wheels, and old motor car shafts, and a company has been formed for the production of welded motor car wheels. An important feature is that only a moderate amount of skill on the part of the operator is required to secure satisfactory results.

## DOES THE PRICE DETERMINE SALE?

**One Dealer Passes Along Some Observations Made in Recent Days**

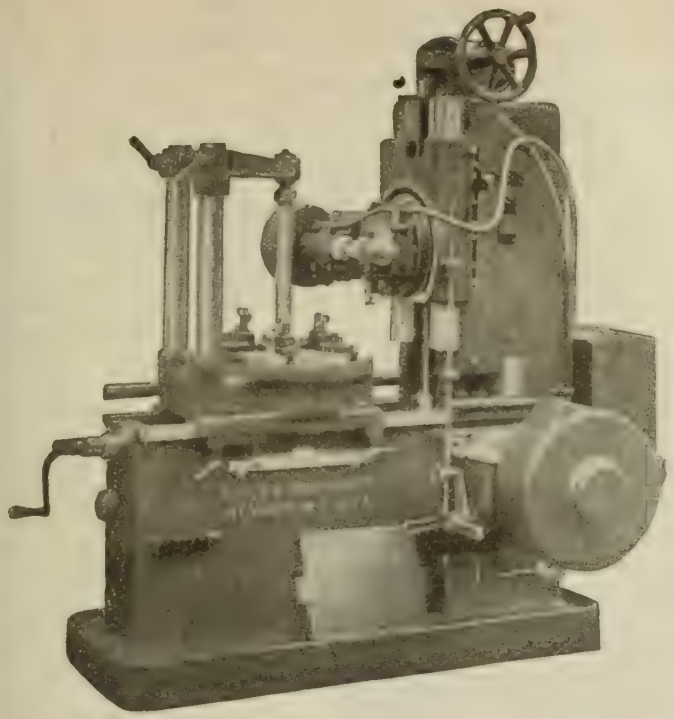
Is this a price market for machine tools and similar articles, rather than a place where quality is highly considered?

The question is prompted because one of the dealers in Canada believes that price is one of the great factors on determining sales here now. His belief seems to have been strengthened lately by coming in contact with another salesman who was out selling a high-grade article, the chief competition to which came from a much cheaper make.

The last-named man was out selling a high-grade magneto, but he found that he could not sell against some of the makes that seemed to have the run of the market at a lower price. There is no question that the article of the high price is a superior one, but it can't be sold in the present competitive market.

One of his customers, a maker of tractors, told him, "We have to make things with regard to price. We put the most quality we can in, and try to turn out something that will stand up and give the purchaser his money's worth, but we have got to cut out the high quality in order to get down to the price at which the thing will sell." The salesman handling the magneto has written his firm asking for a re-design that will bring the article down to the price the people here want to pay. If they will agree to this proposition he seems to think there is a big field in which to do business, but if they insist on keeping up to a price they might as well leave the market.

We are not making any comment on this, simply passing it along as one of the opinions of the Canadian market that one hears in the course of a day spent around the warehouses and supply stores.



Gould & Eberhardt
GEAR HOBBERS
are
*Automatic* therefore *Economical*

If you cut gears in quantities they can be cut with advantage on G. & E. Gear Cutting Machinery.

For gears up to 120" dia.

Catalog describing full line of Gear-cutting, Hobbing and Rack-cutting machines on request.

*Write for prices and deliveries*

The A. R. Williams Machinery Company, Limited

ST. JOHN, N.B.
WINNIPEG, VANCOUVER

*If It's Machinery—Write "Williams"*

64 Front Street West
TORONTO

# MONTREAL NOTES

E. T. Spidy, who for the past several years has been production engineer at the Angus shops of the C.P.R., has severed his connection with the railroad company to become associated with the Dominion Engineering Company, being appointed to the position of assistant superintendent. On the occasion of his leaving the C.P.R. Mr. Spidy was presented with a silver tea set and a handsome travelling bag.

* * *

The Canadian firm of Torrington Company at Upper Bedford, Quebec, who for many years have been manufacturing knitting machine needles, have installed equipment for the making of all kinds of machine screws, cap and set screws, etc. Production will show rapid development from now and they are now in a position to supply the trade demands for these products. David J. Reid is the manager of the Canadian Company.

* * *

To further the construction of the new Labor Temple in the city of Montreal, the company, which was incorporated some time ago with a capital of $500,000, has appointed a permanent executive to carry out the necessary work. The various labor unions in the city are interested in the venture and it is not thought that any great difficulty will be experienced in the raising of the money. The new executive is as follows: President, Arthur Martel; vice-president. J. T. Foster; secretary, A. Bastien; directors, Gustave Francq, J. Lesperance, B. Drolet, J. L. Bourbonniere and S. Clegg.

## NICKEL PLANT TO RESUME WORK

Sudbury.—The British-America Nickel Corporation will resume operations about April 20.

The new plans of the company are not for the complete operation of the plant as before it was closed down a couple of weeks ago.

Instead it is the intention of the company to leave the smelter closed for the present, but a good sized force of men will be put on to carry out a programme of underground development.

The fact that the company needed considerable underground work for the efficient working of the Murray Mine has been known for some time.

A second shaft has been necessary, as since the mine has been operating practically all the ore hauled to the surface went into the smelter direct, and there was little opportunity to pile up an ore dump on surface. A second shaft would overcome this. However, the blocking out and stopping of the ore bodies has been kept but little ahead of the actual mining operations, and it is understood that the work which will start towards the latter part of April will have the solution of this problem in hand.

The corporation has already selected all the men required for this work. They were not dropped from the payroll, but were really given a holiday.

These employees have been told to hold themselves in readiness for a call some time about the 19th of April.

The refinancing of the corporation has been completed and the Norwegian State Bank is lending their assistance to the corporation. Plans to resume work are timed to fit in with the receiving of the news that the loan has been confirmed.

The Norwegian Government has taken a material interest in this venture prior to putting its approval on the present investment of some two million dollars by the Norway bank.

---

During 1920 the number of large incandescent lamps sold in the U. S. totalled about 231,000,000. Of this amount about 215,000,000 were tungsten filament lamps and 16,000,000 carbon filament lamps. This means that 93 per cent. of the lamps sold had tungsten filaments. According to these estimates, the large lamp business of 1920 represents an increase of 25 per cent. over 1919.

# SELECTED MARKET QUOTATIONS

**Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.**

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $26 00 |
| Lake Superior, charcoal, Chicago | 40 50 |
| Standard low phos., Philadelphia | 41 50 |
| Bessemer, Pittsburgh | 28 96 |
| Basic, Valley furnace | 26 00 |
| Toronto price:— | |
| Silicon, 2.25% to 2.75% | 39 25 |

## IRON AND STEEL

| Per lb. to Large Buyers | Cents |
|---|---|
| Iron bars, base, Toronto | $ 4 50 |
| Steel bars, base, Toronto | 4 50 |
| Iron bars, base, Montreal | 4 25 |
| Steel bars, base, Montreal | 4 25 |
| Reinforcing bars, base | 4 50 |
| Steel hoops | 6 00 |
| Tire steel | 5 00 |
| Spring steel | 8 00 |
| Band steel, No. 10 gauge and 3-16 in. base | 5 50 |
| Chequered floor plate 3-16 and heavier | 7 50 |
| Bessemer rails, heavy, at mill | 2 35 |
| Steel bars, Pittsburgh | 2 10-2 25 |
| Tank plates, Pittsburgh | 2 65 |
| Structural shapes, Pittsburgh | 2 45 |
| Steel hoops, Pittsburgh | 3 05 |
| F.O.B., Toronto Warehouse | |
| Small shapes | 4 50 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 3 48 |
| Structural shapes | 3 58 |
| Plates | 3 78 |
| Small shapes under 3-in. | 3 48 |

## FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

| | C.L. | L.C.L. |
|---|---|---|
| Montreal | 58½ | 73 |
| St. John, N.B. | 84½ | 106½ |
| Halifax | 86 | 108 |
| Toronto | 38 | 54 |
| Guelph | 38 | 54 |
| London | 38 | 54 |
| Windsor | 35 | 50½ |

Current surcharge, 9 per cent.

## METALS

Gross.

| | Montreal | Toronto |
|---|---|---|
| Lake copper | $18 00 | $17 50 |
| Electric copper | 17 50 | 17 50 |
| Castings, copper | 17 25 | 18 00 |
| Tin | 37 00 | 40 00 |
| Spelter | 7 75 | 7 50 |
| Lead | 6 50 | 7 50 |
| Antimony | 8 00 | 8 25 |
| Aluminum | 34 50 | 30 00 |

Prices per 100 lbs.

## PLATES

| | | |
|---|---|---|
| Plates, 3-16 in. | $5 25 | $5 25 |
| Plates, ¼ up | 4 75 | 4 75 |

## PIPE—WROUGHT

Standard Buttweld Pipe

Per 100 Ft.

| | Steel | | Gen. Wrought Iron | |
|---|---|---|---|---|
| | Blk. | Galv. | Blk. | Galv. |
| ⅛ | $ 6 50 | $ 8 50 | $..... | $..... |
| ¼ | 5 31 | 7 41 | 5 91 | 8 01 |
| ⅜ | 5 31 | 7 41 | 5 91 | 8 01 |
| ½ | 7 10 | 8 63 | 7 95 | 9 48 |
| ¾ | 8 80 | 10 87 | 9 95 | 12 02 |
| 1 | 13 01 | 16 07 | 14 71 | 17 77 |
| 1¼ | 17 60 | 21 74 | 19 90 | 24 04 |
| 1½ | 21 04 | 25 99 | 23 79 | 27 84 |
| 2 | 28 31 | 34 97 | 32 01 | 38 67 |
| 2½ | 44 75 | 55 28 | .... | .... |
| 3 | 58 52 | 72 29 | .... | .... |
| 3½ | 74 06 | 90 62 | .... | .... |
| 4 | 87 75 | 107 37 | .... | .... |

Standard Lapweld Pipe

Per 100 Ft.

| | Steel | | Gen. Wrought Iron | |
|---|---|---|---|---|
| | Blk. | Galv. | Blk. | Galv. |
| 2 | $32 01 | $ 38 67 | $35 71 | $42 37 |
| 2½ | 48 26 | 58 79 | 54 11 | 64 64 |
| 3 | 63 11 | 76 88 | 70 76 | 84 53 |
| 3½ | 75 90 | 92 46 | 85 10 | 101 66 |
| 4 | 89 93 | 107 55 | 100 83 | 120 45 |
| 4½ | 1 05 | 1 29 | 1 30 | 1 54 |
| 5 | 1 22 | 1 50 | 1 52 | 1 80 |
| 6 | 1 58 | 1 95 | 1 97 | 2 33 |
| 7 | 2 06 | 2 53 | 2 53 | 3 01 |
| 8L | 2 16 | 2 66 | 2 66 | 3 16 |
| 8 | 2 49 | 3 07 | 3 07 | 3 64 |
| 9 | 2 98 | 3 67 | 3 67 | 4 36 |
| 10L | 2 77 | 3 41 | 3 41 | 4 05 |
| 10 | 3 56 | 4 39 | 4 39 | 5 21 |

**Prices—Ontario, Quebec and Maritime Provinces**

## WROUGHT NIPPLES

4-in. and under, 50 per cent.
4½-in. and larger, 40 per cent.
4-in. and under, running thread, 20%.
Standard couplings, 4-in. and under, 20%
Dd., 4½-in. and larger, net.

## OLD MATERIAL

Dealers' Average Buying Prices

Per 100 Pounds.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $ 9 50 | $ 9 00 |
| Copper, crucible | 11 50 | 11 00 |
| Copper, heavy | 11 00 | 11 00 |
| Copper wire | 11 00 | 11 00 |
| No. 1 machine composition | 10 00 | 9 75 |
| New brass cuttings | 7 00 | 8 00 |
| Red brass turnings | 8 00 | 8 00 |
| Yellow brass turnings | 6 00 | 6 00 |
| Light brass | 5 00 | 5 00 |
| Medium brass | 6 00 | 6 00 |
| Scrap zinc | 4 00 | 4 00 |
| Heavy lead | 4 50 | 4 00 |
| Tea lead | 2 00 | 2 00 |
| Aluminum | 12 00 | 10 00 |

| | Per Ton | Gross |
|---|---|---|
| Boiler plate | $11 00 | $12 00 |
| Heavy melting steel | 15 00 | 14 00 |
| Axles (wrought iron) | 25 00 | 20 00 |
| Rails (scrap) | 15 00 | 14 00 |
| Malleable scrap | 20 00 | 20 00 |
| No. 1 machine cast iron | 30 00 | 25 00 |
| Pipe, wrought | 8 50 | 8 00 |
| Car wheel | 30 00 | 25 00 |
| Steel axles | 20 00 | 18 00 |
| Mach. shop turnings | 8 00 | 6 00 |
| Stove plate | 23 00 | 20 00 |
| Cast boring | 5 00 | 7 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, 7-16 and up | Net list |
| Carriage bolts, ⅜" and less | 15 |
| Coach and lag screws | —20 |
| Stove bolts | 55 |
| Wrought washers | —25 |
| Elevator bolts | Net |
| Machine bolts, 7-16 and over | —5 |
| Machine bolts, ⅜-in. and less | —30 |
| Blank bolts | Net |
| Bolt ends | —5 |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | +25 |
| Machine screws, fl. and rd. hd., brass | Net |
| Machine screws, o. and fil. hd., brass | Net |
| Nuts, square, blank | +25 add $2 00 |
| Nuts, square, tapped | add 2 25 |
| Nuts, hex., blank | add 2 25 |
| Nuts, hex., tapped | add 2 75 |
| Copper rivets and burrs, list less | 27½ |
| Burrs only, list plus | 10 |
| Iron rivets and burrs | 37½ and 5 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, bright | 67½ |
| Wood screws, flat, brass | 55 |
| Wood screws, O. & R., brass | 55½ |
| Wood screws, flat, bronze | 50 |
| Wood screws, O. & R., bronze | 47½ |

## MILLED PRODUCTS

(Prices on unbroken packages)

| | Per Cent |
|---|---|
| Set screws | Less 40% |
| Square and hexagon head cap screws | Less 30% |
| Round head cap screws | Plus 10% |
| Fillister head cap screws | Less 10% |
| Flat head cap screws | Net list |
| Button head cap screws | Plus 10% |
| Studs | Less 20% |
| Semi-finished nuts up to and including 1-in. | Less 35% |
| Semi-finished nuts 1⅛ to 1½" | Less 30% |
| Semi-finished nuts 1⅝ to 2 in. | Net list |
| Coupling bolts | Plus 10% |
| Taper pins | Less 40% |
| Planer bolts without fillet | Plus 40% |
| Planer bolts with fillet | Pus 50% |
| Patch bolts | Plus 80% |
| Hollow set screws | Plus 20% |
| Thumb screws | Less 35% |
| Thumb nuts | Less 65% |

## BILLETS

F.O.B. Pittsburgh.

| | Per gross ton |
|---|---|
| Bessemer billets | $43 50 |
| Open-hearth billets | 43 50 |
| O.H. sheet bars | 47 00 |
| Forging billets | 48 50 |
| Wire rods | 57 00 |

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails, base | $5 10 |
| Cut nails, base | 5 75 |
| Miscellaneous wire nails | 50% |

## ROPE AND PACKING

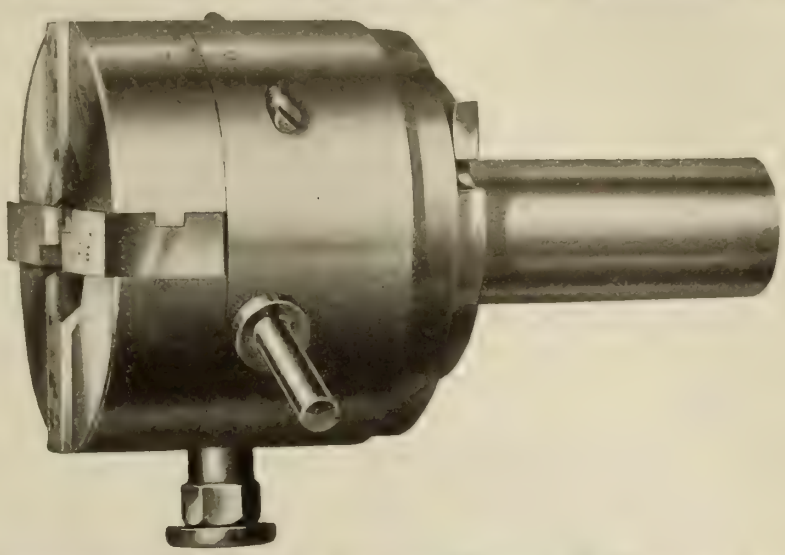
| | |
|---|---|
| Plumbers' oakum, per lb. | 0 10¼ |
| Packing, square braided | 0 38 |
| Packing, No. 1 Italian | 0 44 |
| Packing, No. 2 Italian | 0 36 |
| Pure Manila rope | 0 26 |
| British Manila rope | 0 20 |
| New Zealand hemp | 0 20 |

## POLISHED DRILL ROD

Discount off list, Montreal and Toronto — Net

Right on the Lead

# A Geometric Die Head for the Brown & Sharpe Automatic



The Geometric Die Heads for the Brown & Sharpe Automatic Screw Machines are arranged with an adjustable locking bolt. This provides a ready means for governing the point of tripping the Die Head.

The closing handle is located in a convenient position to strike a stop on the machine, which automatically closes the Die Head when the turret revolves.

The Die Heads are provided with shanks to fit the particular size machine on which they are to be used.

| Geometric Die Head Size | Brown & Sharpe Mach. Applied to | Capacity | Shank |
|---|---|---|---|
| 5-16″ C. B-4631A | 00 and 00G | 1-8″ 5-16″ | 5-8″ x 1 5-16″ |
| 9-16″ C. B-4631B | 0 and 0G | 1-8″ — 9-16″ | 3-4″ x 2 1-16″ |
| 3-4″ C. B-4631C | 2 and 2G | 1-4″ 3-4″ | 1″ x 2 3-8″ |

The use of these Die Heads makes unnecessary the reversing of the spindle to back the Die off the threaded work.

Thy are especially useful for threading operations when only one spindle pulley is available for driving, or on machines not arranged to reverse.

**All sizes of these Die Heads carry four chasers.**

## THE GEOMETRIC TOOL COMPANY

### NEW HAVEN, CONNECTICUT

*Canadian Agents:*

Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta
Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Toronto, St. John, N.B., Halifax, N.S.

*If interested tear out this page and place with letters to be answered.*

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | $ 0 25 |
| Solder, guaranteed | 0 27 |
| Soldering coppers, lb. | 0 62½ |
| White lead, pure, cwt. | 17 00 |
| Red dry lead, 100-lb. kegs, per cwt. | 13 00 |
| Linseed oil, boiled, single bbls. | 1 03 |
| Wood alcohol, per gal. | 2 75 |
| Whiting, plain, per 100 lbs. | 3 00 |

### CARBON DRILLS AND REAMERS

| | |
|---|---|
| S.S. drills, wire size | 40 and 5 |
| Can. carbon cutters, plus | 10 |
| Standard drills, all sizes | 40 and 5 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 and 5 |
| Bit stock | 50 |
| Ratchet drills | 10 |
| Pure turp., single bbls., gal. | 1 20 |
| Linseed oil, raw, single bbls. | 1 00 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 50 |
| Sleeves | 50 |
| Taper pin reamers | 25 off |
| Drills and countersinks | Net |
| Bridge reamers, carbon | 50 |
| Centre reamers | 5 |
| Gasoline, per gal., bulk | 0 42 |
| Chucking reamers | Net |
| Hand reamers | 10 |
| High speed drills, list net to plus | 20 |
| Can. high speed cutters, net to plus | 10 |
| American | plus 40 |

### COLD ROLLED STEEL

[At Warehouse]

| | |
|---|---|
| Rounds and squares | $7.00 base |
| Hexagons and flats | 7.00 base |

### IRON PIPE FITTINGS

| | Black | Galv. |
|---|---|---|
| Class A | 60 | 75 |
| Class B | 26 | 36 |
| Class C | 17 | 26 |

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 8 00 | $ 6 50 |
| Sheets, blue ann., No. 10 | 6 50 | 6 00 |
| Canada plates, dull, 52 sheets | 12 00 | 13 00 |
| Can. plates, all bright | 14 00 | ..... |
| Apollo brand, 10¾ oz., galvanized | .... | ..... |
| Queen's Head, 28 B.W.G. | 11 50 | ..... |
| Fleur-de-Lis, 28 B.W.G. | 10 50 | ..... |
| Gorbal's Best, No. 28 | .... | ..... |
| Colborne Crown, No. 28 | .... | ..... |
| Premier, No. 28, U.S. | 10 00 | 9 00 |
| Premier, 10¾-oz. | 10 50 | 9 40 |
| Zinc sheets | 13 00 | 20 00 |

### PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13; 5-16, $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

### ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13; 5-16 in., $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

**Prices per 100 lbs.**

### FILES AND RASPS

| | Per Cent. |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 32½ |
| Black Diamond | 27½ |
| J. Barton Smith, Eagle | 50 |
| McClennand, Globe | 50 |
| Delta Files | 20 |
| Disston | 40 |
| Whitman & Barnes | 50 |
| Great Western-American | 50 |
| Kearney & Foot, Arcade | 50 |

### BOILER TUBES

| Size | Seamless | Lapweld |
|---|---|---|
| 1 in. | $26 00 | $..... |
| 1¼ in. | 27 25 | ..... |
| 1½ in. | 26 25 | 29 50 |
| 1¾ in. | 29 75 | 27 00 |
| 2 in. | 29 25 | 25 50 |
| 2¼ in. | 33 00 | 28 50 |
| 2½ in. | 44 75 | 31 50 |
| 3 in. | 49 25 | 40 00 |
| 3¼ in. | ..... | 48 50 |
| 3½ in. | 63 50 | 43 50 |
| 4 in. | 85 00 | 55 50 |

Prices per 100 ft., Montreal and Toronto

### OILS AND COMPOUNDS

| | |
|---|---|
| Castor oil, per lb. | — |
| Royalite, per gal., bulk | 28 |
| Palacine | 31 |
| Machine oil, per gal. | 58 |
| Black oil, per gal. | 27 |
| Cylinder oil, Capital | 1.01 |
| Petroleum fuel oil, bbls., net | 11.2 |

### BELTING—No. 1 OAK TANNED

| | |
|---|---|
| Extra heavy, single and double | 15% |
| Standard | 15 and 10% |
| Cut leather lacing, No. 1 | 2 00 |
| Leather in side | 2 40 3 00 |

### TAPES

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES

| | |
|---|---|
| Polishing wheels, felt | $4 50 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, Turkish | 8¾ |
| Pumice, ground | 06 |
| Emery glue | 30 |
| Tripoli composition | 9½ |
| Crocus composition | 12 |
| Emery composition | 11 |
| Rouge, silver | 64 |
| Rouge, powder, nickel | 38 |

**Prices per lb.**

### ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | 8½ |
| Grits, 80 and finer | 6 |

### BRASS—Warehouse Price

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 30 |
| Brass sheets, 24 gauge and heavier, base | 38 |
| Brass tubing, seamless | 42 |
| Copper tubing, seamless | 44 |

| | | | |
|---|---|---|---|
| XXX Extra | .21 | Atlas | .19 |
| Peerless | .22 | X Empire | .15 |
| Grand | .21½ | Ideal | .18 |
| Superior | .21½ | X Press | .13½ |
| X L C R | .16½ | | |

### WASTE

**Colored**

| | | | |
|---|---|---|---|
| Lion | 13½ | Popular | 10½ |
| Standard | 12 | Keen | 9 |
| No. 1 | 14 | | |

**Wool Packing**

| | | | |
|---|---|---|---|
| Arrow | 35 | Anvil | 22 |
| Axle | 28 | Anchor | 17 |

**Washed Wipers**

| | | | |
|---|---|---|---|
| Select White | 20 | Dark colored | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

### RUBBER BELTING

| | | | |
|---|---|---|---|
| Standard | 10% | Best grades | 15% |

### ANODES

| | |
|---|---|
| Nickel | .55 to .60 |
| Copper | .38 to .40 |
| Tin | .70 to .70 |
| Zinc | .16 to .17 |

**Prices per lb.**

### COPPER PRODUCTS

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | $30 00 | $34 00, |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 32 00 | 38 00 |
| Copper sheet, tinned, 14 x 60, 14 oz. | 38 00 | 42 00 |
| Copper sheet, planished, 16 oz. base | 44 00 | 48 00 |
| Braziers', in sheets, 6 x 4 base | 36 00 | 41 00 |

### LEAD SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $ 9 50 | $14 50 |
| Sheets, 3½ lbs. sq. ft. | 9 25 | 14 00 |
| Sheets, 4 to 6 lbs. sq. ft. | 9 00 | 13 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS

| | |
|---|---|
| Acid, boracic | $ .25 |
| Acid, hydrochloric | .03¾ |
| Acid, nitric | .10¼ |
| Acid, sulphuric | .03¾ |
| Ammonia, aqua | .20 |
| Ammonium, carbonate | .23 |
| Ammonium, chloride | .22 |
| Ammonium, hydrosulphuret | .75 |
| Ammonium sulphate | .30 |
| Arsenic, white | .18 |
| Copper, carbonate, annhy. | .35 |
| Copper, sulphate | .10 |
| Cobalt, sulphate | .20 |
| Iron perchloride | .62 |
| Lead acetate | .30 |
| Nickel ammonium sulphate | 16½ |
| Nickel carbonate | .30 |
| Nickel sulphate | .17½ |
| Potassium sulphide (substitute) | .40 |
| Silver Chloride (per oz.) | 1.15 |
| Silver nitrate (per oz.) | 1.10 |
| Sodium bisulphate | .13 |
| Sodium carbonate crystals | .04 |
| Sodium cyanide, 127-130% | .39 |
| Sodium hyposulphite per 100 lb. | 6.50 |
| Sodium phosphate | .15 |
| Tin chloride | .80 |
| Zinc chloride, C.P. | .30 |
| Zinc sulphate | .08 |

**Prices per lb. unless otherwise stated**

MADE IN CANADA
AND MADE BETTER

# *ANNOUNCEMENT*

Watch this page next issue for full information descriptive of the **MacFarlane Line** of **Tools** and **Equipment.** These tools are manufactured in Canada—the product of a modern Canadian Industry.

G. W. MacFARLANE ENGINEERING
LIMITED
PARIS - CANADA

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# INDUSTRIAL NEWS

## NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES



## Engineering

The Dundalk Woollen Mills will be rebuilt at an estimated cost of $25,000.

Louis Herschorn, 167 St. Paul Street East, is planning to alter warehouse.

The Neal Baking Co., Windsor, Ont., are planning a new bakery to cost $250,000.

Joseph Crane, of New Westminster, will construct a shipyard at North Vancouver, B.C.

H. B. Charade, 2770 Hutchison Street, Montreal, is contemplating the erection of an automobile repair shop.

A moving picture house will be erected at Moose Jaw, Sask., by the Famous Players Moving Picture Corporation.

A warehouse will be erected at Lethbridge by the Winnipeg Oil Company, Erin and Notre Dame Avenue, Winnipeg.

J. H. Stewart, architect, 344 Lister Street, Hamilton, Ont., will receive tenders for erection of garage estimated to cost $40,000.

An attempt is being made by the local board of trade to have the Port Arthur Structural Iron Works locate its plant at Sault Ste. Marie.

Owing to the partial collapse of one of the wing dams, the 1,500 horsepower electric plant at Parry Sound is almost a complete wreck.

The Fairweather Building, 297 Portage Avenue, Winnipeg, is to be remodelled into a restaurant to be operated by Julius Bros., 538 Main Street. The cost is estimated at $90,000.

A theatre will be erected by the Winnipeg Amusement Co. at the corner of Main and Church Streets, and the general contract has been placed with Sutherland Construction Co., 301 Merchants Bank Building.

The Normandy Sales Co., Ltd., has been incorporated with head offices at Toronto, and capital stock of $50,000, to carry on the business of making, buying and selling automobile tires, tubes and auto accessories of all kinds.

It was stated by Col. E. W. Steadman, A.R.C.S., at the annual popular lecture by the Engineering Institute of Canada in the Victoria Museum, Ottawa, that German-made mercantile airplanes are being made and laid down in Canada, while British manufacturers are being forced to close their factories owing to lack of support.

## GERMANY IS REBUILDING HER FOREIGN TRADE VERY RAPIDLY

The foreign trade of Germany, to which the London conference gave much attention in its discussions and plans, apparently amounted, says a statement by the National City Bank of New York, to nearly or perhaps quite $2,000,000,000 in the calendar year 1920, as against about $5,000,000,000 in the year prior to the war, though the ratio of "total values" of 1920 compared with those of 1913 does not, of course, indicate a corresponding ratio in quantity, since prices of 1920 were much higher than those of 1913.

This estimate of approximately $2,000,000,000 as the total foreign trade of Germany with 60,000,000 population in 1920, as against $5,000,000,000 with 67,000,000 population prior to the war, is necessarily based upon the trade figures of the countries buying from or selling to her, since her own trade figures at the present time are not only fragmentary, but stated in units of a depreciated and constantly fluctuating currency.

The race between the United States, Great Britain and France to regain trade with Germany has been a close one. Official records of the three countries in question show that the trade of the United States with Germany in 1920 was $390,000,000, that of Great Britain £82,255,000 and that of France approximately 3,500,000,000 francs. Belgium and Italy also showed an equal trade willingness to "forget the past," while the neutrals on all of her frontages, Switzerland, Netherlands, the Scandinavian States, Czecho-Slovakia, Poland, and even Soviet Russia, showed marked gains over the preceding year, apparently bringing the grand total of Germany's foreign trade in 1920 to approximately $2,000,000,000.

---

Frank M. Foster, transportation engineer, Windsor and Detroit, has purchased 51 feet by 110 feet on the north side of Pitt Street, Windsor, Ont., where he is intending to build a large passenger car service station and motor show rooms.

The Dodge Brothers Motor Car Co., which has been closed since last December, reopened on March 17 with a force of between 3,500 and 4,000 men, it was officially announced at the company's offices. The company normally employs 20,000 men.

A very enjoyable evening was held at the King Edward Hotel, Toronto, by the firm of Barber, Wynne-Roberts & Seymour, consulting engineers, of Toronto, on the occasion of their first annual banquet on Friday night.

The Universal Tires, Ltd., has been incorporated with head office at Montreal, and capital stock of $50,000, to carry on the business of dealers in automobile tires and accessories and to manufacture, buy, sell, repair and deal in automobile tires, etc.

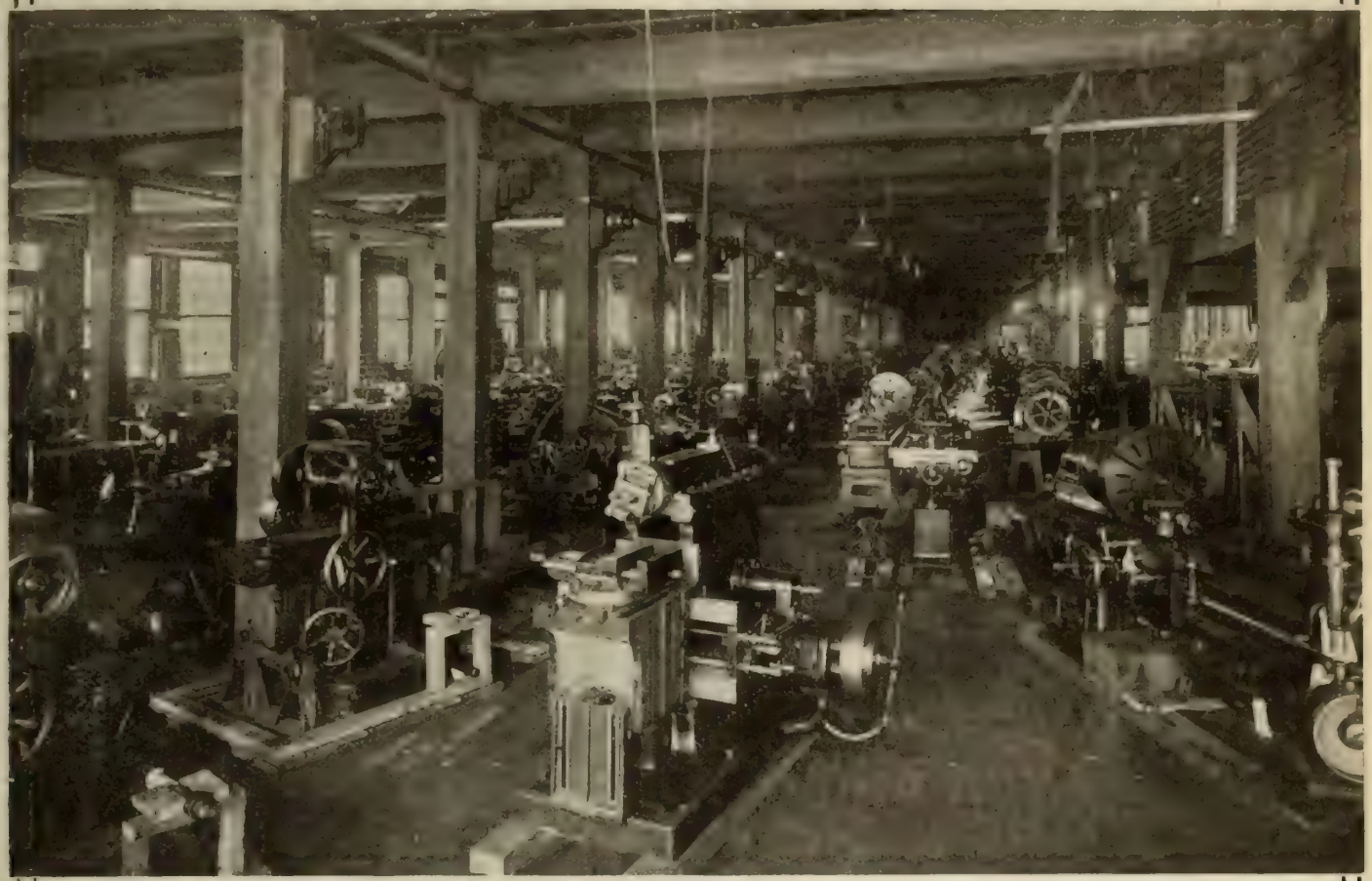
A warehouse will be erected shortly by an American plumbing and hardware supply company on York Street, London, Ont. The new building will be three stories in height and will cover approximately 4,000 square feet.

The Hart Stocker Co., Ltd., Edmonton, Alta., has been incorporated with capital stock of $2,000,000 to carry on the manufacture of farm implements, machinery, etc.

The Smiths Falls Malleable and Castings Co., Ltd., Smiths Falls, Ont., recently incorporated, have increased their capital stock from $150,000 to $750,000 and provision is made for the manufacture of steel castings. The company plan to double the capacity of their No. 2 plant and also equip a machine shop.

**New Arrangement.**—The General Combustion Co. of Canada have secured the Canadian representation for T. H. Watson & Co., of Sheffield, England, and will handle, build and sell their various electric smelting, melting and refining furnaces. The Canadian company will also handle the "Greaves-Etchells" type of furnace, largely used in United States and European countries. The General Combustion Co. are also taking over the designs of the Electric Furnace Construction Co., of Philadelphia, on the different types of electrically heated core ovens, annealing and heat-treating furnaces, and will have the active cooperation of the American company in the solution of furnace problems generally.

# MACHINE TOOLS



## From This Immense Stock we can Meet all Requirements of the Metalworking and Woodworking Industries

Included in this exhibition of machine tools are lathes, planers, millers, shapers, drill presses, grinders and other metal working tools in a variety of designs, in addition to a complete line of woodworking tools—band saws, jointers, saw benches, surfacers and pattern makers lathes, etc.. etc.

G&W MACHINERY

There is a variety of used machine tools in stock at our warehouse, many of them as good as new. You can save a good deal of expense by purchasing these machines, and they are warranted to give first-class service. We will be pleased to answer your enquiry.

GARLOCK-WALKER MACHINERY CO., LIMITED
32 Front St. West TORONTO Telephone Main 5346
MONTREAL and WINNIPEG

GARLOCK WALKER
HIGH GRADE MACHINE TOOLS

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# PURCHASING AGENTS START MOVE TO MAKE CONTRACTS BINDING

By HARRY BOTSFORD

"TWO months ago," a paper salesman told me the other day, "I had over $190,000.00 worth of orders on my books. Yesterday the president of the company called me in and told me that, due to cancellations, those same orders have dwindled to $10,000.00. Isn't that enough to discourage a fellow?"

The salesman was right—it is enough to discourage even the most stout hearted of individuals! As a matter of fact the above situation is too common to-day and it is one of the most disturbing factors that business has to contend with in this day of getting back to normal conditions. The contractual break-down is directly allied to the cancellation evil and while business men, as a rule, fume and fret over the deplorable situation, apparently little or nothing aside from a few strictly temporary emergency measures have been adopted or tried out with a view of eliminating the present evil.

The National Association of Purchasing Agents have long realized that a solution to the problem must be found and that such a solution must be arrived at by a calm getting-together of both sides affected by the issue and trying to reach some equitable, practical and inviolate form of contract which will not place any unfair burden on any of the parties concerned.

In their effort to make contracts safe the National Association of Purchasing Agents are co-operating with various trade, manufacturing and professional associations in the United States and Canada in an attempt to arrive at a co-operative contract form which will be possible to standardize. The N. A. P. A. intend to reach a contract form, which, when universally accepted and established, will result in a crystallization of business opinion toward living up to contractual obligations.

The working plan of the N. A. P. A. is simplicity itself. Each of the national commodity committees will work out a contract form meeting with their specific needs. This, in turn, will be presented to particular trade, manufacturing or professional organizations interested and suggestions and revisions requested on the form. If necessary joint conferences will meet and arrive at mutual agreements.

When the various commodity contracts are worked out they will be turned over to the standardization committee, who will then draw up a basic standard form of contract, which will meet the need of every industry, and, in conjunction with the commodity committees, make provisions for each special commodity requirement.

This briefly, is the definite program worked out by the National Association of Purchasing Agents. It is the organization's wish that every business firm and association will co-operate with them in this matter. It is not the purpose of the N.A.P.A. to inaugurate a contract form that will merely satisfy the buyer, but rather a contract form that is mutually fair in every phase to buyer and seller alike.

The N.A.P.A. have taken the initiative in the solution of this tremendously important problem and in the immense amount of work involved they must have the confidence and co-operation of the entire business and industrial world. Any suggestion as to the proposed form will be welcomed at the national headquarters of the National Association of Purchasing Agents at 19 Park Place, New York City.

Let us all help to make contracts safe.

# WELDING SOCIETY ELECTS OFFICERS

**Newly Formed Association Will Go Ahead and Do Educational Work in Canada**

The recently formed Canadian Welding Society held a meeting this month in Montreal, when the following officers were elected: J. H. Wood, Canadian manager of the Commercial Acetylene Supply Co., of Toronto, was elected president; first vice-president, T. Jones, works manager of the Canadian Vickers, Ltd.; second vice-president, H. E. Musset, sales manager of the Canada Carbide Co.; both vice-presidents are Montreal men.

The six directors are F. Borys, of L'Air Liquide Society; R. H. Combs, of the Prest-O-Lite Co.; F. C. Hamilton, of the Canadian John Wood Co.; J. G. McCarty, of the Metal and Thermit Corporation; A. J. McDougall, of the National Electric Products Co., and W. F. Thatcher, of the Dominion Oxygen Co.

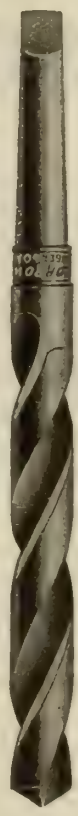


# MORROW DRILLS

## *FULLY GUARANTEED*



Every Tool we send out bears a genuine guarantee, and we will replace without trouble or delay any drill found defective in either material or workmanship. Remember MORROW for *more holes* with *less regrinding.*



**Cap Screws, Set Screws, Engine Studs**
**Semi-Finished Nuts, Special**
**Screw Machine Parts**

*Please Note Our New Montreal Address :*

JOHN MORROW SCREW & NUT CO., LIMITED
489 St. Paul Street West, Montreal, Que.

*Telephone:* Main 8418

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of your employees depend your profit and production



Don't be contented with half-way goodness or makeshift drinking arrangements

Throw out the germ-laden Drinking Cup!

Give your men a clean drink

PURO (MADE IN CANADA) SANITARY DRINKING FOUNTAIN



Allows just the proper amount of cool, clean fresh water to come through the bubbler. No spurting, overflowing, no loss. "Puro" regulates itself. "Puro" saves 35% on water bills, too. You can attach it in a few minutes. Tell us how many men, how many departments and we'll tell you how much the cost will be.

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SAY YOU SAW IT IN CANADIAN MACHINERY

RATES FOR CLASSIFIED ADVERTISING

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## Scrap Metal Market

The scrap market continues to decline.

On the Chicago market it was thought the bottom had been reached, but practically all grades have gone considerably lower. Railroads continue to pour out large lists and as they need the cash realized from this material, they are letting it go at the low figures offered.

The scrap prices are so low at Boston, that small dealers say they cannot pay loading and cartage charges and net a profit even if the material were given them, particularly is this true of turnings and borings which are down to $5.50. Mixed borings and turnings in fact have sold as low as $4.50.

Considerable weakness is shown in scrap prices on the New York market, and only a few if any grades have not dropped off during the past few days. City wrought is scarce and firm, but the other grades have declined from $1 to $2. A factor in the present decline is the low prices dealers can do in buying from the railroads.

Practically no market exists at Pittsburgh, as where ordinarily 1,000 tons would represent a minimum sale, sales at present involve single carloads. Heavy melting steel is down from $15 to $16, to $13 to $14, and bundled sheets from $11 to $12, to $10 to $11.

The scrap market at Buffalo is quiet with little inquiry. The principal interest is trading between dealers in a few cars of stove plate and No. 1 cast scrap. The stove plate is bringing $18.50 to $19, the cast about $20. One steelmaker is still paying $13.50 for heavy melting steel, and picking up a few lots at this price.

## Pig Iron Market

The downward trend which has characterized the pig iron market for many weeks continues.

On the Pittsburgh market only two sales of importance were made during the week. A merchant producer with furnaces in the Valley reports a sale of 1,500 tons of standard basic for immediate delivery to a Pittsburgh consumer at $25 furnace. One company closed for 500 tons of basic at $22.75, valley furnace, but this iron was purchased from a middleman, and it is thought will come from some of the large stocks lying in the yards of steel manufacturers in the Mahoning Valley. There is very little interest shown in Bessemer, and very few inquiries in foundry iron.

Chicago reports that a melter in Wisconsin who recently bought 2,000 tons of Northern foundry at $26 delivered has purchased a like amount at the same price. A sale was made of 200 tons of Southern foundry at $24 base Birmingham. Generally speaking, the market is quiet and prices continue to slide downward.

On the New York market a sale was made of 500 tons of No. 2 plain pig iron for prompt delivery at $24.46 eastern Pennsylvania furnace. This is the lowest price which has been recorded. The seller will not sell any more at that price and is now asking $26 furnace. There is a little improvement in inquiry, and one firm is figuring on several thousand tons for prompt shipment.

The market shows very little change at Cleveland. One interest reports sales in prompt shipment foundry iron during the week aggregating 2,000 tons and including one 500 ton lot for shipment to New England. This business was taken at $26. This is the usual quotation on foundry iron in the Valley district, but $27 is being quoted by most of the local furnaces.

The Buffalo market shows no improvement from the low ebb reached last week, nor is there much change in sight in the immediate future. Sales are light, a total movement of 2,000 tons for the week is reported by one furnace. Inquiry is poor. Little is heard of resale, and this is a hopeful sign to furnace interests which see a possibility that buyers of resale iron will be obliged to deal with furnaces rather than brokers.

Philadelphia reports that the sales of the week have been confined to foundry iron, a total of a few thousand tons, including one lot of 1,000 tons and another of 600 tons. Prices on this business have ranged from $25 to $26 furnace for iron analyzing 1.75 to 2.25 silicon.

## Personal

Senator Smeaton White, of Montreal, was elected to the board of the Steel Company of Canada at a meeting of the directors. The election of Senator White was to fill the vacancy created by the death of Francis H. Whitton, of Hamilton.

The death occurred on March 16 of Kenneth A. MacKenzie, of the Technical School staff, Toronto. Mr. MacKenzie has been with the Technical School since 1917. Previous to that he was a teacher in the public schools of Weston and Bolton, being later engaged in engineering work in British Columbia and other parts of the West.

J. C. Blair, Canadian representative of the Alfred Herbert Co., has returned to Toronto after an extended trip through the eastern territory, including Montreal through to Halifax, and also including steel and coal areas of Nova Scotia and Cape Breton. Mr. Blair was particularly impressed with the reception accorded the presentation of his case for British-made goods, this being the first time he has had the opportunity of going over the ground personally since coming to Canada.

### NEW CATALOGUES

Those interested in any of the catalogues described below can procure a copy of the same by writing direct to these firms. Mention that you noticed this in Canadian Machinery.

#### ROLLER BEARING BOOKLET

The American Roller Bearing Co., Pittsburgh, Pa., have issued a new bulletin No. 1005, dealing with their type C roller bearings. These are the heavy duty and standard types, and first of all the characteristics of these bearings are gone into. The proper installation of the same is next discussed, after which several applications are shown in photographic and line drawing form. The specifications covering these bearings completes this interesting booklet, and to those interested in roller bearings, we feel sure it would prove of interest.

#### TOOL HOLDER CATALOGUE

The Canadian Production Tool Co., Ltd., Walkerville, Ont., have issued a very interesting catalogue dealing with their new line of tool steel tool holders. These tool holders are said to be able to use up scrap high speed steel of all sizes within their range, and even worn out drills are used as turning tools with success.

Various sizes and styles are made, these being shown in detail. Special tool holders are also illustrated, and in fact the 32 pages of this book is full of information to the man wishing to economize on his steel.

#### HELPS AND HINTS

The British Aluminium Co., Ltd., with Canadian offices at 263-267 Adelaide St., Toronto, Canada, have issued four very useful booklets on aluminum. Booklet No. 1 contains hints and helps for foundry users of this metal, while booklet No. 2 is devoted to aluminum spinning and press work.

The third booklet covers this metal as used in machine shop practice, and the fourth volume speaks on the finishing processes sometimes put on this metal. These include cleaning, polishing, painting, coloring, etc. These booklets have been bound in fairly stiff covers and are made to fit the pocket, so that they should prove a ready reference to those interested.

#### COTTRELL PROCESS

The Western Precipitation Co., 1016 West 9th St., Los Angeles, Cal., have issued a catalogue dealing with their Cottrell processes of electrical precipitation of suspended particles from gases. First of all the history of electrical precipitation is given, after which the operation of the Cottrell precipitator is explained.

Next the construction of the same is discussed, after which a number of applications are shown in photographic form. Particulars of these installations are given, and to those interested in this process we can recommend a reading of the booklet which consists of some 32 pages.

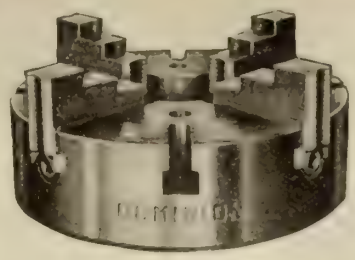
#### INTERESTING DATA

F. H. Emra and partners, civil engineers, Central Chambers, Ottawa, have taken over the Canadian rights for various English machines, some of which have been forwarded for our attention. These take the form of two catalogues, the first of these being entitled "Mechanical Power Transmission."

This book deals with the Power Plant Co., Ltd., products of West Drayton, Middlesex, England, and is divided into several sections, the first of which is devoted to a talk about themselves and their facilities. Section two deals with double helical and other gears, and explains their unique method of manufacture.

The third section deals with photographic reproductions of interesting installations. Section four describes briefly the Sykes gear cutting machine, while section five discusses the use of their flexible couplings. Section six, which is the last, deals with the Mitchell type of thrust block, and states its employment in marine propulsion.

The second book deals exclusively, and more fully with the Sykes patent gear generating machine, and discusses how it was evolved, improved upon, and how one operator can now attend to three machines.

# DOMINION CHUCKS

STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY



## All Screws Are Reversible

SCREWS are made of the best grade steel. Both ends are broached and are heat treated after machining. They are reversible, so that either end may be used, are large enough in diameter to stand the torsional strains applied by operator when setting up his work. They are made to give the best service—and may be depended upon to stand up under the hardest usage.

DOMINION STEEL PRODUCTS CO. LIMITED

*Engineers • Manufacturers*

BRANTFORD, CANADA


#### MACHINE TOOL CATALOGUE

The St. Louis Machine Tool Co., St. Louis, Mo., have issued a catalogue, No. 16, which deals with their line of machine tools. This includes grinders of various types, polishing machines, tapping machines, tapping chucks, and safety collars and guards. Details are given regarding the various parts going to make up these machines, and some interesting data regarding grinders is given on the last page of this book.

#### DIAMOND STATE FIBRE

A handsome, substantially-bound new catalog, profusely illustrated and containing a summary of Diamond Fibre and its different uses, has just been issued by the Diamond State Fibre Company of Canada, Limited. This catalog should prove of interest to manufacturers, engineers and others who wish to keep abreast of improvements in raw material and the finished product.

#### STATIC ELECTRICITY.

Here is a peculiar case, where trouble arose from static electricity in a textile factory. The machine affected was a 15 horse-power motor fixed to a platform suspended from a wooden ceiling. The frame of the motor was not earthed, the only electrical connection being that of the leads. It was observed that flashing between the stator and rotor took place at intervals of from four to ten minutes, and on dry days was very pronounced. The motor was tested for ordinary faults, but nothing was found out of order. Finally, the flashing affected the stator insulation, and the motor was burned out. A spare motor was put into use immediately, but still there was the same amount of flashing. Then at last the frame of the machine was earthed, and the trouble ceased. Steps were next taken to devise a means of collecting and disposing of the static charge from the belt, when the trouble was completely overcome.

The American Society of Testing Materials have adopted as standard a test for determining the softening point of fire-clay brick, by comparison of test cones with standard Orton pyrometric cones heated in a suitable furnace.

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1 VERTICAL BOILER [illegible] LBS w.p.

Box [illegible] Canadian Machinery.

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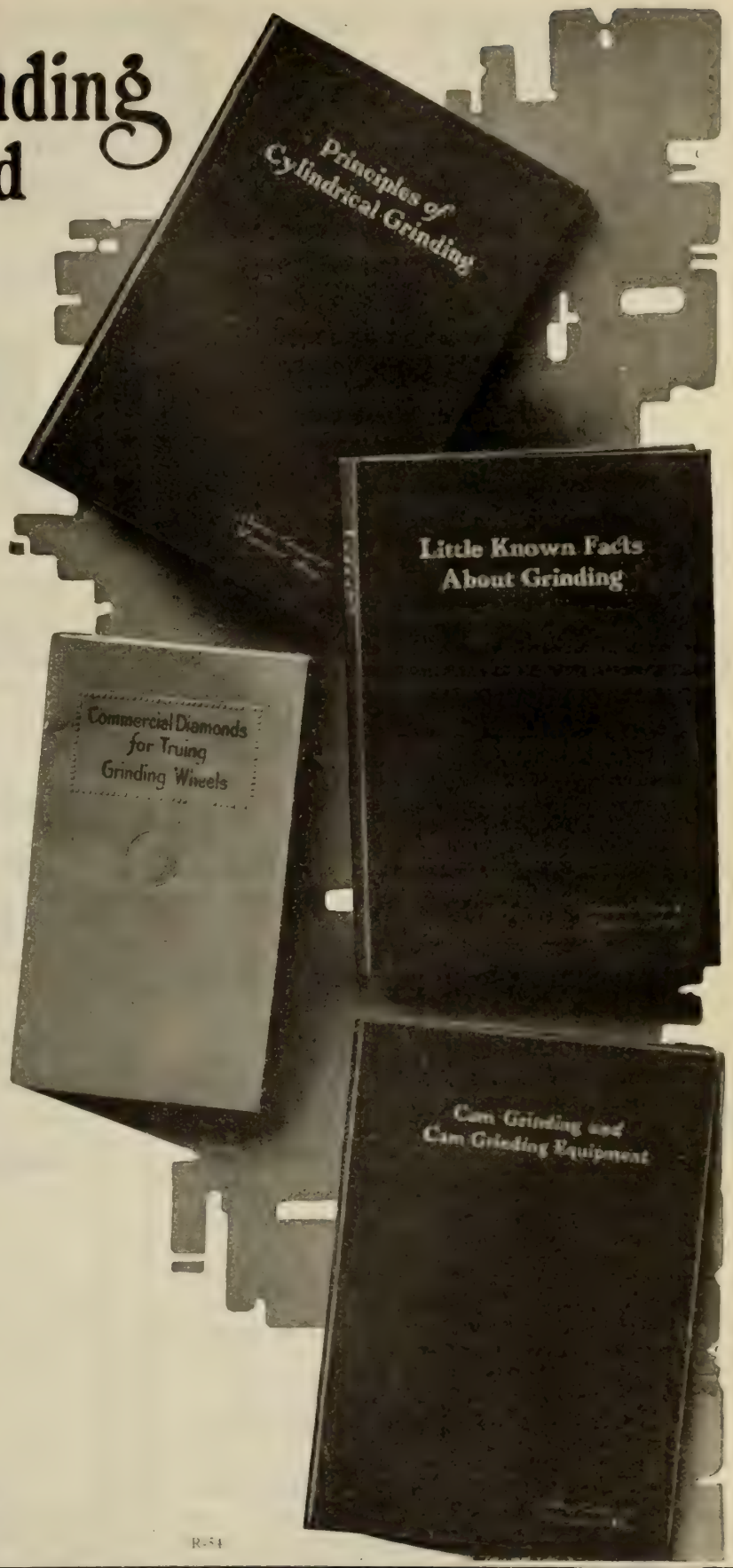
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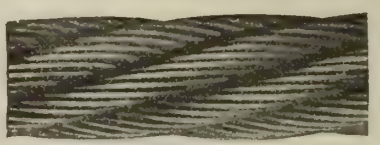
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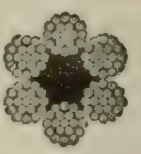
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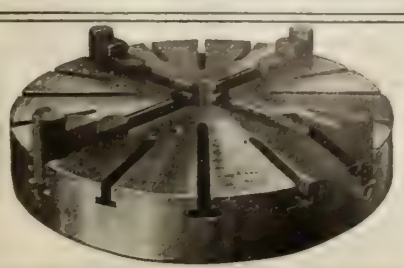
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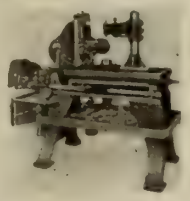
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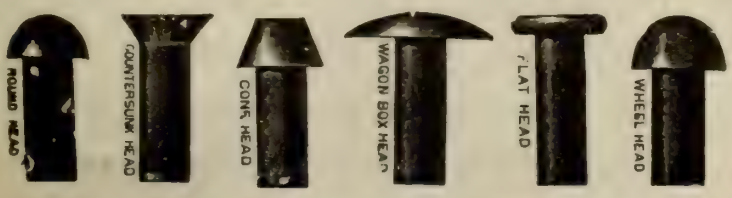
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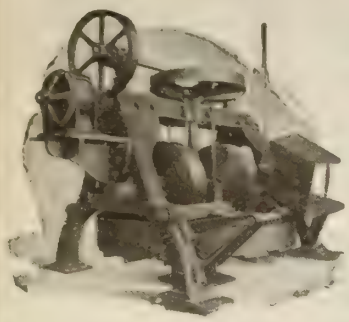
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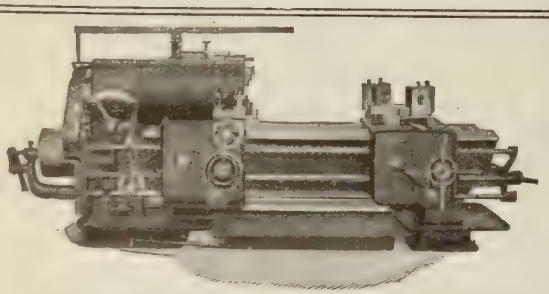
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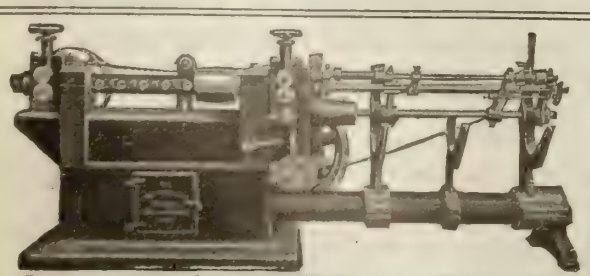
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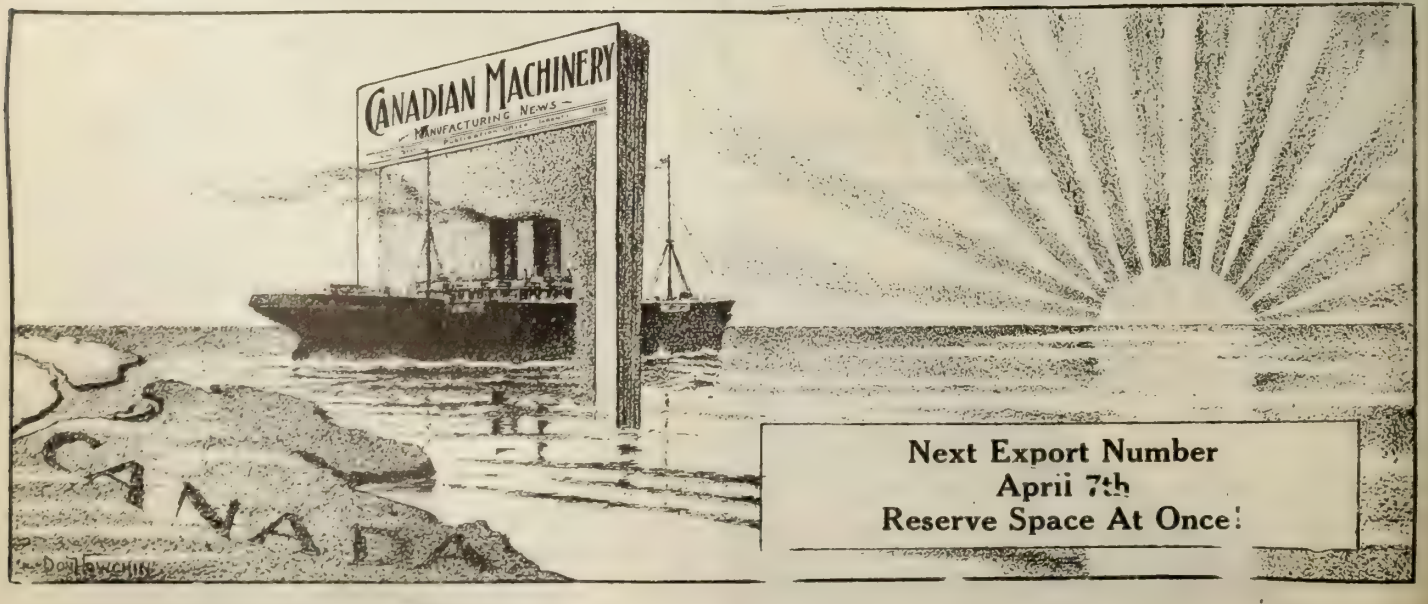
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# Canadian Machinery BUYERS DIRECTORY

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**Abrasive Discs**
Norton Co. of Can., Ltd., Hamilton, Ont.
Oakey & Sons, Ltd., John London S.E., Eng.
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Abrasive Materials**
Can. Hart Products, Ltd., Hamilton, Ont.
Dom Abrasive Wheel Co., Ltd., Mimico, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Acetylene, Dissolved**
L'Air Liquide Society, Toronto, Ont.

**Accumulators, Hydraulic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Air Lifts**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Air Purifiers and Coolers**
Sturtevant Co., B. F., Boston, Mass.

**Analyses, Chemical**
Toronto Testing Laboratory, Toronto, Ont.

**Angle Bars**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Anvils**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Columbia Hdwe. Division, Cleveland, O.
Petrie, Ltd., H. W., Toronto, Ont.

**Arbors**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Cleveland Twist Drill Co., Cleveland, O.
Ford-Smith Machine Co., Hamilton, Ont
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Jacobs Mfg. Co., Hartford, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.

**Axles, Car**
Dom. Foundries & Steel, Hamilton, Ont.

**Babbitt Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

**Balls, Brass, Bronze and Steel**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian SKF Co., Toronto, Ont.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

**Barrels, Tumbling**
Baird Machine Co., Bridgeport, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Bars, Boring**
Armstrong Bros. Tool Co., Chicago, Ill.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Madison Mfg. Co., Muskegon, Mich.

**Bars, Boring, Portable**
Underwood Corp., H. B., Philadelphia, Pa

**Bars, Bronze Cored**
Moore & Son, Thos., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

**Bars, Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Bars, Steel**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Dom Foundries & Steel, Hamilton, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Ontario Metal Products Co., Ltd., Toronto, Ont
Pilot Steel & Tool Co., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.

**Bearings, Ball**
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Railway Roller Bearing Co., Syracuse, N.Y.

**Bearings, Bronze**
Tallman Brass & Metal Co., Hamilton, Ont.
Railway Roller Bearing Co., Syracuse, N.Y.

**Bearings, Die-Cast**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y
Tallman Brass & Metal Co., Hamilton, Ont.

**Bearings, Journal**
Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Bearings, Roller**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

**Belt Cement**
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

**Belt Clamps**
Graton & Knight Mfg. Co., Worcester, Mass.

**Belt Dressings and Fillers**
Aikenhead Hardware Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont
Graton & Knight Mfg. Co., Worcester, Mass.

**Belt Fasteners**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Belt Lacing**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

**Belt Lacing, Steel**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing, Hinged**
Flexible Steel Lacing Co., Chicago, Ill

**Belt Lacing, Flexible Steel**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing Machines**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
McLaren Belting Co., J. C., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Belt Joiners, Conveyor**
Flexible Steel Lacing Co., Chicago, Ill

**Belt Tools**
Graton & Knight Mfg. Co., Worcester, Mass

**Belting, Chain**
Can Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Belting, Fabric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
Goodyear Tire & Rubber Co of Can., Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Foss Machinery & Supply Co., Geo F., Montreal, Que
McLaren Belting Co., J. C., Montreal, Que.
Sumner & Co., New York City

**Belting, Leather**
Atkins & Co., Inc., E. C., Indianapolis, I
Can. Fairbanks-Morse Ltd., Montreal Q
Federal Eng'r'ng Co., Ltd., Toronto, Ont
Graton & Knight Mfg Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Smith Belting Co., Toronto, Ont.
Sumner & Co., New York City.
Tullis & Son, Ltd., John, Glasgow, Scot

**Belting, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co, Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.
Quaker City Rubber Co., Philadelphia, Pa

**Belts, Abrasive**
Federal Eng'r'ng Co., Ltd., Toronto, Ont
Oakey & Sons, Ltd., John, London, S.E., Eng.

**Bench Countershaft Standards**
Ford-Smith Machine Co., Hamilton, Ont

**Benches, Work**
Aikenhead Hardware Ltd., Toronto, Ont.

**Bending Machines, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bertrams Ltd., Edinburgh, Scotland.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy. Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Bins, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Blocks**
Ford Chain Block Co., Philadelphia, Pa
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Chain (See Hoists, Hand)**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block Co., Philadelphia, Pa.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Die**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Blocks, Pillow**
Can. Link-Belt Co., Toronto, Ont.

**Blowers**
Can. Blower & Forge Co., Ltd., Kitchener.
General Combustion Co. of Can., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Sturtevant Co., B. F., Boston, Mass.

**Bolt and Nut Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Bolt and Nut Machinery, Automatic**
National Acme Co., Cleveland, Ohio.

**Bolts and Nuts**
London Bolt & Hinge Works, London, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Petrie, Ltd., H. W., Toronto, Ont.
Steel Co of Canada, Ltd., Hamilton, Ont.

**Bolt Threading Die Heads**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa

**Boosters**
Sturtevant Co., B. F., Boston, Mass.

**Boring and Turning Mills, Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.

**Boring, Drilling and Milling Machines, Horizontal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy. Co., Toronto, Ont
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont
Landis Tool Co., Waynesboro, Pa

**Boring, Drilling and Milling Mach., Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Canada Machinery Corp., Galt, Ont
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy. Co., Toronto, Ont
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont
Oliver Machinery Co., Grand Rapids, Mich
Petrie, Ltd., H. W., Toronto, Ont

**Boring Heads**
Aikenhead Hardware Ltd., Toronto, Ont.

**Boring Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Gisholt Machine Co., Madison, Wis

**Brakes, Magnetic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Brass**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bricks, Fire**
Elk Firebrick Co. of Can., Ltd., Hamilton, Ont.

**Bridges**
Hamilton Bridge Works Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

**Broaching Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont

**Bronze**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bronze, Phosphor**
British Smelting & Refining Co., Ltd Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont
Ontario Metal Products Co., Ltd., Toronto, Ont

**Bucket Carriers, Pivoted**
Can. Link-Belt Co., Toronto, Ont

**Buffing or Polishing Machines (See Polishing and Buffing Machines)**
Blount Co., J. G., Everett, Mass.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Petrie, Ltd., H. W., Toronto, Ont.
U S. Electrical Tool Co., Cincinnati, O

**Bulldozers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy Co., Toronto, Ont

**Burners, Oil and Gas**
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

**Bushings**
Fisher Motor Co., Ltd., Orillia, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll Ont.

**Cabinets, Oil**
S. F. Bowser & Co., Ltd., Toronto, Ont

**Calipers**
Brown & Sharpe Mfg. Co., Providence, R.I
Starrett Co., L. S., Athol, Mass.

**Cams**
Canada Foundries & Forgings Co., Welland, Ont.

**Can-Making Machinery (See Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y
Brown, Boggs & Co., Ltd., Hamilton Ont
MacKinnon Steel Co., Sherbrooke, Que

# BUYERS' DIRECTORY

Union Carbide Co. of Can., Ltd., Welland, Ont.

**Cars, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Castings, Aluminum**
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Brass and Bronze**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Copper**
Can. Hanson & Van Winkle Co., Toronto, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Marine**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Castings, Die Molded**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Ferro-Alloy**
Can. Steel Foundries, Montreal, Que.

**Castings, Iron**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Hyd. Press**
Can. Steel Foundries, Montreal, Que.

**Castings, Monel Metal**
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

**Castings, Naval Bronze**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Nichrome**
Can. Driver-Harris Co., Walkerville, Ont.

**Castings, Nickel**
Can. Hanson & Van Winkle Co., Toronto, Ont.

**Castings, Semi-Steel**
Davidson Mfg. Co., Thos., Montreal, Que.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

**Castings, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

**Cements, Iron**
Smooth Mfg. Co., Jersey City, N.J.

**Centering Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Chains (See Sprockets and Chains)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chains, Driving**
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chasers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chemists**
Toronto Testing Laboratory, Toronto, Ont.

**Chucking Machines**
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Chucks, Drill**
Jacobs Mfg. Co., Hartford, Conn.

**Chucks, Drill and Tap**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Lathe**
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Magnetic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**
Columbia Hdwe. Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

**Cleaners, Metal, Waste, General**
Oakley Chemical Co., New York, N.Y.

**Clocks, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Clutches, Friction**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**
Can. Link-Belt Co., Toronto, Ont.

**Collars, Shaft or Set**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

**Collets**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compressors, Air**
Curtis Pneumatic Machinery Co., St. Louis, Mo.

**Compressors, Air and Gas**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**
Ford-Smith Machine Co., Hamilton, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Conveyor Belt Joiners**
Flexible Steel Lacing Co., Chicago, Ill.

**Copper**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Cored Bronze Bars**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Cotter Pins**
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Counterbores**
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Countershafts**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Couplers, Car and Locomotive**
Can. Steel Foundries, Montreal, Que.

**Couplings, Flexible**
Holden Co., Ltd., Montreal, Que.

**Couplings, Rigid**
Bernard Industrial Co., A., Fortierville, Que.

**Couplings, Shaft**
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

**Cranes, Electric**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.

**Cranes, Hand (See Hoists, Hand)**
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

**Cranes, Locomotive**
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Cranes, Traveling**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Crank Pin Turning Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia, Pa.

**Cutters, Flue**
Holden Co., Ltd., Montreal, Que.

**Cutters, Gear**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Milling**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Machine Co., Cleveland.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.

**Cutters, Stay Bolt**
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Thread**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.

**Cutting-Off Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Cutting-Off Machines, Pipe (See Pipe Cutting and Threading Machines)**
Landis Machine Co., Inc., Waynesboro, Pa.
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Cutting-Off Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Pilot Steel & Tool Co., Montreal, Que.

**Cutting Oil Filters (See Oil Filtering Systems)**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Cataract Refining Co., Toronto, Ont.

**Cutting, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

**Cutting, Oxy-Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Dealers, Machinery (See Searchlight Section)**
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**De[illegible] Straps**
[illegible]onsolidated Rubber Co., Ltd., [illegible]real, Que.

**D[illegible]onds, Black and [illegible]ugh**
Joyce-Koebel Co., Inc., [illegible]w York, N.Y.

**Diamond, Carbon and Bortz**
Joyce-Koebel Co., Inc., [illegible]w York, N.Y.

**Diamond Tools**
Aikenhead Hardware Ltd. Toronto, Ont.
Can. Desmond-Stephan Co., Hamilton, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Wheel Trueing Tool Co., Detroit, Mich.

**Diamond Crossings**
Can. Steel Foundries, Montreal, Que.

**Die-Castings**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Dies, Pipe-Threading**
Jones & Lamson Machine Co., Springfield, Vt.

**Die Sinking Machines, Automatic**
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

**Die Sinkers**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Screw and Thread Cutting**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

# BUYERS' DIRECTORY

**Dies, Forging**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

**Dies, Hammer**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Self-Opening, Adjustable**
Can. Fairbanks-Morse Co., Ltd., Montreal
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Dies, Threading-Opening**
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Disc Cement**
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Dividing Heads**
Ackworthle, Ltd., John, Birmingham, Eng.
Dickow, Fred. C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont
Hendey Machine Co., Torrington, Conn
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Dogs, Lathe and Milling Machine**
Armstrong Bros. Tool Co., Chicago, Ill

**Drafting Boards and Tables**
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Drafting Materials**
American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Dressers, Grinding Wheel**
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Drill Holders**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drill Rods**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Drill Speed...**
Canada M... Corp., Galt, ...

**Drilling Ma... ine Heads**
Henry & W... Mfg Co., Hartford, Conn.
Hoefer Mfg ...o., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

**Drilling Machines, Automatic**
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

**Drilling Machines, Bench**
Beacon Engineering Co., Tipton, England.
Can Blower & Forge Co., Ltd., Kitchener
Can. Fairbanks-Morse Co., Ltd., Montreal.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng
U S Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Electric and Hand**
Aikenhead Hardware Ltd., Toronto, Ont
Can. Fairbanks-Morse Co., Ltd., Montreal
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Gang**
Bertram & Son Co., Ltd., The Jonn, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy Co., Toronto, Ont
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drilling Machines, Heavy Duty**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Bertram & Son Co., Ltd., The John, Dundas Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Multiple Spindle**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

**Drilling Machines, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Drilling Machines, Portable**
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Radial**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Drilling Machines, Sensitive**
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Turret**
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

**Drilling Machines, Vertical**
Aurora Tool Works, Aurora, Ind
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng
Sprellinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Drills, Center**
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drills, High Speed Twist**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Lyman Tube & Supply Co., Montreal, Que
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Drills, Twist and Flat**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.

**Dust Handling Equipment**
Can. Blower & Forge Co., Ltd., Kitchener.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Electrical Instruments**
Bristol Co., Waterbury, Conn
Northern Electric Co., Montreal, Que.

**Electrical Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O.

**Elevating Trucks (See Trucks)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Elevators and Conveyors**
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que
Matnews Gravity Carrier Co., Port Hope, Ont.

**Emery Wheels (See Grinding Wheels)**
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I
Can. Hart Products, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Engines, Capstan**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Engineers, Mechanical**
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif

**Expanders, Tube**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que
Jardine & Co., A. B., Hespeler, Ont
Petrie, Ltd., H. W., Toronto, Ont.

**Eyeglasses, Safety (See Goggles, Safety)**
Prest-O-Lite Co. of Can., Toronto, Ont
Willson Goggles, Inc., Reading, Pa.

**Fans, Electric**
Can. Blower & Forge Co., Ltd., Kitchener
Can. Fairbanks-Morse Co., Ltd., Montreal
Northern Electric Co., Montreal, Que
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Sturtevant Co., B. F., Boston, Mass

**Fans, Exhaust**
Can. Blower & Forge Co., Ltd., Kitchener.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Sturtevant Co., B. F., Boston, Mass.

**Fans, Ventilating**
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Petrie, Ltd., H. W., Toronto, Ont
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass

**Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont
Northern Electric Co., Montreal, Que.

**File Handles**
Ingersoll File Co., Ltd., Ingersoll, Ont.

**Files and Rasps**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Canada Saw Co., Montreal, Que

**Filing Machines**
Garlock-Walker Mchy. Co., Toronto, Ont
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Filler, Iron (See Cements, Iron)**
Smooth Mfg. Co., Jersey City, N.J

**Fire Extinguishers**
Can. Consolidated Rubber Co., Ltd Montreal, Que.

**Fittings, Pipe**
International Malleable Iron Co., Guelph, Ont.

**Flexible Shafts**
Aikenhead Hardware Ltd., Toronto, Ont

**Flux, Galvanizing**
British Smelting & Refining Co., Ltd Montreal, Que.

**Fluxes, Welding**
L'Air Liquide Society, Toronto, Ont.

**Forging Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy. Co., Toronto, Ont
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot

**Forgings, Drop**
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd Toronto, Ont.

**Forgings, Hammer**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Dom Foundries & Steel, Hamilton, Ont
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S
Steel Co. of Canada, Ltd., Hamilton, Ont

**Foundry Equipment**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Ford-Smith Machine Co., Hamilton, Ont
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont

**Foundry Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I
Rice Lewis & Son, Ltd., Toronto, Ont
Sturtevant Co., B. F., Boston, Mass

**Frogs, Spring or Rigid**
Can. Steel Foundries, Montreal, Que.

**Fuel Oil Burning System**
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Heat Treating Coal**
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers Que.
Rockwell Co., W. S., New York City

**Furnaces, Heat Treating Oil and Gas**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Bellevue Industrial Furnace Co., Detroit
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd Hiram, Walkerville, Ont.

**Furnaces and Ovens, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd Hiram, Walkerville, Ont.

**Furnaces, Tempering and Annealing**
Brown & Sharpe Mfg. Co., Providence, R.I
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont

**Furniture, Machine Shop**
Garlock-Walker Mchy. Co., Toronto, Ont

**Gages, Comparator**
Jones & Lamson Machine Co., Springfield, Vt.
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont.
Perdue, W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass.

**Gages, Measuring (See Tool Work)**
Chesterman & Co., Ltd., J., Sheffield, Eng
Crescent Machine Co., Ltd., Montreal, Q
Greenfield Tap & Die Corp., Galt, Ont
Johansson Inc., C. E., Windsor, Ont
Starrett Co., L. S., Athol, Mass.

**Gages, Recording**
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.

# BUYERS' DIRECTORY

**Gages, Snap, Thread and Cylindrical**
Ackworthie, Ltd., John, Birmingham, Eng
Brown & Sharpe Mfg. Co., Providence, R I
Can. Fairbanks-Morse Co., Ltd., Montreal
Greenfield Tap & Die Corp., Galt, Ont
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Standard**
Armstrong Whitworth Co of Can., Lt Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis.
Johansson Inc., C. E., Windsor, Ont

**Gages, Thread**
Ackworthie, Ltd., John, Birmingham, Eng
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass

**Garnet, Emery and Flint Paper and Cloth**
Ritchey Supply Co., Toronto, Ont.

**Gas, Coal Compressed**
L'Air Liquide Society, Toronto, Ont

**Gas, Compressed**
Prest-O-Lite Co. of Can., Toronto, Ont

**Gaskets**
Diamond State Fibre Co of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg Co., Jersey City, N J

**Gear Blanks**
Canada Foundries & Forgings Co., Welland, Ont.
Can Steel Foundries, Montreal, Que
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom Foundries & Steel, Hamilton, Ont
Hamilton Gear & Machine Co., Toronto Ontario
Philadelphia Gear Works, Philadelphia, Pa.

**Gear-Cutting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R I
Can. Fairbanks-Morse Co., Ltd., Montreal.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

**Gear Testing Machines**
Brown & Sharpe Mfg. Co., Providence, R I

**Gears, Cast**
Can. Link-Belt Co., Toronto, Ont.
Can Steel Foundries, Montreal, Que
Dom Foundries & Steel, Hamilton, Ont
Fisher Motor Co., Ltd., Orillia, Ont
Hull Iron & Steel Foundries, Hull, Que

**Gears, Cut**
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co of Can., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom Steel Products Co., Brantford, Ont
Ford-Smith Machine Co., Hamilton, Ont
Gardner & Son, Robt., Montreal, Que.
Hamilton Gear & Machine Co., Toronto, Ontario.
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., B., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que

**Gears, Dressed**
Kennedy & Sons, Wm., Owen Sound, Ont

**Gears, Forged**
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Gears, Herringbone**
Dom Steel Products Co., Brantford, Ont
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

**Gears, Machine Moulded**
Can. Steel Foundries, Montreal, Que

**Gears, Rawhide (See Gears, Cut)**
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear, Silent Chain**
Gardner & Son, Robt., Montreal, Que
Morse Chain Co., Ithaca, N Y
Can. Link-Belt Co., Ltd., Toronto, Can
Hans Renold of Canada, Ltd., Montreal, Quebec.

**Gears, Worm**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto Ontario.

**Generators, Acetylene**
L'Air Liquide Society, Toronto, Ont

**Generators, Electric**
Holden Co., Ltd., Montreal, Que
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Goggles, Safety**
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

**Grab Buckets**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Grease Cups, Pressed Steel and Brass**
Can. Winkley Co., Ltd, Windsor, Ont.

**Greases, Lubricating**
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

**Grinding Discs**
Ritchey Supply Co., Toronto, Ont.

**Grinding Machines**
Brown & Sharpe Mfg. Co., Providence, R I
Can. Fairbanks-Morse Co., Ltd., Montreal.

**Grinding Machines, Abrasive Belt**
Beacon Engineering Co., Tipton, England
Norton Co of Can., Ltd., Hamilton, Ont

**Grinding Machines, Automatic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Bench**
Aikenhead Hardware Ltd., Toronto, Ont
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F., Montreal, Que
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Grinding Machines, Center**
U S. Electrical Tool Co., Cincinnati, O
Wisconsin Electric Co., Racine, Wis

**Grinding Machines Chaser**
Jones & Lamson Machine Co., Springfield, Vt.

**Grinding Machines, Cutter and Reamer**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Cylindrical**
Garlock-Walker Mchy. Co., Toronto, Ont
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Die**
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio
National Machinery Co., Tiffin, Ont.

**Grinding Machines, Disc**
Beacon Engineering Co., Tipton, England
Ford-Smith Machine Co., Hamilton, Ont

**Grinding Machines, Drill**
Beacon Engineering Co., Tipton, England
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Face**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Floor and Tool**
Beacon Engineering Co., Tipton, England.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Mower Tool Co., Erie, Pa
National Acme Co., Cleveland, Ohio
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng

**Grinding Machines, Internal**
Garlock Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que

**Grinding Machines, Portable**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Power Oscillating Tool**
Herbert Ltd., Alfred, Toronto, Ont.

**Grinding Machines, Ring Wheel**
Ford-Smith Machine Co., Hamilton, Ont

**Grinding Machines, Snagging**
Blount Co., J. G., Everett, Mass.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Surface**
Garlock-Walker Mchy. Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machinery, Tool Post**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Universal**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.

**Grinding Wheels**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co of Canada, Ltd., Brantford, Ont.

**Guards, Machinery and Window**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Guards, Electric Lamp**
Flexible Steel Lacing Co., Chicago, Ill.

**Gun-Barrel Machinery**
Steinle Turret Machine Co., Madison, Wis.

**Hack Saws, Power**
Ackworthie, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Hamilton, Canada.
Garlock-Walker Mchy. Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hammers, Chipping**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hammers, Drop**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

**Hammers, Electric**
Aikenhead Hardware Ltd., Toronto, Ont
Brown, Boggs & Co., Ltd., Hamilton, Ont
Holden Co., Ltd., Montreal, Que.

**Hammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich

**Hammers, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hammers, Rivetting**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hangers, Shafting**
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Terry & Co., John C., Birmingham, Eng
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hardening, Case-Hardening and Tempering**
Hamilton Gear & Machine Co., Toronto, Ont.

**Hardness Testing Apparatus**
Shore Instrument Co., Jamaica, N.Y.

**Heating**
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.

**Hobbing Machines**
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hobs**
Armstrong-Whitworth of Canada, Ltd. Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R.I
Greenfield Tap & Die Corp., Galt, Ont
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.

**Hoists, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Shepard Electric Crane & Hoist Co. Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

**Hoists, Hand**
Lyman Tube & Supply Co., Montreal, Que
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Hoists, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Curtis Pneumatic Machinery Co., St Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont

**Holders-On, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Cleveland Pneumatic Tool Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill

**Hose, Flexible Steel**
Can. Fairbanks-Morse Co., Ltd., Montreal
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Hose, Industrial**
Dunlop Tire & Rubber Goods Co., Ltd. Toronto, Ont.
Goodyear Tire & Rubber Co. of Can. Ltd., Toronto, Ont.

**Hose, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Foamite Firefoam Co., Hamilton Ont.

**Hydraulic Leather**
Graton & Knight Mfg. Co., Worcester Mass.

**Hydraulic Machinery**
Bertram & Son Co., Ltd., The John Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.

**Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Index Centers**
Dickow, Fred. C., Machinery Co., Chicago, Ill.

**Igniters, Gas Engine**
Canada Foundries & Forgings Co., Welland, Ont.

**Indicators, Speed and Test**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.

**Insulation**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Jacks, Hydraulic**
Norton, A. O., Boston, Mass.

**Jacks, Planer**
Armstrong Bros. Tool Co., Chicago, Ill
Starrett Co., L. S., Athol, Mass.

Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que.
Crescent Machine Co., Ltd., Montreal, Q.

# BUYERS' DIRECTORY

**Jigs and Fixtures (See Tool Work)**
Fisher Motor Co., Ltd., Orillia, Ont
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que

**Keyseating Machines**
Bilton Machine Co., Bridgeport, Conn
Garlock-Walker Mchy. Co., Toronto, Ont
Morton Mfg Co., Muskegon, Mich
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Keys, Machine**
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

**Knives, Machine**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Oliver Machy Co., Grand Rapids, Mich.
Simonds Canada Saw Co., Montreal, Que.

**Knurl Holders**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lacing Leather**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

**Lamps, Electric**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**Lathe Attachments**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.

**Lathe Pans, Portable**
Canada Machinery Corp., Galt, Ont.

**Lathe Tools**
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

**Lathes, Automatic and Semi-Automatic**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Bench**
Archibald & Co., Chas. P., Montreal, Q
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lathes, Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield Vermont.
McDougall Co., Ltd., R., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Engine**
Archibald & Co., Chas. P., Montreal, Q
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Hardinge Bros., Inc., Chicago, Ill
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill
Roelefson Machine & Tool Co., Toronto, Ont.
Sidney Machine Tool Co., Sidney, Ohio
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Extension and Gap**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich

**Lathes, Heavy Duty Projectile Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blaskill Wire Machy. Co., Ltd., Montreal
Sidney Machine Tool Co., Sidney, Ohio
Steinle Turret Machine Co., Madison Wis
Williams Machinery & Supply Co., A. R., Montreal, Que

**Lathes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio
Blount Co., J. G., Everett, Mass
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio

**Lathes, Polishing (See Polishing and Buffing Machines)**
Ford-Smith Machine Co., Hamilton, Ont.

**Lathes, Relieving**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn
McDougall Co., Ltd., R., Galt, Ont.

**Lathe, Universal Hand**
Brown & Sharpe Mfg Co., Providence, R I.

**Lathes, Screw-Cutting**
Jones & Lamson Machine Co., Springfield, Vt.

**Lathe, Speed and Hand**
Blount Co., J. G., Everett, Mass.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy Co., Grand Rapids, Mich

**Lathes, Spinning**
Terry & Co., John C., Birmingham, Eng.

**Lathes, Threading**
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

**Lathes, Vertical Turret**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

**Lathes, Wood Turning**
Blount Co., J. G., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy. Co., Toronto, Ont
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Lead Pipe**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Lighting Fixtures**
Northern Electric Co., Montreal, Que
Tallman Brass & Metal Co., Hamilton, Ont

**Linoleum Mill Machinery**
Bertrams Ltd., Edinburgh, Scotland

**Liquid Air Plants**
L'Air Liquide Society, Toronto, Ont

**Lockers, Clothes**
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

**Lubricants**
Cateract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Lubricating Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can

**Machinists' Small Tools**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg Co., Providence, R I
Can. Fairbanks-Morse Co., Ltd., Montreal
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont
Pilot Steel & Tool Co., Montreal, Que
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que
Rice Lewis & Son, Ltd., Toronto, Ont
Rockford Milling Machine Co., Rockford Ill.
Starrett Co., L. S., Athol, Mass
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Manganese Steel**
Can. Steel Foundries, Montreal, Que

**Mandrels, Expanding**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Mandrels, Solid**
Atkins & Co., Inc., E. C., Indianapolis, I
Cleveland Twist Drill Co., Cleveland, O
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.

**Measuring Machines**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Metals, Alloy**
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Tallman Brass & Metal, Ltd., Hamilton, Ontario
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Metalite Cloth**
Ritchey Supply Co., Toronto, Ont.

**Micrometer Calipers**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg Co., Providence, R I
Rice Lewis & Son, Ltd., Toronto, Ont.

**Milling Attachments**
Ackworthie, Ltd., John, Birmingham, Eng
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis
Petrie, Ltd., H. W., Toronto, Ont

**Milling Machines**
Brown & Sharpe Mfg Co., Providence, R I
Can. Fairbanks-Morse Co., Ltd., Montreal

**Milling Machines, Automatic**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Bench**
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng

**Milling Machines, Hand**
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng
United States Machine Tool Co., Cincinnati, Ohio.

**Milling Machines, Horizontal and Planer Type**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal Q
Cleveland Milling Machine Co., Cleveland
Ford-Smith Machine Co., Hamilton, Ont
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto Ont.

**Milling Machines, Plain**
Bilton Machine Co., Bridgeport, Conn
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cleveland Milling Machine Co., Cleveland
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill
Terry & Co., John C., Birmingham, Eng

**Milling Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Milling Machines, Universal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Mchy. Co., Toronto, Ont
Hendey Machine Co., Torrington, Conn
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis
Petrie, Ltd., H. W., Toronto, Ont
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Milling Machines, Vertical**
Cincinnati Milling Machine Co., Cincinnati, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

**Monel Metal**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Motors, Electric**
Atkins & Co., Inc., E. C., Indianapolis, I
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy Co., Toronto, Ont
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis

**Moulded Rubber Goods**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Nail Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Nails and Staples**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Nickel, Bars, Sheets, Wire, Etc.**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Nickel Plating Outfits**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Nickel Silver**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Nitrogen**
L'Air Liquide Society, Toronto, Ont.

**Nut Tappers (See Bolt and Nut Machinery)**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio

**Nuts, Finished and Semi-finished**
Galt Machine Screw Co., Galt, Ont.

**Nuts, S.A.E., Plain and Castellated**
Galt Machine Screw Co., Galt, Ont.

**Oil Filtering and Storage Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can

**Oil Storage Engineers**
Bowser, S. F., & Co., Ltd., Toronto, Can

**Oils**
Canadian Oil Companies, Ltd., Toronto Ont.
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Hole Covers**
Can Winkley Co., Ltd., Windsor, Ont

**Oils, Soluble**
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oxygen**
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont
L'Air Liquide Society, Toronto, Ont

**Oxy-Acetylene Apparatus**
L'Air Liquide Society, Toronto, Ont.

**Packing, Hydraulic**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N S

**Packing, Steam**
Can. Consolidated Rubber Co., Ltd., Montreal Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
Graton & Knight Mfg. Co., Worcester Mass.
Guildford & Sons, Ltd., Halifax, N S

**Paper Mill Conveyors**
Bertrams Ltd., Edinburgh, Scotland

**Patents**
Fetherstonhaugh & Co., Ottawa, Ont
Marion & Marion, Montreal, Que.

**Pans, Wet and Dry**
Frost Mfg. Co., Chicago, Ill.

**Pattern-Shop Machinery (See Woodworking Machinery)**
Canada Machinery Corp., Galt, Ont
Oliver Machinery Co., Grand Rapids, Mich

**Patterns, Wood and Metal**
Crescent Machine Co., Ltd., Montreal, Q
Victoria Foundry Co., Ltd., Ottawa, Ont
Wraggis Pattern Works, Galt, Ont.

**Penstocks, Steel**
MacKinnon Steel Co., Sherbrooke, Que

# BUYERS' DIRECTORY

**Phosphor Tin**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Photographic Duplicating Machines**
Commercial Camera Co., Providence, R.I.

**Pig Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Bending Machines**
American Pipe Bending Machine Co., Boston, Mass.
Can. Fairbanks-Morse Co., Ltd., Montreal
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

**Pipe Couplings**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Cutting and Threading Machines**
Can. Fairbanks-Morse Co., Ltd., Montreal
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**
Landis Machine Co., Inc., Waynesboro, Pa.

**Pipe Fitters' Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa.

**Piston-Ring Machines**
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Planers, Parallels**
L. & P. Mfg. Co., Niagara Falls, Ont.

**Planing Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Planing Machines, Rotary**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Pneumatic Tools**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**
Ackworthle, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Blount Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Pots, Steel**
Sawyer Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Pressed Steel Parts**
Ackworthle, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich.
Can. Fairbanks-Morse Co., Ltd., Montreal
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Presses, Drop and Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Toledo Machine & Tool Co., Toledo, Ohio

**Presses, Foot and Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

**Presses, Forcing**
Atlas Press Co., Kalamazoo, Mich.
Stewart & Co., Duncan, Glasgow, Scot.

**Presses, Hydraulic**
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

**Presses, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Protractors**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Propellers**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Pulleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal and Fibre**
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Pulp and Paper Mill Equipment**
MacKinnon Steel Co., Sherbrooke, Que.

**Pumps, Automobile Tire**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Pumps, Barrel and Boiler-feed**
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coalant**
Trahern Pump Co., Rockford, Ill.

**Pumps, Geared and Hand**
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

**Pumps, Lubricant and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Jardine & Co., A. B., Hespeler, Ont.

**Punches, Power**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

**Punching Machines, Horizontal**
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Racks, Cut**
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**
Holden Co., Ltd., Montreal, Que.

**Reamer Holders**
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

**Reamers, Expanding**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Reamers, Solid**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Reamers, Taper**
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Recorders, Temperature**
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Recorders, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Rheostats**
Northern Electric Co., Montreal, Que.

**Resistance Materials**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Respirators**
Willson Goggles, Inc., Reading, Pa.

**Rivets**
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Rivet Heaters**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.

**Riveting Machines**
Bilton Machine Co., Bridgeport, Conn.
Can. Fairbanks-Morse Co., Ltd., Montreal
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**
Stewart & Co., Duncan, Glasgow, Scot.

**Rolls (Rubber Covered)**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rudder Frames, Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Rubber Goods, Mechanical**
Quaker City Rubber Co., Philadelphia, Pa.

**Rules, Steel**
Chesterman & Co., Ltd., J., Sheffield, Eng.

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Rust Preventatives**
Oakley Chemical Co., New York, N.Y.

**Sand Equipment**
Can. Link-Belt Co., Toronto, Ont.

**Sand Mills**
Frost Mfg. Co., Chicago, Ill.

**Sanding Machinery**
Oliver Machy. Co., Grand Rapids, Mich.

**Sand Rammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Cleveland Pneumatic Tool Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven Mich.

**Saw Frames and Blades, Hack**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Sawing Machines, Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Sawing Machines, Power Hack**
Ackworthie, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Saw Sharpening Machines**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saw Tables, Universal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Hot and Cold**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Saws, High Speed Steel**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Metal Band**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saws, Metal, Power**
Clemson Bros., Inc., Hamilton, Ont.

**Saws, Metal Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

**Saws, Milling**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Saws, Screw Slotting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Swing Cut-off**
Oliver Machinery Co., Grand Rapids, Mich.

**Scales**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal, Q.

**Screens**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Screw Driving Machine**
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Screw Extractors**
Cleveland Twist Drill Co., Cleveland, O.

**Screw Machine Work**
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
Tallman Brass & Metal Co., Hamilton, Ont.

# BUYERS' DIRECTORY

**Screw Machinery, Wood and Lag**
Cook Co., Asa S., Hartford, Conn

**Screw Machines**
Brown & Sharpe Mfg Co., Providence, R I

**Screw Machines, Automatic**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

**Screw Machines, Plain or Hand**
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio.

**Screw Plates**
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

**Screws, Cap and Set**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Screws, Machine**
Barnes Co., Wallace, Bristol, Conn.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Screws, Safety Set**
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Second-Hand Machinery**
**( See Searchlight Section)**
Petrie, Ltd., H. W., Toronto, Ont.

**Separators, Moisture and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Separators, Oil and Waste**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Shafting**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Shapes, Cold-Drawn Special Steel**
Union Drawn Steel Co., Hamilton, Ont.

**Shaping Machines**
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Walcott Lathe Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Shapers, Wood**
Oliver Machinery Co., Grand Rapids, Mich.

**Shears, Hand**
Can. Blower & Forge Co., Ltd., Kitchener.

**Shears, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y
art & Co., Duncan, Glasgow, Scot.
Toledo Machine & Tool Co., Toledo, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.

**Shearing Machines, Angle, Iron Bar and Gate**
Bertrams Ltd., Edinburgh, Scotland.

**Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio

**Sheets, Nickel, Resist, Alloy**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Sheets, Nickel, Monel and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Side Frames, Locomotive**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Slotting Attachments**
Ford-Smith Machine Co., Ltd., Hamilton, Ont
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

**Slotting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont

**Solders**
British Smelting & Refining Co., Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Canada

**Snap Flasks**
Oliver Machy. Co., Grand Rapids, Mich

**Special Machinery and Tools**
Brown Engineering Corp., Ltd., Toronto
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Spectacles, Industrial**
Willson Goggles, Inc., Reading, Pa.

**Springs**
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

**Spring-making Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Sprockets and Chains**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Squares**
Brown & Sharpe Mfg. Co., Providence, R I

**Stamping, Metal**
American Pulley Co., Philadelphia, Pa
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Stamps, Steel**
Diamond Saw & Stamping Works, Buffalo, N.Y.

**Stairways, Wrought Iron**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Steam Specialties**
Crane Ltd., Montreal, Que.

**Steel Plate**
Dom. Foundries & Steel, Hamilton, Ont.

**Steels, Tool**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel Blooms and Billets**
Steel Co. of Canada, Ltd., Hamilton, Ont

**Steel, Cold-Rolled Strip**
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Steel Castings**
Dom. Foundries & Steel, Hamilton, Ont.

**Steel Forgings**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Steel, Shafting and Free Cutting Screw**
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

**Steel, Sheet**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

**Steel, Tanks**
Can. John Wood Mfg. Co., Toronto, Ont.

**Steel, Stainless**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel Wire Rods**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steels, Alloy, Open Hearth and Electric**
United Alloy Steel Corp., Canton, Ohio

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Barnes Co., Wallace, Bristol, Conn.
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Can. Driver-Harris Co., Walkerville, Ont
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Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.
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Vulcan Crucible Steel Co., Aliquippa, Pa.

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Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Pilot Steel & Tool Co., Montreal, Que.
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Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

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Vanadium Alloys Steel, Latrobe, Pa.

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Bertrams Ltd., Edinburgh, Scotland.

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Bilton Machine Co., Bridgeport, Conn.

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Atkins & Co., Inc., E. C., Indianapolis, I

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Starrett Co., L. S., Athol, Mass.

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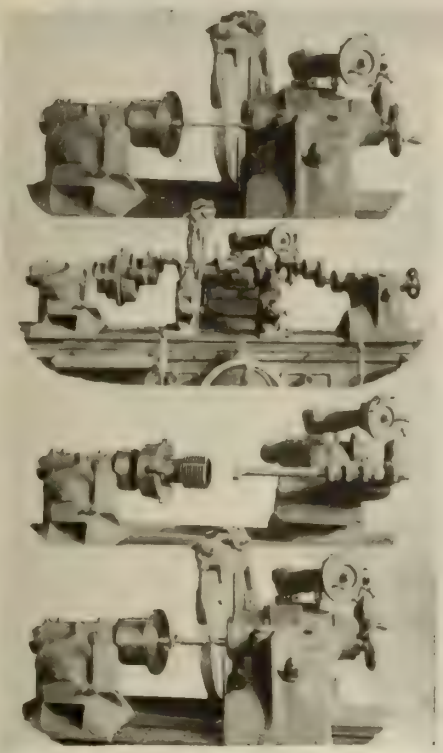
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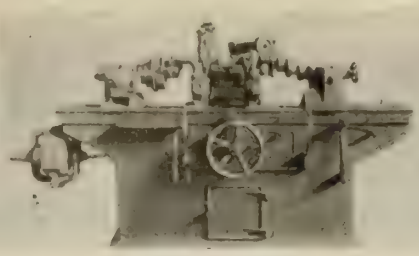
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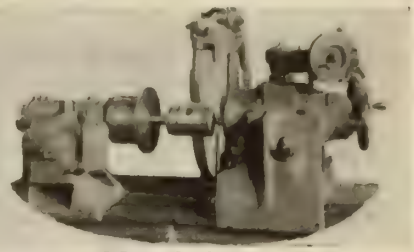
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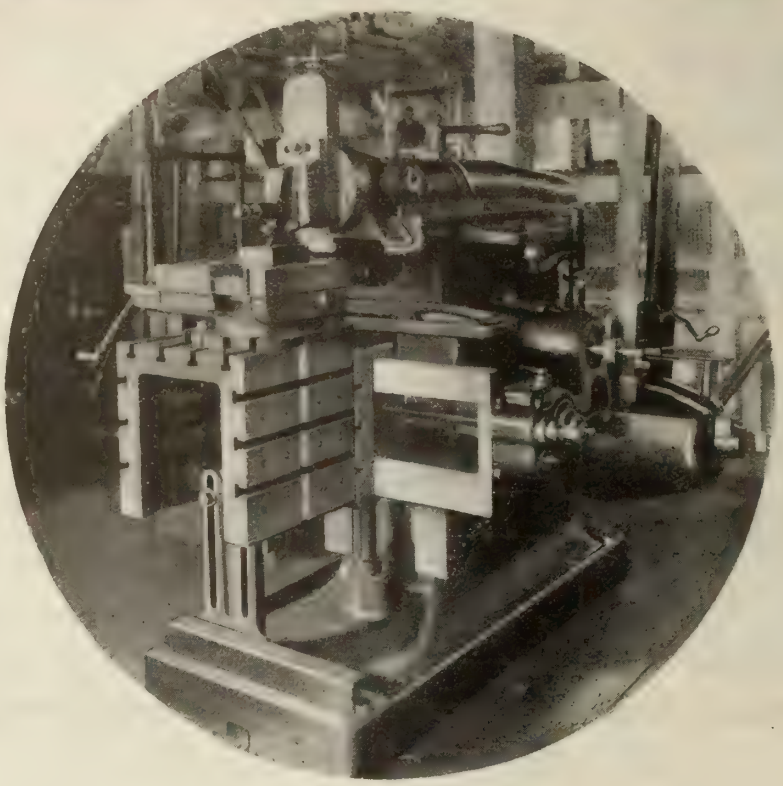
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Williams Machinery Co., A. R. 59
Whiton Machine Co., D. E. ..... 75

# HENDEY



## "Different Shapes and Sizes Which Are Seldom Duplicates"

This is what the Norton Company say of the work done on this Hendey 20-inch Crank Shaper. They use it exclusively for their special mold work.

The Machine Shop Foreman comments as follows: "We find that the Hendey Crank Shaper is a first class machine—very accurate and rigid.

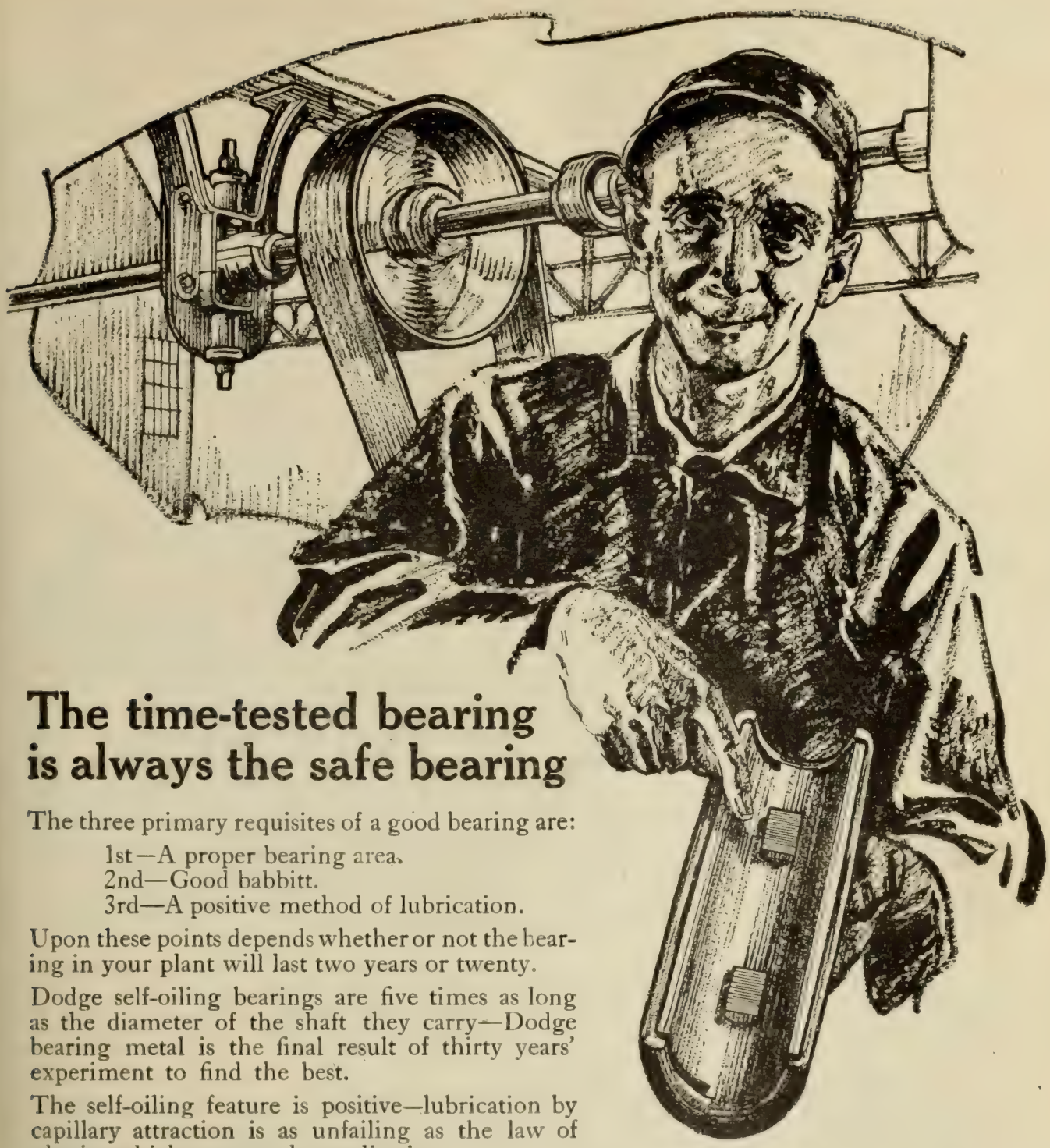
"The micrometer adjustments, quick stop belt shifting device, and power feed are some of the features that are very valuable for our work."

Remember what users think of Hendeys when considering the installation of crank shapers, millers and lathes.

## The Hendey Machine Company
### Torrington, Conn., U.S.A.

*Canadian Agents:*

A. R. Williams Machinery Co., Vancouver
A. R. Williams Machinery Co., Toronto
A. R. Williams Machinery Co., St. John, N.B.
A. R. Williams Co., 260 Princess St., Winnipeg
Williams & Wilson, Montreal



# The time-tested bearing is always the safe bearing

The three primary requisites of a good bearing are:

1st—A proper bearing area.
2nd—Good babbitt.
3rd—A positive method of lubrication.

Upon these points depends whether or not the bearing in your plant will last two years or twenty.

Dodge self-oiling bearings are five times as long as the diameter of the shaft they carry—Dodge bearing metal is the final result of thirty years' experiment to find the best.

The self-oiling feature is positive—lubrication by capillary attraction is as unfailing as the law of physics which governs the application.

Dodge bearings are built for long, hard service; when shafts are properly aligned and installed they constitute the most economical and least troublesome "roadbed for power" possible.

**The capillary bearing is self-acting and needs but one filling of oil in each six months. Only clean oil reaches the shaft. The normal depreciation of this frictionless bearing will not exceed 2% per year. Can you find another lineshaft bearing that may boast as low an upkeep cost?**

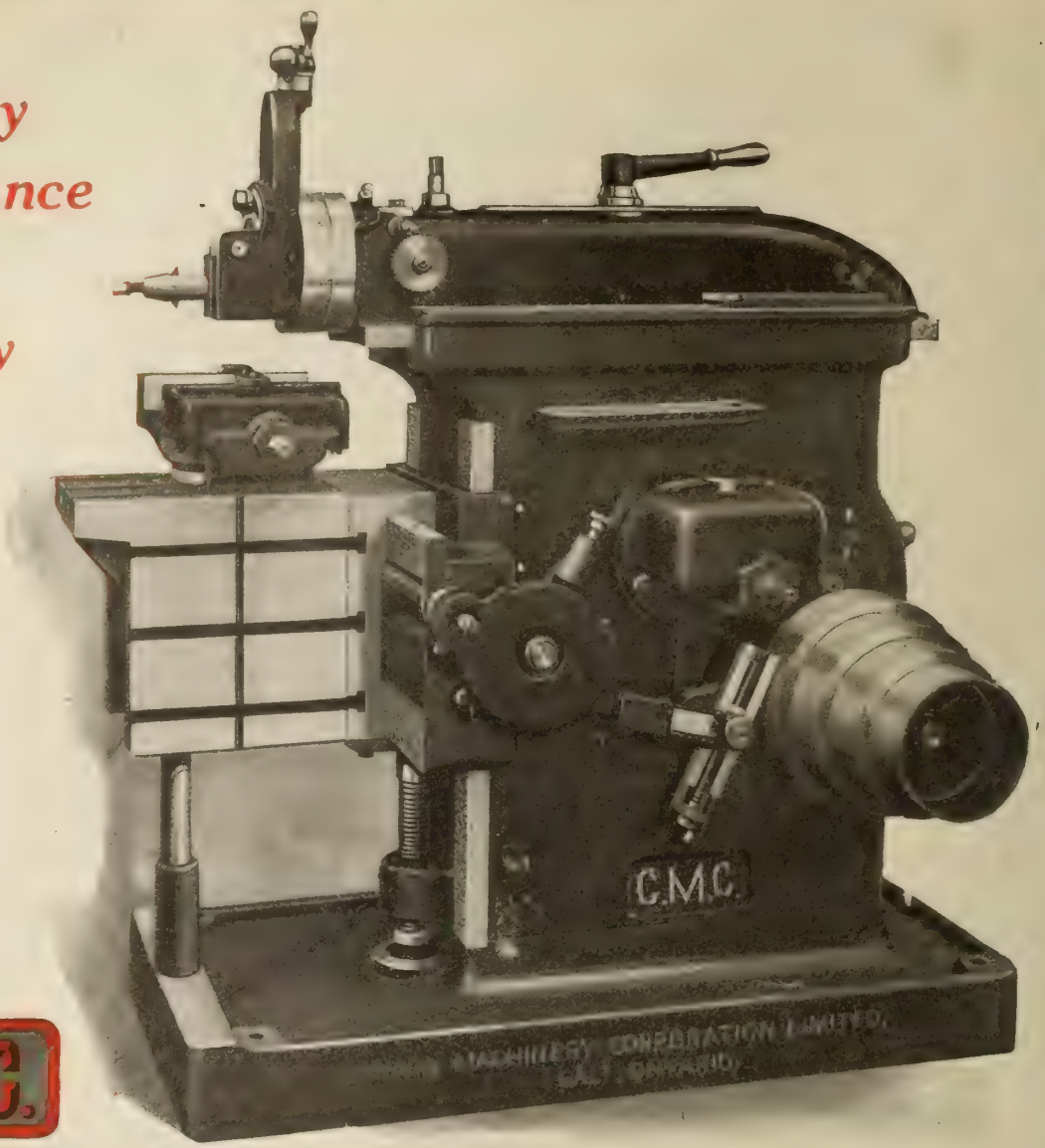
**DODGE**

**Power Transmission Machinery**

## Dodge Manufacturing Company of Canada, Ltd.

Factory and Main Office: Toronto, Ont.
Eastern Branch: Montreal, Que.

*Simplicity*
*Convenience*
*Rigidity*
*Accuracy*




*The*
C.M.C.

# 16″ x 20″ Back Geared Crank Shaper

is accurate and speedy. It is a production tool of high order and is equipped with time and labor saving features such as power down feed to head, instantly reversible automatic cross feed, and adjustment to length of stroke by constant-reading stroke indicator while machine is in operation. This latter feature is very important as the stroke indicator shows at all times the exact stroke the Shaper is set for, whether in operation or not.

**Write us for full particulars.**

CANADA MACHINERY CORPORATION
LIMITED
GALT - ONTARIO

# CANADIAN MACHINERY AND MANUFACTURING NEWS

Vol. XXV., No. 13 Published by the MacLean Publishing Company, Limited, Toronto March 31, 1921 $4.00 a Year Subscription Price


| READ AND PASS TO | check | See Page | READ AND PASS TO | check | See Page | READ AND PASS TO | check | See Page |
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BERTRAM
MACHINE TOOLS

48" X 48"
Open Side Planer

*Four Belt Drive*
*1 Rail Head and Side Head*



General Machine Shop Equipment, Locomotive and Car Shop Equipment, Structural, Bridge and Shipyard Machinery. Repair Shop Machinery.

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You can't help noticing the good qualities of

## Pratt & Whitney Taps

Their free cutting qualities, their extreme accuracy and their extraordinary ability to outlive others distinguish them.

The con-eccentric relief—a distinctive P & W feature—is the secret of their goodness. One-third of the cutting edge is concentric. The remaining two-thirds has eccentric relief. Taps can be sharpened at the only correct point on the face of the cutting edge. Sharpening in no way ... their size.

Yes, they cost a little more than some others, but they're well worth the difference. Carried in stock as are all other P & W Small Tools at our sales offices and agencies as listed.

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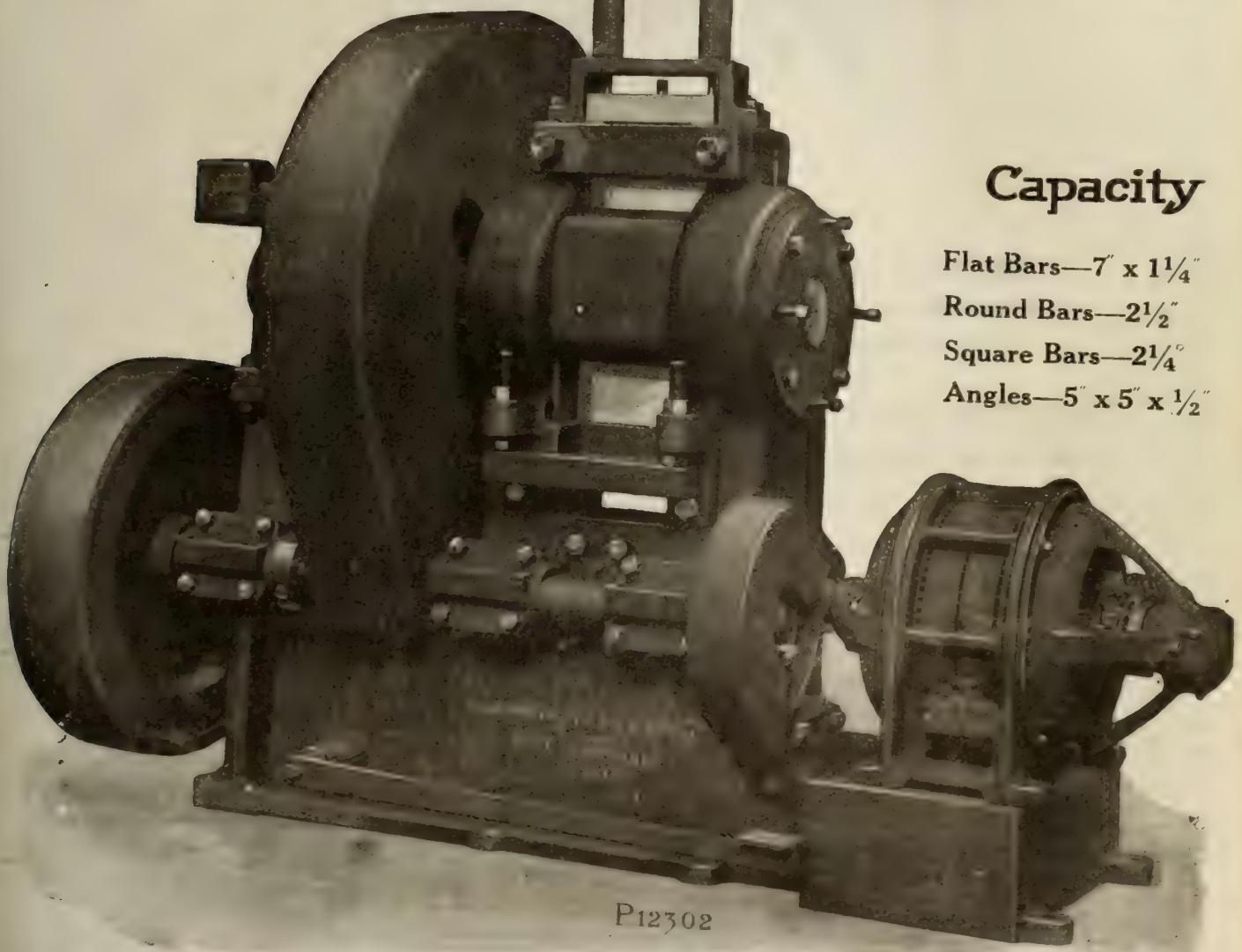
# The BERTRAM Page

## MACHINE TOOLS

J.B.&S.Co

## No. 1. Guillotine Frame Bar Shear

## Motor Driven 10 H.P. Motor



P12302

### Capacity

Flat Bars—7″ x 1¼″
Round Bars—2½″
Square Bars—2¼″
Angles—5″ x 5″ x ½″

# The John Bertram & Sons Co., Limited

DUNDAS. ONTARIO. CANADA.

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*If interested tear out this page and place with letters to be answered.*




**You know—every machinist knows—the material he is going to cut—but how many know what blade will do the work quickest, easiest, most economically?**

What blade should this man be using? **He's cutting Brass.** Look at the Starrett Hack Saw Chart, under the name of the material to be cut, and you find numbers 103 and 112.

If your hack saw frame will take a 12-inch blade use the No. 112 Saw. Why? Because it's a heavier, sturdier blade—and you can cut faster with it. If you use the No. 103, the only difference is that it's a thinner, narrower blade.

But whichever you use—always follow the Starrett Hack Saw Chart, and use Starrett Hacksaw Blades.

*Send for Catalog No. 22 "3" and a copy of the Chart*

THE L. S. STARRETT COMPANY
*The World's Greatest Toolmakers*
*Manufacturers of Hack Saws Unexcelled*
ATHOL, MASS.

STARRETT TOOLS — STARRETT HACK SAWS CUT QUICKER LAST LONGER

# Use Starrett Hack Saws

42-163

# We Have Everything You Need in Modern

# Machine Tools

## and Manufacturing Equipment

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SULPHATE OF AMMONIA
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*SULPHURIC ACID*
*NITRE CAKE*

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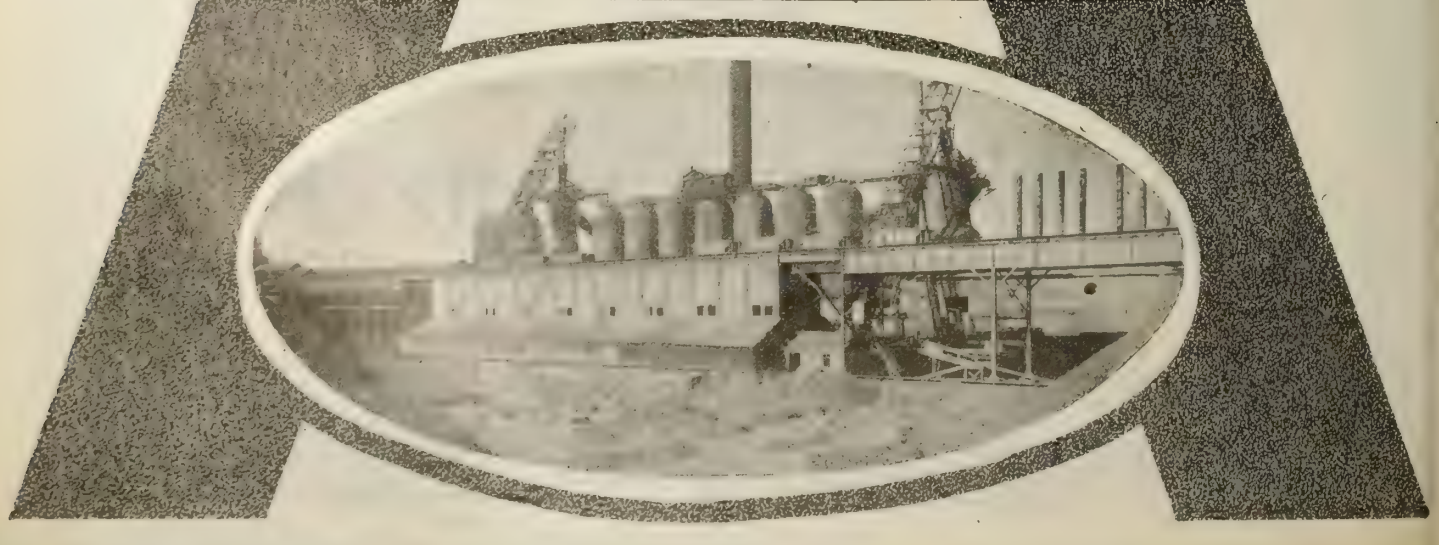
MARK OF ALGOMA O.H. QUALITY

## Open Hearth
# Alloy Steel

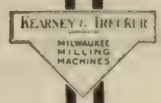
Chrome-Vanadium Chrome-Nickel
Nickel

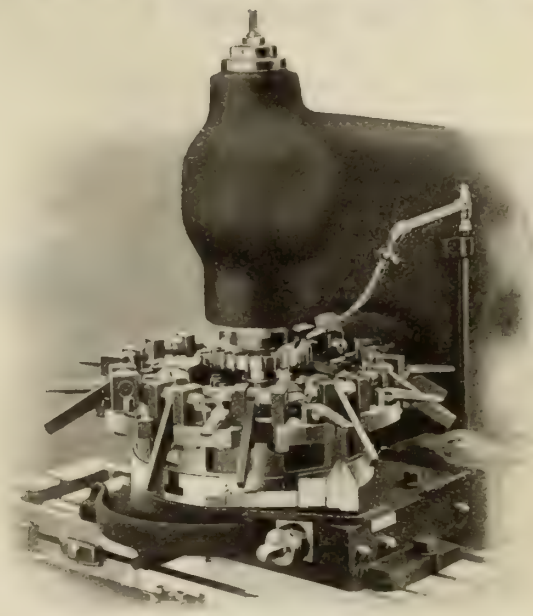
The quality of our product is of the very best—and is exclusively steel made by the Open Hearth Process, and can be furnished in all grades, from the softest rivet stock to high carbon special spring material.

***Order from us and you'll get both quality and prompt service. A trial is convincing.***



# MILWAUKEE MILLING MACHINES



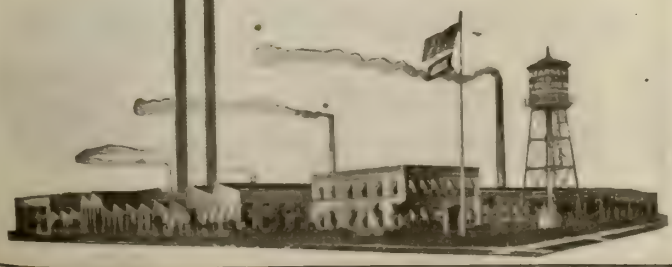
Continuous milling of 10-inch adjustable wrenches on a Milwaukee Vertical Milling Machine. These parts are turned out at the rate of 3,000 a day and the finished surface bears a constant and accurate relation to other selected points on the part.

## *Rapid, Economical Milling*

Manufacturing milling by the continuous process is an advanced step in milling machine practice that is worthy of the serious consideration of the management of any plant. The motion in this milling process is continuous. It is reasonable, therefore, that in this way maximum production is secured. This sort of milling is most desirable in the machining of parts in large quantities. The rotary table with chucking fixture holding the work revolves, and the cutter is in operation and in the work at all times. The operator removes the finished piece and puts another unmilled one in its place.

Milwaukee Vertical Milling Machines are particularly well adapted to continuous milling. The spindle is adjustable for wear only as sufficient adjustment can be obtained by the adjustment of the knee alone, the same as it is in the horizontal type milling machines.

Have you any milling that would be well adapted to continuous milling? Let us help you.



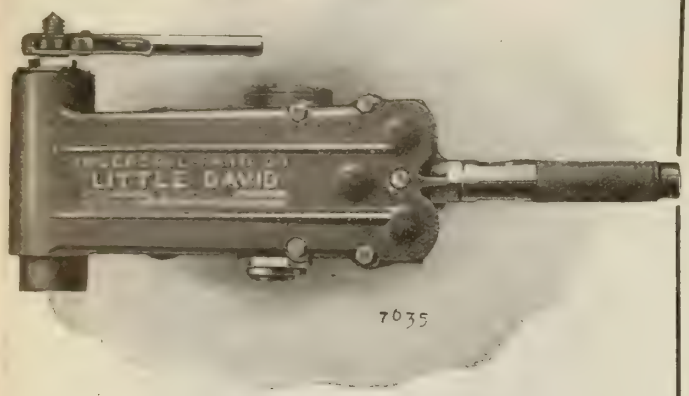
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CORPORATION
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*Canadian Representatives:*

Williams & Wilson, Ltd., Montreal
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# A Handy Drill

## for the place that's hard to get at




Number 9
"Little David" Close Quarter Drill
will drive a 3 in. Twist Drill or a 2 in. Tap or Reamer.

"Little David" Close Quarter Drills will save you time and money for drilling, tapping, reaming, or running down nuts and studs in cramped places. They can be used right up against a lug or boss on a casting, or wherever space is scanty and ordinary pneumatic drills are of little use.

"Little Davids" contain less parts than used in other drills of this type, and, being simpler and more rugged, will last longer. Power is transmitted from the pistons to the spindle by three simple rocking levers, and as there are no chains, gearing, or other "frills," the air consumption is less than that of any other drill of equal size and power.

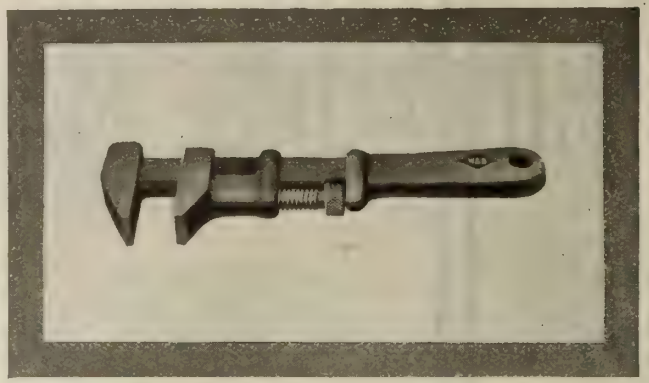
"I'd just as soon think of trying to get along without a socket wrench for my car as to do without my 'Little David' Close Quarter Drill," an enthusiastic user told us not long ago.

Made in two sizes.

"Little David" Close Quarter Drills are members of a family of Canadian built Pneumatic Tools. Write for Bulletins describing the entire line.

**Canadian Ingersoll-Rand Co.,**
**Limited**

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# WILLIAMS' Superior Wrenches

"W & B" Railroad Special Wrenches are indestructible — under gruelling punishment their ease of action and accuracy of fit are maintained. They are the most durable screw wrench made.

Seven sizes, 6 to 21 inches, with maximum capacity of 3 15/16 inches. Guaranteed. At your dealers'.

Ask for booklet.

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**LIMITED**

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**DROP-FORGINGS**
**often cheaper than castings**
**—always far superior—**

# ROCKFORD

## —the best for varied work

General manufacturing plants prefer the **Rockford Miller** because they require a machine which they can depend on to do any work within its range to the complete satisfaction of the inspection department.

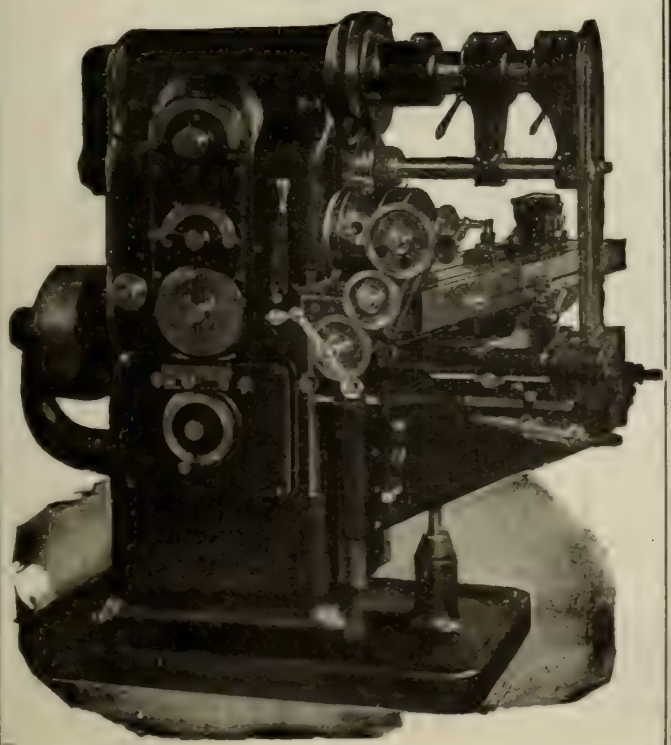
**Simplicity of operation** and **absolute rigidity under every condition** are distinctively **Rockford** features. They have made this the very best machine for general manufacturing.

***Full details on request***

**Rockford Milling Machine Co.**
**Rockford, Illinois**

*Agents:*
**Rudel-Belnap Machinery Co.**
**Toronto**

A. A. Jones & Shipman, Ltd., Leicester, England, Great Britain; Louis Besse, Paris, France and Belgium; Societa Anonima Adler & Co., Milano, Italy, Italy and Colonies; Rylander & Asplund, Stockholm, Sweden, Scandinavia; Casamitjana Hermanos, Barcelona, Spain, Spain and Portugal; Selson Engineering Co., Melbourne, Australia; M. Mett Engineering Co., Petrograd, Russia.



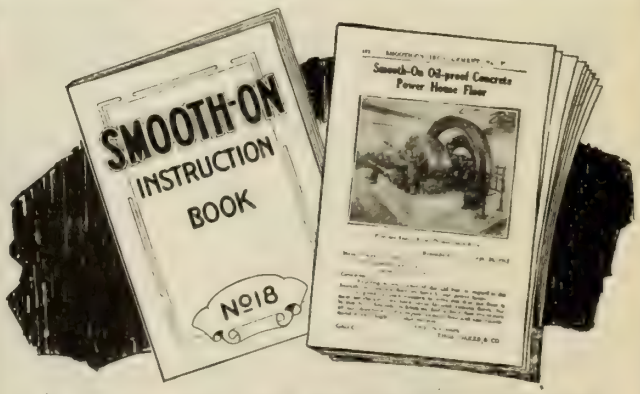
# FREE

## A Book of Facts and Figures on FIRE BRICK

You should have this handy little reference book—costs **you nothing.** It gives valuable hints on how to get the best results from the fire brick you use in your furnace linings, cupolas, boiler arches and all fire brick masonry. In addition to this there are tables showing the number of brick required to make certain size linings, and comparison of various thermometer scales, circumference and areas of circles, in addition to weights of various materials.

**Let us have your name and address now, while you have it in mind.**

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Canadian Distributors:
CANADIAN ASBESTOS CO.,
Montreal - - - - - Toronto, Canada.


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# THE JOHNSON FRICTION CLUTCH

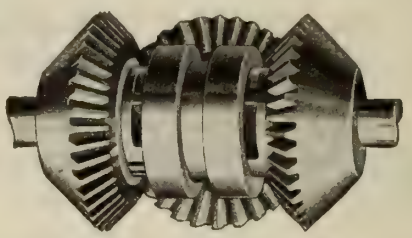
## Clutches for Reversing Functions



Johnson Clutch Installation on Newton Milling Machine

A reversing clutch is a very common requirement on machinery, and one which is encountered in many different forms. Whatever the situation may be, a Johnson Clutch offers the best method of handling it.

The bevel gear assembly shown here is one of the ways in which a Johnson Double Clutch is frequently applied for reversing functions. Many of the best machine tools are equipped in this manner.



Double Clutch in Nest of Bevel Gears

**Write for our Yellow Catalog and Booklet,**

**"Clutches As Applied To Machine Building."**

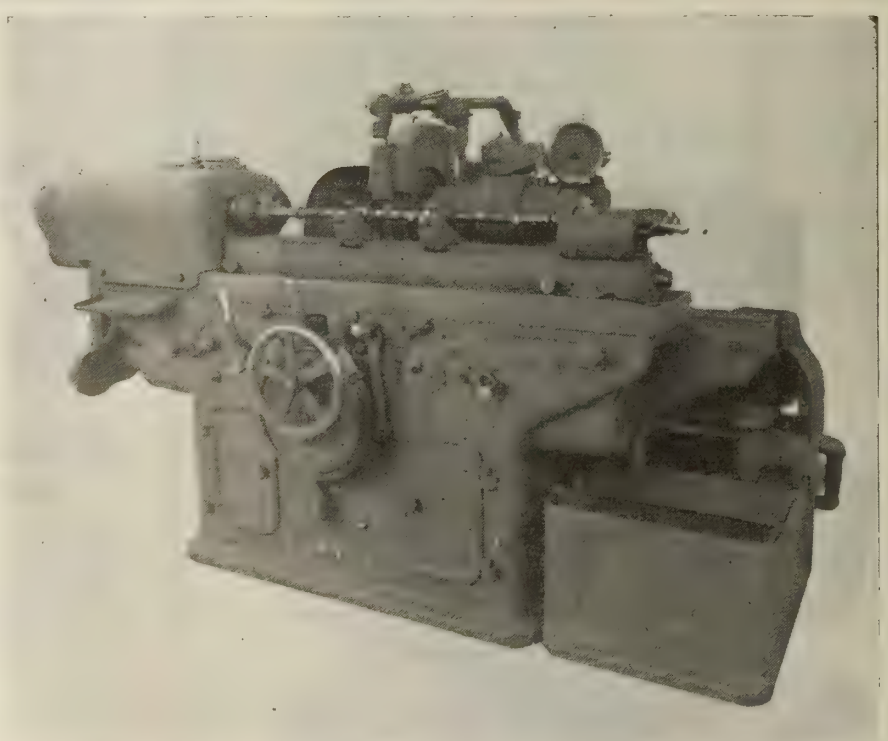
CANADIAN AGENTS:

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CANADIAN FAIRBANKS-MORSE CO., LIMITED, Montreal, Toronto, Winnipeg

**THE CARLYLE JOHNSON MACHINE CO.** MANCHESTER, CONN.

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LANDIS design and performance is especially suited to rapid and accurate production.

The location of the master cam is directly over operating center. It is fully protected from water and grit.

The LANDIS has removed all chance from cam grinding by insuring precise adjustment and easy operation.

The makers of high-grade motors depend on the LANDIS.

You'll see why when you look up the details.

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**LANDIS**

**Cam Grinding Machine**

# CANADIAN STEEL FOUNDRIES LIMITED

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- Guard Rail Clamps
- Complete Intersection

This list is merely an indication

General Offices:
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## WE CAN SUPPLY

# STEEL PLATE

—IN—

**Universal Edge** - up to 40 in. wide

**Sheared Edge** - up to 60 in. wide

**Any Thickness** **Any Lengths**

*Send Us Your Enquiries.*

## Dominion Foundries & Steel, Limited

**HAMILTON, ONTARIO**

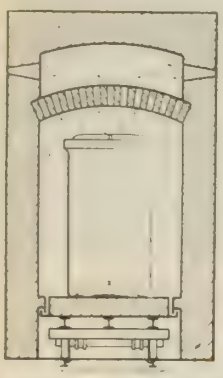
# USES and LIMITATIONS

of

## Car Type and Car-and-Ball Type Furnaces

W. S. ROCKWELL CO. INDUSTRIAL FURNACES NEW YORK

**are clearly defined in Bulletin 222-T**



Irregular heating of high charge in air furnace, showing tendency to overheat at the top and formation of cold zone (X) at bottom due to comparatively cold hearth.

Typical installations are shown to illustrate—

The applicability of car type and car-and-ball type furnaces to the heat-treatment of material that cannot be advantageously handled in other types of furnaces.

Factors governing selection of the type (car or car-and-ball) best suited to individual manufacturing requirements.

Difference in design of each type.

Influence of unequal cooling on the quality of finished product.

*In brief, this bulletin is a discussion of principles which will appeal to those interested in furnace design, loading and handling methods, heat generation and utilization, etc.*

***Write for Bulletin 222-T***

**W. S. ROCKWELL COMPANY**

We make Industrial Heating Furnaces for every requirement

Furnace Engineers and Contractors

50 Church St. (Hudson Terminal Bldg.) New York

"FURNACE AND FUEL TO SUIT CONDITIONS"

*Canadian Representative:*

**R. J. McLean, 604 Southam Building, Montreal, P.Q.**






# WHY NOT?

Why not Save Time, Grinding Wheels and High Speed Steel by using Armstrong Tool Holders on Your Lathes and Planers?

Refuse Imitations and Substitutes.

**Catalogue free.**

**Armstrong Bros. Tool Co.**

"The Tool Holder People"

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# W·ATKINS&CoLd *Sheffield ENG*

*The*

**HIGH SPEED STEELS**

*For superior cutting power:*

**"Double Waco" and "Waco Superior"**

**Carbon Tool Steels**

***For all Purposes.***

**"Turtle Brand,"** unequalled for reliability.

**MINERS' DRILL STEELS**

Solid and Hollow.

All Sections.




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**TORONTO**

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TRAHERN
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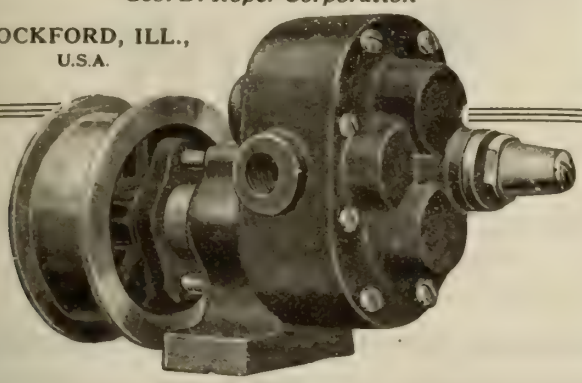
## Coolant Pumps

TRAHERN Coolant Pumps are built as regular equipment into leading Machine Tools. They are easily connected to any machine and will pump any liquid not containing grit.

Deliver 16½ G.P.M. at low speed; smooth, forceful stream free from pulsation. Reverse automatically, supply may be shut off at discharge without stopping pump; operate against 100 lbs. pressure if desired. Will not lose prime when properly installed.

**Write for our Bulletin 44, giving details.**

TRAHERN PUMP DIVISION
*Geo. D. Roper Corporation*
ROCKFORD, ILL., U.S.A.



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*QUICK DELIVERIES*

**High Carbon Steel**
**Manganese Steel**
**Chrome Steel**
**Mild Steel**

*QUALITY GUARANTEED*

Sizes—½ lb. to 5,000 lbs. each

THE WILLIAM KENNEDY & SONS,
*LIMITED*
OWEN SOUND, ONTARIO
ESTABLISHED 1860

# STEEL *for*
## Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

**We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.**

Steel Ingots
*by the*
HARMET
Liquid Process

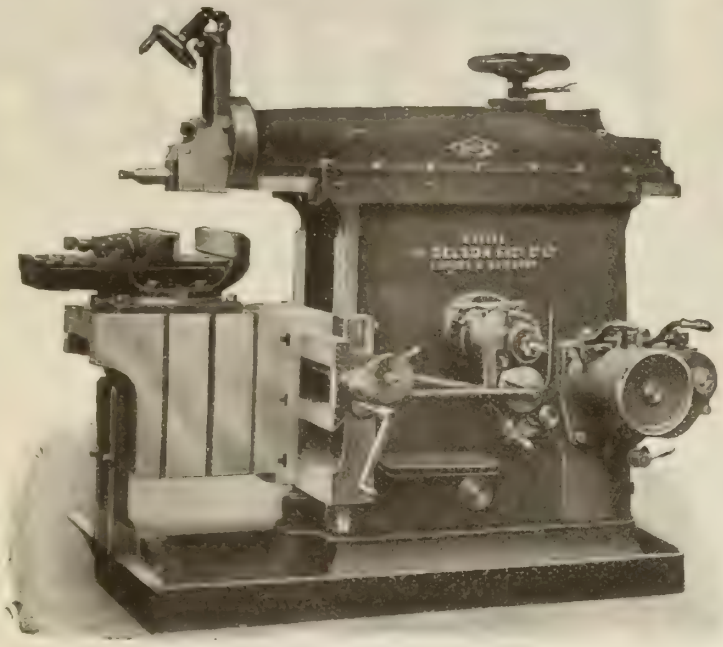


## Nova Scotia Steel and Coal Co., Limited

*Head Offices:*
New Glasgow, N.S.

Sales Offices:
Western Room 14 Windsor Hotel
MONTREAL

# The "SELSON" Shaping Machines



*High Speed*
*and*
*Heavy Cut*

**Sizes**
**10, 13, 17, 25, and 30"**

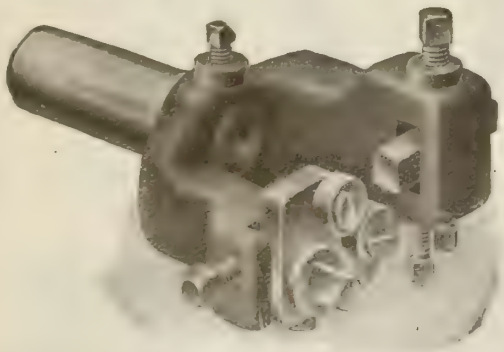
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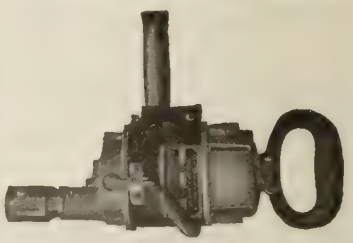


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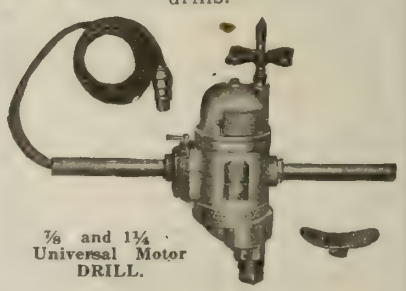
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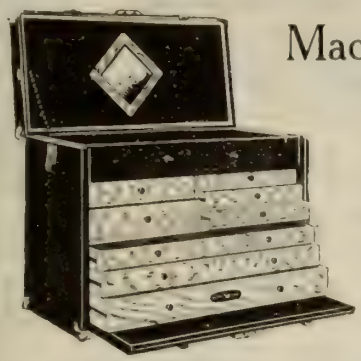
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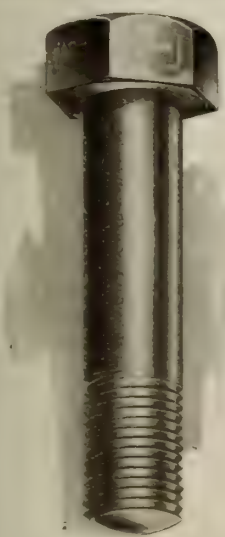
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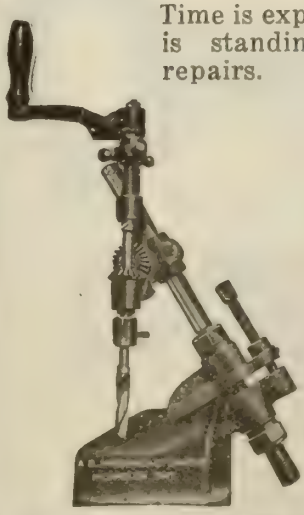
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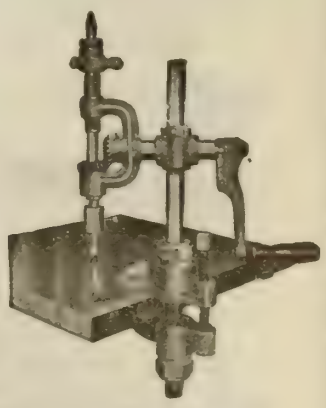
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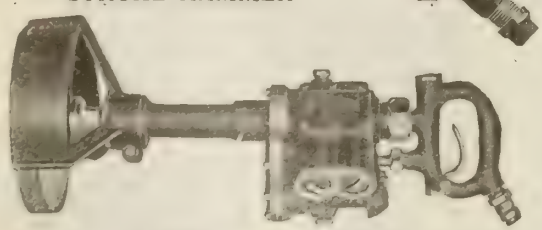
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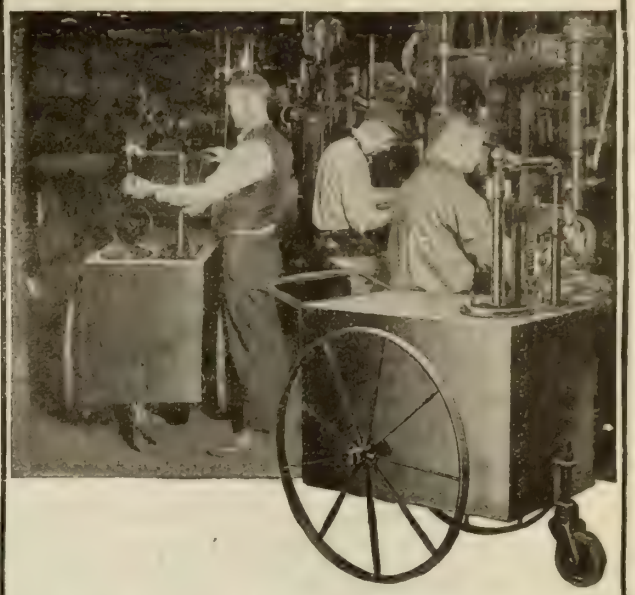
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# Carrying On By Marking Time

*By J. K. Munro*

HAY foot—straw foot—left foot—right foot—and never getting anywhere! That's J. K. Munro's view of the Parliament at Ottawa during March. Crerar and Lapointe are the only men who have really said anything, in "J. K.'s" opinion. After a survey of the Dominion Mr. Munro prophesies that there will be a Farmer Government, sure, in 1922—and probably supported by several French-Canadians.

And the Budget—"it is not likely," says Canada's leading political pundit, "that it will be a very sweeping document. It will likely provide for a sales tax of about one per cent, to make up the hundred million by which the estimates exceed the revenue, and the excess profits tax will likely be wiped out. That's about all."

## John Barleycorn and Jack Canuck

It's a hard question for the man-on-the-street to answer, How Dry is Canada? But Charles Christopher Jenkins has studied the question from all angles, and you will find his article extraordinarily informative and—in the light of Ontario's vote April 18—very timely.

**"For Sale For a Song."**
By Agnes C. Laut.

The question whether Oriental labor will solve some of our problems is here discussed.

**"From Ontario to Tin Pan Alley."**
By Geoffrey O'Hara.

A Canadian wrote "K-K-Katy" and also a song for Caruso. He tells how he won success.

**"The Drama of Our Great Forests."**
By Arthur Heming.

A further instalment of the artist-author's adventures with Oo-koo-hoo in Canada's primitive Northland.

**"As a Man to His Friend."**
By William Merriman Rouse.

A stirring story of the Ottawa Valley, of two lumberjacks, an actress and a barber.

**"Linen Sheets."**
By Alan Sullivan.

What do the occupants of an Old Woman's Home think of, as they wait for the "Reaper"? A poignant story with a surprise climax.

**"Pawned."**
By Frank L. Packard.

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**"Why Have We Juvenile Crime?"**
By Ethel M. Chapman.

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## REVIEW OF REVIEWS

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Unemployment Crisis in Britain ..... R. H. Tawney
Optimistic About the League ..... Lord Robert Cecil
Ideal British Cabinet ..... London Magazine
Common Sense Bridge ..... A. E. Manning Foster
Kipling's "Lurgan Sahib" Dies ..... London Times

U.S. a Bar to Naval Disarmaments ..... Scientific American
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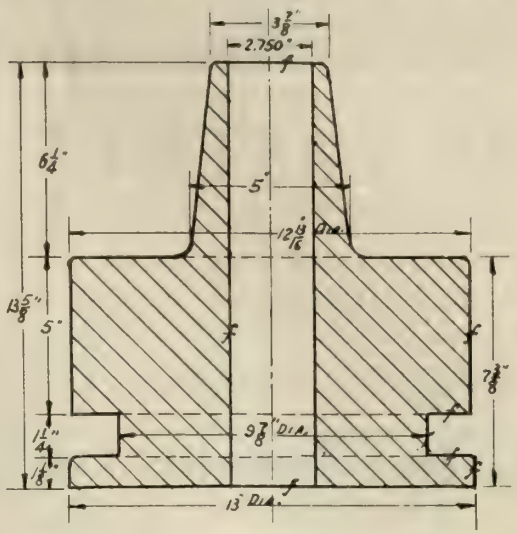
"CANADA'S NATIONAL MAGAZINE"

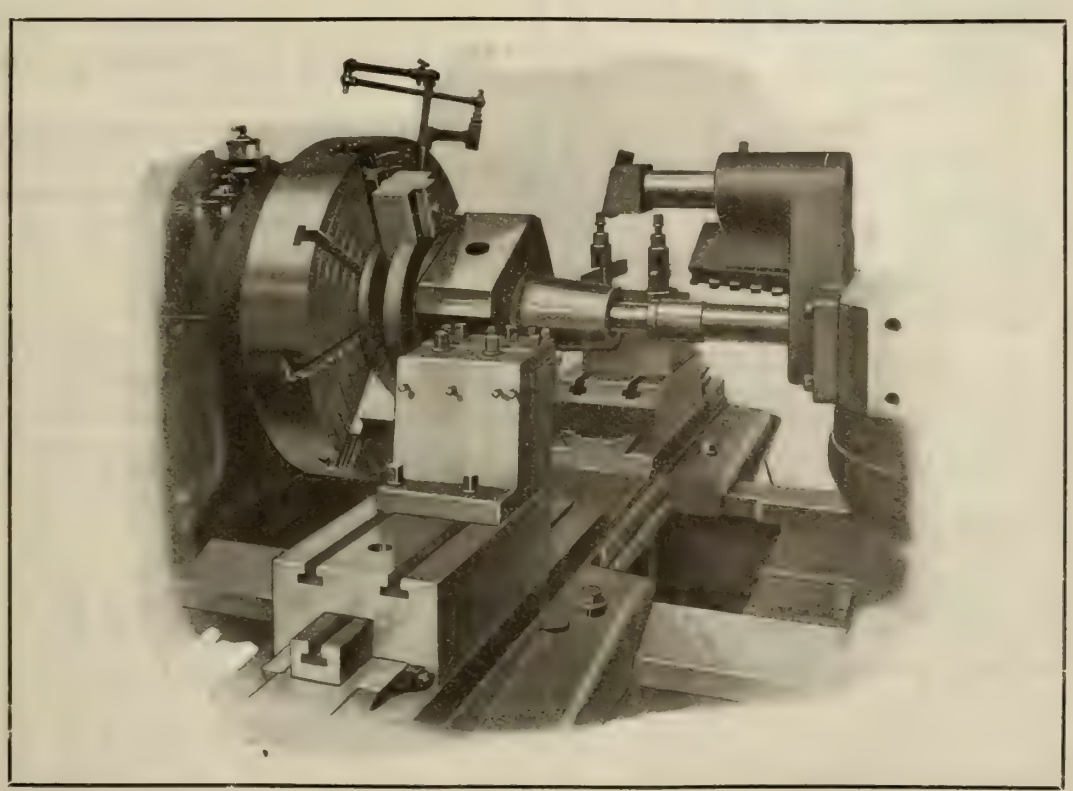

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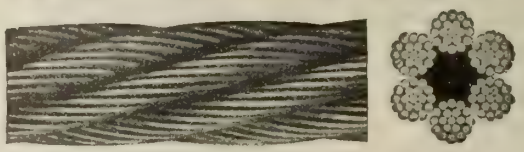
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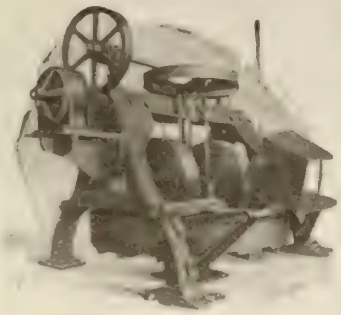
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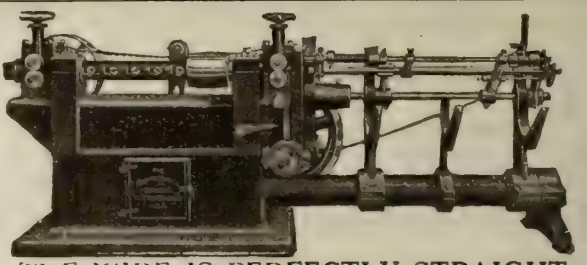
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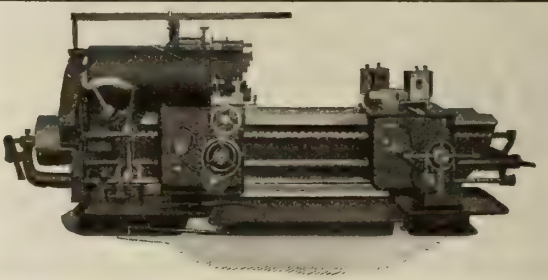
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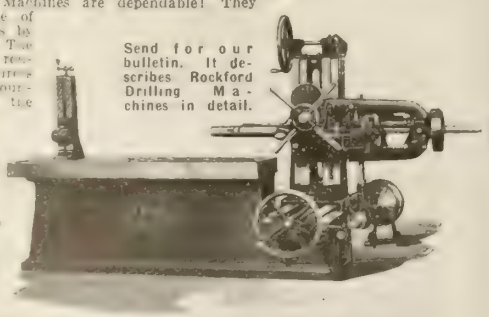
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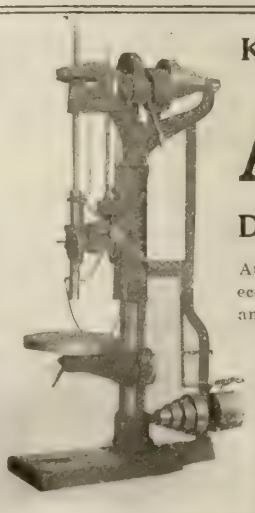
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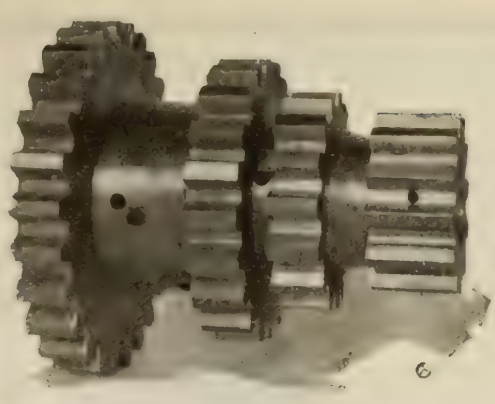
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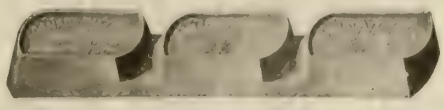


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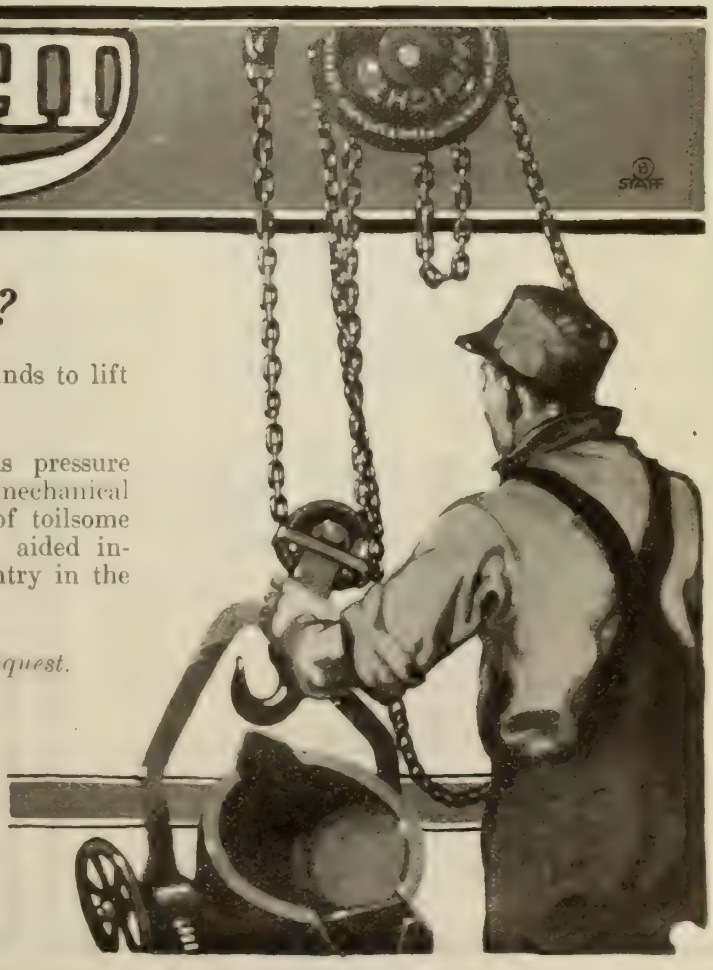


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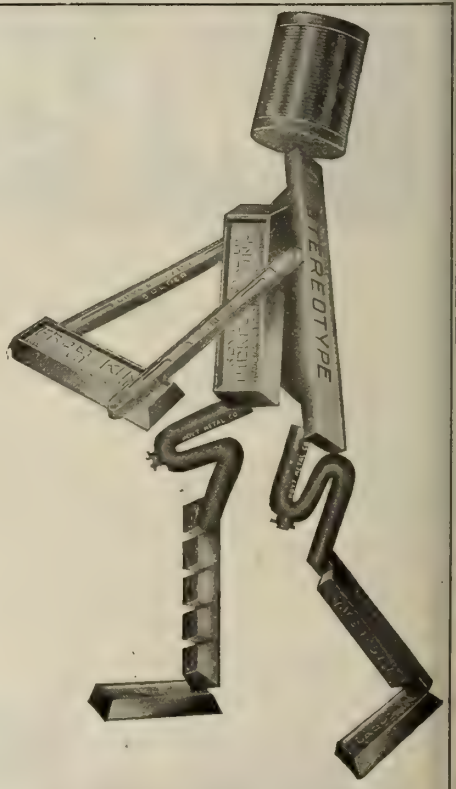
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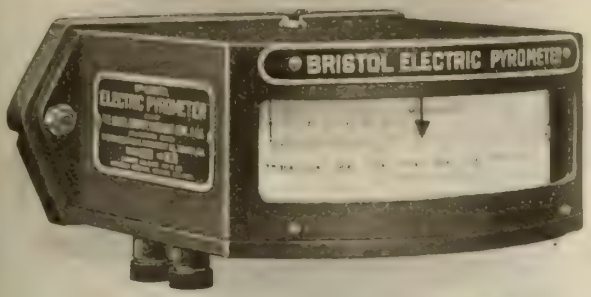
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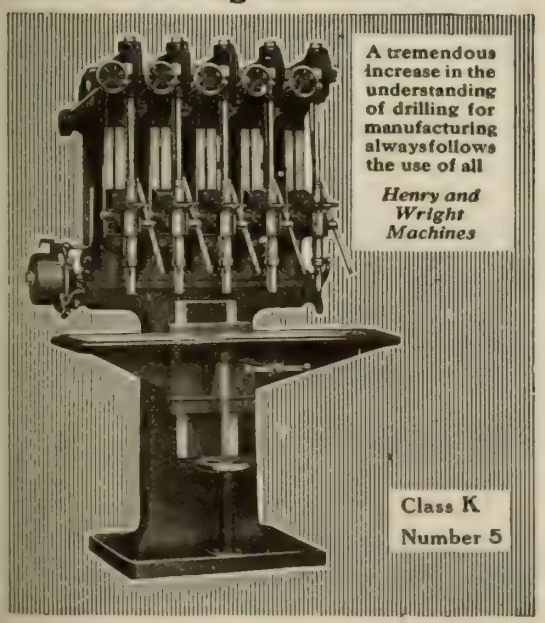
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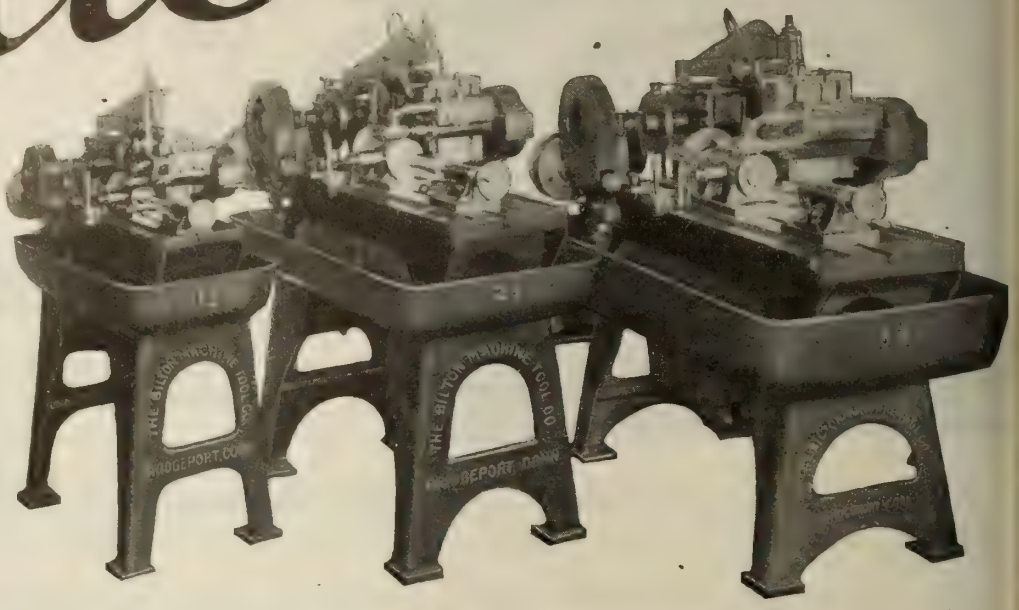
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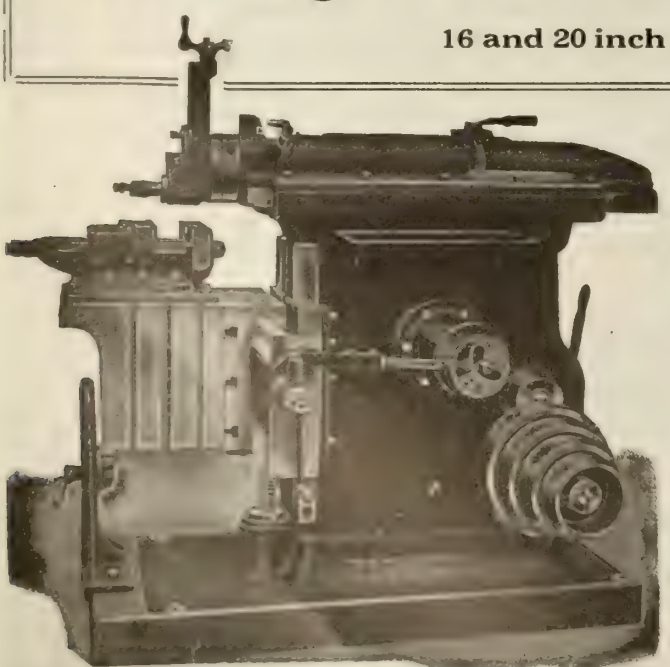
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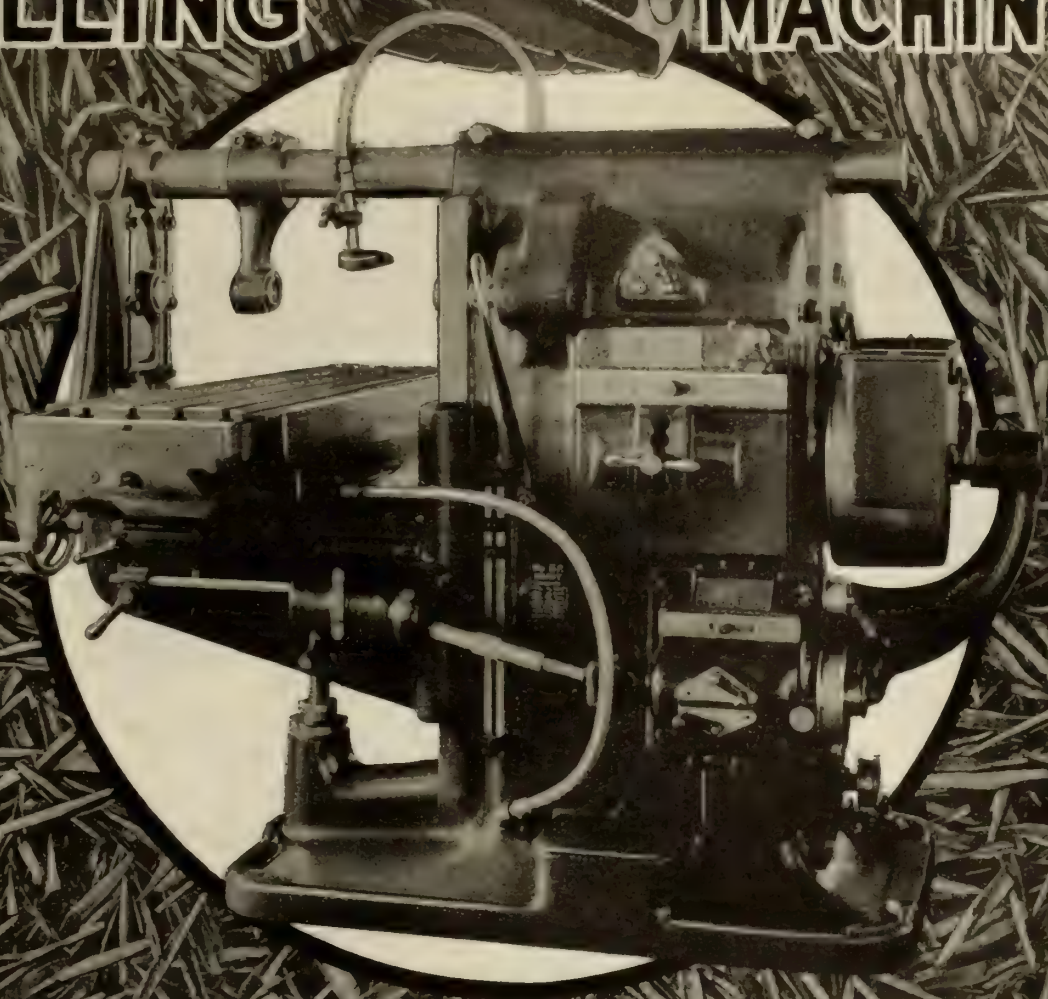
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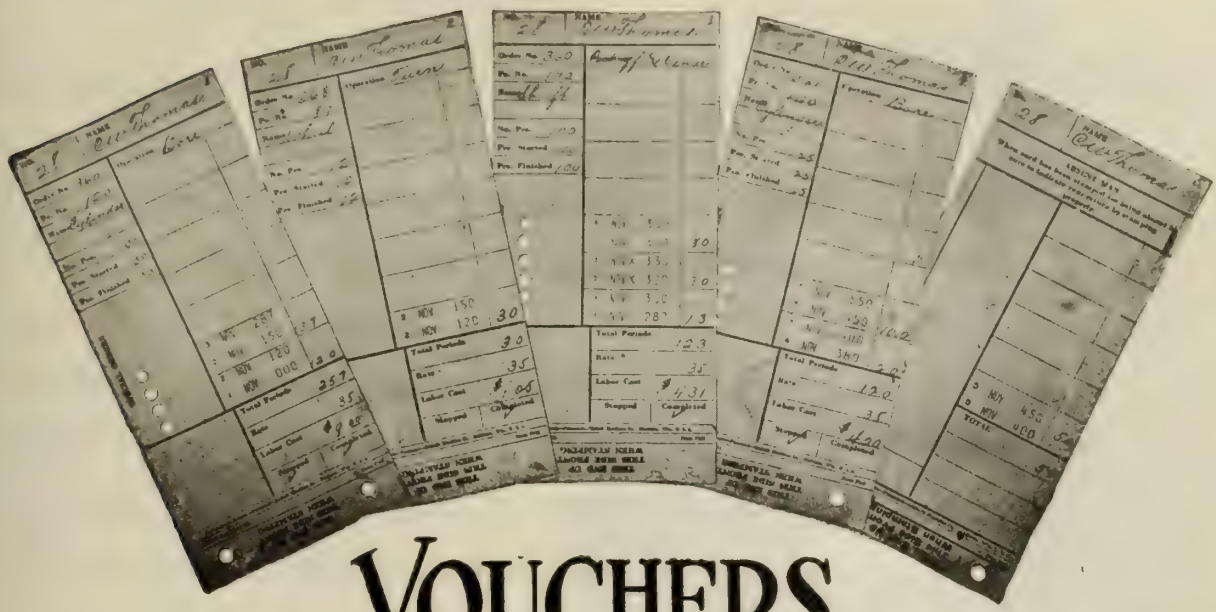
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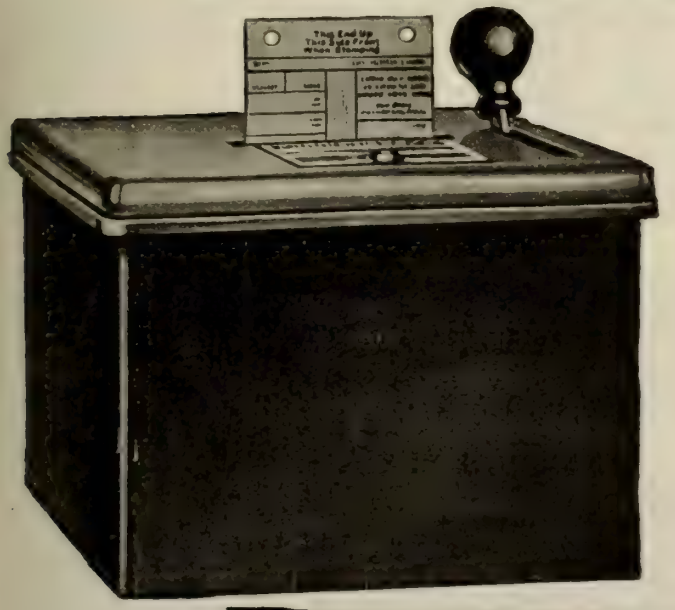
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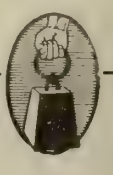
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CANADIAN MACHINERY
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MANUFACTURING NEWS

VOL. XXV. No. 13. March 31, 1921.

# *Efficient Fixtures used in Gear Cutting*

Holding Gear Blanks—Methods of testing truth of arbor and work—arbors and faceplates—holding gears with shanks—holding internal gears, also varied work.

*By Douglas T. Hamilton*

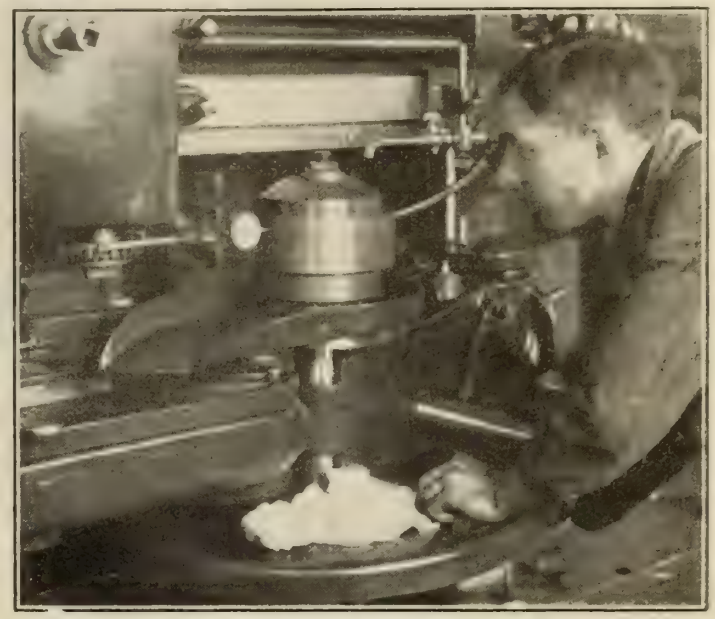


FIG 4. TESTING SQUARENESS OF SIDES WITH HOLE GEAR BLANSK CLAMPED IN PLACE

IN deciding on the best method of holding any particular piece of work when cutting gear teeth, there are certain necessary factors which must be considered. In the following we will enumerate a few of them:—the work must be so held that the teeth will be cut concentric with the hole in, or the shank on the gear. Slender gear blanks or those having thin walls, which are liable to spring out of shape should be very carefully clamped to hold them accurately. Internal gears should be held in some type of fixture, which will not distort the gear, and will hold it concentric while the teeth are being cut. A large number of gear blanks should not be held on an arbor at one time, unless the sides are absolutely square with the holes—this point will be dealt with more fully later. The work-arbor should run absolutely true, as is also true of face-plates against which the work is clamped.

### Holding Gear Blanks

Bearing these points in mind, we will now explain how work can be accurately and satisfactorily held on the Fellows gear shaper, but before doing so it might be advisable to explain briefly the principle of this machine, and its peculiar features relative to the holding and cutting of gears.

Fig. 1 shows a section through the work-spindle of the Fellows gear shaper, and illustrates the construction

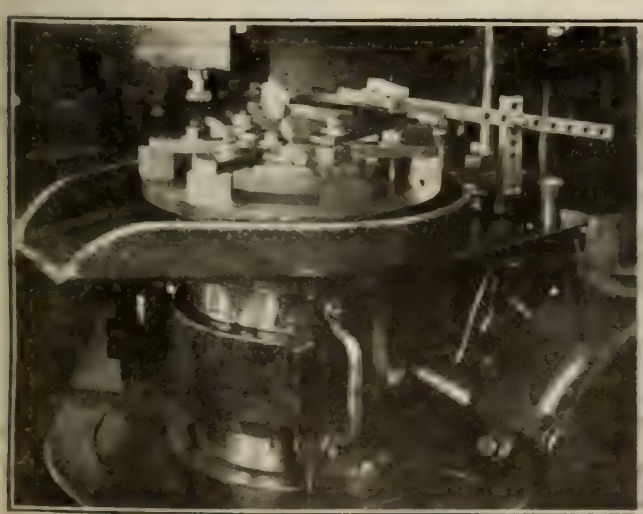


FIG 11—SHOWING UNIVERSAL APPLICATION OF A FACE-PLATE TYPE OF FIXTURE ON THE GEAR SHAPER.

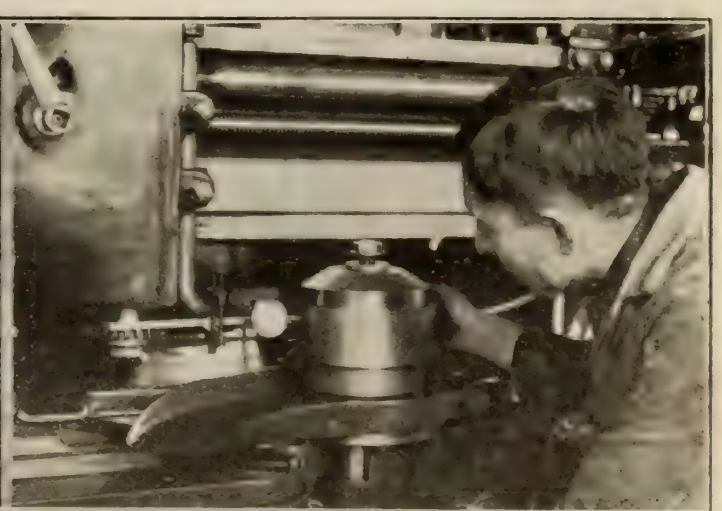


FIG. 3—TESTING TRUTH OF EXTERNAL SURFACE OF GEAR BLANKS WITH HOLE.

of this spindle, as well as the type of standard work-arbor used. It will be noticed in this case that the spindle has a removable inserted tapered sleeve in which the standard work-arbor fits. This standard work-arbor differs from most work-arbors used in gear cutting machines, in that it has a reverse taper and the tighter the work is clamped to the face of the work-spindle, the tighter this work-arbor is held in the sleeve, so that all members, arbor, work, etc., are bound together as a solid unit. The work can therefore be cut either on the "push" or "pull" stroke of the cutter, the "pull" stroke generally being recommended for ordinary gear blanks, because the work-support, as shown in Fig. 1, can be brought into play to prevent any distortion of the work-arbor, while the teeth are being cut.

### Methods of Testing Truth of Arbor and Work

There are certain preliminary operations which must be carefully handled prior to the cutting of a gear on the gear shaper. The first and most important one is to see that the arbor and work-spindle sleeve are perfectly clean. Then the work-arbor should be inserted in the sleeve from the botom, and tested for truth by means of a dial test indicator, as illustrated in Fig. 2. If the arbor is found to be out of truth, it is possible that a slight amount of dirt has collected in the work-spindle sleeve. The arbor should be removed, and the arbor and the sleeve carefully cleaned.

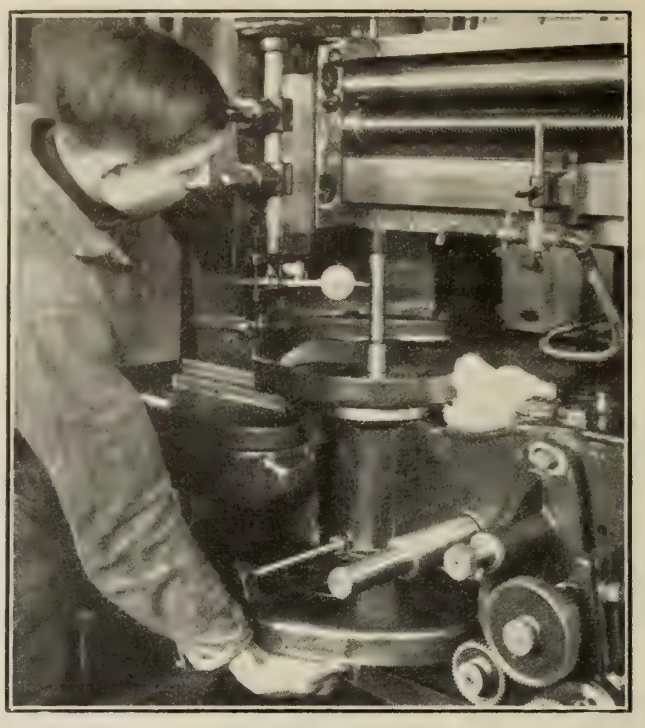


FIG. 2—TESTING TRUTH OF WORK-ARBOR WITH A DIAL INDICATOR.

The next step is to test the gear blanks themselves. If the work-arbor has been found to run true, the gear blanks, as shown in Fig. 3, are placed on the work-arbor and the nut left untightened. The dial test indicator is now brought in contact with the circumference of the work, and the work rotated on the work-arbor to determine if the holes in the gear blanks are concentric with the external circumference. If the gear blanks are found to be concentric, the nut is tightened and the test shown in Fig. 4 is then made. This consists in testing the gear blanks for truth of the holes with the sides. If the sides of the gear blanks have not been squared with the holes, the gear blanks will distort the arbor out of its true vertical plane, and if after the test in Fig. 4, the work is found to run out more than in test Fig. 3, it is a clear indication that the sides have not been faced square with the holes. If this difference in eccentricity exceeds the manufacturing tolerances on the work, the gear blanks should be removed and refaced; otherwise, the teeth will not be cut concentric with the holes in the gear blanks.

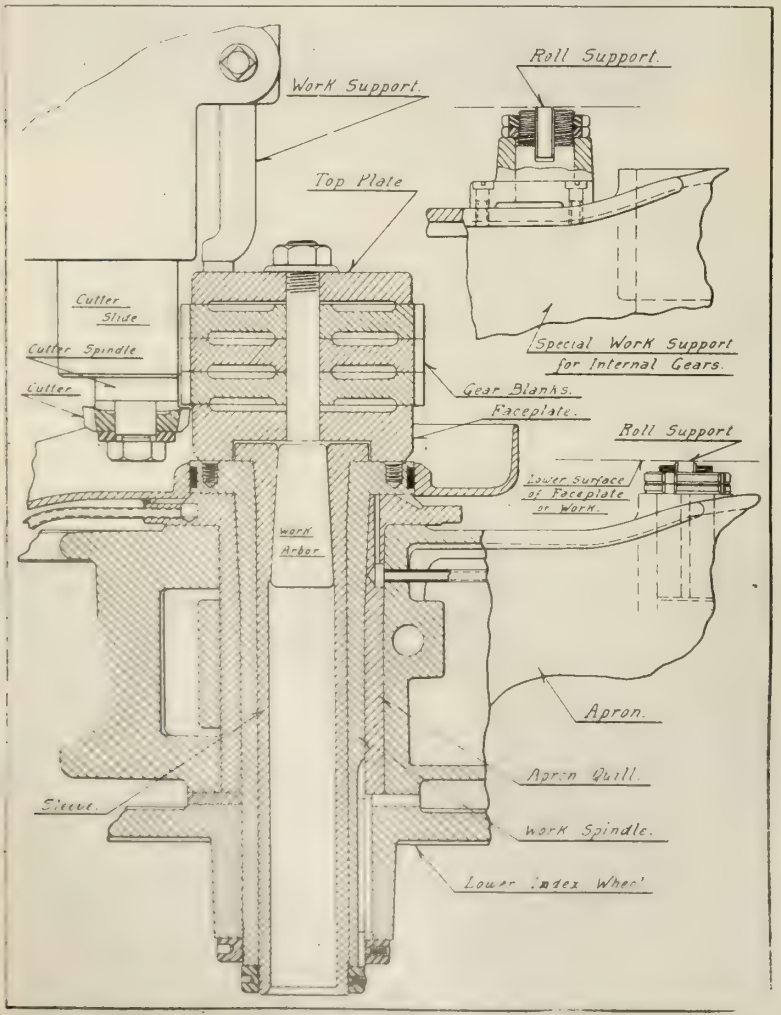



FIG. 1—SECTION THROUGH GEAR SHAPER WORK-SPINDLE AND APRON SHOWING REVERSE TAPER WORK-ARBOR AND METHOD OF HOLDING AND CLAMPING GEAR BLANKS

### Arbors and Faceplates

Under no condition should a soft work-arbor be used. The arbor should either be made from machinery steel pack-hardened and ground, or from tool steel hardened and ground. A good pack-hardened machinery steel arbor is satisfactory. If the bushings are used, care should be taken to see that they are true, and it is preferable to grind them. They need not be hardened unless there is a large number of gears to

cut. All washers or faceplates used for supporting gear blanks should be kept true and faced off evenly either on a grinding machine or on a lathe, to insure that the faces are square with the holes. Gear blanks that have been found to be inaccurately machined should be corrected before the teeth are cut. This is especially necessary if it is found that the faces of the rims are not true with the holes.

Experience has shown that money spent for first-class equipment for holding gear blanks, and for keeping them to a high standard is money well spent. If the work is handled under the right conditions, elaborate inspection of gear blanks after cutting is not necessary.

### Methods of Holding Various Forms of Gear Blanks

Some of the principles previously explained in connection with the holding of gear blanks will be further illustrated by means of examples. Fig. 1 shows how an ordinary plain gear blank, either with or without arms, can be satisfactorily held. The work should rest on a faceplate, and have a faceplate on top of it, so that the members can be clamped together and the work-supports used.

Fig. 5 shows how a small pinion is held. In this particular case, the faceplate is dispensed with, the work-arbor itself acting as one. The arbor is held up in the sleeve by a nut because the shape of the work necessitates operating the cutter on the "push" stroke. The thrust, therefore, comes on this nut located on top of the work-spindle. As the work has a tapered hole, a washer is used. This practice is better than using a tapered arbor, as the bushing is much easier and cheaper to make, and can be easily renewed. This is a very simple but effective fixture.

Fig. 6 shows how a two-step gear is held. It will be noticed here at A that the lower face-plate is recessed to clear the hub on the gear blank, and supports the latter close to the rim. The clamping plate is also recessed to clear the other end of the gear blank.

This is a comparatively simple fixture and if accurately machined will produce exceptionally good work. The hole in this gear blank is square, necessitating the use of a bushing on the work-arbor. For cutting the small gear, the fixture shown at B is used, and consists simply of two plain washers. The gear blank rests on a washer located on top of the sleeve in the work spindle and is clamped in place by a top washer and nut. Owing to the shape of the work, a cutter spindle extension and thin-web cutter are necessary.

### Holding Gears Having Shanks

One principle that should be adhered to in the holding of gear blanks is that as far as possible they should be located from the same points that are used when the member is assembled in the finished product. Holding work on centers should be dispensed with, because seldom if ever is the work held on centers when in actual use. The work should be supported in exactly the same manner as when in actual use; and this, of course, with accurate fixtures, eliminates the possibility of eccentricity, which is one of the chief causes of noisy gears.

Fig. 7 shows an interesting type of fixture for holding a pinion having a bearing on both ends. It will be noticed here that the work-arbor is of special shape, and is used to center a floating fixture, this floating fixture being clamped directly to the top face of the work-spindle. At the upper end, the work is supported by a special supporting arm. This is held on the apron of the machine, and surrounds the work-spindle taking the place of the regular chip-pan. It comprises a main fixture and two locating studs, one at the rear end of the arm and the other in the centre. The latter is provided at its lower end with rack teeth so that the supporting arm can be elevated to remove the work. This arrangement provides a very accurate and efficient means of holding small pinions which have a shank on both ends.

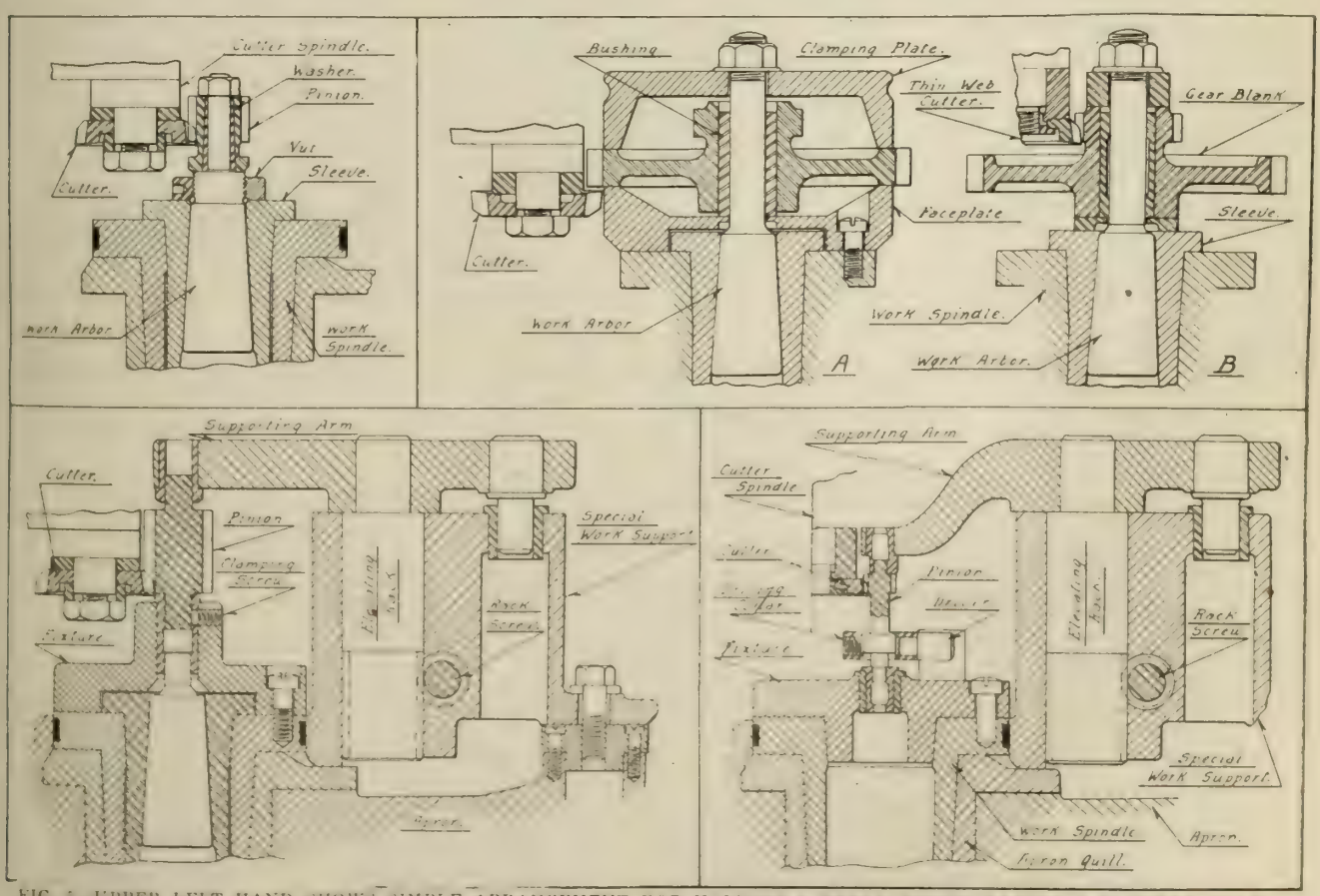



FIG. 5 UPPER LEFT HAND SHOWS SIMPLE ARRANGEMENT FOR HOLDING A SMALL PINION HAVING A TAPERED HOLE.
FIG. 6 UPPER RIGHT HAND SHOWS METHOD OF HOLDING A TWO-STEP GEAR FOR CUTTING TEETH ON SMALL AND LARGE STEPS
FIG. 7 LOWER LEFT, ILLUSTRATES A SPECIAL FIXTURE FOR HOLDING A PINION HAVING A SHANK ON BOTH ENDS
FIG. 8 LOWER RIGHT SHOWS A SOMEWHAT SIMILAR FIXTURE TO FIG. 7, WITH THE EXCEPTION THAT THE PINION IS SMALLER AND THE WORK IS DRIVEN IN A DIFFERENT MANNER.

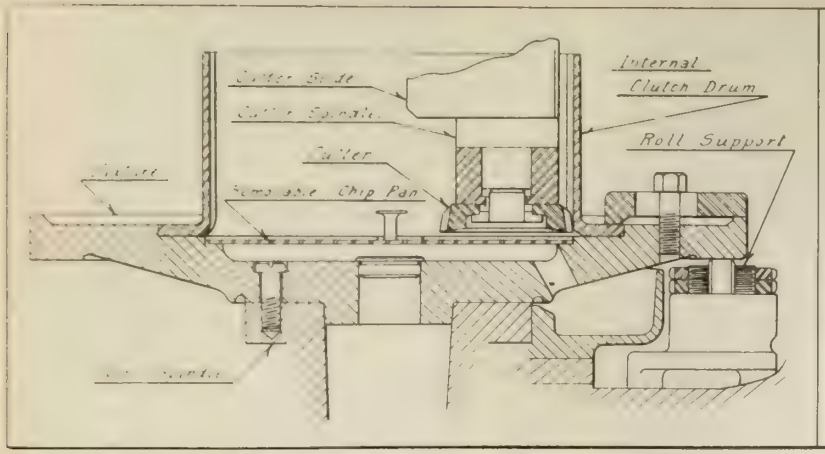



FIG. 9—CUTTING AN INTERNAL GEAR CLUTCH HOUSING.

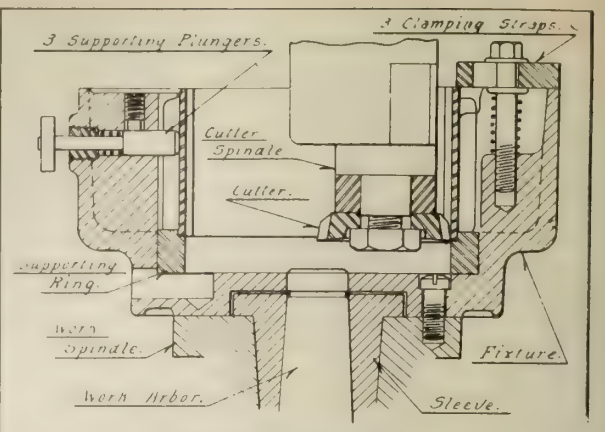



FIG. 10—A POT-TYPE FIXTURE FOR CUTTING A THIN-WALL INTERNAL GEAR.

A slightly different arrangement is shown in Fig 8, where the pinion is much smaller. In this particular case, a floating fixture is used, and the work-arbor is dispensed with. In setting up, the work is clamped, and then trued up by means of an indicator, after which the fixture is clamped in position. At the upper end, the work is supported by an arm held on a fixture similar to that shown in Fig. 7, but owing to the shortness of the work, a special over-arm support is necessary. In this particular case the work is driven by a dog which is clamped to the work itself and fits into a slot cut in a projection on the fixture.

**Holding Internal Gears**

Internal gears in many cases present difficult holding propositions, and especially when the internal gear has a considerably long face and a comparatively thin wall, such as is the case with clutch housings and similar work. If the clutch housing shell is heavy enough, then a fixture of the type shown in Fig. 9 can be used with satisfaction. This is a very simple fixture and is easily made. It comprises a faceplate, which is centered by the work-spindle itself, and is also clamped to it. The roll support on the apron, which is a standard appliance on the gear shaper, provides additional support for the fixture. A seat on the fixture is machined to fit the work, and the latter is held in place by means of three clamping straps. The work, aside from this support at the bottom, is not supported against the deflecting action of the cutter. The gear shaper, owing to the fact that the forward face of the cutter is provided with a clearance angle, exerts very little outward thrust, so that in this particular case, further support for the work is unnecessary.

An internal gear having a thinner wall is illustrated in Fig. 10. Here the wall of the gear is too thin to resist the outward thrust of the cutter, and therefore, a pot-type of fixture is necessary. This carries four spring plungers, which are locked after the work is clamped; thus serving to resist the thrust of the cutter against the work. Three clamping straps operating against the top face of the work are used to hold the work against the hardened steel ring in the fixture itself. This fixture differs from the other in that it is centered by the work arbor instead of the work-spindle; but it is clamped to the work-spindle in a similar manner.

**A Universal Fixture**

An exclusive advantage of the gear shaper method is shown in Fig. 11. Owing to the arrangement of the work-spindle which is carried on an apron that can be swung clear from the machine, the work can be clamped and held on a faceplate in a similar manner to a lathe. It can also be trued up accurately by means of a dial test indicator. This is illustrated very clearly in Fig. 11, which shows the cutting of an internal gear on the gear shaper without the use of a fixture, except an ordinary faceplate and locating ring, for centering work, the work being held by clamping straps as illustrated. This method of holding work is of great advantage in a jobbing shop.

# *Pipe Capacity—Relative Sizes of Opening Areas*

In heating and ventilation, water or air distribution it is often necessary for feeders to be taken from the main header, or vice versa. The combined cross sectional areas of the branches should equal that of the main line. Areas of circles vary as the squares of their diameters.

1—Three equal branches leading from one main. 2—Two feeders in ratio of 3:2 leading from main. 3—Two elongated sections leading from round main. Suppose main pipe D in cases 1 and 2 to be 15 ins. diameter. Area of large opening equals 15 inches squared x .7854″ = 176.715 sq. in.

1—Area of one small pipe equals 176.715 ÷ 3 = 58.905 sq. in.

Diameter (d) equals 8.66 inches.

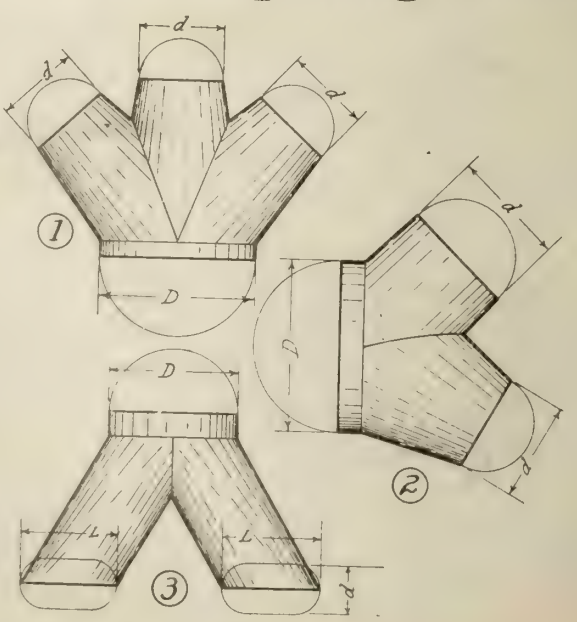
2—Ratio of branches 3 : 2.

$$\text{Area of large branch} = \frac{3}{5} \text{ of } 176.715'' = 106.03 \text{ sq. in.}$$

$$\text{Dia. of large branch} = \sqrt{\left(\frac{A}{.7854}\right)} = 11.62 \text{ inches.}$$

$$\text{Area of small branch} = \frac{2}{5} \text{ of } 176.715'' = 70.68 \text{ sq. in.}$$

$$\text{Dia. of small branch} = \sqrt{\left(\frac{A}{.7854}\right)} = 9.48 \text{ inches.}$$




*Canadian Machinery.*

# It's Often the Simple Idea that Saves the Time

## A Milling Problem—A Planer Kink—A Simple Calculation—A Portable Polisher, Two Punch Press Ideas, and a Simple Yet Effective Fixture.

By DONALD A. HAMPSON, Member A.S.M.E.

A DIFFICULT milling job is depicted at Fig. 1. We had to cut out the notches A-A on the pieces shown to the left of this view, and the parts were of drawn steel, ¼ inch thick, and having a section about ¾ inch wide left between the notches. To turn them out in manufacturing time, forty-eight were placed in a holder, this in turn clamped in a milling fixture, and the work passed between two straddle mills. The operator burred the work and loaded a spare holder while the machine was running.

The machine was in first-class condition, the fixtures well made, but we could not get the pieces to measure closer than 0.002 inch and this was too much off to pass—the particular measurement being from the bottom to the notch. A part of this variation was due to inaccuracy in the steel but most of it came from the work being unevenly clamped. We used a bar of steel like the one in Fig. 1 for a clamp over the work. We tried these clamps thick and stiff, and we tried them thinner, with an additional screw in the centre—but the work varied just the same.

Not until we adopted the scheme illustrated did we have success. A dovetail slot was planed the full length on the under side, and in this slot was driven a filler of maple cut across the grain. When wedged full, the clamp was put on the planer and the wood surface machined off true with the back and straight. This insert seemed to have the necessary qualities, for the accuracy, after its use, was all that could be desired.

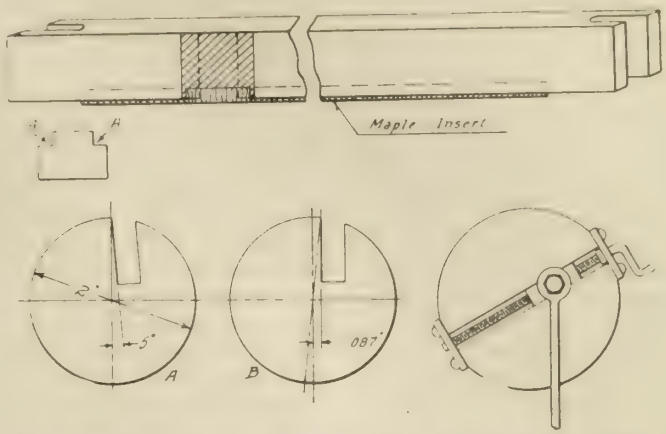



FIG. 1 UPPER VIEW. FIG. 2 LOWER RIGHT HAND VIEW. FIG. 3 LOWER LEFT HAND VIEW.

### A Planer Kink

Many old planers have the feed driven by a rod set in the flange on the stub end of a half-turn shaft. Means of adjusting the amount of feed are provided by the slot in the flange, along which the rod may be set by shifting the bolt.

The time lost in setting this bolt, getting it too far or not far enough, and in guessing at the proper place, then leaving it at the wrong one because it is an effort to change—that lost time would pay for the alteration shown at Fig. 2 in the first month. Flat plates are screwed across the ends of the slots, a screw is turned up and one end bent to the form of a crank, and a nut is made to slide in the T slot. This change makes feed shifting as easy as on any modern tool. Adjusting can be done while the machine is running and the various increments of feed secured both positively and quickly.

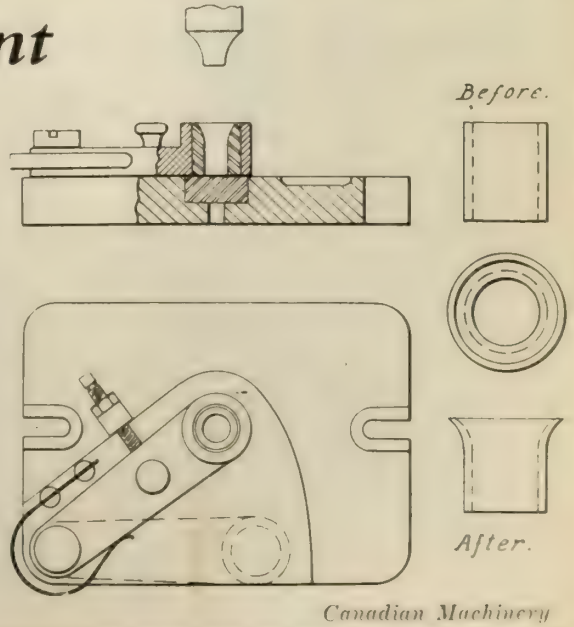
### Another Story

Some cutter blanks were sent in from a nearby shop to have the slots milled, these to be milled so that the cutting edge of the tool should lie at an angle of 5 degrees with the diameter, as shown at Fig. 3-A. The machinist to whom the job was given laid out the angle on the end of one piece and set

# *Punch Press Attachment*

The drawing herewith illustrates a safety device fitted to a die for the protection of the operator when placing the work in position. The operation is the flaring of the small tube as shown. The tubes are first cut off in the automatic from three-quarter inch by one-half inch steel, and then bell mouthed in the punch press. Instead of the operator placing them against the guide and holding with his fingers, we arranged the swinging arm shown. This arm consists of a piece of steel pivoted at the left hand end, and with a bell mouthed container at the other. A tension spring kept the arm against an adjustable stop, which aligned the work beneath the punch. The operator pulled the arm back as the ram ascended and his hands were never in the danger zone.

*By D. A. Hampson*




*Canadian Machinery*

up the piece on centres, intending to line it up with a square from the table top. Its position then would be as shown at B. He found, however, that he could not reach his scribed line when set up. He next asked for help to determine the distance between the arrows in the figure, as his idea was to set the side of his cutter to an arbor on the centres, then move with the aid of the dials.

Actually, he could have made the calculation himself, but it was easier to ask than to think it out, so, like many others, he lost a chance to apply a bit of his education to everyday work. The desired distance, the side of the cut, and the diameter, form the three sides of a triangle in which the unknown distance in the "side opposite" and half the diameter is the "hypotenuse." This, when the angle is known, forms one of the simplest of trigonomic equations. The sine of the angle is .087. The equation is SO = Hyp. x sin., which in this case may be solved mentally 1 x .087 = 0.087 inch. This is the distance off centre when the line of cut is placed vertically.

### A Simple Idea

One of the workmen from the foundry appeared in the shop unexpectedly with a miniature electric motor, a discarded brush that his foreman had given him and a drawing. He said he had been studying on an idea and would like to get a little machine work done for himself at the usual shop rates. It was a shop policy to encourage any of the men who would think along mechanical lines and this fellow's job was put through the same day. The idea was that of an electrical stove polisher, in fact a scheme to lighten the housewife's labor, and while doing so to shine the stove without the use of polish, adding another to the long list of devices that have revolutionized our homes in the past decade or two.

Fig. 4 shows that the device is very similar to the light portable grinders, extensions of the motor shaft carrying the "abrasive wheel" and the two handles. In this case, a section of a wire brush worn down to five inches in diameter formed the working tool. This was brought in contact with the top of the stove and there moved about at will. No preparation was used. Our man's theory was that cast iron has in its composition practically the same elements that form the basis of stove polishes. The results he got were proof that he was right. His revolving brush removes the rust and dirt from the surface and further metal-to-metal contact burnishes the iron, which supplies its own graphite polish, so to speak.

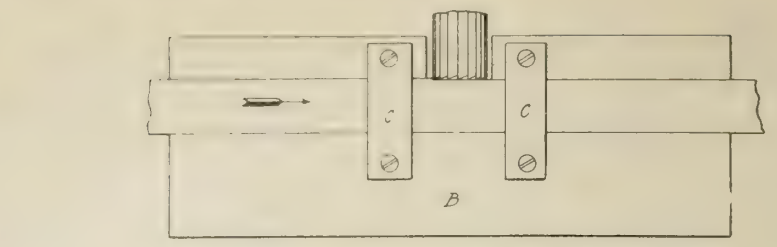



FIG. 5—FIXTURE FOR REDUCING EDGE OF BARS.

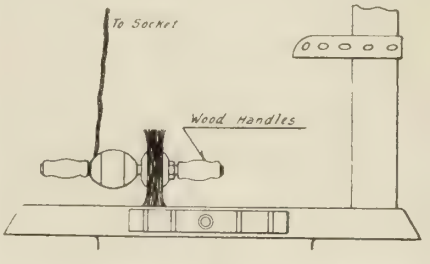



FIG. 4 SHOWING STYLE OF STOVE POLISHER.

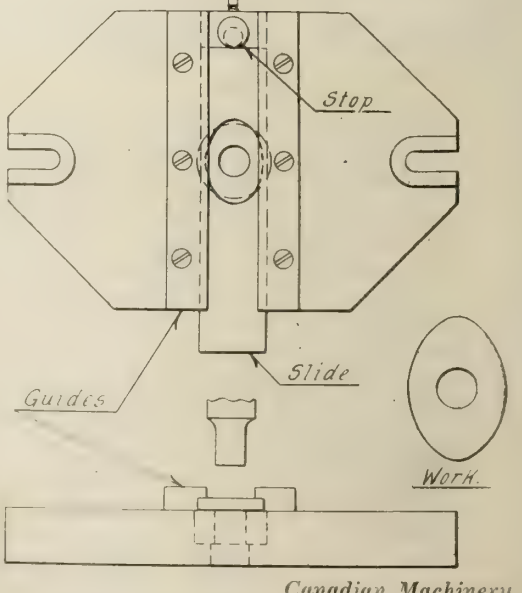
A certain shop manufactures nearly a million pieces per year from rectangular cold drawn steel bars. Various kinds of vises hold the bars, which are placed a number at a time in milling machines, and cut off. Frequently it is possible to do some forming along with the cutting off. Ordinarily, the shop's stock of steel includes all the sizes needed, but conditions such as have existed during recent years and the "specials" that have to be made for large buyers sometimes require steel of a size that is not obtainable. The only way to get it is to cut down the next larger size.

Fig. 5 shows a fixture used for reducing the edge of bars a few thousandths. For instance, steel .873 inch x .183 inch would be in stock and this would be the nearest to make a thousand pieces .870 inch x .183 inch from. If there wasn't a fixture for cutting to this size, the cost of one of the type shown is a mere trifle. B is a piece of cast iron planed top and bottom with a tongue on the bottom to fit the miller table. When bolted to the table, a slot is milled, .184 inch deep and .870 inch wide. The left hand end is widened to .873 inch. The two straps C fasten over the slot to confine the bars. A new bar is pushed in at the left hand end, an end mill removes the excess at high speed and the bar passes out at the right hand end the required size.

# *Punch Press Feeding Device*

We were always fortunate in the matter of punch press accidents and wanted to remain so. Safety devices applied to old and new tools are profitable expenditures. The oval piece here shown is of 1-16 inch brass. The operation is to punch the center hole. The die is set in the die block and the top is provided with two strips for guiding the slide which carries the work. When placing in the work the strip is pulled out, and then pushed in below the punch. When the hole is punched, the slide is pulled out far enough to allow the work to drop out into a box located below the press bed. In addition to this safety arrangement the press is provided with a guard, but as the hands of the operator never go near the punch, the guard is only an added protection.

*By D. A. Hampson*



# Typical Examples of Manufacturing Lathe Work

*By J. H. Moore*

THE modern machine tool of to-day is a very different tool from its prototype of ten years ago. Wonderful improvements have been made until we now have automatic millers, automatic screw machines, automatic lathes—but why go further; every up-to-date mechanic knows the rest off by heart.

There comes a time, however, when a problem arises that the automatic cannot economically solve. True, the automatic type of machine is ideal when large quantities are put through at a time, but how about the shop not quite big enough for that, where the work goes through in lots not large enough to justify the installation of special automatic machinery. Are they to be content with ordinary production, or can they obtain a higher rate of production without quite so much expenditure?

That question is easily solved by looking through the advertising pages of any modern technical journal. In such pages will be found all types of machines that are medium steps, so to speak, in increased production. These steps may, of course, lead to the point where increase of business calls for a still further expenditure in equipment, but let us leave the possibility at this point and consider the use of the manufacturing lathe as a productive measure.

There are, of course, numerous manufacturing lathes of various designs on the market, each claiming some particular feature or features. We will, however, not attempt to even touch upon these points, but rather let this article be a lesson on a few examples of the possibilities of such a machine tool. Through the courtesy of the Lodge and Shipley Co., Cincinnati, Ohio, we are able to show in photographic form some work completed on their particular type of manufacturing lathe.

The main idea embodied in the design of such machines is this: to retain the simplicity of the general purpose engine lathe, at the same time adding attachments which will make the machine accomplish repetition work. For example, multiple positive diameter stops, automatic length feed stops, special tool blocks, and so on.

Take the use of the stops. In the first case the diameter stops allow repetition work of certain sizes, while the length stops guarantee that the feed trips at the same point in each case. The value of special and multiple tool blocks is readily understood, for by their use it is possible to group the cutting tools for productive purposes.

Without going into the design of such machines let us consider a few examples of work performed. At Fig. 1 is shown the machinery of a shaft such as could be found in almost any manufacturing plant. The piece shown is the main driving shaft for a selective headstock, and the operation-times given include handling, setting up, etc. This piece was machined to demonstrate the difference in machining time possible, and for the sake of comparison ten pieces were machined under three conditions. The diameter and length stops were both used at the first test, and the time for the ten pieces was 1 hour 56 minutes or an average of 12 minutes each.

In the second test the diameter stops only were used, and in this case 3 hours 4 minutes or 18 minutes each was necessary to complete the ten pieces.

The third and last test was accomplished without the use of either the length or diameter stops, and 4 hours and 3 minutes was necessary to complete the ten pieces. This meant that the average time for each piece was 24 minutes. It would be well to add that the work was accomplished on the same lathe by the same operator, under the same conditions, the test being held to demonstrate the efficiency of the stops. From a glance at the time figures it will be seen that production increased 100 per cent.

### Another Example

Fig. 2 shows a rather interesting piece which if it was to be made in sufficient quantities would no doubt be produced on an automatic screw machine, or some such production tool. However, in this case the lots were limited, so that it was made on a manufacturing lathe. The work is known as the turning of selective head main driving shaft beading nuts, and the work is done at one setting from large bar stock, leaving the bar stock in the centre intact. This was accomplished on an 18″ machine, and the tool set up consisted of an L-tool, threading tool, cut-off tool, and finishing tool, in a four-way tool block. A facing tool was also held in a high duty tool block.

The operations consisted of the following steps. The stock was first turned on the outside with the finishing tool, after which the outside of stock was threaded with the threading tool. Next came the cutting under ring with the

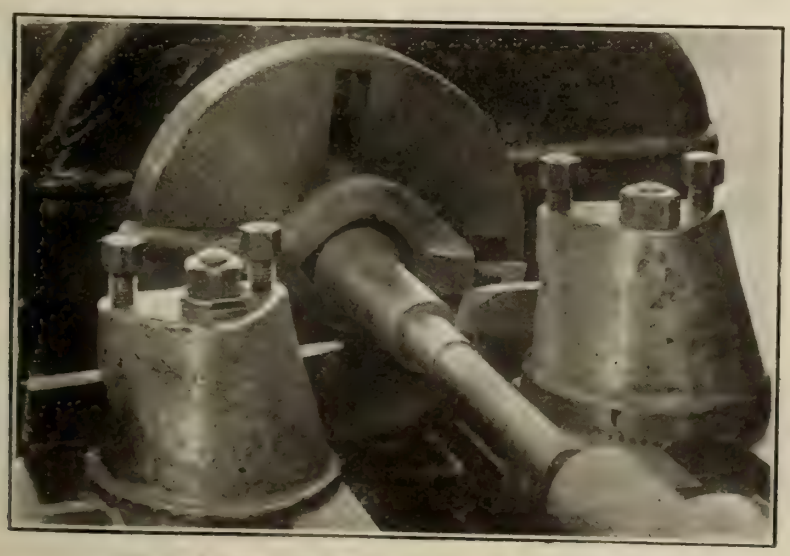


FIG. 1. A GOOD EXAMPLE OF SHAFT TURNING.

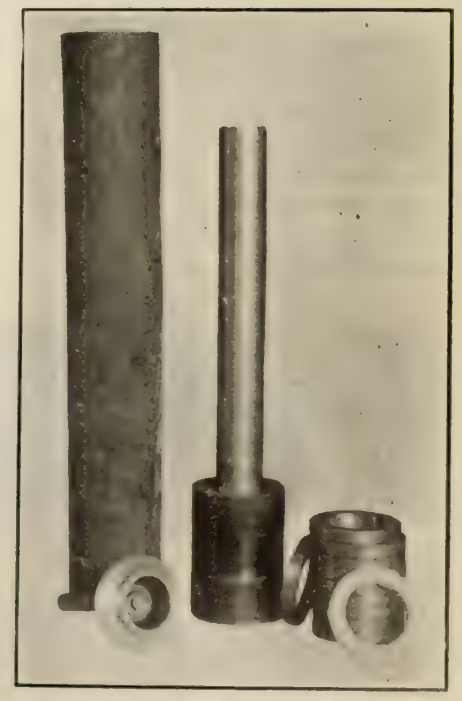


FIG. 2. SHOWING THE ROUGH STOCK AND FINISHED PIECES.

L-tool, leaving the bar stock in the centre intact.

The fourth step consisted in facing off the end of ring with the tool in the rear rest. In the fifth step, the cut-off tool in the four-way tool block, and the facing tool on the rear rest are set so that when the fourth step is finished the cut-off tool when run forward will cut off the ring to its proper thickness.

The sixth step consists of running in the cut off ⅛", revolving the swing threading tool into position, and the chamfering of both outer edges of the ring. The next and last step consists of finishing with the cutting-off tool. It will be noted that the photograph shows the testing plug, samples of the work, and both the rough stock, and the appearance of same after the nuts have been made.

Fig. 3 illustrates a close-up view of the L-tool cutting under ring, while Fig. 4 illustrates the turning of rings in the third operation.

### Two Other Examples

Fig. 5 depicts a rather interesting job being performed. The work is that of turning a double bevel gear, and the value of multiple tooling is very evident in this view. In the first operation a four-way tool block is used on the front rest, while the gang tool block shown is used in the second operation, viz., the machining of the beveled surfaces.

There are many other examples that we could illustrate, but enough has been shown to point out the advantage of studying your work intelligently, and securing as efficient a tool as your business will permit. We are all after lower production costs, and a good way to obtain the same is to study your present methods of production, then see if you can make an improvement on the same. Suppose you are putting through certain kinds of work in lots of 5 or 10. Think carefully. Is it not possible to put them through in lots of 10 or 20? If you can conveniently do so, try this method, use the proper equipment, then watch your production costs go down.

## HOW FAR WILL A PUMP DRAW WATER?

This is a question often asked in reference to ordinary pumps used for raising water to just over ground level, and as a rough guide it may be taken that the maximum distance in feet would be equal to the number of inches at which a mercurial barometer is standing, although in practice this depth would usually be impossible, as leakages and friction have to be considered. Usually, says Practical Engineer, a simple pump will, if it is absolutely tight and sound from the piston or bucket to the water level, raise water slowly from a depth of about 30 feet below the bottom valve, but more usually 28 feet would be the limit of effective working, although few pumps can be depended on for more than a 25-foot draw owing to faults in their fitting. Even a pinhole will destroy the vacuum under the lower valve in a very short time or a few grains of sand in the valve, and preventing it closing tightly, will have the same effect, this very often being the cause of pumps "losing water" when drawing from a sandy source. As to how high a pump will lift water above itself, the limits may be defined by the power available to lift the weight and the strength of the appliances used in the putting the necessary power into effective action. Horizontally, water can be moved for practically any distance, taking friction into consideration, as this is considerable. Pumps with more than 25 feet effective suction will rarely be found satisfactory for any length of time.

## RUSTPROOF PROCESS

Rust. Who hasn't heard of the word, far less experienced the trouble of trying to remove it from exposed or neglected material. But now comes a process that is said to overcome the trouble entirely.

The Andrews rustproofing process, with premises at the Andrews Rust Proofing Laboratories, 821 Book Bldg., Detroit, Mich., is said to be exhibiting satisfactory results in this line, and following is description of the process as given out.

The pieces to be rustproofed are placed in a furnace which burns a mixture of gas and air. It is claimed that after the work has reached the uniform heat of the furnace, an atmosphere is created that forms an oxide which penetrates the most minute pores of the metal. The work is then removed from the furnace and immersed in a bath of oil, heated to a temperature of 100 degrees Fahr. The oil carbonizes and, mixing with the oxide, forms a paste which sinks into the pores. At the same time, quenching in the oil contracts the pores and seals up the deposit therein. While the temperature of the furnace is not given, it is stated that it is not high enough to distort or in any way injure the work.

Among the claims made for the process are: That parts treated by it have a fine ebony finish and that they have withstood a test by being sprayed with salt water in a closed vessel for 83 hours and remaining suspended over the salt solution for an additional 157 hours without being rusted.

## INSPECTION OF HOISTING CHAINS

Few details in industrial life cause more accidents to men and machinery than that associated with the handling of heavy material. Too often this work is carried on with little or no attention to the lifting appliances. A chain or rope is secured and placed on the work and it is expected that it will give the same service that it did the previous time. The imperative need of systematic inspection to hoisting appliances was again demonstrated in the fatal accident to a railroad employee in Charlottetown, P.E.I., recently. A locomotive tender was being hoisted from position and the workman was pulling out some blocks from underneath when the hoisting chain broke, the tender falling and crushing his arm. He died following amputation. The safety feature of industrial welfare is one of the factors where consistent co-operation between executive heads and the workmen is essential to mutual confidence and maximum efficiency.

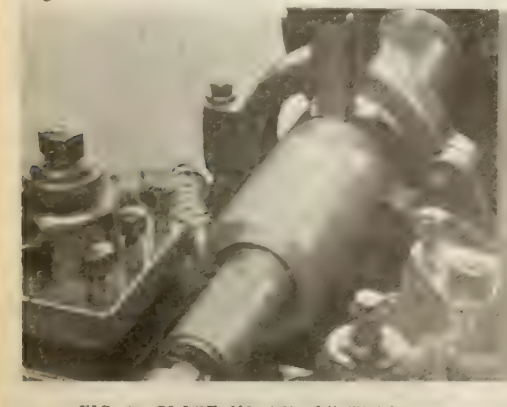


FIG. 3—CLOSE UP OF "L" TOOL.



FIG. 4—TURNING OF RINGS.

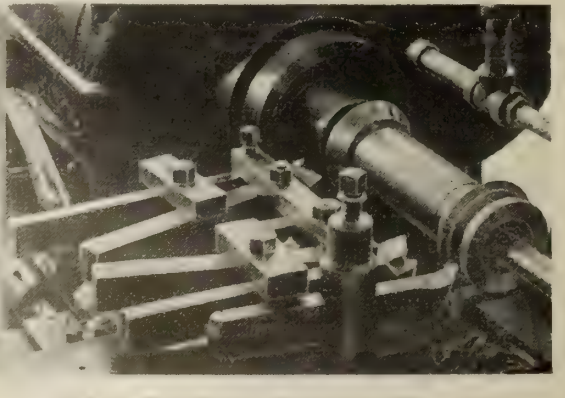


FIG. 5—TURNING A DOUBLE BEVEL GEAR

# Points to Consider in Cylindrical Grinding

## Factors Which Determine Wheel-wearing Action—Laws Relating to Draw-in and Traversed Cuts—Production Costs.

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CYLINDRICAL grinding is a subject in which we are all vitally interested. This paper, which was presented before the American Society of Mechanical Engineers, comprises a study of the laws involved, and an analysis of grinding action both for draw-in cuts and traversed cuts.

In view of the effect of wheel wear on grinding efficiency, formulas are derived for wheel wear in terms of known variables such as grain size of wheel, work speed, wheel speed, feed, etc. By calculating values for wheel wear for different conditions and comparing them with production figures calculated under the same conditions, a proper selection of wheels may be made.

The fact that the expense due to wheel wear comprises but a small item in the total cost of grinding, however, may lead to wrong conclusions if this is made the controlling factor. In the latter part of his paper, therefore, the author discusses the subject of production costs and the various factors that should be considered in securing the highest possible grinding efficiency. With this introduction, let the author speak for himself.

In Fig. 1 is shown a section of wheel and work with the elements greatly enlarged. The grain paths across the work are indicated and a shaded area indicates the shape of a single chip. The grain paths are shown as straight lines tangent to the feed circle. Actually these paths are not straight lines, but are epicycloidal curves. However, within the limits of probable dimensions which are actually involved in any cylindrical grinding operation, a graphical layout of the grain paths on a large scale (say ¼ in. = 0.0010 in.) will show that these curves are so nearly straight lines that the error is negligible. The mathematical relations are greatly simplified by this assumption. By actual trial it was found that there was seldom over 2 per cent. difference in the values of maximum chip depth obtained by the use of the actual and the assumed forms of grain path.

### Wheel-Wearing Action

The three factors to be considered as determining wheel-wearing action are (1) the frequency with which the grain is applied, (2) the average grain depth of cut as indicated by the chip dimensions, and (3) the kinetic energy of the grain due to its mass and velocity.

[In his complete paper, the author here discusses the three factors mentioned and derives the formulas given below for grain depth of cut and for wheel wear, using the following notation:

N = r.p.m. of wheel

V = surface speed of wheel, ft. per min.

u = work speed in ft. per min.

R = wheel radius in inches.

r = work radius, inches

f = depth of cut, inches on work radius

$\mu$ = interval between grains, inches

S = radius of feed circle = r — f, inches

G = maximum depth of chip, inches.]

Frequency of application depends upon the revolutions per minute of the wheel. Work done is measured by the dimensions of the chip removed by each grain and the total number of chips removed. Kinetic energy is proportional to the

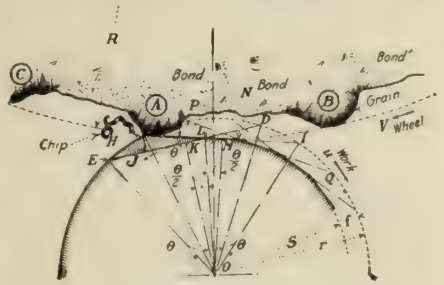



FIG. 1—DIAGRAM ILLUSTRATING THE CUTTING ACTION.

mass and square of the velocity of the cutting particles.

Frequency of application of the grain $= N = \frac{12V}{2\pi R}$, and volume of wheel wear $= \frac{12V}{2\pi R} \times 2\pi R$. Therefore wheel wear is directly proportional to 12V; or dropping the constant, is directly proportional to V.

The formula for grain depth of cut, as derived in the complete paper, simplified by the omission of inconsequential terms, is

$$G = \frac{\mu u}{V} \sqrt{\frac{2f}{r}} \text{ (approximately)} \ldots [1]$$

From this it is deduced that grain depth of cut varies directly with grain interval, work speed, and square root of radial feed; and inversely with wheel speed, and square root of work radius.

The kinetic energy of the cutting particles increases with the square of the velocity. For a certain depth of cut the resistance of the work to the grain is very nearly proportional to this depth, as the cuts are very small, even when compared to the total size of the grain. Theoretically, for some low velocity the kinetic energy of the grain should just equal the energy required to remove the chip (the feed would be reduced to maintain constant grain depth of cut under reduced wheel-velocity conditions) and wheel wear would be caused without any chip being removed up to this point. Actually the bond strength is always sufficient to prevent this condition. Our assumption is then clear that:

Wheel wear varies inversely with the surplus kinetic energy of cutting particles and is inversely proportional to effective wheel surface velocities (wheel speed minus work speed).

We are now prepared to combine factors.

a Wheel wear is proportional to the wheel speed, or to V.

b Wheel wear is proportional to the grain depth of cut, as expressed in Formula [1].

c Wheel wear is inversely proportional to surplus kinetic energy of the cutting particles, or proportional to $1/(V - u)^2$. The term u is usually negligible as compared with V and it may therefore be assumed that $1/V^2 = 1/(V - u)^2$.

From these relations, a, b and c, an index of wheel-wearing action ($WW_1$) due to grinding (where the wheel face is free-cutting) may be expressed as follows:

$$WW_1 = V \frac{\mu u}{V} \sqrt{\frac{2f}{r}} \times \frac{1}{V^2}$$

$$= \frac{\mu u}{V^2} \sqrt{\frac{2f}{r}} \ldots\ldots\ldots\ldots [2]$$

### Laws of Grinding for Draw-In Cuts

From this expression we may derive the following laws of cylindrical grinding, operative within the usual limits of speeds and dimensions. For straight-in (draw-in) cuts a free-cutting wheel will wear according to the effect of wheel-wearing action as follows:

a Wheel-wearing action increases directly as:

1 Grain interval (grain size—inversely as grade)

2 Work speed (surface)

3 Square root of diametral cut (feed).

b Wheel-wearing action increases directly as the following are decreased:

1 Square of wheel speed (surface)

2 Square root of work radius.

A soft wheel is more susceptible to wheel-wearing action than a hard wheel and will more nearly follow the theoretical conditions. It is therefore more free-cutting and will cut more nearly the full chip than a hard wheel. There is consequently a gain in production as wheels of softer grades are used, all other conditions remaining constant, up to the point where the chips are geometrically perfect for a given condition of speeds and dimensions. It is clear from this standpoint that the softest possible

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wheel should be used. High wheel speeds up to the safe limit are, of course, necessary if the soft wheels are to perform in a satisfactory manner.

To show the practical application of Formula [2] for wheel-wearing action (Index of Wheel Wear), Table 1 is given.

In column 1 of the table are the work speeds provided on a recent grinding machine, given in order so that actual values can be experimentally obtained to check with the theoretical. In the succeeding columns are two series of values as follows:

1 Following the term "Production" are approximate values for cubic inches of metal removed per minute for a wheel 1 in. wide. These were calculated by the formula, Production = nominal work diameter $\times \pi \times$ r.p.m. $\times$ depth of cut (assumed to be 0.0005 in.), which gives values slightly less than the true values.

2 Following the terms "Wheel Wear" are values of the actual wheel wear obtained by multiplying the Index of Wheel Wear, calculated by Formula [2], by a constant derived by experiment. This constant is for convenience expressed in the form $1800 \times 10^{4}$.

Sample Calculation. In Formula [2] assume:

$u = 53$ r.p.m. $= 13.9$ ft. per min.
$r = \frac{1}{2}$ in. (work diameter 1 in.)
$f = 0.0005$ in.
$V = 6000$ ft. per min.
$\mu = 0.05$
$R = 9.0$ in. (wheel radius)
Substituting,

$$WW_1 = \frac{0.05 \times 13.9}{36{,}000{,}000} \sqrt{\frac{0.001}{0.5}}$$

$$= 0.0000000196 \times 0.047 = 9212 \times 10^{-13}$$

Multiplying by constant given above ($1800 \times 10^{4}$),

$WW_1 = 0.0166$ cu. in. per min. for wheel 1 in. wide.

The corresponding "Production" in Table 1 is 0.0835 cu. in.

It will be seen that the wheel-wear values increase rapidly as work speed increases. The value 0.0166 for work of 1 in. diameter at 53 r.p.m. becomes 0.1040 for work of 4 in. diameter at. 167 r.p.m. The same wheel cannot be properly used for both cases, as one sufficiently soft to cut freely in the first case would wear so fast as to be nearly useless in the second case. However, where wheel-wear values are nearly the same we may expect the same wheel to act properly. For instance, a wheel suitable for 1-in. work at 138 r.p.m. wears at the rate of 0.0433 cu. in. per min.; and one suitable for 4-in. work at 72.5 r.p.m. wears at the rate of 0.0450 cu. in per min. In all probability one wheel would serve for both.

### Selection of Wheels for Draw-In Cuts

From Table 1, and by experimental tests with various wheels, certain ranges of wheel-wear values may be found which correspond to definite grades of wheels of suitable grain size and abrasive for the material to be ground. Once this is done, the selection of proper wheels is no longer a question of guesswork, as wheel-wear indices may be computed for any set of conditions and the proper wheel selected. The question of the variation in wheels has been reduced to a point where it no longer can be a very large factor, and we may always change our speeds or feeds to correct the action in the proper direction if we understand the laws which have been previously pointed out. As an example of the possibilities of wheel selection, it has been found that for a certain machine the following wheels (Norton system of grade) are suitable for straight-in cuts on mild steel:

| Wheel Designation | | Wheel-Wear Values, Table 1 |
|---|---|---|
| 36 or 46 J | for values from | 0150 to .0250 |
| 36 or 46 K | for values from | .0250 to .0350 |
| 36 or 46 L | for values from | .0350 to .0450 |
| 36 or 46 M | for values of | .0450 and higher |

Use no wheels harder than M. For hard materials use a grade softer and No. 60 grain. These values are for straight-in cuts only.

Influence of Feed. As an example of the effect of doubling the feed, let us assume the conditions as above, except that the feed is increased to 0.001 in. (on radius).

$$WW = \frac{\mu u}{V^2} \sqrt{\frac{2f}{r}} = \frac{0.05 \times 13.9}{36{,}000{,}000} \sqrt{\frac{0.002}{0.5}}$$

$= 1200 \times 10^{-13}$.

Wheel wear $= 1800 \times 10^{4} \times 1240 \times 10^{-13} = 0.0224$ cu. in. per min. per inch of wheel face. Production is approximately doubled and

$$\text{Wheel-wear increase} = \frac{0.0224 - 0.0166}{0.0166} \times 100 = 35 \text{ per cent.}$$

This indicates how advantageously an increase of feed operates to obtain increased production (up to the limit of grain penetration). If we had doubled work speed we would simply have doubled both production and wheel wear.

### Traversed Cuts

The most important development in recent grinding machines is the recognition and utilization of the fact that overall operating efficiency for traversed cylindrical work increases as traverse speeds are increased. (This assumes that for a given traverse speed, width of wheel and revolution of work are so related as to cause the cutting face to just cover the lead of the work.)

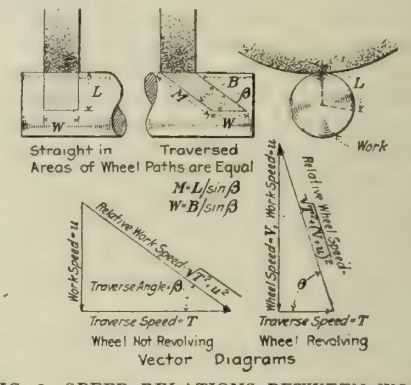



FIG. 2—SPEED RELATIONS BETWEEN WORK AND WHEEL.

Referring to Fig. 2, let

W = width of wheel face

L = length of projected arc of rotation of work

M = actual length of path of traversed cut

B = actual width of path of traversed cut

$B$ = traverse angle

Then $B = W \sin B$; $M = L/\sin B$; areas $W \times L$ and $B \times M$ are equal. Wheel width of cut is proportional to W for straight-in cut, but reduced to B for traversed cut.

It is to be noted that relative work speed has been increased over actual work speed in the inverse proportion of the sine of the traverse angle. This relative increase does not appear in the projected (end view) relations. As these alone affect individual grain depth of cut, we have gained in relative work speed to get over the longer path M so as to cover the same area in the same time on a narrower width, B, without increasing grain depth of cut.

Now if the wheel rotates, each grain cuts across the work at an angle $\Theta$, resulting from speed relations shown by Fig. 2 (vector diagram for rotating wheel). Then the individual grain paths are at a much steeper angle than the wheel path to the axis of work rotation, but we have gained in relative wheel speed without increasing individual grain depth of cut. Our wheel width of cut is also reduced by a slight amount proportional to $\sin \Theta$, which is of course much less than the reduction before the wheel was rotated. The net result is a reduction in wheel stress proportional to $\sin \Theta$ and an increase in work speed proportional to $\sin B$, without increase in grain depth of cut.

TABLE I. COMPARISON BETWEEN WHEEL WEAR AND QUANTITY OF METAL REMOVED AT DIFFERENT SPEEDS

| Work Speed in r.p.m. | | Work Diameters — 1 in. | 2 in. | 3 in. | 4 in. |
|---|---|---|---|---|---|
| 53 | Production | 0.0835 | 0.1670 | 0.2500 | 0.3340 |
| | Wheel Wear | 0.1140 | 0.0236 | 0.0290 | 0.0334 |
| 72.5 | Production | 0.1140 | 0.2280 | 0.3420 | 0.4560 |
| | Wheel Wear | 0.0226 | 0.0319 | 0.0390 | 0.0450 |
| 87 | Production | 0.1370 | 0.2740 | 0.4110 | 0.5480 |
| | Wheel Wear | 0.0273 | 0.0387 | 0.0475 | 0.0546 |
| 101 | Production | 0.1586 | 0.3172 | 0.4758 | 0.6344 |
| | Wheel Wear | 0.0316 | 0.0448 | 0.0540 | 0.0635 |
| 138 | Production | 0.2160 | 0.4320 | 0.6480 | 0.8640 |
| | Wheel Wear | 0.0433 | 0.0612 | 0.0645 | 0.0865 |
| 167 | Production | 0.2620 | 0.5240 | 0.7860 | 1.0480 |
| | Wheel Wear | 0.0522 | 0.0740 | 0.0910 | 0.1040 |

Wheel diameter 18 in.; surface speed, 6000 ft. per min.; diametral feed per work revolution (automatic feed), 0.001 in.; grain of wheel, 66 16 Alundum; material, mild machinery steel.

The "head resistance" against the wheel as a whole is reduced by the sin $B$ factor, while wheel width of cut is reduced by sin $\Theta$. These both directly affect wheel wear. For traversed-feed conditions our grain depth of cut remains the same as in straight-in feeds, but wheel wear is reduced in the proportion of sin $B \times$ sin $\Theta$.

If T = traverse speed, V = wheel speed, u = work speed, then

$$WW_1 = \left(\frac{u}{\sqrt{T^2 + u^2}}\right)\left(\frac{V + u}{\sqrt{T^2 + (V + u)^2}}\right)$$

$$\left(\frac{\mu u}{rV^2}\right)\left(\sqrt{2rf}\right) \ldots\ldots\ldots\ldots\ldots [3]$$

In practical cases the second term will be so nearly 1 that it may be neglected. It is evident that T affects the quantity appreciably only when u is kept relatively low. This indicates that a wide wheel should be used to get the effect of reduced wear for a given production, traversing as rapidly as possible. The above formula assumes no overlapping of the cut.

Now by making assumptions and neglecting values whose effect is so small as to make no appreciable difference for purposes of comparison, we reduce the expressions for $WW_1$ exactly as we did in the case of straight-in feeds and obtain:

Index of wheel wear

$$WW_1 = \frac{\mu u}{V^2}\left(\frac{u}{\sqrt{T^2 + u^2}}\right)\sqrt{\frac{2f}{r}} \ldots\ldots [4]$$

**Laws of Grinding for Traversed Cuts**

From this it is evident that for traversed work:

a Wheel wear increases directly with the work speed

b Wheel wear decreases directly as the decrease in the quantity which we term "traverse factor," which is work speed divided by the square root of the sum of the squares of traverse and work speeds

c Wheel wear decreases directly as square of wheel speed increases

d Wheel wear decreases directly as the square root of the work radius increases

e Wheel wear increases directly as the square root of the feed increases.

The value $\frac{u}{\sqrt{T^2 + u^2}}$ in our expression for index of wheel wear is our traverse factor. Where T is large with respect to u this factor will be appreciably less than unity, but as u increases the reduction in wheel-wearing action is less pronounced.

Table 2 gives values of the traverse factor for a certain machine having the work speeds previously given for draw-in cuts, and the following table (traverse) speeds: 10.02, 14.00, 17.00, 19.70, 26.90 and 32.60 ft. per min. The table shows combinations of speeds giving leads from 2.3 in. upward. As the machine was designed for a wheel 2½ in. wide, combinations of speeds giving lesser leads of work are not given.

TABLE 2. TRAVERSE FACTORS

| Traverse ft. per m. | Wk. r.p.m | Lead in. | Work Diameters 1 in. | 2 in. | 3 in. | 4 in. |
|---|---|---|---|---|---|---|
| 10.02 | 53 | 2.3 | 0.810 | 0.950 | 0.975 | 0.985 |
| 14.00 | 53 | 3.1 | 0.705 | 0.883 | 0.946 | 0.968 |
| 14.00 | 72.5 | 2.3 | 0.805 | 0.938 | 0.968 | 0.976 |
| 17.00 | 53 | 3.8 | 0.632 | 0.850 | 0.926 | 0.955 |
| 17.00 | 72.5 | 2.8 | 0.730 | 0.910 | 0.955 | 0.974 |
| 17.00 | 87 | 2.3 | 0.802 | 0.935 | 0.972 | 0.985 |
| 19.70 | 53 | 4.4 | 0.576 | 0.817 | 0.905 | 0.943 |
| 19.70 | 72.5 | 3.2 | 0.691 | 0.884 | 0.943 | 0.967 |
| 19.70 | 87 | 2.7 | 0.756 | 0.916 | 0.961 | 0.980 |
| 19.70 | 101 | 2.3 | 0.802 | 0.935 | 0.971 | 0.986 |
| 26.90 | 53 | 5.9 | 0.460 | 0.720 | 0.839 | 0.900 |
| 26.90 | 72.5 | 4.4 | 0.574 | 0.815 | 0.902 | 0.942 |
| 26.90 | 87 | 3.6 | 0.646 | 0.860 | 0.931 | 0.958 |
| 26.90 | 101 | 3.1 | 0.703 | 0.890 | 0.950 | 0.974 |
| 26.90 | 138 | 2.3 | 0.801 | 0.936 | 0.960 | 0.982 |
| 32.60 | 53 | 7.35 | 0.397 | 0.655 | 0.790 | 0.865 |
| 32.60 | 72.5 | 5.3 | 0.505 | 0.760 | 0.867 | 0.919 |
| 32.60 | 87 | 4.4 | 0.580 | 0.815 | 0.908 | 0.945 |
| 32.60 | 101 | 3.8 | 0.635 | 0.854 | 0.927 | 0.960 |
| 32.60 | 138 | 2.8 | 0.748 | 0.914 | 0.945 | 0.977 |
| 32.60 | 167 | 2.3 | 0.807 | 0.936 | 0.967 | 0.982 |

If we now multiply each of the traverse factors in Table 2 by the wheel-wear value for the corresponding work speed and work diameter as shown in Table 1 (draw-in cuts), we will have a table of wheel-wear values for traversed cuts. These products are given in Table 3.

By assigning certain wheels to specified ranges of wheel-wearing action, we may select the proper wheel through the use of Table 3 in the same way that we did from Table 1. Actually in the case of Table 3 the wheels used would be somewhat softer for the same index figure because the actual depth of cut does not follow the indicated depth (as shown by the feeding mechanism) as closely for traversed work as for draw-in work, and therefore the actual cut is not so deep. This means, of course, that the "spring away" action of the work is more pronounced for traversed than for draw-in work. Careful use of steady rests is therefore very essential.

The following wheels are found to be satisfactory for our machine for traversed cuts on mild steel under the assumed conditions:

| Wheel Designation | | Wheel-Wear Values, Table 3 |
|---|---|---|
| 36 or 36 I | for values up to | .02500 |
| 36 or 46 J | for values from | .02500 to .04000 |
| 36 or 46 K | for values from | .04000 to .05000 |
| 36 or 46 L | for values from | .05000 or .06000 |
| 36 or 46 M | for values from | .06000 |

Use No. 60 grain for hard material and a grade softer; but use no wheel softer than I.

Important Note. These statements of wheel assignment are based upon assumptions of the best machine conditions and most careful operation to prevent any abuse of the wheel. Field practice will usually show harder wheels in use due to conditions which abuse the wheel. Efficiency is sacrificed where such is the case.

**Production Costs**

If wheel wear were the most important element of production cost, grinding efficiency might be considered on this basis without leading to the fallacy which exists to-day. As a matter of fact, the wheel cost is almost negligible compared with the other costs, and wheel selection should be based upon the production capacity of the wheel under the given set of grinding conditions, allowing the wheel wear to be as high as is necessary to get a free action without excessive wear (which would cause difficulty in sizing work and the need for frequent dressing). The all-important factor is the rate at which the wheel may be made to cut and still not get out of truth. This affects the grinding time, any reduction of which is of vastly more importance than an increase of wheel wear which may result from such a reduction.

TABLE 4. PRODUCTION-COST FACTORS.

| Table Speed, ft. per min. | Work, r.p.m. | Lead, in. | Diam. of Work 1 in. | 4 in. |
|---|---|---|---|---|
| 10.02 | 53 | 2.3 | 3.68 | 13.45 |
| 14.00 | 53 | 3.1 | 5.16 | 18.80 |
| 14.00 | 72.5 | 2.3 | 4.95 | 17.85 |
| 17.00 | 53 | 3.8 | 6.00 | 21.00 |
| 17.00 | 72.5 | 2.8 | 6.00 | 21.80 |
| 17.00 | 87 | 2.3 | 5.85 | 22.00 |
| 19.70 | 53 | 4.4 | 6.40 | 23.70 |
| 19.70 | 72.5 | 3.2 | 6.80 | 23.50 |
| 19.70 | 87 | 2.7 | 6.84 | 23.45 |
| 19.70 | 101 | 2.3 | 6.75 | 23.30 |
| 26.90 | 53 | 5.9 | 9.05 | 29.80 |
| 26.90 | 72.5 | 4.4 | 9.34 | 29.85 |
| 26.90 | 87 | 3.6 | 9.00 | 29.00 |
| 26.90 | 101 | 3.1 | 9.03 | 29.10 |
| 26.90 | 138 | 2.3 | 9.00 | 29.15 |
| 32.60 | 53 | 7.35 | 11.70 | 35.70 |
| 32.60 | 72.5 | 5.3 | 11.30 | 34.60 |
| 32.60 | 87 | 4.4 | 11.00 | 33.60 |
| 32.60 | 101 | 3.8 | 10.90 | 33.40 |
| 32.60 | 138 | 2.8 | 10.80 | 33.30 |
| 32.60 | 167 | 2.3 | 10.62 | 32.90 |

In good practice the volume of wheel wear is approximately a tenth of the material removed (mild steel) during roughing operations. A conservative estimate of the cost of operating a modern cylindrical grinding machine (ex-

TABLE 3. WHEEL-WEAR VALUES FOR TRAVERSED CUTS

| Traverse, ft. per min. | Work, r.p.m | Lead, in. | Work Diameters 1 in. | 2 in. | 3 in. | 4 in. |
|---|---|---|---|---|---|---|
| 10.02 | 53 | 2.3 | 0.01340 | 0.02240 | 0.02820 | 0.03280 |
| 14.00 | 53 | 3.1 | 0.01170 | 0.02080 | 0.02740 | 0.03230 |
| 14.00 | 72.5 | 2.3 | 0.01820 | 0.02450 | 0.03775 | 0.04390 |
| 17.00 | 53 | 3.8 | 0.01050 | 0.02005 | 0.02685 | 0.03185 |
| 17.00 | 72.5 | 2.8 | 0.01650 | 0.02900 | 0.03720 | 0.04370 |
| 17.00 | 87 | 2.3 | 0.02190 | 0.03620 | 0.04620 | 0.05390 |
| 19.7 | 53 | 4.4 | 0.00955 | 0.01930 | 0.02620 | 0.03142 |
| 19.7 | 72.5 | 3.2 | 0.01560 | 0.02820 | 0.03675 | 0.04350 |
| 19.7 | 87 | 2.7 | 0.02060 | 0.03540 | 0.04570 | 0.05355 |
| 19.7 | 101 | 2.3 | 0.02540 | 0.04185 | 0.05245 | 0.06260 |
| 26.9 | 53 | 5.9 | 0.00763 | 0.01695 | 0.02430 | 0.03000 |
| 26.9 | 72.5 | 4.4 | 0.01290 | 0.02600 | 0.03520 | 0.04240 |
| 26.9 | 87 | 3.6 | 0.01760 | 0.03320 | 0.04420 | 0.05235 |
| 26.9 | 101 | 3.1 | 0.02220 | 0.03980 | 0.05125 | 0.06185 |
| 26.9 | 138 | 2.3 | 0.03470 | 0.05130 | 0.06195 | 0.08500 |
| 32.6 | 53 | 7.35 | 0.00660 | 0.01545 | 0.02290 | 0.02885 |
| 32.6 | 72.5 | 5.3 | 0.01140 | 0.02420 | 0.03380 | 0.04130 |
| 32.6 | 87 | 4.4 | 0.01580 | 0.03150 | 0.04315 | 0.05160 |
| 32.6 | 101 | 3.8 | 0.02000 | 0.03820 | 0.05000 | 0.06100 |
| 32.6 | 138 | 2.8 | 0.03230 | 0.05580 | 0.06095 | 0.08450 |
| 32.6 | 167 | 2.3 | 0.04210 | 0.06940 | 0.08800 | 0.10230 |

clusive of wheel cost) is, say, five cents per minute, including labor at day-rate wages. The useful content of the wheel may be assumed to be such that the wheel is actually worth seven cents per cubic inch. If production could be increased to 2 cu. in. per min. where previously we obtained 1½ cu. in. and wheel wear jumped from 0.15 cu. in., say, to 0.25 cu. in. per min., our first cost would be: $(0.05 + 0.15 \times 0.07) \div 1.5 =$ \$0.0404 or 4.04 cents per cu. in. removed. In the second case, $(0.05 + 0.25 \times 0.07) \div 2 =$ \$0.0338, or 3.38 cents per cu. in. removed.

Now the overall production efficiency of the machine based upon all costs involved is indicated by production-cost factors proportional to the earning rate of the machine. In the first case this factor would be: (production) ÷ (cost) = $\frac{1.5}{0.05 + 0.15 \times 0.07} = 24.8$. In the second case, $\frac{2.0}{0.05 + 0.25 \times 0.07} = 29.6$

It evidently will pay to wear the wheel more in order to obtain the higher rate as the overall gain in the foregoing is about 19 per cent. The above assumed values are reasonable and the figures given might be considered as typical. Table 4 gives these production-cost factors, or relative earning rates based upon these costs and the grinding conditions previously assumed in Tables 1, 2 and 3, the variations being due to traverse and work-speed relations only, but with proper choice of wheels in each case. Then, for the machine which we have used as an illustration it is evident that for work of a certain size and a wheel of a certain width there is one speed combination which will utilize the machine to the greatest profit. If we are able to use wheels of the width needed to cover the lead under the best speed-relation conditions, we will obtain the best earning rate of which the machine is capable. If wide wheels are not available, we still have speed-relation conditions which will give very nearly as high a rate for the narrower wheels.

In Table 4 the production-cost factors are given for 1-in. and 4-in. diameters of work only. The factors may also be expressed as earnings per unit of time, or the relative amounts the machine would earn in equal lengths of time under the various conditions as given.

Note that, due to high traverse, a 2.3-in. wheel which earns \$3.68 in a certain length of time when grinding 1-in. work at low traverse and work speeds, will earn \$10.62 in the same length of time when using the high speeds. If the widest wheel (7.35-in. face) be used the machine will earn \$11.70 in the same length of time. The grade of wheel is suitable in each case according to the speed changes. This clearly shows that high traverse speeds cause a corresponding increase in earnings in spite of the necessary increase in work speed.

Considering the cost of wheels 7.35 in. wide as compared to wheels 2.3 in. wide, and the relative power required to drive the two wheels, it is very evident that the use of a harder wheel 2.3 in. wide would offset the difference in wearing action without greatly reducing production and that the production of the 7.35-in. wheel is matched by the production of the 2.3-in. wheel using highest traverse and highest work speed.

The most striking conclusion from the above is the fact that in order to use a narrow wheel and get great production the high work speed does not cause excessive wheel wear due to the relief on the wheel brought about by the high traverse speed. This traverse speed is also necessary to allow the rapid exposure of fresh work surface to the cutting face, making for a highly economical combination.

The foregoing should demonstrate clearly what this new development in the science of grinding may mean to the art as practised throughout our production shops.

Actual grinding tests upon a machine having the high-traverse feature, and making use of the speeds shown in the table, have conclusively proven the deductions indicated by the mathematical calculations. On mild machine steel (0.15 per cent. carbon) over diameters ranging from ¾ in. to 4 in., production rates as high as 2.00 cu. in. per min. have been easily attained, grinding to limits of 0.0010 in., removing 0.060 in. from the diameter over lengths of from 36 to 72 in.

When machine conditions, truth and balance of wheel, and proper use of steady rests and grinding compound are intelligently and skilfully handled, wheels of 36 and 46 grain size, and grades I to L (Norton system of grading) have been used in these roughing operations. Especially where the feeding is carefully regulated so as never to crowd the radial depth of cut to more than the possible depth of grain penetration (say, not to exceed 0.0015 in. on the diameter) per traverse, it has been found that the wheel face remained sufficiently true to leave a commercial finish of fair degree absolutely free from chatter marks, feed lines or any other imperfections of real or imaginary consequence.

Owing to the fact that in the above the highest work and traverse speeds were used in every case, the grade (hardness) of wheel was increased as the diameter of the work increased. This is in accordance with our formula for index of wheel wear. Instead of considering the work speed and work radius independently, they were in this case tied together by the fact that a constant work r.p.m. was used. The expression for this is as follows:

$$\text{Work speed } u = \frac{2\mu rN}{12} \quad \ldots\ldots\ldots [5]$$

where r = work radius (inches) and N = r.p.m. Substituting [5] in [4],

$$WW_1 = \frac{0.275\mu}{V^2}\left(\frac{N^2}{\sqrt{(T^2 + 0.275r^2N^2)}}\right) \times \sqrt{2fr^3} \quad \ldots\ldots\ldots [6]$$

Now, if V, N, T and f are made constant, $WW_1$ must vary as the value r appears in the formula, the greatest effect being the $\sqrt{r^3}$ factor and we would expect therefore to use harder wheels as r increases.

### Conclusions

The conclusions to be drawn from the foregoing are definite and indicate positively how to arrive at the solution of precision grinding problems, provided one has an intelligent knowledge of abrasive wheels and the usual materials ground.

Greatest grinding efficiency is obtained by the use of the softest wheels suited to the nature of the material ground. This efficiency is dependent upon the control of the dimension and speed relations between the wheel and the work so that the individual chip may have the minimum depth for a given volume determined by the maximum allowable radial depth of cut. This means long arc of contact, low work speeds and maximum feeds. With these conditions established, increase of traverse speed increases production without increase of wheel-wearing action. Machine conditions must be such as to maintain as accurately as is reasonably possible the speed and dimensional relations of the wheel and the work.

There is an enormous field for the industrial engineer in obtaining better production at less cost in grinding operations. There is a definite science involved, there is no mystery about it. The proper appreciation of the laws of grinding by machine designers and operators is rapidly increasing and we may expect a constant improvement in the art as a consequence.

---

**Too Good To Be True.**—A newspaper despatch from Ottawa a few days ago stated: A question answered in the House has whetted curiosity a bit. That answer states that the contract for steel plates with the Dominion Steel Co. has been cancelled and that the Government is not required to pay any damages on account of the cancellation. Explanation of all this is awaited, as the plate contract was large and generally considered fat. That the Government got out of it without the payment of a dollar seems almost too good to be true.

*The figure of 5 cents a minute as time cost of operation is based upon labor at 75 cents an hour and an hourly burden of \$2.25 an hour (power, investment, rent, heat, light, etc.)

# Have You Tried This Contest Yet? If not--- Do so Now

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.




The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

## What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

We welcome a new name to the list of scale winners. D. G. Gains, engineer, at Montreal, P.Q., was the only reader to send in a correct list. Question No. 4 was the stumbling block. Note how large the request sticks out in this advertisement, then you will see why we listed it as we did.

### CONTEST FOR MARCH 31ST ISSUE

**Contestants are required to write us, stating to which advertisements we refer in this number.**

1 A request for your name and address so that you can get something for nothing.
2 A very pertinent question.
3 A machine designed to give rapid and accurate production.
4 A very common requirement.
5 Something said to be filling a long-felt want.
6 How to save time and money when drilling, tapping, etc.
7 Something that makes no allowance for error.
8 A product that will stand gruelling punishment.
9 A machine that has three important features.
10 Something of value that is given free.
11—A seemingly foolish question.
12—Something that offers indisputable evidence.

### These are Correct Answers for List from March 10th Issue:

1—Kearney & Trecker.
2—The Tube Co. of Canada.
3—J. C. McLaren Belting Co., Ltd.
4—Hamilton Gear & Machine Co.
5—L. S. Starrett Co.
6—Canadian Blower & Forge Co.
7—A. R. Williams Co.
8—Keller Pneumatic Tool Co.
9—Murchey Machine & Tool Co.
10—Cleveland Pneumatic Tool Co. of Canada. Ltd.
11—John Bertram & Sons Co., Ltd.
12—Dominion Steel Products Co., Ltd.

## Closing Date for This Contest is April 21st.



# WHAT OUR READERS THINK AND DO

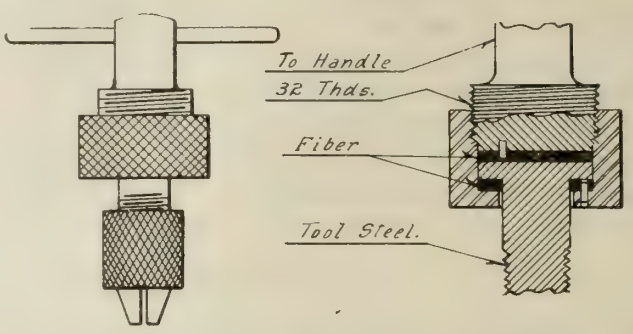


## QUICK ACTING TAILSTOCK

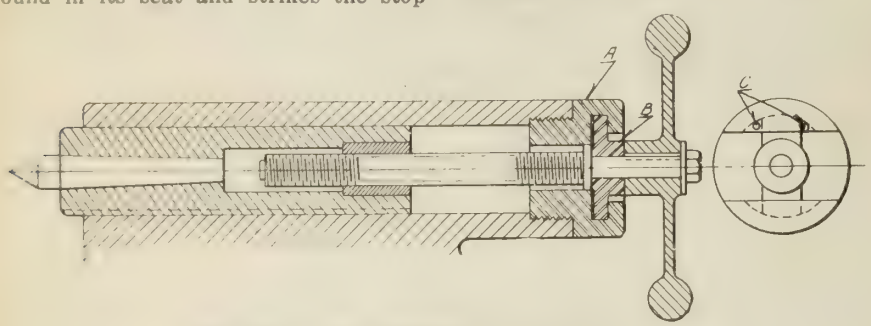
By John Homewood

Desiring a quick acting tailstock for our spinning lathes, here is what we did. We replaced the regular rear thrust cap with a steel one of the type shown at A on accompanying sketch. This cap was bored out to allow the screw to slide through. A tee slot was placed in this cap to form a seat for the latch B as shown, this latch being free running on the screw.

When we desired to release our tailstock, we gave it a quarter of a turn, and pulled it back out of the way. To bring into service, we merely pushed it up, gave it a twist and tightened it into place. In action the lock is turned around in its seat and strikes the stop pin C. We found that this idea saved considerable time and gave satisfactory service.




SECTIONAL AND DETAIL VIEW OF THE TAP WRENCH.




SECTIONAL VIEW THROUGH THE TAILSTOCK.

## HOW TO PREVENT SOME TAP BREAKAGE.

The drawing shows a friction tap wrench—a tool that it will pay any shop to have for smaller work. It is the familiar T wrench, but with a change in the stem, which is divided midway between chuck and handle for the friction device.

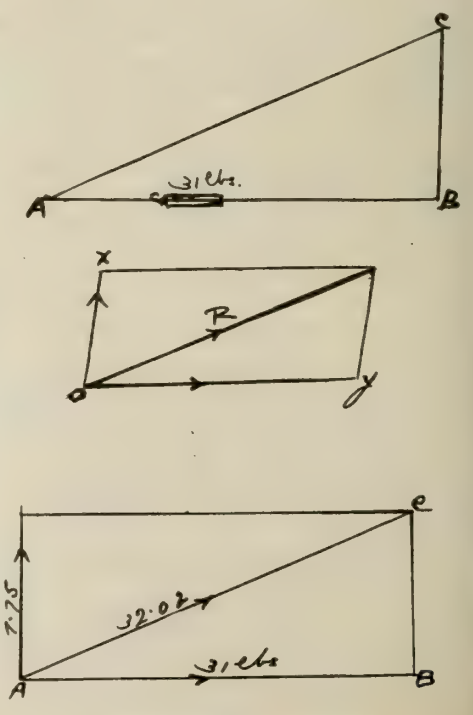
The sectional view shows how the friction works. It has the same construction as the safety tapping devices on the market. A divided shaft, one member of which is flanged to make the "friction" surfaces against which fiber collars bear, is united by a threaded coupling that may be set to any tension desired in accordance with the apparent strength of the tap or the material being worked.

The assembled wrench is neat in appearance and is a first class safety in any hands but the most indifferent. As with all friction tappers, it should be loosened up when starting on a new job —it will then slip, but can be set up tighter until the slipping is reduced to a reasonable amount.

## COMPOSITION OF FORCES

**Question:**—A B C is a triangle, of which the angle B is a right angle and the sides A C and B C are 60 inch and 15 inch respectively in length. The spring balance D is subjected to a stress of 31 lbs. What are the components of the stress on D along A C and B C ?

**Answer:**—What our correspondent is after is, we think, an explanation of the resolution of forces. His question is stated in a rather peculiar manner, as there is no need to suppose the presence of a spring balance. A force of 31 lbs. acts along the line A B. Now this force would be one of the components of the resultant force, which is expressed in magnitude and direction by the diagonal of the parallelogram of forces. Any two forces acting through a common point, can be resolved into a single force acting through the same point in the following manner. Let the lines OY and OX represent in magnitude and direction two forces acting through the point O. If we complete the parallelogram as shown, the diagonal will represent in direction and magnitude the resultant of the two forces. Similarly if we have a single force we can resolve it into two forces at right angles to each other. In the case given we can assume the two forces to be acting along BC and AB through a common point A. The force acting on the BC will be equal to AB sine A, which is taking the measurements given, .31 x 15/60, while the force acting on AC is equal to AB/cos. A, which is 31/.968. These give us respectively 7.75 and 32.07 lbs. The component forces are 7.75 and 31, while the resultant force is 32.02.




RESOLUTION OF FORCES.

## FIVE SHORT CUTS

By J. H. MOORE

IN describing this short trip through a certain plant, it is only fair to state that the ideas about to be told were picked at random, and noticed while on the walk, so to speak. In a way, there is a lesson to be learned from this, viz., that it is wonderful what you can notice while on a tour through any plant. It pays to keep your eyes open and your mind clear, for you never can tell when some real idea may appear.

The first thing I noted was the spinning of some rivets. The work being accomplished was the riveting of small spring steel clips to spring steel grain tubes. "Didn't you use to do that by the hammer method?" I enquired. "Yes," was the reply, "but we broke so many tubes that we decided to adopt the spinning method. Since the new machines have been installed we have had no further trouble. Production is satisfactory, and we get just as good results."

The next thing that aroused my curiosity was a double punch die. The punch die section itself was only about 4⅛ in. wide, yet two separate rows of punches were plainly visible. "What's that used for?" I asked.

"That's the die for punching the platform," came the reply, my informant knowing that I was familiar with the shape of the piece in question. For the benefit of readers let me explain that this particular piece called the platform is made of sheet metal and is about 36 inches square. On all four sides is a row of holes, these of course varying in size, and even in center distance. Having worked at this plant in days gone by, I knew that the big idea in those days was to make an elaborate die that would punch all holes at one stroke. "Did you never make the big die?" I asked, and laughingly came the reply, "I should say not. After we drew up the plans and estimated the cost, we found it would run us about $3,500 or more. This was a rather imposing figure and we shelved the matter indefinitely. Suddenly the idea you see before you was suggested. As you can notice, the dies are placed in an ordinary standard die section, which in turn fits our standard bolster. Each die is an insert, therefore is easily replaced when worn, and at very little cost. The same condition holds good for the punches. In punching one side, we use the first line of punches, while for the others we use the second line. A simple gauge guarantees the position of the stock, and although we have to handle the work twice, the production is splendid, at the same time the upkeep of the die is practically nil. Instead of $3,500 (the cost of the elaborate die), the one as used cost less than $500, so you see it was a good move all around. It's just another story that goes to prove that elaborate ideas are not always the best. In case you imagine me prejudiced let me show you one example of misplaced effort."

### WE WANT IDEAS

It is our earnest wish to make this section a real help to every reader. It is only by an interchange of ideas that such a condition can be made possible. Why is it that we do not receive more short cuts and machine shop kinks for this department? Is it because there are no new ideas, or time-saving kinks in existence?

Of course not, for in every shop throughout Canada there are little stunts and devices in use that we want to tell about. We cannot see them all, so it's up to the readers to tell us about them.

Do not bother about your style of writing. Send us an idea that's worth while, and we will soon whip it up into shape. Send us a sketch or a blueprint of the device, together with your own style of description, and we will do the rest.

Not only that, but we'll pay you a good price for every article published.—Editor.

Soon we were standing at a long die that looked very much like a dam for a lock. There was a wheel attached, this in turn moving a vise up and down a slide. "This is what I call exhibit A," remarked my guide. "The work which it was supposed to accomplish was the bending of a piece of sheet metal to a certain angle. Without my knowledge this was wished on me, but I never even used it, as the time it would take to bend a piece on the fixture is over twice what it takes to do it by hand. What we actually do is this. A girl takes the piece of metal, holds it a certain distance over the bench, and hits it a blow with a wooden hammer. The complete operation is accomplished in less time than it would take to place the piece in the fixture, so you see this is yet another story to prove that before a change is made it is well to study all the angles of the case."

### Milling Fixture

The next scheme noticed was a fixture used in milling keyways on some shafts. The fixture was made in double style, that is, two duplicate fixtures on the one main casting. This of course allowed the unloading and reloading of one fixture while the work was being performed on the other. Six pieces were held in each jig, and strange to say all six pieces were gripped by one main handle. On investigation I found a series of eccentrics underneath the fixture, these operating the float clamps on top.

A point that I couldn't help but comment on was how easy the pieces came out of the vee blocks, and on inquiry here is what I found. The lower vee block was the regular 90 degree style—but, the top clamps were bevelled 40 degrees, not 45, so that the slight change in this angle made all the difference in removing the pieces from the jig.

The last scheme that I noted was not so much a new fixture as a new machine. "Didn't you used to plane your drop die blocks?" I asked. "We sure did, but found it cheaper to purchase that special manufacturing miller you are looking at. Where before we took from three to five hours for each block, we can now complete a set every 2½ hours by the straddle mill process. We find it easier to keep the different faces square with each other, and we do not tie up our planers as we did before."

These ideas are not by any means world beaters, but just ordinary everyday problems met with in the average shop, and go to show what can be accomplished by sticking to the problem in hand.

## BURNING FUEL OIL

Set the burners open wide,
Do not touch the valves at side;
Keep the pressure on the pump,
And up the bally steam will jump;
If the smoke is black and thick,
Open up the fans a bit;
If the smoke is thick and white,
To slow the fans will be quite right;
For when sufficient air is given,
No smoke ascendeth up to heaven.
If the jets refuse to squirt,
Assume the cause is due to dirt.
Should the flame be short and white,
You have combustion clear and bright;
But should the flame be yellow and long,
Combustion is entirely wrong.
A wise man to his heater sees,
And keeps it 200 degrees;
To have it more is not quite wise,
Because the oil may carbonize;
A little lower has been found
To give as good results all round.
If the filters are kept clean,
No rise in pressure will be seen;
But should the pump kick up a ruction,
There's likely air within the suction.
The pressure governs the supply,
So do not keep it very high.
If these instructions you will follow,
You'll beat the other fellow hollow.

Extract from "Marine Engineering Knowledge," W. C. MacGibbon.

## RESISTANCE OF BODY

Measurements have been made during the past few months by the American Bureau of Standards of the electric resistance of the human body, the measurements being made in such a way as not to include the resistance through the skin where currents entered and left the body. By eliminating the large and uncertain resistances through the skin, results were secured which are said to be more consistent than any previously obtained. These show that the resistance of the same part of the body of different individuals may differ by a ratio of three to two or even more, the resistance of a person changing from day to day and often by small amounts in an hour. The resistance also depends to some extent upon the position of the body and the extent to which the muscles are relaxed.



# DEVELOPMENTS IN SHOP EQUIPMENT

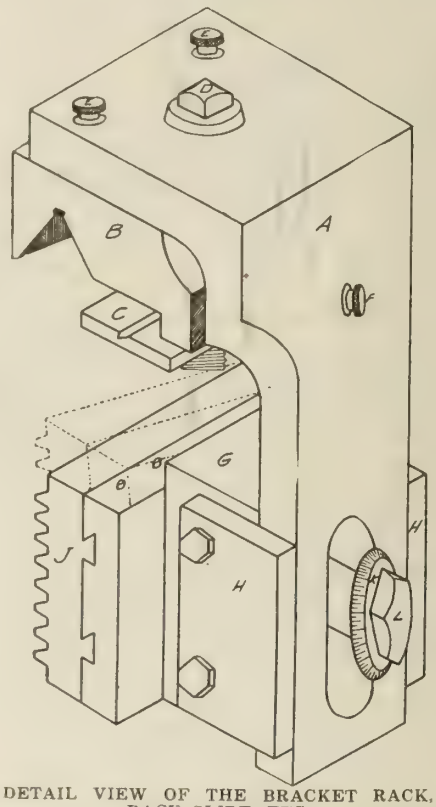


## THREAD LEAD-SCREW VARIATOR

The Precision and Thread Grinder Manufacturing Co., 1 South 21st St., Philadelphia, Pa., is manufacturing a lead-screw variator for lathe attachment. The variator is built in two models of similar design but different size. The Model "A" is adjustable to fit lathes up to 12-in. swing. The Model "B" to fit lathes from 13-in. to 20-in. swing. The normal length of travel for the carriage is 6 inches, but greater lengths can be provided

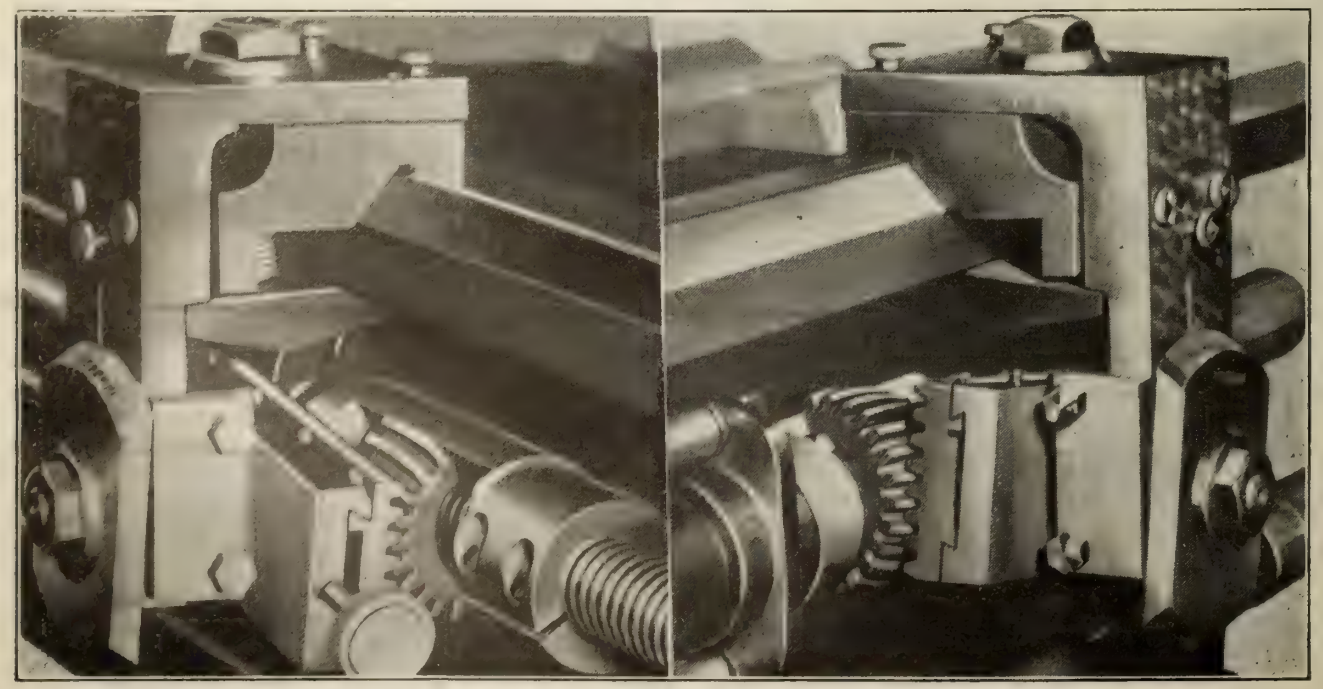
This device is intended for elongating or diminishing the normal lead on lathes, also for correcting errors in the lead of the screw. It is used to aid the ordinary lathe to perform precision thread cutting, and metric threads can be cut without the use of translating gears. Briefly, here are the main points of the device.

The stationary part of the device consists of a bracket, clamped on the ways of the lathe. This bracket is composed of two pieces, the outer frame and the ways adaptor. These can be seen on sketch. The outer frame is adjustable horizontally sufficiently to make the proper connection between the bracket and the mechanism carried on the lead screw. The bracket carries a swiveling rack and provision is made for vertical adjustment to bring the center of the rack pivot in line with the center of the lead screw. The adjustment can be locked, and subsequent tilting of the rack does not disturb it. A dial is provided, to show the degree of inclination of the rack.

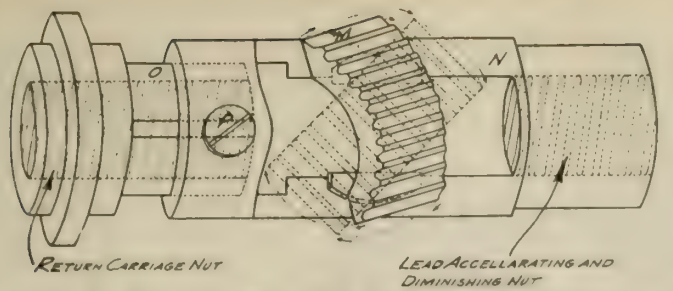



DETAIL VIEW OF THE BRACKET RACK, RACK SLIDE, ETC.

The mechanism on the lead screw consists of an adjustable nut, having an extension carrying a gear segment that is free to swivel in line with the rack. The variation in the lead is obtained by the rotation of this half gear, in accordance with the angle at which the rack is set, as the nut is traversed by the action of the lead screw. The lead-screw nut in the lathe carriage is not employed, but the connection is made between the variator nut and the carriage by the two rods and plate. The variator nut moves the lathe carriage only during the machining operation. The return of the carriage to its initial position is obtained by a second nut, keyed in the frame of the variator nut to permit longitudinal movements independent of those making variations in the lead. The two views shown illus-



THESE TWO VIEWS SHOW THE DEVICE AT THE START AND FINISH OF THE TRAVEL.




DETAIL VIEW OF THE VARIATING NUT, ALSO RETURN CARRIAGE NUT.

trate the device at the beginning and end of the traverse.

A dust guard is furnished to protect the lead screw from abrasive dust when performing grinding operations. It is recommended that the variator be positioned near the tailstock end of the lathe, as that part of the lead screw is generally but little used.

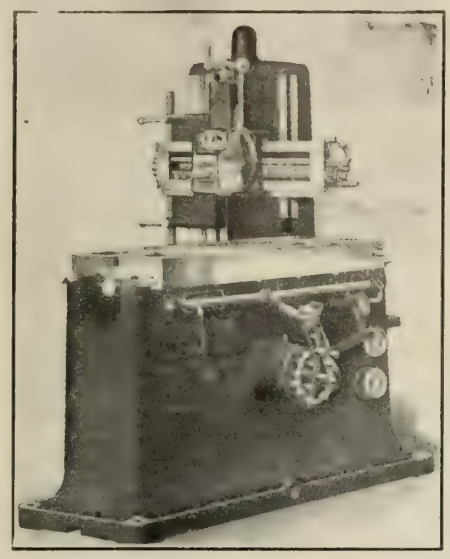
In order to aid in setting the lead variator for either the normal lead of the screw or for a change of lead, a gage block is provided. The block is used by clamping it directly upon the threaded work, it fitting all diameters up to 3 inches. The block is 1 inch thick, so that by turning the work through the same number of turns as threads per inch required and measuring the travel of the carriage by a dial indicator on it adjusted to fit the block, the variation of the pitch of the lead screw can be determined. The desired pitch can be obtained by varying the angle of the swiveling rack to suit the conditions, and then locking it in place.

The device is said to be particularly useful in the manufacture of taps and thread gages, as the necessary correction in the lead can be made while machining, in order to compensate for changes of size during heat treatment, thus reducing the amount of grinding required after hardening. Of course, a sample is first made up from the stock to be used, so as to ascertain the correction necessary.

## SHAPING PLANER

The Automatic Machine Co., Bridgeport, Conn., have placed on the market the Coulter shaping planer as shown in photograph. A feature of this machine is the combination clutch and brake mechanism operated from the front, by means of which the table can be stopped and started instantly without bothering the motor or countershaft. In fact, with this arrangement, no countershaft is necessary on the belt-driven model, as it can be belted direct to the main line shaft, saving ceiling space where head room is limited. A length of stroke indicator is provided, also clamps for clamping the down feed while the cross feed is working, or vice versa.

The clutch-brake mechanism consists of a raybestos-lined brake and a main driving pulley made up of two concentric wheels, the inside rim of one and the outside rim of the other being beveled at an angle which by repeated tests has been shown to be most satisfactory for the purpose. When by movement of the operating handle the clutch is thrown out, the brake is simultaneously applied and released again when the clutch is thrown in. There is a split nut on the driving shaft so that the amount of friction in the clutch can be adjusted. The large bearing surface and large diameter means the minimum of wear, the maximum of torque for the minimum of friction, absence of any appreciable heating, and the arrangement is so simple that there is nothing to get out of order. From this friction pulley the power is transmitted through sliding gears of large diameter to a bull wheel and crank which drives the table similar to the mechanism driving and shaper ram. The transmission shafts of this driving mechanism run on ball bearings.



GENERAL VIEW OF THE SHAPING PLANER.

This machine has the shaper advantages of quick return stroke; variable speeds and ability to cut to a shoulder are combined with planer accuracy and table capacity. The maximum stroke can be taken anywhere on the table by merely positioning it under the tool without disturbing the work, and this maximum stroke can be taken with the same degree of accuracy as a shorter one.

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# CANADIAN MACHINERY
## AND MANUFACTURING NEWS

Published in the Interests of the Machinery, Manufacturing, Iron, Steel, and Metal Working Industries.

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A. R. KENNEDY, Managing Editor
J. H. MOORE, Technical Editor
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## Can You Stand Competition?

KEEN competition is the one outstanding feature of business in the machine tool, small tool, iron and steel markets at the moment.

Prices are being cut where it is possible. Machine tool dealers are more or less barred from this practice because they have nothing to do with setting prices. Their schedules are furnished by the makers of these machines.

It is a buyers' market now, and it is going to remain a buyers' market for some time.

Some dealers argue that this keen competition is simply the result of an effort to reduce high-cost stocks.

It is in part, but never lose sight of the fact that the same ability to produce that filled these warehouses is still in existence.

The capacity for making steel in Canada is increasing. Since the war there has been laid down a plate mill in the East with very large capacity. In Hamilton there has just been completed another rolling mill, and at Ojibway there is in process a plant that will turn out a large range of steel and iron.

The automobile plants are becoming more highly organized every week. Their combined capacity, were they running full tilt, would exceed anything we have yet known.

Foundries that specialize are coming into existence. Some of these are million dollar concerns, equipped in the last word of new devices for speed and efficiency.

It all means that there is going to be large production—output on an unprecedented scale.

It means that there is going to be more competition in Canada—not less.

There is nothing theoretical or imaginary in this. Any one who keeps in touch with developments can verify it in his own line.

The firm that is efficient—that serves its customers truly and well—that is so equipped that it can turn out a good, reliable article at a marketable price, will get business.

The machine tool house, or the steel warehouse, that has its fingers on the markets, that keeps its customers well and faithfully informed of what it has to sell, will get business.

If you are not in a position to face stiff opposition in your line, your business future is not certain.

We are having business competition in Canada right now and we are not going to have less of it as days go by.

## The Recovery of Germany

THIS paper has published in the last few weeks the opinions of a number of Canadian manufacturers regarding German trade. It is only natural that the subject should be a very delicate one, but it is more real than delicate and must be faced.

German competition is going to face Canadian manufacturers, whether they want it or not. Our manufacturers have a right to ask for protection against cheap German labor and German dumping, if, coupled with it, goes protection for the consumer.

Charles M. Schwab has returned only recently from six weeks spent in Europe, in which time he made it a point to get in close touch with German trade affairs. He states:

"Germany will recover from the effects of the world war much sooner, perhaps, than any other European country involved in it.

"Germany is a conquered country and her people are aware of it, but they are like a strong man who has failed in business and sets his teeth determined to win back what he has lost by hard work and competent management. The secret of Germany's industrial success was the efficiency of her workers. They still have that efficiency and that training that is necessary to win in the world of commerce and manufacture. Business is bad, of course, in Germany, as in all other countries, including America, but it is on the mend."

Instances are also coming to the surface that show the sort of competition Canadian manufacturers, or any others for that matter, must be prepared to face from Germany. Prices are being named in more cases and these give something concrete on which to base comparisons. An English correspondent writes as follows:

"One example, amidst hundreds given me, with papers and contracts to support it, is quite sufficient. The representative of a big English business house said he had just secured the entire foreign output of the Solingen factory, manufacturing machetes for Cuba, South American and African plantations. The price was $1.50 a dozen up to 10,000 dozen and $1 flat for orders above 10,000 dozen. The best England could do for goods of the same quality was, he said, $2.25 a dozen, with no reduction for large orders. He did not know United States prices exactly, but was positive they were above $1.75 for the same goods."

So there you have it. Canada has not got to face the matter of selling much to Germany, except it be raw material, because German currency is all against such a development. Germany selling to Canada is the real problem. Is Ottawa prepared to deal intelligently with this matter—in such a way that justice shall be done to our industries and no injustice to our consumers?

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A firm of importers in Trichinopoly, South India, writing to Canadian Machinery, asking for sample copies of this paper, address us as follows: "Canadian Machinery, Montreal, Canada, U.S., America." And so with all that tender care and routing, the letter reached us right side up.

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The National Association of Purchasing Agents is behind a movement to make a contract sure—a thing that cannot be called off and discarded at the whim of the should-be purchaser. If they can root this sow thistle out of our industrial garden more power to them.

# *Is Russia Ready for World Trade Yet?*

THE matter of opening up trade with Russia is attracting the attention of the world. Several Canadian companies that formerly had big business connections there frankly admit that they do not know very much—if anything at all—about what has been going on since they pulled out.

These concerns are far from satisfied that there is anything sufficiently stable on which to build a trade that would be worth while.

To put the matter short and pointed, their first question would be: Who is going to pay for the goods?

It has not taken Herbert Hoover, Secretary of Commerce in the Harding government, long to make a pronouncement on the question of trading with Soviet Russia.

In the issue of March 22 of the U.S. official Daily Consular and Trade Reports, Mr. Hoover states:

"The question of trade with Russia is far more a political question than an economic one so long as Russia is in control of the Bolsheviki. Under their economic system, no matter how much they moderate it in name, there can be no real return to production in Russia; and therefore, Russia will have no considerable commodities to export and, consequently, no great ability to obtain imports.

"There are no export commodities in Russia to-day worth consideration except gold, platinum, and jewelry in the hands of the Bolshevist government. The people are starving, cold, underclad. If they had any consumable commodities they would have used them long since.




Philadelphia "Public Ledger."

**Little Red Riding Hood Isn't Sure That It's Really Grandma**

### A Period of Destruction

"No better indication of the destruction of production under the Bolshevist system exists than in the case of flax. Pre-war Russia produced 500,000 tons of flax per annum and the country consumed 120,000 tons. The production in 1920 was about 40,000 tons—with mills and lands at least capable of spinning 120,000 tons and the population underclad. In any event, no consequential export flax is available, nor ever will be available, under this economic system.

"Nor can trade with Russia under a government that repudiates private property be based on credit. Thus the whole question from a trade point of view develops into furnishing commodities equal to the gold, platinum and jewelry, variously estimated from $60,000,000 to $200,000,000, in the hands of the Bolshevist government; and after that has been expended there can be little expectation of continued trade. There has been no prohibition on trade for a long time so far as exchange of commodities is concerned. Trade is open through the Baltic States, and Italy has been trading in the South. The real blockade has been the failure of the Russians to produce anything except gold and platinum to trade with.

### Who Owns This Gold?

"There has been but little trade for gold because its title has been called into question by the French Government and by threats of private actions in the courts on the ground that it is stolen or subject to foreign liens. It is apparently the intention under the British trade agreement to allow this matter to be threshed out, so far as England is concerned, in the British courts. The terms of the German agreement in this particular are unknown. If any one European nation accepts the gold, no doubt all of them will.

"Europe cannot recover its economic stability until Russia returns to production. Trading for this parcel of gold would not effect this remedy—nor would the goods obtained by the Bolsheviki in return for it restore their production. That requires the abandonment of their present economic system."

Now there is no doubt a great deal of truth in the stand that Mr. Hoover has taken, and it can be accepted as being the attitude that will be taken by United States, as Mr. Hoover would hardly make such a statement off his own bat.

The weakness of the whole situation is that so many nations in the world are so keen for business with gold behind it, that the prospect of trading with Russia as long as the gold hangs out, will be too strong to be resisted.

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The man who has been sitting back for months waiting for prices to hit rock bottom has nothing much more to show for it than a pair of shiny pants.

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Wages paid to the war-shop mechanic are done for in this country. The skilled man, who has seen years of study and whose advice and work are worth while, should have every consideration in wage adjustments. In pre-war years he was seldom paid sufficient to compensate for his years of training and study.



# MARKET DEVELOPMENTS



## More Factories Are Starting to Work

### Pittsburgh Reports a Slight Improvement in Buying, Although Production is Still Very Low—Getting Rid of Stocks is the Chief Business Yet of the Warehouses Here

CONDITIONS in general are undoubtedly moving in the direction of a better period of trading for the machine tool market. Sales are not increasing, nor can it be said that worth-while prospects are on the increase, but there is an improvement in the operations of several of the industries that are the best customers of the machine tool dealers.

There have been a number of reductions in the price of tools since the first of the year, but of late the number of these has fallen off and prices seem likely to stand for the present.

The steel market is the centre of interest for the moment. There are those who want to see the Steel Corporation take the lead and make a new schedule more in line with the present prices of other commodities and again there are those who wish to see prices left where they are. The latter group is composed largely of firms with stocks on hand that they would like to work off in the present market. There are all sorts of rumors in the steel market as to what is likely to happen and when, and in the absence of anything authoritative these are all more or less uncertain, but they all have the effect of making the buyer believe that a better price is coming and in such an atmosphere he is going to buy about pound for pound of what he actually needs.

A number of steel prices have been marked down recently and there has been a drop in tubes, plates, sheets, bar mill material and other small lines. The market as it stands lacks stability and the anxiety to secure business makes any of the prices quoted more or less liable to sagging.

The market for small tools, drills, reamers, cutters, etc., is quiet and sales are made for actual use. Price cutting, according to the dealers, is being freely indulged in and the market is much in favor of the buyer.

There is no rift in the cloud that has been hanging over the scrap metal market for months now. Dealers are practically out of the market, even at the low levels that are in use now and are taking on nothing unless they see right ahead of them a place where they can dispose of it to advantage or to cover a contract.

## MONTREAL REPORTS QUIET WEEK, BUT FAIR SALES IN SOME LINES

Special to CANADIAN MACHINERY.

MONTREAL, March 31.—Industrial conditions during the past week have varied but little from those during the first quarter of the year. The second quarter shows no promise of immediate betterment, but encouraging reports have come in of greater inquiry, usually for small lots, but generally well distributed. One phase of the present situation that tends to develop nervousness is the uncertainty that pervades the railroad conditions, particularly in the relation that exists between executives and the workmen. The possibility of concerted effort on the part of the former to revise the working conditions, and a determined attitude on the part of the employees to reject any proposal of this nature, gives rise to the belief that labor troubles will, during the coming months, disturb the stability of the present quiet, but otherwise sound, industrial outlook. Railroad shops in this district have suspended operations in repair departments for about ten days. Reports from various trade representatives appear to emphasize the fact of industrial dullness, and the consensus of opinion seems to give weight to the statement of one dealer that he "did not look for any marked improvement before midsummer, although light but regular business would continue throughout the spring months."

Commenting on business conditions, a Canadian manufacturer stated: "It is my belief that from now on we will experience changed conditions in commercial activity, particularly in the way of stocks carried. In past years it has been a recognized practice, especially in the retail business, to lay in a three, six or twelve months' stock of commodities, but during the past year this principle has been reversed, the result being that retailers, and even jobbers, are finding it practical and profitable to carry light stocks and replenish their supplies more frequently. Just recently I was informed by a certain retailer that his stock during the past nine months had never exceeded 50 per cent. of what it was prior to the war, and yet the total turnover was but a small fraction below that of pre-war business. This, of course, reacts on the wholesaler or jobber, but more in the size of the individual orders than in the aggregate year's sales." This statement applied particularly to retail business, but it likewise reflects the condition that has existed, and which may be continued, in metal working industries. Manufacturers and consumers will probably be content to operate on smaller "on hand" stocks, working on the basis of covering more frequently. As stated by one dealer here: "The trade has operated on a hand-to-mouth system for many months back, so that the idea has become a habit, and it would not be surprising to see this attitude a feature of future trading, especially as long as present uncertainty dominates the situation."

Steel plate movement has declined in volume; railroads and shipyards are taking less material, the order for the day being for single plates rather than for tonnage supplies. One tank manufacturer here stated that their business was

quite good with work on the books for several months ahead. Spring activity is expected to add to the sheet demand. Revision has been made in quotations on sheets. No. 28 black has been reduced to 6½ cents, while blue annealed are quoted at 5½ cents. Galvanized sheets are lower, the prices now being 8¾ cents for No. 28 and 5¼ cents for 10¾ oz. Queen's Head and Fleur-de-Lis have also declined.

**Keener Competition in Selling Tools**

That business in this locality is not as bad as in many of the large American centres was shown in a statement by a United States business man this week, here on a visit to their Canadian representatives. He said: "'Business conditions here are much more satisfactory than in the States. Many of your plants here are running on short time, some of them even with reduced staffs, but over there a great many factories are closed down entirely, and have been for some time, with little hope of early betterment. I find that sales here of our products are relatively much better than at home." Some activity has been reported in the way of machine tools, mostly for new lines to be manufactured or where new departments are being opened by engineering firms. Marine shops are preparing for a busy season. One firm here, not previously engaged in this work, has established a marine repair department, and additional machines have been installed for carrying out the work. The general tool demand is quiet, and supply movement shows a little falling off, with keener competition featuring the selling market.

## POINTS IN WEEK'S MARKETING NOTES

**The big question in the steel market this week is regarding the attitude of the Steel Corporation on its price schedule. Some reports say that this will come out on the 15th of April, but there is nothing official about this.**

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**The Steel Corporation is producing this week at between 40 and 43 per cent. of its capacity.**

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**Pittsburgh says that bars are selling at 2 cents in carload lots.**

—

**Pig iron is selling at $25 at Pittsburgh, and some sales have been made at $1 under that mark.**

—

**The warehouses in Toronto district are quoting iron and steel bars at 4 4½ cents per pound.**

—

**There is a very small demand for plate, and warehouses here are quoting $4.75 for 3-16-inch.**

—

**The sale of small tools is going on in very limited quantities, consumers buying only what they need from day to day. Several of the dealers were complaining this week that prices were still being cut. As the market stands it is very much in favor of the buyer.**

—

**There is no improvement in the scrap metal situation this week. Dealers will not guarantee to pay the prices quoted on another page of this paper. Many of them are out of the market entirely.**

## MARKET REMAINS RATHER "SPOTTY"

**Price Conditions Have Quite a Bit to Do with Sales—Price Cutting Is Being Indulged in**

TORONTO.—The used machine is still figuring quite largely in the Canadian market, especially in the woodworking field. In fact some of the dealers are doing a very good business.

The metal working machine tool trade is quiet. Some sales are being made, but they are not large, and inquiries are not as promising as they were a few weeks ago. The matter of prices may or may not have something to do with the matter of sales not being closed. It still provides the would-be purchaser with a talking point, though, and there are times when he makes the best of it.

Dealers have had many notices of reductions in the prices of machine tools since the first of the year, and there seems to have been a let-up in the movement during the past week or so. One of the firms was making comparisons in the prices of lathes now and at previous times, finding that one well-known maker, in his last price list, which included a reduction of about 15 per cent., had almost duplicated the list which had been issued for 1918. Of course the 1918 prices are well in advance of the 1914, but it is not held in any quarter, as far as we can find out, that there will be a return to anything like that price. As is always the case, when a price is cut, the question that comes first to be answered is, "Will there be another reduction?" Getting the machine tool market established on anything like a working basis, where buyers will have confidence in prices, is quite one of the largest problems that the trade is facing now.

One well-known machinery house told this paper to-day that the month just closing was one of the best they had experienced in used equipment, especially for woodworking shops. He attributed this to the fact that building is getting under way in a good many of the centres where costs are not quite as excessive as they are here. Then he considered that the price had a great deal to do with it. Some firms were anxious to increase their output slightly, and did not feel able to take on an extensive line just now. They were turning to the used tool market.

Motors, this same firm claimed, were moving out slowly at present. Some weeks ago there was a reduction of about 7 per cent. in this line, but prices are weak, and the trade seems to think there is going to be another break.

**In the Steel Market**

Many of the warehouses are still busy liquidating their stock, and there is not a great deal of money being made in this business. There is a growing expectation, and one hears the story many times, that the selling schedule of the Steel Corporation is to be revised downward. Officials of the company in Canada who would be likely to know, were any information being given out, claim they have heard nothing about it. But the story runs something like this, as Canadian Machinery heard it in several places to-day:

"Corporation prices are going to be altered and the new schedule will be given out on April 15, when it will be seen that bars will be down to 1.75." April 15 is not far away, so it will soon be seen whether or not this guess is good for anything.

One merchant declared that he was quite satisfied to see the Corporation price stay where it is. "Were a cut to be made, it would mean that we would have to write off a good-sized sum on every ton in our stock, and there is quite a bit of material there that was brought it from the premium mills. Of course, it may be that when buying starts prices will improve, and we will get some of the loss back, but it is a chance in business that we must all take. We can't win all the time. Certain it is there are few wins to be scored in the present market."

**Sheets Fairly Active**

A fair business is being done in sheets, particularly galvanized. Some of the stove makers have been taking in a fairly good tonnage from the jobbers this week. This may mean that the stove business is very poor, and that they would rather let the warehouse take the chance on a price, and they buy in small quantities rather than stock up from the mills themselves.

This is hardly the season for plate, but very little of it is being sold. We quote plate from warehouses at 4.75 for 3-16-inch and 4.25 for ¼-inch and up.

The competition for business in bar mill material is still keen, but dealers do not show quite the same eagerness to put nicks in their prices as they did a few weeks ago. We are quoting iron and steel bars at 4.25 this week, although it is known that some of the warehouses

are doing four cents on anything that looks like a desirable order.

Black sheets are quoted at 6.50 for 28 gauge, and blue annealed at 5.50. Galvanized 28 at 8.50 and 10¾ oz. at 8.90. These prices may be regarded as fairly indicative of the market, although we are willing to admit there may be several cases in which a figure more favorable to the buyer has been quoted.

Tubes are moving out on a fairly good basis. Prices have been revised downward this week, and local warehouses for the most part are quoting $40 for 100 feet of three-inch lapweld and $49.25 for seamless. The repair business in boilers seems to be keeping up in fairly good shape. Every effort is being made to make existing equipment do for a while longer.

### Small Tool Market

There is not much business going to the dealers in small tools just now. Although some of the firms that are generally counted upon to use large quantities of this class of supplies are getting under way they seem to be fairly well stocked. Competition continues keen for anything in the way of a decent sized order, and some of the dealers are always ready to tell a yarn about the way some of the prices are being pared in order to take home an order. Files, too, are being sold in somewhat the same way, some of the jobbers going so far as to claim that some makers are giving prices lower than those that could be obtained for them by the jobbers.

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## AUTO PLANTS ARE RUNNING BETTER

**And From This the Machine Tool Market Sees Encouraging Signs For the Future**

Special to CANADIAN MACHINERY.

NEW YORK, March 31.—While there is undoubtedly a better tone in the machinery markets, this is not yet reflected in any important increase in orders. Inquiries have improved, both as to number and volume, but prospective purchasers are slow in closing. A distinctly better condition is apparent in used tools.

There are three large lists still pending, and just how soon action will be taken is not known. The American Sugar Refining Co., which recently inquired for about fifty machines for a repair shop at its Baltimore, Md., refinery, has given some indication that it may place orders within a week or two on at least a part of its list. The Batavia Car Works, Batavia, N.Y., is expected to buy mostly used tools. Its list called for about twenty-five or thirty machines. The General Electric Co., which two weeks ago issued an inquiry for thirty miscellaneous machines, may not buy all of the machines on this list. It has been found that its requirements at Schenectady can be met in part by moving machines from one department to another. Just how extensive its purchases will be, therefore, remains in doubt.

The declines in prices which have recently taken place have affected nearly all important types of machines, but not all manufacturers have reduced. Many of the lathe builders announced reductions within the past week and the milling machine makers are mostly on a lower price level. Some business has been placed, which may be almost directly traced to price reductions. The need for the machines was not so urgent but that prospective buyers could afford to wait for the reductions which they felt were sure to come sooner or later.

The machine-tool trade gets some encouragement from the improvement in the automobile industry. While it is not expected that there will be any early buying of tools by automobile manufacturers, themselves, the resumption of automobile manufacturing on a normal scale will have a decidedly beneficial effect on business sentiment generally and will be the means directly or indirectly of releasing some orders for tools. The Ford plant at Detroit is now turning out 3,000 cars a day, which is about 75 per cent. of its capacity. The Franklin plant at Syracuse, N.Y., is working close to 100 per cent., while the Studebaker, Buick, Dodge, Cadillac, Dort and other plants have shown recent betterment in operations. Automobile parts manufacturers have benefited to a slight extent, though many of the automobile companies are said to have fairly good stocks of finished parts and raw materials.

## PITTSBURG EXPECTS CORPORATION TO REVISE ITS PRICES—BUT WHEN?

Special to CANADIAN MACHINERY.

PITTSBURGH, March 31.—About three weeks ago the first signs of an increase in demand for steel products appeared, and the experience now accumulated is that the improvement is of extremely moderate proportions. No one is disappointed, for very little was expected. The only point about the improvement is that the turn has been rounded. Business has not become so good that there is any danger of its going the other way, for it has scarcely any room in which to grow worse.

Since the first of the year the question has been whether there would be a spring buying movement. There was no serious expectation that the turn of the year would bring increased activity, but there is almost invariably an improvement in spring, unless the business has been done in advance. Probably there is now a tendency for business to expand, the tendency being checked by recognition of the fact that steel prices are not yet adjusted to a basis that would likely prove more or less permanent.

There is much discussion of the United States Steel Corporation's attitude on prices and its probable action. The independents, although a couple of months ago they began on a rather broad scale to cut the Steel Corporation or Industrial Board prices, have not even by this time made a definite and stable market. Independent prices went down sharply for two or three weeks and since then they have scarcely been sagging. The level is fairly well defined now, but it is not established by buying. It is chiefly a carload market, with plain indications that on large lots some of the independents would make further concessions, of indefinite amount. Thus there is no established market, and there is no tendency for the market to seek a definite and stable level. In the circumstances it is recognized everywhere that the matter is left for the Steel Corporation to settle. The real market will come when the Steel Corporation acts. It does not follow that the prices the Steel Corporation names will become absolutely the market. Independents may cut those prices slightly, or they may be unwilling to go altogether as low. Or, some may cut the prices and some refuse to meet them. Nevertheless, the Steel Corporation prices will, according to the common view in the trade, represent the market in general, furnishing a schedule in which buyers can have considerable confidence.

The Corporation has not acted and there is no indication as to when it will act. Some men, chiefly outside the trade, have criticized the Corporation for not acting, while many, chiefly within the trade, warmly commend the Corporation's course as being the wise one. Those who criticise the Corporation speak as if business would develop if the reductions were made.

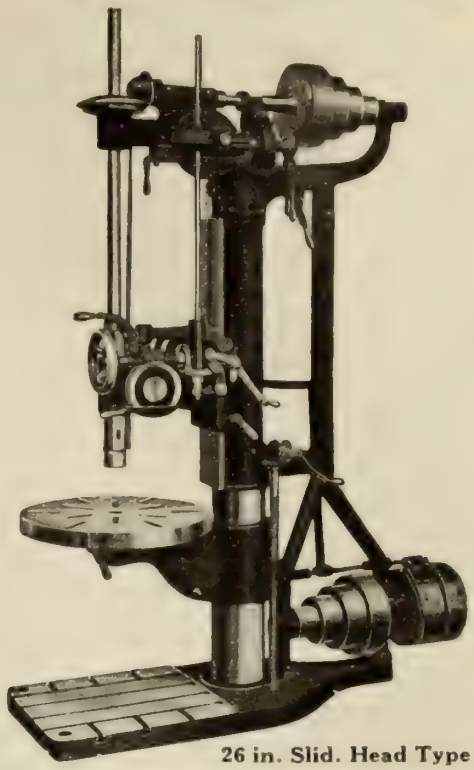
This divergence of opinion arises from confusion between cause and effect. A reduction in prices does not cause people to buy unless they are ready to buy. When people are ready to buy and expect lower prices, failure of prices to decline will cause them to delay buying. The proponents of a price reduction by the Steel Corporation have assumed that price reduction would cause buyers to take hold. Those in the trade are convinced that buyers are not ready yet, and assume that when the Steel Corporation see that buyers are ready it will reduce prices. In other words, a disposition on the part of buyers to take hold must be regarded as a cause for the Steel Corporation to reduce prices, not a result of its doing so. Hence the proper view to take of the present situation is that the Steel Corporation is

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waiting until buyers are ready to take hold. Then the Corporation will reduce prices and will be glad that the occasion, now being waited for, has arrived. To reduce prices before the buying disposition is developed would be to waste an important psychological influence. Besides, a great many customers of the Corporation do not wish it to reduce prices. They have stocks of raw material and manufactured goods to work off.

### Production

Week before last it was estimated that the Steel Corporation was down to a 45 per cent. operation. That estimate, which was quite general, proves to have been incorrect, as the Corporation actually produced steel in the week at 49 per cent. of capacity. Last week, however, it may have gone down to a 45 per cent. rate, as the general tendency of the Corporation's operations is a declining one. The independents have continued to peg along at an average of about 20 per cent., though there are numerous changes in the active list. One mill may close for a week or two while another resumes. Newspaper accounts of mills resuming or closing must not be taken at face, as in some cases the resumptions are emphasized and the stoppages omitted, or vice versa.

Assuming the correct percentages of present operations to be 45 per cent. for the Steel Corporation and 20 per cent. for the independents, the Corporation is producing steel ingots at the rate of 10,000,000 tons a year and the independents at 6,000,000 tons, making 16,000,000 tons altogether, or about 30 per cent. of the total, while the Corporation would be making 62½ per cent. of all the steel. The Corporation has about 43 per cent. of the capacity. In 1919 it made 51 per cent. of the steel and in 1920 about 48 per cent. Its annual report for 1920, just issued, shows that it made 14,532,646 tons of pig iron, 19,277,960 tons of ingots and 14,228,502 tons of steel products for sale. The total steel ingot production of the country may be estimated at between 40,000,000 and 41,000,000 tons, the official figures for 1920 not being compiled as yet.

### Prices

Bars, shapes and plates are practically unchanged. For several weeks they have stood at 2c for bars and 2.10c for shapes and plates, in carload lots with desirable specifications. On large lots concessions could be secured, but hardly as large concessions as seemed possible a month ago. Black sheets remain at 3.85c, while galvanized can be done at 4.90c about as readily as they could be done at 5c a fortnight ago. Tin plate remains at $7 as the mill price. The deadlock has not been broken and consumers are buying very sparingly. They can buy at second hand from stocks at between $5 and $6 and they can also buy imported plates, from stock, at about $5, New York, but the loss and expense in cutting down would add to the actual cost and these stocks do not move freely.

Standard steel pipe is now added to the list of steel products on which concessions are obtainable from the Industrial Board or Steel Corporation schedule, making the list complete with the exception of tin plate. Several independent mills will readily give an extra 2½ per cent. discount on standard steel pipe, equal to about $2 a ton, while it seems that in a few cases an extra 5 per cent. has been given.

### Pig Iron

Foundry pig iron is now offered at $25, valley, or $1 decline, malleable being also offered at this price. In basic pig iron the market was quotable nominal for several weeks, on an asking price by the merchant furnaces of $25, valley. Now there has been a definite change, in that the steel works, offering pig iron out of stocks they were awkward enough to accumulate as they were slowing down their operations, will sell at $23, and a few small sales have been effected. The merchant furnaces have decided not to follow the market, but to stand aside until the steel works have disposed of their accumulations. The $23 price is below the merchant furnace cost, and may even be a shade below the cost of replacement by steel works without counting overhead, but the steel works see an advantage in selling out of these stocks, because when they need pig iron they can make it and use molten iron in steel making, saving the cost of remelting.

# GRATITUDE IS THE EXPECTATION OF FAVORS THAT ARE STILL TO COME

HE wasn't in a particularly good mood about the thing when we called the other morning, and before anything was done he talked, and using the proper and well recognized way of doing things, we record what he said:

"Well can you beat that?"

"Beat what?"

"Well, not so very many weeks ago a couple of chaps came in here, and wanted us to start them up in business. They had both of them had considerable experience in the woodworking business, and seemed to be anxious to get to work and do something. They secured a contract for making up some cheap furniture, enough to keep them busy for the next few months, and it was on top of this contract that they wanted us to stake them to the plant. We went into the matter carefully, and in order to give them a start, we decided to go ahead.

"I can tell you this, that no person ever got so much equipment out of this place on such a small payment. Well, to cut down on the in-between stuff, they got started, and have been going along pretty fair ever since, and have picked up a couple of other little lines that can be done on their same equipment. Well, they wanted some little thing the other day, and one of them came in here to find out what it was worth. He wasn't looking for a plant any more. He was a full-fledged mill owner.

"I told him what it would be worth to put it in, and about how long he would have to wait, when he broke in with, 'Never mind about that. We don't think we'll buy anything more here. You've been getting enough of our business for a while.'

"It took me quite a little while to get enough wind to remark that it might be good policy for us to collect for what we had sold before letting them have anything more,—but what's the use? The chances are that man will get along."

# NO BRIGHT SKY IN WASTE METALS

**Dealers Declare That Even Lowly Price Schedule Fails to Move Material**

There has been nothing come to the surface yet that would make the scrap metal trade look any better. If such a thing were possible, the tendency is still to shove prices down to a lower level. A glance at the schedule would show anyone that the figures will go up as soon as there is anything in the line of a demand for material, for until the demand comes prices stay in the cellar.

"For all intents and purposes we are out of the market," stated one of the largest dealers this morning. "Even at the figures you are quoting it is doubtful if we would take on anything at all, unless we could see where we were going to dispose of it almost at once."

Yards state that neither the steel mills nor the foundries, which are their largest buyers, are taking on anything.

The whole waste material trade is depressed the same as the metal end of the business.

# GOOD NEWS FOR THE RAIL MILLS

**Work On Extending The T. & N. O. Will Be Gone On With This Season**

Cochrane.—George W. Lee, chairman of the T. & N. O. Railway Commission, made the statement here that the surveys in connection with plans to extend the railway north from Cochrane toward James Bay will be gone ahead with immediately. It is planned to complete all surveying so as to proceed with the first 70 miles of the extension about next fall.

Among other things, the line will touch Kettle Falls on the Abitibi River, where a large hydro-electric plant may be installed for the purpose of operating pulp and paper mills, as well as providing power for the electrification of the T. & N. O. Railway.

Cochrane business men are enthusiastic about the contemplated development and the extension of the railway, and the present step is believed to be ultimately designed with the object in view of finally continuing right on to tidewater at James Bay.

## Pig Iron Market

Pig iron has been further reduced during the week. More blast furnaces are going out and the Steel Corporation's curtailment of pig iron output has been rather rapid. The appearance of three definite inquiries for round lots of the steel-making grades on the Pittsburgh market has developed a competitive market between merchant and steel plant offerings. A merchant producer with furnaces in the Valley reports a sale of 1,000 tons for immediate delivery at $25, but against this is one of a similar quantity to a Valley steel maker from one of the Valley steel plants at a price of $23 furnaces, while the Allegheny Steel Co., which has an inquiry out for 1,000 tons each of basic and Bessemer, is said to have been quoted $23 and $25 respectively on these grades. Practically nothing has been done in the past week in foundry iron, and the price has become nominal.

The only large inquiry before the trade at Chicago is that of a Wisconsin melter who recently bought two 2,000-ton lots of Northern foundry at $26 delivered. The American Radiator Co. has bought 300 tons of Southern foundry 2.25 to 2.75 per cent. silicon at $25 base Birmingham for its Detroit plant.

A slight improvement is noticed in the demand for foundry iron for prompt shipment on the Cleveland market. With the exception of one small lot of malleable iron, all the sales were in foundry iron. A local producer has reduced its price $1 a ton to $26 for No. 2 foundry for outside shipment.

Buffalo reports that a local furnace has been approached from two sources and asked to name a price on a large tonnage of pig iron unquestionably for speculative purposes. From this it is believed that certain speculators believe that the bottom has been reached and that it is a good time to buy. Sales are no better.

## Scrap Metal Market

There has been a sharp decline in prices during the past week. Trading is practically at a standstill and some large declines are being forced.

Philadelphia reports that iron and steel scrap is now selling at prices netting the sellers more of a loss than at any time in history. Several hundred tons of heavy melting steel scrap were sold last week at $12.75 delivered, and several small sales were reported on other grades.

The absence of buying on the New York market is bringing further declines in practically all materials with the exception of cast material. The declines range from 50 cents to $1.50.

On the Pittsburgh market buyers will not take tonnage except at prices so ridiculously low that they become unattractive to dealers. The Pennsylvania railroad recently sold some steel axles a little above $18 and hence this grade has dropped from $22 and $23 to $18 and $19.

The scrap market has found a new level at Buffalo with heavy melting steel at $11.50. One buyer in this district is offering no more than $10 and insisting on No. 1 grade with strict inspection, but not much selling is being done at this figure. There is a little business being done in stove plate, about 500 tons being sold in small lots at $19.

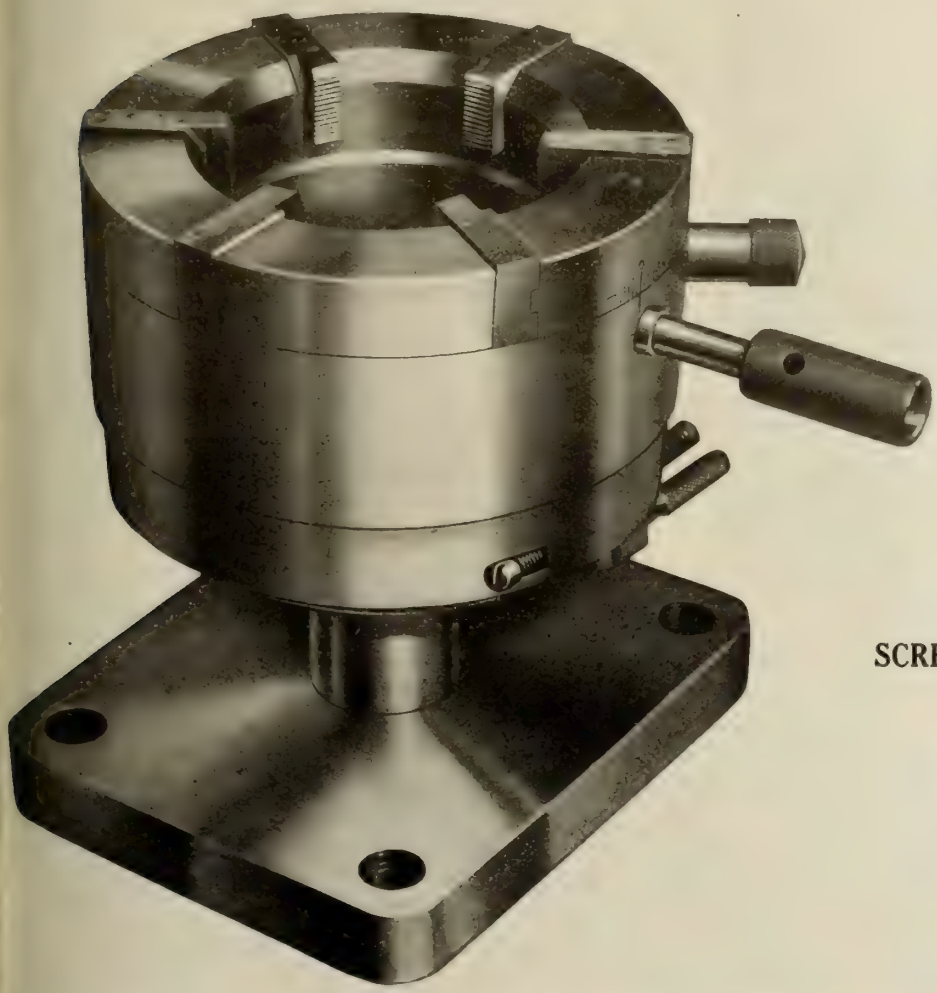
Dealing has been almost wholly lacking at Cleveland, and the quotations that were regarded as bottom are now discarded. Reductions have been made all along the line with the exception of one or two grades.

There is a little keener demand, and heavy melting steel is slightly higher on the Detroit scrap market. The market in other lines is dull. Conditions are brightening in the Detroit automobile plants and dealers are looking for better conditions to result in scrap.

Right on the Lead

# — IT'S A STAR —

**This Was the Reply of a Production Manager When Asked How He Liked**
**THE GEOMETRIC DIE HEAD**



The Geometric Die Head illustrated is flanged for bolting to the Turret Face.

GEOMETRIC
SCREW THREAD CUTTING TOOLS
ORIGINATE
AND
SET THE STANDARD

Geometric Automatic Die Heads and Collapsing Taps are furnished in several types so as to best adapt them to the Turrets of Hand and Automatic Screw Machines.

The usual requirement is for a Tool that is held stationary and the work rotated, but if a Rotary Die Head or Collapsing Tap is needed, a Geometric of just the right construction is available.

## THE GEOMETRIC TOOL COMPANY
**NEW HAVEN CONNECTICUT**

*CANADIAN AGENTS:*

Williams & Wilson Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, St. John, N.B., Halifax, N.S.
Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

*If interested tear out this page and place with letters to be answered.*

# SELECTED MARKET QUOTATIONS

**Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.**

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $26 00 |
| Lake Superior, charcoal, Chicago | 40 50 |
| Standard low phos., Philadelphia | 41 50 |
| Bessemer, Pittsburgh | 28 96 |
| Basic, Valley furnace | 26 00 |
| Toronto price:— | |
| Silicon, 2.25% to 2.75% | 39 25 |

## IRON AND STEEL

| Per lb. to Large Buyers | Cents |
|---|---|
| Iron bars, base Toronto | $ 4 25 |
| Steel bars, base, Toronto | 4 25 |
| Iron bars, base, Montreal | 4 25 |
| Steel bars, base, Montreal | 4 25 |
| Reinforcing bars, base | 4 25 |
| Steel hoops | 5 50 |
| Tire steel | 5 00 |
| Spring steel | 8 00 |
| Band steel, No. 10 gauge and 3-16 in. base | 4 75 |
| Chequered floor plate 3-16 and heavier | 6 50 |
| Bessemer rails, heavy, at mill | 2 35 |
| Steel bars, Pittsburgh | 2 10-2 25 |
| Tank plates, Pittsburgh | 2 65 |
| Structural shapes, Pittsburgh | 2 45 |
| Steel hoops, Pittsburgh | 3 05 |
| F.O.B., Toronto Warehouse | |
| Small shapes | 4 50 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 3 48 |
| Structural shapes | 3 58 |
| Plates | 3 78 |
| Small shapes under 3-in. | 3 48 |

## FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

| | C.L. | L.C.L. |
|---|---|---|
| Montreal | 58½ | 73 |
| St. John, N.B. | 84½ | 106½ |
| Halifax | 86 | 108 |
| Toronto | 38 | 54 |
| Guelph | 38 | 54 |
| London | 38 | 54 |
| Windsor | 35 | 50½ |

Current surcharge, 9 per cent.

## METALS

| | Gross Montreal | Toronto |
|---|---|---|
| Lake copper | $18 00 | $17 50 |
| Electric copper | 17 50 | 17 50 |
| Castings, copper | 17 25 | 18 00 |
| Tin | 37 00 | 40 00 |
| Spelter | 7 75 | 7 50 |
| Lead | 6 50 | 7 50 |
| Antimony | 8 00 | 8 25 |
| Aluminum | 34 50 | 30 00 |

Prices per 100 lbs.

## PLATES

| | | |
|---|---|---|
| Plates, 3-16 in. | $5 25 | $4 75 |
| Plates, ¼ up | 4 75 | 4 25 |

## PIPE—WROUGHT

**Standard Buttweld Pipe**

Per 100 Ft.

| | Steel Blk. | Steel Galv. | Gen. Wrought Iron Blk. | Gen. Wrought Iron Galv. |
|---|---|---|---|---|
| ⅛ | $ 6 50 | $ 8 50 | $ ... | $ ... |
| ¼ | 5 31 | 7 41 | 5 91 | 8 01 |
| ⅜ | 5 31 | 7 41 | 5 91 | 8 01 |
| ½ | 7 10 | 8 63 | 7 95 | 9 48 |
| ¾ | 8 80 | 10 87 | 9 95 | 12 02 |
| 1 | 13 01 | 16 07 | 14 71 | 17 77 |
| 1¼ | 17 60 | 21 74 | 19 90 | 24 04 |
| 1½ | 21 04 | 25 99 | 23 79 | 27 84 |
| 2 | 28 31 | 34 97 | 32 01 | 38 67 |
| 2½ | 44 75 | 55 28 | .... | .... |
| 3 | 58 52 | 72 29 | .... | .... |
| 3½ | 74 06 | 90 62 | .... | .... |
| 4 | 87 75 | 107 37 | .... | .... |

**Standard Lapweld Pipe**

Per 100 Ft.

| | Steel Blk. | Steel Galv. | Gen. Wrought Iron Blk. | Gen. Wrought Iron Galv. |
|---|---|---|---|---|
| 2 | $32 01 | $ 38 67 | $35 71 | $42 37 |
| 2½ | 48 26 | 58 79 | 54 11 | 64 64 |
| 3 | 63 11 | 76 88 | 70 76 | 84 53 |
| 3½ | 75 90 | 92 46 | 85 10 | 101 66 |
| 4 | 89 93 | 107 55 | 100 83 | 120 45 |
| 4½ | 1 05 | 1 29 | 1 39 | 1 54 |
| 5 | 1 22 | 1 50 | 1 52 | 1 80 |
| 6 | 1 58 | 1 95 | 1 97 | 2 33 |
| 7 | 2 06 | 2 53 | 2 53 | 3 01 |
| 8L | 2 16 | 2 66 | 2 66 | 3 16 |
| 8 | 2 49 | 3 07 | 3 07 | 3 64 |
| 9 | 2 98 | 3 67 | 3 67 | 4 36 |
| 10L | 2 77 | 3 41 | 3 41 | 4 05 |
| 10 | 3 56 | 4 39 | 4 39 | 5 21 |

Prices—Ontario, Quebec and Maritime Provinces

## WROUGHT NIPPLES

4-in. and under, 50 per cent.
4½-in. and larger, 40 per cent.
4-in. and under, running thread, 20%.
Standard couplings, 4-in. and under, 20%
Dd., 4½-in. and larger, net.

## OLD MATERIAL

Dealers' Average Buying Prices

Per 100 Pounds.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $ 9 50 | $ 9 00 |
| Copper, crucible | 11 50 | 11 00 |
| Copper, heavy | 11 00 | 11 00 |
| Copper wire | 11 00 | 11 00 |
| No. 1 machine composition | 10 00 | 9 75 |
| New brass cuttings | 7 00 | 8 00 |
| Red brass turnings | 8 00 | 8 00 |
| Yellow brass turnings | 6 00 | 6 00 |
| Light brass | 5 00 | 5 00 |
| Medium brass | 6 00 | 6 00 |
| Scrap zinc | 4 00 | 4 00 |
| Heavy lead | 4 50 | 4 00 |
| Tea lead | 2 00 | 2 00 |
| Aluminum | 12 00 | 10 00 |

| | Per Ton | Gross |
|---|---|---|
| Boiler plate | $11 00 | $12 00 |
| Heavy melting steel | 15 00 | 14 00 |
| Axles (wrought iron) | 25 00 | 20 00 |
| Rails (scrap) | 15 00 | 14 00 |
| Malleable scrap | 20 00 | 20 00 |
| No. 1 machine cast iron | 30 00 | 25 00 |
| Pipe, wrought | 8 50 | 8 00 |
| Car wheel | 30 00 | 25 00 |
| Steel axles | 20 00 | 18 00 |
| Mach. shop turnings | 8 00 | 6 00 |
| Stove plate | 23 00 | 20 00 |
| Cast boring | 5 00 | 7 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent |
|---|---|
| Carriage bolts, 7-16 and up | Net list |
| Carriage bolts, ⅜" and less | 15 |
| Coach and lag screws | —20 |
| Stove bolts | 55 |
| Wrought washers | —25 |
| Elevator bolts | Net |
| Machine bolts, 7-16 and over | —5 |
| Machine bolts, ⅜-in. and less | —30 |
| Blank bolts | Net |
| Bolt ends | —5 |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | +25 |
| Machine screws, fl. and rd. hd., brass | Net |
| Machine screws, o. and fil. hd., brass | Net |
| Nuts, square, blank | +25 add $2 00 |
| Nuts, square, tapped | add 2 25 |
| Nuts, hex., blank | add 2 25 |
| Nuts, hex., tapped | add 2 75 |
| Copper rivets and burrs, list less | 27½ |
| Burrs only, list plus | 10 |
| Iron rivets and burrs | 37½ and 5 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, bright | 67½ |
| Wood screws, flat, brass | 55 |
| Wood screws, O. & R., brass | 55½ |
| Wood screws, flat, bronze | 50 |
| Wood screws, O. & R., bronze | 47½ |

## MILLED PRODUCTS

(Prices on unbroken packages)

| | Per Cent |
|---|---|
| Set screws | Less 40% |
| Square and hexagon head cap screws | Less 30% |
| Round head cap screws | Plus 10% |
| Fillister head cap screws | Less 10% |
| Flat head cap screws | Net list |
| Button head cap screws | Plus 10% |
| Studs | Less 20% |
| Semi-finished nuts up to and including 1-in. | Less 35% |
| Semi-finished nuts 1⅛ to 1½" | Less 30% |
| Semi-finished nuts 1⅝ to 2 in. | Net list |
| Coupling bolts | Plus 10% |
| Taper pins | Less 40% |
| Planer bolts without fillet | Plus 40% |
| Planer bolts with fillet | Pus 50% |
| Patch bolts | Plus 80% |
| Hollow set screws | Plus 20% |
| Thumb screws | Less 35% |
| Thumb nuts | Less 65% |

## BILLETS

F.O.B. Pittsburgh.

| | Per gross ton |
|---|---|
| Bessemer billets | $43 50 |
| Open-hearth billets | 43 50 |
| O.H. sheet bars | 47 00 |
| Forging billets | 48 50 |
| Wire rods | 57 00 |

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails, base | $5 10 |
| Cut nails, base | 5 75 |
| Miscellaneous wire nails | 50% |

## ROPE AND PACKING

| | |
|---|---|
| Plumbers' oakum, per lb. | 0 10¼ |
| Packing, square braided | 0 38 |
| Packing, No. 1 Italian | 0 44 |
| Packing, No. 2 Italian | 0 36 |
| Pure Manila rope | 0 26 |
| British Manila rope | 0 20 |
| New Zealand hemp | 0 20 |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | Net |

# ATKINS
## METAL CUTTING SAWS




**Solve your Metal Cutting problems, easily, quickly and economically, by adopting the products made by**

# ATKINS

We make Kwik-Kut Power Hack Saw Machines which use practically the full cutting edge of the Hack Saw Blade at each stroke; Metal Cutting Band Saw Machines for general shop work, cutting all classes of metal up to 12 x 14 inches.

Your requirements for Metal Cutting Circular Saws can be supplied promptly and we solicit a trial of our "AAA" Non-Breakable and Power Hack Saw Blades and Frames.

*"A Better Saw for Every Use"*

## E. C. Atkins & Co.

Established 1857

*"The Sterling Quality Saw People"*

*Factory:* HAMILTON, ONT. *Branch:* VANCOUVER, B.C.

## THE FINEST ON EARTH

*If interested tear out this page and place with letters to be answered.*

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | $ 0 25 |
| Solder, guaranteed | 0 27 |
| Soldering coppers, lb. | 0 62½ |
| White lead, pure, cwt. | 17 00 |
| Red dry lead, 100-lb. kegs, per cwt. | 13 00 |
| Linseed oil, boiled, single bbls. | 1 03 |
| Wood alcohol, per gal. | 2 75 |
| Whiting, plain, per 100 lbs. | 3 00 |

### CARBON DRILLS AND REAMERS

| | |
|---|---|
| S.S. drills, wire size | 40 and 5 |
| Can. carbon cutters, plus | 10 |
| Standard drills, all sizes | 40 and 5 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 and 5 |
| Bit stock | 50 |
| Ratchet drills | 10 |
| Pure turp., single bbls., gal. | 1 20 |
| Linseed oil, raw, single bbls. | 1 00 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 50 |
| Sleeves | 50 |
| Taper pin reamers | 25 off |
| Drills and countersinks | Net |
| Bridge reamers, carbon | 50 |
| Centre reamers | 5 |
| Gasoline, per gal., bulk | 0 42 |
| Chucking reamers | Net |
| Hand reamers | 10 |
| High speed drills, list net to plus | 20 |
| Can. high speed cutters, net to plus | 10 |
| American | plus 40 |

### COLD ROLLED STEEL

[At Warehouse]

| | |
|---|---|
| Rounds and squares | $7.00 base |
| Hexagons and flats | 7.00 base |

### IRON PIPE FITTINGS

| | Black | Galv. |
|---|---|---|
| Class A | 60 | 75 |
| Class B | 26 | 36 |
| Class C | 17 | 26 |

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 6 50 | $ 6 50 |
| Sheets, blue ann., No. 10 | 5 50 | 5 50 |
| Canada plates, dull, 52 sheets | 12 00 | 13 00 |
| Can. plates, all bright | 14 00 | ..... |
| Apollo brand, 10¾ oz., galvanized | .... | ..... |
| Queen's Head, 28 B.W.G. | 10 75 | ..... |
| Fleur-de-Lis, 28 B.W.G. | 10 00 | ..... |
| Gorbal's Best, No. 28 | .... | ..... |
| Colborne Crown, No. 28 | .... | ..... |
| Premier, No. 28, U.S. | 8 75 | 8 50 |
| Premier, 10¾-oz. | 8 25 | 8 90 |
| Zinc sheets | 13 00 | 15 00 |

### PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13; 5-16, $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

### ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13; 5-16 in., $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

**Prices per 100 lbs.**

### FILES AND RASPS

| | Per Cent. |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 32½ |
| Black Diamond | 27½ |
| J. Barton Smith, Eagle | 50 |
| McClennand, Globe | 50 |
| Delta Files | 20 |
| Disston | 40 |
| Whitman & Barnes | 50 |
| Great Western-American | 50 |
| Kearney & Foot, Arcade | 50 |

### BOILER TUBES

| Size | Seamless | Lapweld |
|---|---|---|
| 1 in. | $26 00 | $..... |
| 1¼ in. | 27 25 | ..... |
| 1½ in. | 26 25 | 29 50 |
| 1¾ in. | 29 75 | 27 00 |
| 2 in. | 29 25 | 24 50 |
| 2¼ in. | 33 00 | 28 50 |
| 2½ in. | 44 75 | 32 50 |
| 3 in. | 49 25 | 40 00 |
| 3¼ in. | ..... | 48 50 |
| 3½ in. | 63 50 | 43 50 |
| 4 in. | 85 00 | 55 50 |

Prices per 100 ft., Montreal and Toronto

### OILS AND COMPOUNDS

| | |
|---|---|
| Castor oil, per lb. | — |
| Royalite, per gal., bulk | 28 |
| Palacine | 31 |
| Machine oil, per gal. | 58 |
| Black oil, per gal. | 27 |
| Cylinder oil, Capital | 1.01 |
| Petroleum fuel oil, bbls., net | 11.2 |

### BELTING—No. 1 OAK TANNED

| | |
|---|---|
| Extra heavy, single and double | 15% |
| Standard | 15 and 10% |
| Cut leather lacing, No. 1 | 2 00 |
| Leather in side | 2 40 3 00 |

### TAPES

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES

| | |
|---|---|
| Polishing wheels, felt | $4 50 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, Turkish | 8¾ |
| Pumice, ground | 06 |
| Emery glue | 30 |
| Tripoli composition | 9½ |
| Crocus composition | 12 |
| Emery composition | 11 |
| Rouge, silver | 64 |
| Rouge, powder, nickel | 38 |

**Prices per lb.**

### ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | 8½ |
| Grits, 80 and finer | 6 |

### BRASS—Warehouse Price

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 30 |
| Brass sheets, 24 gauge and heavier, base | 38 |
| Brass tubing, seamless | 42 |
| Copper tubing, seamless | 44 |

| | |
|---|---|
| XXX Extra | 21 |
| Peerless | 22 |
| Grand | 21½ |
| Superior | 21½ |
| X L C R | 16½ |
| Atlas | 19 |
| X Empire | 15 |
| Ideal | 18 |
| X Press | 13½ |

### WASTE

**Colored**

| | | | |
|---|---|---|---|
| Lion | 13½ | Popular | 10½ |
| Standard | 12 | Keen | 9 |
| No. 1 | 14 | | |

**Wool Packing**

| | | | |
|---|---|---|---|
| Arrow | 35 | Anvil | 22 |
| Axle | 28 | Anchor | 17 |

**Washed Wipers**

| | | | |
|---|---|---|---|
| Select White | 20 | Dark colored | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

### RUBBER BELTING

| | | | |
|---|---|---|---|
| Standard | 10% | Best grades | 15% |

### ANODES

| | |
|---|---|
| Nickel | .55 to .60 |
| Copper | .38 to .40 |
| Tin | .70 to .70 |
| Zinc | .16 to .17 |

**Prices per lb.**

### COPPER PRODUCTS

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | $30 00 | $34 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 32 00 | 38 00 |
| Copper sheet, tinned, 14 x 60, 14 oz. | 38 00 | 42 00 |
| Copper sheet, planished, 16 oz. base | 44 00 | 48 00 |
| Braziers', in sheets, 6 x 4 base | 36 00 | 41 00 |

### LEAD SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $ 9 50 | $14 50 |
| Sheets, 3½ lbs. sq. ft. | 9 25 | 14 00 |
| Sheets, 4 to 6 lbs. sq. ft. | 9 00 | 13 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS

| | |
|---|---|
| Acid, boracic | $ .25 |
| Acid, hydrochloric | .03¾ |
| Acid, nitric | .10¼ |
| Acid, sulphuric | .03¾ |
| Ammonia, aqua | .20 |
| Ammonium, carbonate | .23 |
| Ammonium, chloride | .22 |
| Ammonium, hydrosulphuret | .75 |
| Ammonium sulphate | .30 |
| Arsenic, white | .18 |
| Copper, carbonate, annhy. | .35 |
| Copper, sulphate | .10 |
| Cobalt, sulphate | .20 |
| Iron perchloride | .62 |
| Lead acetate | .30 |
| Nickel ammonium sulphate | 16½ |
| Nickel carbonate | .30 |
| Nickel sulphate | .17½ |
| Potassium sulphide (substitute) | .40 |
| Silver Chloride (per oz.) | 1.15 |
| Silver nitrate (per oz.) | 1.10 |
| Sodium bisulphate | .13 |
| Sodium carbonate crystals | .04 |
| Sodium cyanide, 127-130% | .39 |
| Sodium hyposulphite per 100 lb. | 6.50 |
| Sodium phosphate | .15 |
| Tin chloride | .80 |
| Zinc chloride, C.P. | .30 |
| Zinc sulphate | .08 |

**Prices per lb. unless otherwise stated**



# MORROW DRILLS

## *Made from Hammered Steel Bars*

They are made of English Sheffield steel, Morrow tempered, with a web of graduated thickness. They possess strength where strength is needed and give *more holes* with *less regrinding.*

**Oldest, largest and best equipped plant in the Dominion, manufacturing Set Screws, Cap Screws, Engine Studs and Semi-Finished Nuts.**

**Sole distributors of P-H and IMPERIAL FILES.**



***Please Note Our New Montreal Office:***

**JOHN MORROW SCREW & NUT CO. LTD.**

489 St. Paul Street West, MONTREAL, QUE.

***Telephone:*** **Main 8418.**

*WORKS AT*

# INGERSOLL

*If interested tear out this page and place with letters to be answered.*

## Engineering

A garage is contemplated by John O'Grady, 84 Osgoode Street, Ottawa, Ont.

The Three Hills Milling Co., Three Hills, Alta., are planning to erect a flour mill at cost of $30,000.

A warehouse will be erected by Irving Wood & Co., 2907 Dundas Street West, Toronto, at a cost of $20,000.

Black and Irish, 606 Merchants Bank Building, Winnipeg, Man., are contemplating the erection of a garage.

Plans for alterations to the Kay Building, Toronto, Ont., are being prepared by F. H. Maranit, architect, Manning Chambers.

The Butterfly Hosiery Co., Drummondville, Que., contemplate the erection of an extension to factory at a cost of $300,000.

A plumbing shop and public hall are being built by H. Massicotte & Freres, Inc., Cap de la Madeleine, Que., at a cost of $10,000.

The Royal Brush Co., Hamilton, Ont., is asking for a small second-hand planer, 16 or 18-inch, with long bed; also cut off and rip saw.

The National Castings, Ltd., Belleville, Ont., will start work in the near future on the erection of a foundry and other additions.

Royal Drug Exchange, 51 St. Joseph Street, Quebec, Que., has purchased the building and will transform it into a large pharmaceutical warehouse.

The Mimico-New Toronto Joint Sewage Commission, Mimico, Ont., will purchase pumps of 2,000 and 1,500 gallons per minute capacity for a pumping station.

The Supercharge Engine Co. of Canada, Ltd., 120 St. James Street, Montreal, will receive bids for the erection of a plant and will purchase the necessary equipment.

The Temiskaming & Northern Ontari Railway Commission, 56 Church Street, Toronto, will build shops and engine houses to cost about $80,000 and will spend $57,500 on equipment.

The contract for the erection of office and brass foundry for the Taylor & Arnold Engraving Co., 260 St. James Street, Montreal, has been awarded to W. H. Madigan, 949 Atwater Avenue.

The Engineering & Machine Works of Canada, Ltd., St. Catharines, Ont., desires a high embossing type press for making ½-inch letters and figures for numbering wood patterns.

The machine shop, boiler house and forge of the Nova Scotia Steel & Coal Co.'s shipbuilding plant at Trenton, N.S., recently destroyed by fire with a loss of $60,000, will be rebuilt at once and new equipment purchased.

The Gove Motor Co., Tilbury, Ont., will start work about April 1 on the erection of factory to manufacture automobiles and trucks and will be in the market for metal-working machinery and special equipment.

The Dods Knitting Co. will build an addition to their factory in Orangeville, giving them an additional 20,000 feet of floor space.

Construction will begin next month on the new pulp and paper mill at Kenora, Ont., for E. W. Backus, of International Falls, Minn. Five hundred men will be employed on construction work.

Thos. Sharpe, Avenue Block, Winnipeg, Man., has been awarded the contract for erection of a garage at cost of $80,000 for Consolidated Motors, Ltd., corner Portage Avenue and Victoria Street.

**Enlarging Plant.**—The Peterborough Gas Works are building an extension to their plant, which will, when completed, give double the capacity of the present purifiers. The Economic Gas Construction Co., of Toronto, have secured the contract for this work.

**Wants Equipment.**—A correspondent wishes to know who can supply him with a machine for making buggy and perambulator wheels, these to range from 4 inches to 18 inches diameter. He also asks, "Who can supply the material for these wheels; ribs, spokes, and rubber cushions?" Any firm interested in this request can secure further information by writing the editor of Canadian Machinery.

**Looks for Good Year.**—Fred Armstrong, president of the Port Hope Sanitary Manufacturing Co., reiterated his belief at the annual meeting that the present year would witness a large volume of building throughout Canada. He, however, emphasized the importance of amicable relations between employer and employee. Only routine business was transacted at the meeting, and the former directors were re-elected as follows: L. M. Wood, R. J. Cluff, W. D. Ross, Fred Armstrong, M. L. Davies, Robert Fleming and W. J. Cluff.

**Going to Start.**—Speaking to a representative of this paper, James Hamilton, managing director of the Peter Hamilton Co., Peterboro, engaged in foundry and machine shop work, stated that the foundry end of the business, employing about twenty men, which has been closed for a month due to lack of orders, will reopen in the course of the next few days. Mr. Hamilton believed that the general slump, under which business has been laboring for the past few months, is due for a break, and he is quite hopeful that the coming season will be a good one for business in general.

## Personal

T. A. Hollinrake, president and general manager of the A. R. Williams Machinery Co., has been spending the last couple of weeks at Atlantic City.

Willys-Overland, Limited, are announcing an appointment of special interest in automobile circles, in the selection of H. E. Brasier as manager of the Toronto Branch, succeeding H. D. Scully, who has resigned to take up other important work. Mr. Brasier has been service manager for Canada for some years, and is widely known throughout the whole Canadian Overland organization. He will have a field for which he is particularly adapted owing to his large acquaintance in the city. He was connected with the bicycle industry first, and later joined the Russell Motor Car Co., where he was for several years accountant at the Toronto Branch. When this company was taken over by the Willys-Overland, Ltd., his good work led to his appointment as service manager at the head office.

## Montreal Notes

The Lyman Tube and Supply Company have been appointed Canadian distributors for the "Hoffman" ball and roller bearings, manufactured by the Hoffman Manufacturing Company of Chelmsford, Essex, England.

* * *

Roderick McLean, engineer, 128 Bleury St., Montreal, has secured the Canadian agency for the Cleworth, Wheal and Company, of Castleton, England, manufacturers of air filters, humidifiers and water coolers.

* * *

R. Percy Sims, consulting engineer, of Montreal, is moving his office from 424 Philips Place to more commodious offices at 358 Beaver Hall Hill. This firm has the contract for the refrigerating plant of the new cold storage warehouse being erected for the Montreal Harbor Commissioners.

* * *

Both the Angus shops of the C.P.R. and the Point St. Charles shops of the Grand Trunk have been closed down for a period of about ten days owing to the lack of work in the way of locomotive repairs. It is expected that some proposition will be made to the men in the near future regarding a revision of the working schedule and the rates of wages.

* * *

The engineering firm of G. and J. Weir, of Montreal, have added a new department to their business. This section will take care of the repairing of vessels plying to and from the port of Montreal, and a thoroughly experienced staff of workmen and an efficient superintendent from the parent plant will look after this division of the work. Work on the new foundry of this firm has been started, and it is expected that the plant will be in operation before the middle of the summer. This firm has considerable work booked ahead, and full time operation is looked for throughout the season.

# MacFARLANE Portable Floor Crane




## *The Biggest Labor-Saver in the Plant*

MACFARLANE Portable Floor Crane and Hoist has a capacity 2 to 6,000 lbs. Cut illustrates the industrial types with high base and large wheels; it is easy moving and can be operated by one man at full capacity.

Equipped with Hyatt Roller Bearings.

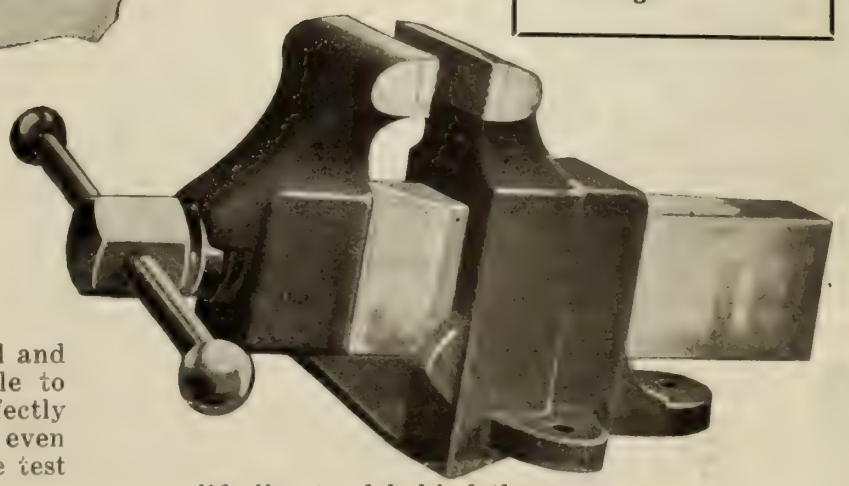
THE LARGEST TYPE OF HOIST is similar except for base casting, which is lower, to allow machine being placed under axles of car and in such places where little height from floor is experienced.

MADE - IN - CANADA AND MADE BETTER

*The* MacFARLANE LINE

**Portable Floor Hoists and Cranes.**
**Machinists' Vises of all types.**
**Trolley Wheels.**
**Oilless Bushings.**
**Heavy Duty Winches.**
**Grey Iron Bronze and Aluminum Castings.**

## MacFARLANE *Quality Vise*



Machinists' Vise — a solid, sturdy tool; the main casting is entirely of semi-steel and jaws of high carbon steel fused in place. Balls are of steel and so arranged that it is impossible to remove them. The teeth are perfectly milled and possess a perfect, even grip. All vises undergo a severe test before leaving the factory; thus we can unqualifiedly stand behind them.

We manufacture all types of vises, including the quick-acting vise.

FULL INFORMATION PROMPTLY GIVEN

## G. W. MacFARLANE ENGINEERING, LIMITED

PARIS, CANADA

*If interested tear out this page and place with letters to be answered.*




THE "FLU" Stayed out of this PLANT

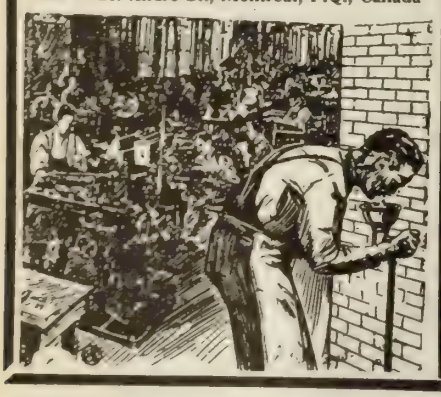
PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)

The only fountain with a bowl that prevents lips touching the bubbler paid its moderate cost over and over in all those well-ordered plants whose precautionary measures successfully barred the Spanish influenza. PURO saves lives, time and water. Write

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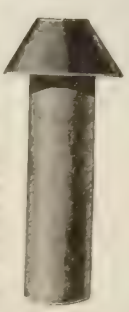
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We are equipped to fill the requirements of the Marine trade promptly. Square head, hexagon head and all kinds of Machine, Deck, Carriage Bolts and Rivets.



QUALITY PRODUCTS

LONDON BOLT & HINGE WORKS

LONDON, CANADA


# U. S. AUTO PLANTS READY TO PUT PRODUCTION AT CAPACITY

Detroit.—One hundred per cent. production schedules will be put into effect in practically every automobile plant in Detroit, beginning next Monday, it was learned in a canvass of the factories.

Manufacturers are optimistic over the future of the industry. Almost every plant reported orders coming in rapidly. Men are being hired every day, and departments are being built up to a normal basis.

The Paige Detroit Motor Car Company will resume full time production Monday.

Officials of the Hupp Motor Car Co. said that production will be increased to normal next Monday.

### Increase 50 Per Cent.

Production in the Hudson and Essex plants will be 50 per cent. greater in April than it was during March, an official stated. The company acknowledged that it has more orders on its books at present than it can fill in the next 60 days.

All plants of the Studebaker Corporation, which have been running on a five-day-week basis, will be operated six days the first week in April.

During April production in the Packard plant will be 50 per cent. greater than it was during the last three months. In May it will be increased to 100 per cent. more than during January, February and March.

### Open New Plant

The new plant of the King Motor Co. will be opened next week.

The Maxwell Co. will increase production to a 45 per cent. basis next week.

Production in the plant of the Chalmers Motor Car Co. will be 75 per cent. greater during April than in March, said one official.

Officials at other plants, although admitting that production will be increased April 1, refused to give actual figures.

The Ford Motor Car Co. has received orders for 90,000 cars to be delivered in April, as against about 80,000 in March.

# OSHAWA PLANTS WELL UNDER WAY

**Operations There Have Been On The Increase and Unemployment Has Almost Ceased**

According to an Oshawa man, conditions in the automobile plants in that town are constantly improving, and the McLaughlin, Chevrolet and Oldsmobile shops are all running. The rate of production, of course, is not up to normal, but it is increasing. "I have no definite figures," said our informant, "but I should say that around 60 per cent. at least would be their present rate of operation."

"Another thing that we can judge by," he said, "is the unemployment, which has practically ceased. Some of the men who were skilled in certain lines of work in the auto shops who were let out some months ago have been brought back to work, and some time ago all the married men had been given their places back. Fittings Limited is also working on a fairly good basis, and they must have about 80 per cent. of their normal staff at work now. Indications are that things are moving along in a much better way than they were a few months ago, and there is a feeling that business is very much on the mend."

# RECENT CHANGES MADE IN PRICES

**Some of the Firms That Have Announced Reductions in Their Schedules**

Reductions of about 15 per cent. on Kearney & Trecker, Kempsmith and Hendey milling machines are reported. Cincinnati and Brown & Sharpe were reduced some weeks ago. The Canedy-Otto Mfg. Co. has reduced prices about 15 per cent. on its line of radial and upright drills, forges, grinders, etc. The Champion Blower & Forge Co. has announced reductions approximating 10 per cent. and the Royersford Foundry & Machine Co. has cut 10 per cent. on its punching and shearing machines and sensitive drills. Reductions on some lines of lathes are also reported and a Western maker of vertical boring machines has reduced prices about 20 per cent.

# EXTEND PLANT AT FORT WILLIAM

**Canada Iron Foundries May Make Extensions and Go in for Wheel Making**

The location of a wheel-making plant to cost $150,000 as a subsidiary of its present plant in Fort William is in contemplation by the Canada Iron Foundries. Major Hughes and C. J. Jobb, of the Montreal offices of the company, met the mayor and aldermen of Fort William regarding the proposed new unit. The aldermen noted that the company's fixed tax assessment expires this year. In requesting a renewal the members of the company pointed out that the company is prepared to go ahead with the building of the wheel-making plant when the council is ready to submit a proposition setting out what the city is willing to do.

In 1920 the company paid out in wages at its Fort William plant over $260,000.

## ALGOMA WANTS TO GET BUSINESS

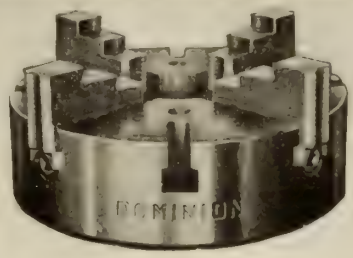
**Steel Mill Needs Orders for Rails — Many Men Out by Shut-Down of the Mills**

Sault Ste. Marie, Ont.—A deputation comprising Mayor Thomas Farquhar, President J. A. Hussey of the Board of Trade, and A. E. Whiteal, president of the Trades and Labor Council of this city, went to Ottawa to wait on the Government to ascertain if something cannot be done toward getting orders for the Algoma Steel plant, which let out a great number of its employees for lack of orders for steel rails. It is estimated that nearly 2,000 men have been walking the streets here out of employment, and that unless orders come in to the Steel Corporation the prospects for the coming summer will not be very bright for the men.

### PIG IRON PRODUCTION

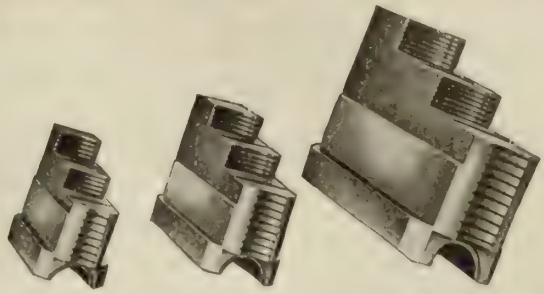
The 1920 pig iron production of the United States was 36,925,987 tons as compared with 31,015,304 tons the preceding year, according to official statistics of the American Iron & Steel Institute, just announced.

Output in 1918 was 39,054,644 tons and in 1917, 38,621,216 tons. Production of 39,437,797 tons in 1916 was largest in history of the industry. Largest production in any pre-war year was in 1913 when output reached 30,966,152 tons.


DOMINION CHUCKS

STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY



The Jaws Are Extra Strong

THEY are drop forgings, made of best quality steel, heat-treated and hardened. The threaded portion of jaws form a half nut for the setting-up screws. Have stood the test of heavy duty work in our own shops where accuracy was the only accepted standard.

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BERTRAMS LIMITED
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OVENS
Japanning and Varnishing Ovens heated by Gas, Electricity, Steam or Coal. Kernchen Siphonage Ventilators, Bakers' Ovens, trucks, casters, etc. Write for Booklet.
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The old established firm. Patents everywhere. Head office, Royal Bank Bldg., Toronto. Ottawa office, 5 Elgin St. Offices throughout Canada. Booklet Free.

Oil Tempered Steel Springs
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Special styles of all kinds to Order.
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DROP FORGE DIES
Send us your blueprints and specifications. Entrust your requirements to experienced workmen and up-to-date equipment. Have your dies made in Canada. First-class workmanship guaranteed.
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*Consulting and Designing* — Tools, Jigs, Fixtures and Special Machinery. Let us shoulder your problems.
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THE TUBE COMPANY OF CANADA LIMITED
Steel Tubing
for all purposes
*Electric and Oxy-Acetylene Welded*
*Also*
*Butt Seam Tubing*
Hot or cold rolled, in sizes ⅜ to 2 inches outside diameter, from 16 to 22-gauge. Also equipped for bending 16-gauge or lighter, any shape or radius. We furnish any shape — Rounds, Squares, Hexagons, Ovals and Special Shapes to customers' specifications.
Expert advice given on all Steel Tubing Problems.
The Tube Company of Canada
33 Dufferin St. TORONTO, ONT.


*If interested tear out this page and place with letters to be answered.*

# Classified Opportunities

## PATTERNS

TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (ctfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

## MACHINERY WANTED

WANTED — ONE USED WATER CINDER mill. State length of time machine has been used, condition and where it can be examined. State lowest net price. G. W. McFarlane Engineering Limited, Paris, Ont.

WANTED—NEW AND RE-MANUFACTURED gas and gasoline engines, boilers, saw-mill machinery, planing mill and sash and door factory machinery. New and manufactured iron and wood-working machinery. Electric motors, dynamos, direct connected steam operated generators, portable electric tools. Builders' hoists, elevators. Box 739F, Canadian Machinery.

IF YOU HAVE IRON-WORKING OR WOODworking machines for sale, or idle machine shop equipment, call or write Canada's largest dealers in new and used machinery. H. W. Petrie Limited, Toronto, Ont. (cfm)

ONE SINGLE STAND 9 x 18 ROLL IN GOOD condition; one receiving separator, capacity about 1,000 bushels per hour. Crane Bros., 817 Ferry St., Niagara Falls, Ont.

Phone Park. 3550 House: Coll. 9660W
197 Clinton Street, Toronto
**A. AUSTIN**
GENERAL MACHINE WORK
Turret Lathe and Automatic Screw Machine a Specialty. Let us quote on your work.
*With:* Garlock, Walker Machinery Co. 163 Dufferin Street.

**General Machine Pattern and Sheet Metal Work**
If production is required
**Let our Battery of Bullards do it**
Large and small machine work our specialty. Our facilities assure first-class production with maximum efficiency. Before ordering get our estimates by mailing us your blue prints, or have our representatives call on you.
**Rubber Machinery Shops**
Canadian Consolidated Rubber Co. Limited
Kitchener, Ont.

## FOR SALE

FOR SALE 100 PACKAGES OF 225 SHEETS each Prime Coke Tin Plates, 55-lb. or 38 gauge, immediate delivery. Inquire Newell Manufacturing Company, Prescott, Ont.

THREE 50 H.P. TYPE C.C.L., TWO 50 H.P. type H.S.; Westinghouse motors, one 30 h.p., and one 32 h.p. and one 40 h.p. Chapman-Walker motor; twenty 16 in. Bliss turret lathes and eleven No. 2 Foster turret lathes, nine No. 3 Foster turret lathes, two 14 in. Warner & Swasey lathes, two No. 6 Warner & Swasey lathes, one No. D1 Colburn drill press, eleven No. 1 Burke hand millers, and one 68N Bliss press and one 57½ Toledo press, one hydraulic accumulator, two No. 55 National Acme automatics; also various other lathes, millers, pumps, hardness testing machines, etc. Apply Box 760F, Canadian Machinery.

**CLOSING TIME**
Advertisements for this section must be in our composing room Tuesday morning prior to day of issue.
In order that the announcements of your wants, machinery for sale, etc., etc., shall not be delayed, please try to have them in our office with the Tuesday morning mail.
**Canadian Machinery**

**Modern Marine Machinery**
Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

**Grey Iron Castings**
Light and Medium-Bench and Floor Repetition Castings; Capacity 15 tons per day.
Expert Metal and Wood Pattern Work. Our advice and estimates will save you money.
Semi-finishing operations on Lathe or Grill on Castings supplied if required.
ASK US.
THE KATIE FOUNDRY, GALT, ONT.

REGO
**WELDING**
*and*
**CUTTING APPARATUS**
Oxygen, Acetylene, and a complete line of Welding and Cutting Supplies.
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of Toronto, Limited
7-11 Sheppard St., Toronto, Ont.
Phones: Adelaide 2841 and 1524
(TF)

## POSITIONS WANTED

POSITION WANTED—MACHINE SHOP SUperintendent or general foreman. Acquainted with modern machine shop practice and heat-treatment of steel. Thirty years' experience. Production or contract work. Box 757, Canadian Machinery.

## AGENTS WANTED

AMERICAN FIRM, SPECIALIZING IN OXYacetylene welding and cutting equipment, is desirous of securing representatives and agents in Canada. Apply Box 763F, Canadian Machinery.

## HELP WANTED

MECHANICAL ENGINEER — WE REQUIRE the services of a mechanical engineer competent to supervise the manufacture of patent automatic machinery and the installing of plant; big position to good man. State particulars to Box 764F, Canadian Machinery.

WANTED—A MAN TO TAKE CHARGE OF A steel range department in a foundry in Ontario; one accustomed to welders preferred; good wages and steady employment to the right man. Apply Box 765F, Canadian Machinery.

## MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (etfm)

**MACHINE WORK WANTED**
We are equipped to handle all kinds of general or special machine work. All operations in our plant are done under the most careful supervision and we can satisfy you as to price. Always available for consultation.
**PERFECT MACHINE COMPANY, GALT**
Builders of Reliable Machinery.

**CANADIAN MACHINE SHOP**
—
Will handle medium Specialty Line — Manufacturing and Selling
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**Apply Quickly**
**Box No. 715F**
**CANADIAN MACHINERY**

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## JOBBERS and DEALERS
### Engineering Supplies

There is absolutely no reason for paying exchange on your purchases of asbestos packings, gaskets and tape. We manufacture a line that is equal to any imported article and sold to jobbers at a price that allows a good margin of profit with protection. If you are not handling our line you are working at a disadvantage. Write us for set of samples, circulars and prices.

**OUR LINE INCLUDES:**

Tiger Superheat Metallic Piston Packing
Tiger High Pressure Piston Packing
Flax Packings
Asbestos Gaskets
Asbestos Tape




**GUILDFORD & SONS LIMITED**
HALIFAX, N.S.

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**Mr. Purchasing Agent, would you like to hear of some special bargains in new and used machinery?**

## Of Course You Would

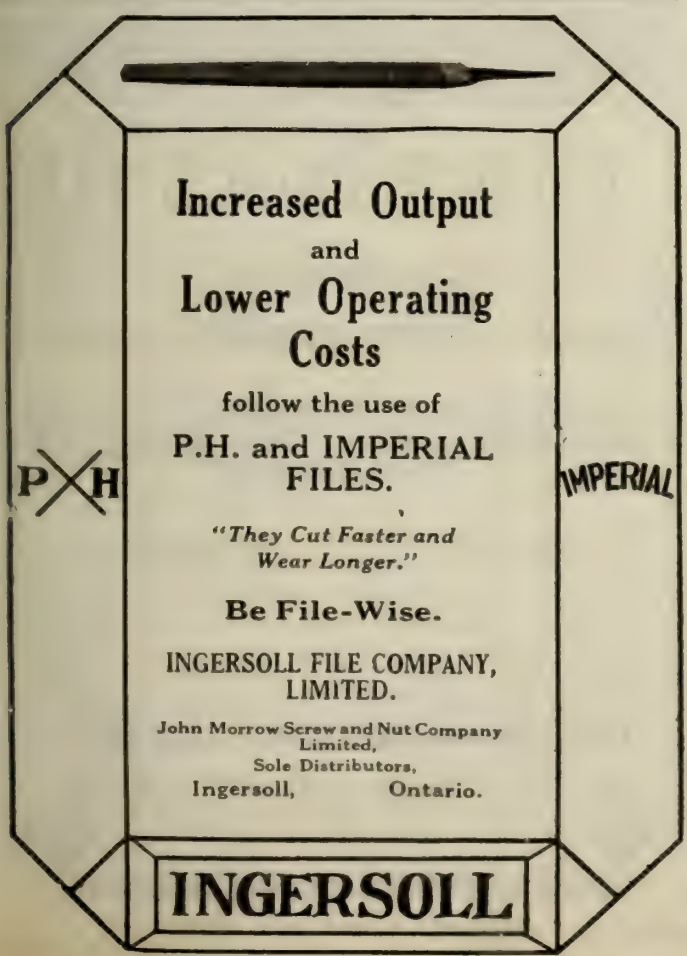
Then it will pay you to watch this advertisement from week to week, as we specialize in all kinds of iron and woodworking machinery, together with a full line of contractors' and mining equipment.

Send us a list of your requirements and we will convince you that our prices are right.

**We are open to buy**
**MILLING MACHINES AND SHAPERS.**

## R. S. HOLLY
**Suite 502 Kent Building**
TORONTO, ONTARIO
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**Cold Rolled Strips and Bars**
**AUTO BODY SHEETS**
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**TIN PLATE CANADA PLATE**
**HOT ROLLED STRIPS**
TUBING---Seamless, Welded, Brass Cased, Flexible

# BRASS

RODS (also Marine Bronze) TUBES SHEETS

# COPPER

RODS WIRE TUBES SHEETS

Quotations made for Mill or Stock deliveries on your requirements of Aluminum, Bronze, Monel Metal, Nickel Silver, Nickeloid, Phosphor Bronze, Tobin Bronze.

*WRITE US FOR PRICES.*

## ONTARIO METAL PRODUCTS
CO., LIMITED
237 Dufferin St., TORONTO, Canada

# GARLOCK-WALKER LIST

## If You Want Machine Equipment, Send Us Your Enquiries

**We have one of the largest stocks of new and used metal and woodworking machines in Canada. Many machines only very slightly used and all absolutely guaranteed. A few machines from our Toronto stock at exceptionally attractive prices are:**

**LATHES**

1—30" x 12' "Blaisdell" (used).
1—30" x 14' "Niles-Bement-Pond" (used).
1—26" x 14' "Niles-Bement-Pond" (used).
1—24" x 10' "Milwaukee" (new).
1—18" x 8' "Rae" (new).
1—16" x 6' "Reed" (used).
1—12" x 8' "LeBlond" Tool Room (used).
1—8" "Rivett" Cabinet Type, full attachments (used).
1—7" "Cataract" Precision (new).

**GAP LATHES**

1—38" x 54" x 12' Bertram (used).
1—22" x 40" x 16' McDougall (used).
1—21" x 30" x 7' South Bend (used).
1—20" x 38" x 12' C.M.C. (used).

**TURRET LATHES**

No. 4 Millhollands, capacity 1⅝" (used).
Several Davis Turrets and other makes. Various capacities.

**SHAPERS**

1—16" "MacKenzie" B.G. Crank Shaper, (new).
1—16" "Rae" B.G. Crank Shaper (slightly used).
1—24" "McGregor-Gurley" B.G. Crank Shaper (used).

**PLANERS**

1—42" x 42" x 20' Putnam, 1 head (used).
1—30" x 30" x 10' Pond, 1 head (used).
1—24" x 24" x 6' Powell, 1 head (new).

**MILLING MACHINES**

1—Briggs High Duty Type "A" 22" Traverse (new).
1—Briggs High Duty Type "B" 42" Traverse (new).
1—Whitney Hand Miller, 18" x 6" table (used).
1—No. 3 Ford-Smith Plain (used).
1—No. 3 Ford-Smith Universal (used).
1—No. 4 Cincinnati Plain (used).

**DRILLS**

2—10" Burke Sensitive (Bench type) (new)
1—15" Barnes (used).
20" "Sibley," "Champions," "Rockwell" and "Silver" (new) and (used).
1—36" C.M.C. Heavy Duty (used).
1—3-spindle 20" Silver Gang Drill (used).
1—4-spindle W. & R. Sensitive (used).

**BORING MACHINES**

1—66" Bement-Niles Vertical, 2 heads, 24" under rail (used).
1—Universal No. 2½ Horizontal Table, 42" x 22" (used).
1—Bullard "New Era" Vertical Turret, 36", complete equipment (new).

**POWER HACK SAWS**

1—No. 10 Racine 8" x 8" Cap. (new).
1—No. 7 Watkins 9" Cap., 18" Blade (used).
1—6" x 6" Racine (used).

**AIR COMPRESSORS**

1—12" x 12" Bury, Class "L," Belt driven (used).
1—8" x 8" Sullivan, Class W.G.-3, Belt driven (used).
1—8 x 10 x 8 Bury, Steam driven (used).

**GRINDING MACHINES**

1—Landis No. 4 Universal (used).
1—Landis Plain, self-contained, 36" x 12" (used).
1—Norton Plain, No. 434 (used).
1—Fitchburg Cylindrical 8" x 36" (new).
Several Tool and Cutter Grinders (new) and (used). "Globe," "Stevens," "LeBlond" and "Cincinnati."

**MISCELLANEOUS**

2—No. 4 Jno. Hall Pipe Machines (1 used) (1 new).
1—Lennox Rotary Bevel Shear, 1" Cap. (new).
1—"High Speed" Hammer, No. 3A (used).
1—Beaudry Champion Power Hammer, No. 9 (used).
1—"Grant" Riveting Machine, No. 80A (used).
1—"Grant" Riveting Machine, No. 80B (new).
1—Arbor Press, No. 4 "Greenerd" (new).

## GARLOCK-WALKER MACHINERY CO., LIMITED

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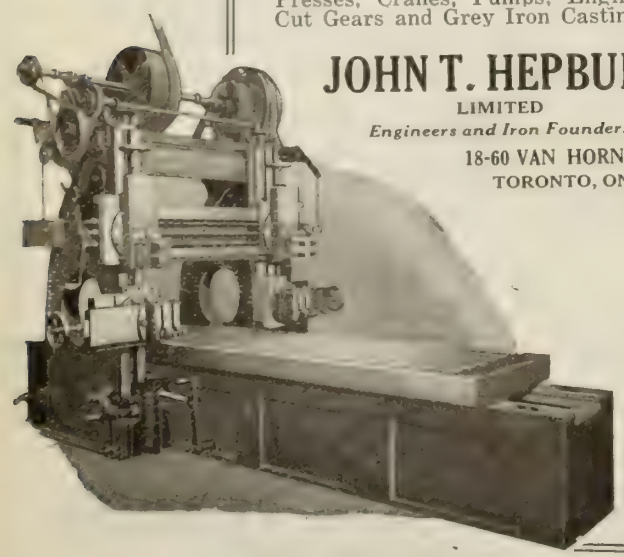
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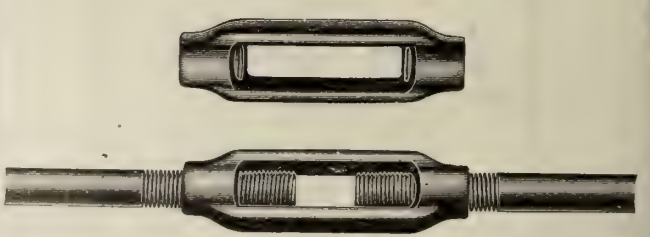
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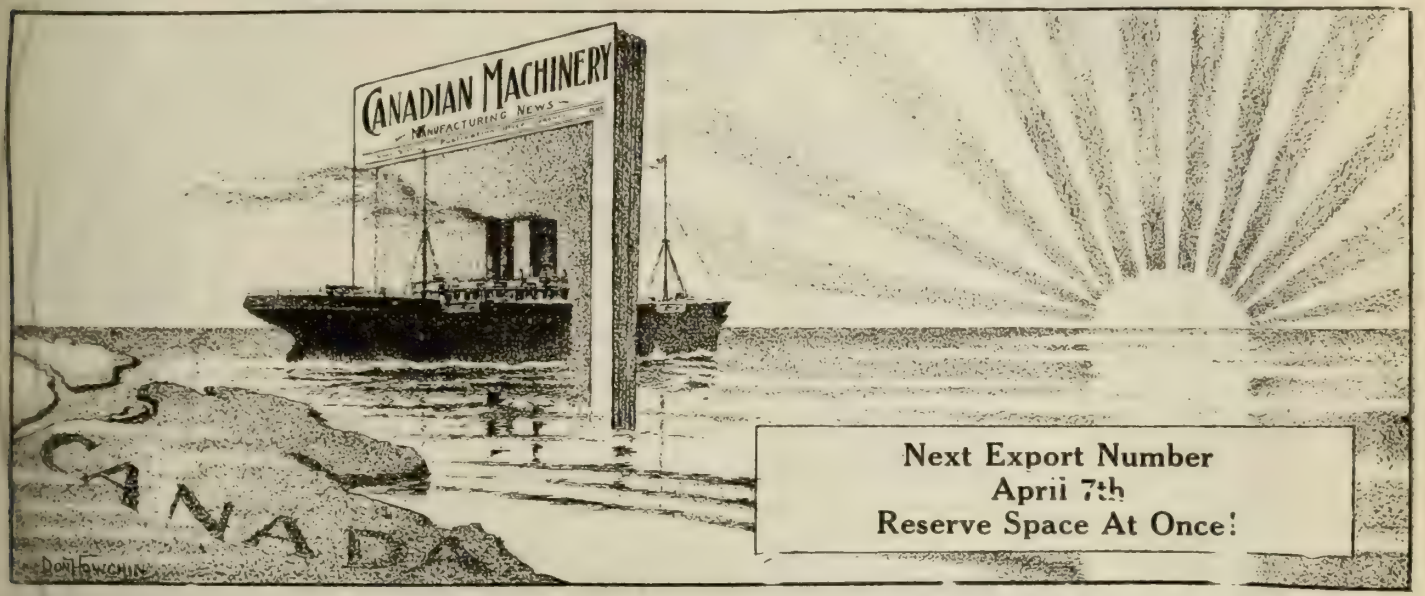
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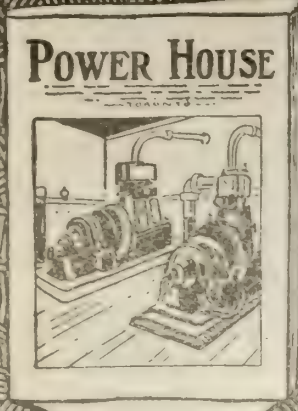
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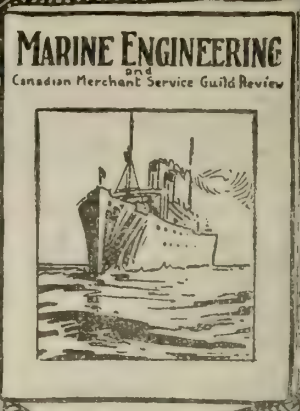
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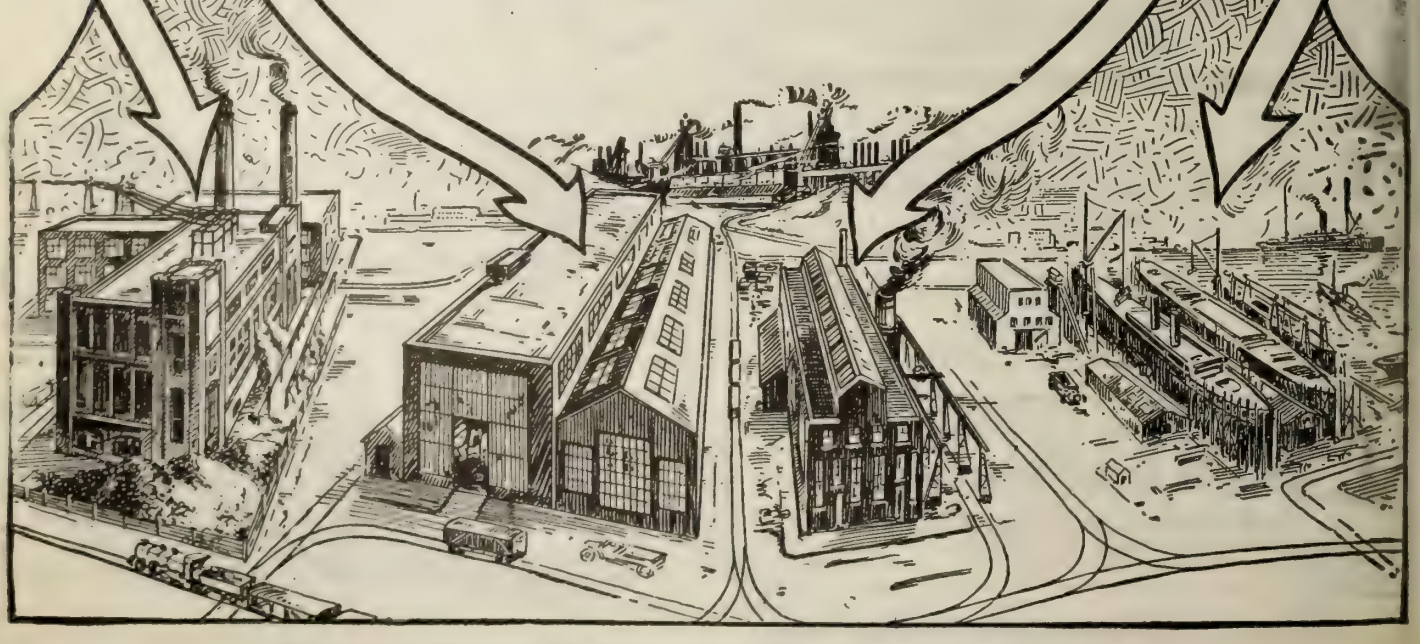
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Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Magnetic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**
Columbia Hdwe. Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

**Cleaners, Metal, Waste, General**
Oakley Chemical Co., New York, N.Y.

**Clocks, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Clutches, Friction**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**
Can. Link-Belt Co., Toronto, Ont.

**Collars, Shaft or Set**
Canada Foundries & Forgings Co., Welland, Ont
Can. Link-Belt Co., Toronto, Ont.

**Collets**
Ackworthle, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hartness Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compressors, Air**
Curtis Pneumatic Machinery Co., St. Louis, Mo.

**Compressors, Air and Gas**
Can. Fairbanks-Morse Co., Ltd., Montreal
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**
Ford-Smith Machine Co., Hamilton, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Convevor Belt Joiners**
Flexible Steel Lacing Co., Cnicago, Ill

**Copper**
Brown's Copper & Brass Rolling Mills Ltd., Toronto, Ont.

**Cored Bronze Bars**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Cotter Pins**
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Counterbores**
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Countershafts**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Couplers, Car and Locomotive**
Can. Steel Foundries, Montreal, Que.

**Couplings, Flexible**
Holden Co., Ltd., Montreal, Que.

**Couplings, Rigid**
Bernard Industrial Co., A., Fortierville, Que.

**Couplings, Shaft**
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

**Cranes, Electric**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.

**Cranes, Hand (See Hoists, Hand)**
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

**Cranes, Locomotive**
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Cranes, Traveling**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont

**Crank Pin Turning Machines**
Garlock-Walker Mchy. Co., Toronto, Ont
Herbert Ltd., Alfred, Toronto, Ont
Underwood Corp., H. B., Philadelphia, Pa

**Cutters, Flue**
Holden Co., Ltd., Montreal, Que.

**Cutters, Gear**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada
Atkins & Co., Inc., E. C., Indianapolis, I.
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Milling**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Machine Co., Cleveland.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.

**Cutters, Stay Bolt**
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Thread**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.

**Cutting-Off Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Cutting-Off Machines, Pipe (See Pipe Cutting and Threading Machines)**
Landis Machine Co., Inc., Waynesboro, Pa.
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Cutting-Off Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Pilot Steel & Tool Co., Montreal, Que.

**Cutting Oil Filters (See Oil Filtering Systems)**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Cataract Refining Co., Toronto, Ont.

**Cutting, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

**Cutting, Oxy-Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Dealers, Machinery (See Searchlight Section)**
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Deckle Straps**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Diamonds, Black and Rough**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond, Carbon and Bortz**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond Tools**
Aikenhead Hardware Ltd., Toronto, Ont
Can. Desmond-Stephan Co., Hamilton Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Wheel Trueing Tool Co., Detroit, Mich.

**Diamond Crossings**
Can. Steel Foundries, Montreal, Que.

**Die-Castings**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Dies, Pipe-Threading**
Jones & Lamson Machine Co., Springfield, Vt.

**Die Sinking Machines, Automatic**
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

**Die Sinkers**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Screw and Thread Cutting**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo, Ohio

# BUYERS' DIRECTORY

**Dies, Forging**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

**Dies, Hammer**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Self-Opening, Adjustable**
Can. Fairbanks Morse Co., Ltd., Montreal.
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Dies, Threading-Opening**
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Disc Cement**
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Dividing Heads**
Ackworthe, Ltd., John, Birmingham, Eng.
Dirkow, Fred. C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Dogs, Lathe and Milling Machine**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drafting Boards and Tables**
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Drafting Materials**
American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Dressers, Grinding Wheel**
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Drill Holders**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drill Rods**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Kitchenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Drill Speeders**
Canada Machinery Corp., Galt, Ont.

**Drilling Machine Heads**
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

**Drilling Machines, Automatic**
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

**Drilling Machines, Bench**
Beacon Engineering Co., Tipton, England.
Canada Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
Union Pneumatic Tool Co., Cincinnati, O.
Westinghouse Electric Co., Racine, Wis.

**Drilling Machines, Electric and Hand**
Kitchenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks Morse Co., Ltd., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Gang**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drilling Machines, Heavy Duty**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Multiple Spindle**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

**Drilling Machines, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Drilling Machines, Portable**
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Radial**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Drilling Machines, Sensitive**
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Turret**
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

**Drilling Machines, Vertical**
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng.
Stevenson Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Drills, Center**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drills, High Speed Twist**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Drills, Twist and Flat**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.

**Dust Handling Equipment**
Can. Blower & Forge Co., Ltd., Kitchener.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Electrical Instruments**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Electrical Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O.

**Elevating Trucks (See Trucks)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Elevators and Conveyors**
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Emery Wheels (See Grinding Wheels)**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Hart Products, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Engines, Capstan**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Engineers, Mechanical**
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.

**Expanders, Tube**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Eyeglasses, Safety (See Goggles, Safety)**
Prest-O-Lite Co. of Can., Toronto, Ont.
Willson Goggles, Inc., Reading, Pa.

**Fans, Electric**
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Northern Electric Co., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Exhaust**
Can. Blower & Forge Co., Ltd., Kitchener.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Ventilating**
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**File Handles**
Ingersoll File Co., Ltd., Ingersoll, Ont.

**Files and Rasps**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Filing Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Filler, Iron (See Cements, Iron)**
Smooth Mfg. Co., Jersey City, N.J.

**Fire Extinguishers**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Fittings, Pipe**
International Malleable Iron Co., Guelph, Ont.

**Flexible Shafts**
Aikenhead Hardware Ltd., Toronto, Ont.

**Flux, Galvanizing**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Fluxes, Welding**
L'Air Liquide Society, Toronto, Ont.

**Forging Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.

**Forgings, Drop**
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd., Toronto, Ont.

**Forgings, Hammer**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Foundry Equipment**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Foundry Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Frogs, Spring or Rigid**
Can. Steel Foundries, Montreal, Que.

**Fuel Oil Burning System**
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Heat Treating Coal**
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Oil and Gas**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bellevue Industrial Furnace Co., Detroit.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces and Ovens, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces, Tempering and Annealing**
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furniture, Machine Shop**
Garlock-Walker Mchy. Co., Toronto, Ont.

**Gages, Comparator**
Jones & Lamson Machine Co., Springfield, Vt.
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont.
Perdue, W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass.

**Gages, Measuring (See Tool Work)**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Gages, Recording**
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.

# BUYERS' DIRECTORY

**Gages, Snap, Thread and Cylindrical**
Ackworthie, Ltd., John, Birmingham, Eng
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Standard**
Armstrong Whitworth Co. of Can., Lt. Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis.
Johansson Inc., C. E., Windsor, Ont.

**Gages, Thread**
Ackworthie Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Garnet, Emery and Flint Paper and Cloth**
Ritchey Supply Co., Toronto, Ont.

**Gas, Coal Compressed**
L'Air Liquide Society, Toronto, Ont.

**Gas, Compressed**
Prest-O-Lite Co. of Can., Toronto, Ont.

**Gaskets**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

**Gear Blanks**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear-Cutting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

**Gear Testing Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Gears, Cast**
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

**Gears, Cut**
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hamilton Gear & Machine Co., Toronto, Ontario.
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Gears, Dressed**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Gears, Forged**
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Gears, Herringbone**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

**Gears, Machine Moulded**
Can. Steel Foundries, Montreal, Que.

**Gears, Rawhide (See Gears, Cut)**
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear, Silent Chain**
Gardner & Son, Robt., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Can. Link-Belt Co., Ltd., Toronto, Can.
Hans Renold of Canada, Ltd., Montreal, Quebec

**Gears, Worm**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.

**Generators, Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Generators, Electric**
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Goggles, Safety**
Perdue, W. B., San Francisco, Calif
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

**Grab Buckets**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Grease Cups, Pressed Steel and Brass**
Can. Winkley Co., Ltd., Windsor, Ont.

**Greases, Lubricating**
Canadian SKF Co., Toronto, Ont.
Cataract Refining Co., Toronto, Ont.

**Grinding Discs**
Ritchey Supply Co., Toronto, Ont.

**Grinding Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal

**Grinding Machines, Abrasive Belt**
Beacon Engineering Co., Tipton, England
Norton Co. of Can., Ltd., Hamilton, Ont

**Grinding Machines, Automatic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Bench**
Aikenhead Hardware Ltd., Toronto, Ont.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Grinding Machines, Center**
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis

**Grinding Machines Chaser**
Jones & Lamson Machine Co., Springfield, Vt.

**Grinding Machines, Cutter and Reamer**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Cylindrical**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Die**
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio
National Machinery Co., Tiffin, Ont.

**Grinding Machines, Disc**
Beacon Engineering Co., Tipton, England
Ford-Smith Machine Co., Hamilton, Ont

**Grinding Machines, Drill**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Face**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Floor and Tool**
Beacon Engineering Co., Tipton, England.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Grinding Machines, Internal**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Portable**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Power Oscillating Tool**
Herbert Ltd., Alfred, Toronto, Ont.

**Grinding Machines, Ring Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Snagging**
Blount Co., J. G., Everett, Mass.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Surface**
Garlock-Walker Mchy. Co., Toronto Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont

**Grinding Machinery, Tool Post**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Universal**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.

**Grinding Wheels**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Guards, Machinery and Window**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Guards, Electric Lamp**
Flexible Steel Lacing Co., Chicago, Ill.

**Gun-Barrel Machinery**
Steinle Turret Machine Co., Madison, Wis.

**Hack Saws, Power**
Ackworthie, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Hamilton, Canada.
Garlock-Walker Mchy. Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hammers, Chipping**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hammers, Drop**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

**Hammers, Electric**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Hammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Hammers, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hammers, Riveting**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hangers, Shafting**
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Terry & Co., John C., Birmingham, Eng.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hardening, Case-Hardening and Tempering**
Hamilton Gear & Machine Co., Toronto, Ont.

**Hardness Testing Apparatus**
Shore Instrument Co., Jamaica, N.Y.

**Heating**
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.

**Hobbing Machines**
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hobs**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd. Dundas, Ont.

**Hoists, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

**Hoists, Hand**
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Hoists, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Curtis Pneumatic Machinery Co., St Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Holders-On, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill

**Hose, Flexible Steel**
Can. Fairbanks-Morse Co., Ltd., Montreal
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Hose, Industrial**
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Hose, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Foamite Firefoam Co., Hamilton, Ont.

**Hydraulic Leather**
Graton & Knight Mfg. Co., Worcester, Mass.

**Hydraulic Machinery**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.

**Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Index Centers**
Dickow, Fred. C., Machinery Co., Chicago, Ill.

**Igniters, Gas Engine**
Canada Foundries & Forgings Co., Welland, Ont.

**Indicators, Speed and Test**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.

**Insulation**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Jacks, Hydraulic**
Norton, A. O., Boston, Mass.

**Jacks, Planer**
Armstrong Bros. Tool Co., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que
Crescent Machine Co., Ltd., Montreal, Q.

# BUYERS' DIRECTORY

**Jigs and Fixtures (See Tool Work)**
Fisher Motor Co., Ltd., Orillia, Ont
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que

**Keyseating Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Keys, Machine**
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

**Knives, Machine**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Simonds Canada Saw Co., Montreal, Que.

**Knurl Holders**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lacing Leather**
Climax Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

**Lamps, Electric**
Federal Eng'ring Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**Lathe Attachments**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.

**Lathe Pans, Portable**
Canada Machinery Corp., Galt, Ont.

**Lathe Tools**
Armstrong Bros. Tool Co., Chicago, Ill.
Can Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

**Lathes, Automatic and Semi-Automatic**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Bench**
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lathes, Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
McDougall Co., Ltd., R., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Engine**
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Sidney Machine Tool Co., Sidney, Ohio.
Strelinger Co of Can., Ltd., Chas. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Extension and Gap**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Lathes, Heavy Duty Projectile Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blahill Wire Machy Co., Ltd., Montreal
Sidney Machine Tool Co., Sidney, Ohio
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis
Herbert Ltd., Alfred, Toronto, Ont
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Polishing (See Polishing and Buffing Machines)**
Ford-Smith Machine Co., Hamilton, Ont

**Lathes, Relieving**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Lathe, Universal Hand**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Lathes, Screw-Cutting**
Jones & Lamson Machine Co., Springfield, Vt.

**Lathe, Speed and Hand**
Blount Co., J. G., Everett, Mass.
Garlock-Walker Mchy. Co., Toronto, Ont
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich

**Lathes, Spinning**
Terry & Co., John C., Birmingham, Eng.

**Lathes, Threading**
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

**Lathes, Vertical Turret**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

**Lathes, Wood Turning**
Blount Co., J. G., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Lead Pipe**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Lighting Fixtures**
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont

**Linoleum Mill Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Liquid Air Plants**
L'Air Liquide Society, Toronto, Ont.

**Lockers, Clothes**
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

**Lubricants**
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Lubricating Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can

**Machinists' Small Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Manganese Steel**
Can Steel Foundries, Montreal, Que

**Mandrels, Expanding**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Mandrels, Solid**
Atkins & Co., Inc., E. C., Indianapolis, I
Cleveland Twist Drill Co., Cleveland, O
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Measuring Machines**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Metals, Alloy**
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont
Can Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Moore & Son, Thos., Montreal, Que
Pilot Steel & Tool Co., Montreal, Que
Tallman Brass & Metal, Ltd., Hamilton, Ontario
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Metalite Cloth**
Ritchey Supply Co., Toronto, Ont.

**Micrometer Calipers**
Aikenhead Hardware Ltd., Toronto, Ont
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Milling Attachments**
Ackworthie, Ltd., John, Birmingham, Eng
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont
Hendey Machine Co., Torrington, Conn
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis
Petrie, Ltd., H. W., Toronto, Ont.

**Milling Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal

**Milling Machines, Automatic**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Bench**
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Hand**
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng
United States Machine Tool Co., Cincinnati, Ohio.

**Milling Machines, Horizontal and Planer Type**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal Q.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Milling Machines, Plain**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cleveland Milling Machine Co., Cleveland
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill
Terry & Co., John C., Birmingham, Eng

**Milling Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Milling Machines, Universal**
Armstrong-Whitworth of Canada, Ltd., Montreal Canada
Cincinnati Milling Machine Co., Cincinnati, Ohio
Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Mchy. Co., Toronto, Ont
Hendey Machine Co., Torrington, Conn
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Milling Machines, Vertical**
Cincinnati Milling Machine Co., Cincinnati, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis
Rockford Milling Machine Co., Rockford, Ill
Williams Machinery Co., A. R., Toronto, Ont

**Monel Metal**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Motors, Electric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock Walker Mchy. Co., Toronto, Ont
MacGovern & Co., Montreal, Que
Northern Electric Co., Montreal, Que
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis

**Moulded Rubber Goods**
Can Consolidated Rubber Co., Ltd., Montreal, Que.

**Nail Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Nails and Staples**
Steel Co. of Canada, Ltd., Hamilton, Ont

**Nickel, Bars, Sheets, Wire, Etc.**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Nickel Plating Outfits**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Nickel Silver**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Nitrogen**
L'Air Liquide Society, Toronto, Ont.

**Nut Tappers (See Bolt and Nut Machinery)**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

**Nuts, Finished and Semi-finished**
Galt Machine Screw Co., Galt, Ont.

**Nuts, S.A.E., Plain and Castellated**
Galt Machine Screw Co., Galt, Ont.

**Oil Filtering and Storage Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oil Storage Engineers**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oils**
Canadian Oil Companies, Ltd., Toronto, Ont.
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Hole Covers**
Can. Winkley Co., Ltd., Windsor, Ont.

**Oils, Soluble**
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oxygen**
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

**Oxy-Acetylene Apparatus**
L'Air Liquide Society, Toronto, Ont.

**Packing, Hydraulic**
Can Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, L..., Halifax, N.S.

**Packing, Steam**
Can. Consolidated Rubber Co., Ltd., Montreal Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

**Paper Mill Conveyors**
Bertrams Ltd., Edinburgh, Scotland.

**Patents**
Fetherstonhaugh & Co., Ottawa, Ont
Marion & Marion, Montreal, Que

**Pans, Wet and Dry**
Frost Mfg. Co., Chicago, Ill.

**Pattern-Shop Machinery (See Woodworking Machinery)**
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich

**Patterns, Wood and Metal**
Crescent Machine Co., Ltd., Montreal, Q
Victoria Foundry Co., Ltd., Ottawa, Ont
Wraggis Pattern Works, Galt, Ont.

**Penstocks, Steel**
MacKinnon Steel Co., Sherbrooke, Que

# BUYERS' DIRECTORY

**Phosphor Tin**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Photographic Duplicating Machines**
Commercial Camera Co., Providence, R.I.

**Pig Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Bending Machines**
American Pipe Bending Machine Co., Boston, Mass.
Can. Fairbanks-Morse Co., Ltd., Montreal
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

**Pipe Couplings**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Cutting and Threading Machines**
Can. Fairbanks Morse Co., Ltd., Montreal
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**
Landis Machine Co., Inc., Waynesboro, Pa.

**Pipe Fitters' Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa.

**Piston-Ring Machines**
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Planers, Parallels**
L. & P. Mfg. Co., Niagara Falls, Ont.

**Planing Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Planing Machines, Rotary**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Pneumatic Tools**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Blount Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Pots, Steel**
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Pressed Steel Parts**
Ackworthie, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich.
Can. Fairbanks-Morse Co., Ltd., Montreal.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strellinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Presses, Drop and Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Toledo Machine & Tool Co., Toledo, Ohio

**Presses, Foot and Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

**Presses, Forcing**
Atlas Press Co., Kalamazoo, Mich.
Stewart & Co., Duncan, Glasgow, Scot.

**Presses, Hydraulic**
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

**Presses, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Protractors**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Propellers**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Pulleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal and Fibre**
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Pulp and Paper Mill Equipment**
MacKinnon Steel Co., Sherbrooke, Que.

**Pumps, Automobile Tire**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Pumps, Barrel and Boiler-feed**
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coalant**
Trahern Pump Co., Rockford, Ill.

**Pumps, Geared and Hand**
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

**Pumps, Lubricant and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener
Jardine & Co., A. B., Hespeler, Ont.

**Punches, Power**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo, Ohio

**Punching Machines, Horizontal**
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Racks, Cut**
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**
Holden Co., Ltd., Montreal, Que.

**Reamer Holders**
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

**Reamers, Expanding**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Reamers, Solid**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Reamers, Taper**
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Recorders, Temperature**
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Recorders, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Rheostats**
Northern Electric Co., Montreal, Que.

**Resistance Materials**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Respirators**
Willson Goggles, Inc., Reading, Pa.

**Rivets**
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Rivet Heaters**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.

**Riveting Machines**
Bilton Machine Co., Bridgeport, Conn.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**
Stewart & Co., Duncan, Glasgow, Scot.

**Rolls (Rubber Covered)**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rudder Frames, Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Rubber Goods, Mechanical**
Quaker City Rubber Co., Philadelphia, Pa.

**Rules, Steel**
Chesterman & Co., Ltd., J., Sheffield, Eng

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R.I

**Rust Preventatives**
Oakley Chemical Co., New York, N.Y.

**Sand Equipment**
Can. Link-Belt Co., Toronto, Ont.

**Sand Mills**
Frost Mfg. Co., Chicago, Ill.

**Sanding Machinery**
Oliver Machy. Co., Grand Rapids, Mich.

**Sand Rammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Saw Frames and Blades, Hack**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Sawing Machines, Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Sawing Machines, Power Hack**
Ackworthie, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Saw Sharpening Machines**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saw Tables, Universal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Hot and Cold**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Saws, High Speed Steel**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Metal Band**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saws, Metal, Power**
Clemson Bros., Inc., Hamilton, Ont.

**Saws, Metal Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

**Saws, Milling**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Saws, Screw Slotting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Swing Cut-off**
Oliver Machinery Co., Grand Rapids, Mich.

**Scales**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal. Q.

**Screens**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Screw Driving Machine**
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Screw Extractors**
Cleveland Twist Drill Co., Cleveland, O.

**Screw Machine Work**
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
Tallman Brass & Metal Co., Hamilton, Ont.

# BUYERS' DIRECTORY

**Screw Machinery, Wood and Lag**
Cook Co., Asa S., Hartford, Conn.

**Screw Machines**
Brown & Sharpe Mfg Co., Providence, R.I.

**Screw Machines, Automatic**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

**Screw Machines, Plain or Hand**
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio.

**Screw Plates**
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

**Screws, Cap and Set**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Screws, Machine**
Barnes Co., Wallace, Bristol, Conn.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Screws, Safety Set**
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Second-Hand Machinery**
**( See Searchlight Section)**
Petrie, Ltd., H. W., Toronto, Ont.

**Separators, Moisture and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Separators, Oil and Waste**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Shafting**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Shapes, Cold-Drawn Special Steel**
Union Drawn Steel Co., Hamilton, Ont.

**Shaping Machines**
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Walcott Lathe Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Shapers, Wood**
Oliver Machinery Co., Grand Rapids, Mich.

**Shears, Hand**
Can. Blower & Forge Co., Ltd., Kitchener.

**Shears, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y.
Stewart & Co., Duncan, Glasgow, Scot
Toledo Machine & Tool Co., Toledo, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.

**Shearing Machines, Angle, Iron Bar and Gate**
Bertrams Ltd., Edinburgh, Scotland.

**Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio.

**Sheets, Nickel, Resist, Alloy**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Sheets, Nickel, Monel and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Side Frames, Locomotive**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Slotting Attachments**
Ford-Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

**Slotting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

**Solders**
British Smelting & Refining Co., Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Canada.

**Snap Flasks**
Oliver Machy. Co., Grand Rapids, Mich.

**Special Machinery and Tools**
Brown Engineering Corp., Ltd., Toronto.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Spectacles, Industrial**
Willson Goggles, Inc., Reading, Pa.

**Springs**
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

**Spring-making Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Sprockets and Chains**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Squares**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Stamping, Metal**
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Stamps, Steel**
Diamond Saw & Stamping Works, Buffalo, N.Y.

**Stairways, Wrought Iron**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Steam Specialties**
Crane Ltd., Montreal, Que.

**Steel Plate**
Dom. Foundries & Steel, Hamilton, Ont.

**Steels, Tool**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel Blooms and Billets**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steel, Cold-Rolled Strip**
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Steel Castings**
Dom. Foundries & Steel, Hamilton, Ont.

**Steel Forgings**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Steel, Shafting and Free Cutting Screw**
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

**Steel, Sheet**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

**Steel, Tanks**
Can. John Wood Mfg. Co., Toronto, Ont.

**Steel, Stainless**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel Wire Rods**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steels, Alloy, Open Hearth and Electric**
United Alloy Steel Corp., Canton, Ohio.

**Steels, Alloy and Carbon**
Algoma Steel Corp., Ltd., Sault Ste Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steels, High-Speed**
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel, Magnet**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel, Structural**
MacKinnon Steel Co., Sherbrooke, Que.

**Steel Tubing, Close Joint and Welded**
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

**Stern Frames, Cast Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Straightening Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Studs**
Galt Machine Screw Co., Galt, Ont.

**Surface Plates**
Bilton Machine Co., Bridgeport, Conn.

**Swaging Machines**
Atkins & Co., Inc., E. C., Indianapolis, I

**Switches, Railway**
Can. Steel Foundries, Montreal, Que.

**Switches and Switchboards**
Northern Electric Co., Montreal, Que.

**Tablets, Bronze, Memorial**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Tachometers**
Aikenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

**Tanks, Steel**
MacKinnon Steel Co., Sherbrooke, Que.

**Tanks and Pumps, Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

**Taper Cutting Dies**
Jones & Lamson Machine Co., Springfield, Vt.

**Tap Holders**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taper Pins**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Tapes, Measuring**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass.

**Tapping Machines and Attachments**
Ackworthle, Ltd., John, Birmingham, Eng
Archibald & Co., Chas. P., Montreal, Q
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Taps and Dies**
Ackworthle, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que
Can. Fairbanks-Morse Co., Ltd., Montreal.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
International Machinery & Supply Co., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taps, Collapsing**
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Teeth, Dredge Bucket**
Kennedy & Sons, Wm., Owen Sound, Ont

**Testing Metals and Materials**
Toronto Testing Laboratory, Toronto, Ont.

**Thermometers**
Bristol Co., Waterbury, Conn.

**Thread-Cutting Tools**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Thread Cutting Machines**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa.

**Threading Machines**
Acme Machinery Co., Cleveland, Ohio.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Thread Lead Testing Machines**
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Thread-Rolling Machines**
Bliss Co., E. W., Brooklyn, N.Y.

**Tongs**
Hepburn Ltd., John T., Toronto, Ont.

**Tool Cases**
Rice Lewis & Son, Ltd., Toronto, Ont.

**Tool Holders**
Armstrong Bros. Tool Co., Chicago, Ill.
Bilton Machine Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Markers, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Tool Posts, Lathe**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Steels for all Purposes**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Tools, Small (See Machinists' Small Tools)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Bertrams Ltd., Edinburgh, Scotland.
Burgess & Marchand, Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Chesterman & Co., Ltd., J., Sheffield, Eng.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Hamilton [illegible]neering Service, Ltd., Hamilton, [illegible]t.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.
National Machine Tool Co., Racine, Wis.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strellinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Tool Work**
Brown Engineering Corp., Ltd., Toronto.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.

**Torches, Blow**
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Trackwork, Railway**
Can. Steel Foundries, Montreal, Que.

**Trackwork, Manganese Steel**
Can. Steel Foundries, Montreal, Que

**Transformers**
Northern Electric Co., Montreal, Que

**Transmission Machinery**
Bernard Industrial Co., A., Fortierville Que.
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Jones & Glassco, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Toronto, Ont.
Renold (Hans) of Canada, Ltd., Montreal Que.

# BUYERS' DIRECTORY

**Transportation Systems (See Trucks)**
Mattews Gravity Carrier Co., Port Hope, Ont.
**Treated Bits**
Can. Atlas Crucible Steel Co., Toronto Ont.
Vanadium Alloys Steel, Latrobe, Pa.
**Trolleys and Tramways**
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.
**Trucks**
Can. Fairbanks-Morse Ltd., Montreal, Q.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Maple Leaf Mfg. Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont.
**Trucks, Industrial Motor**
Maple Leaf Mfg Co., Montreal, Que.
National Steel Car Corp., Ltd., Hamilton, Ont.
**Tube, Products**
Tube Co. of Canada, Toronto, Ont.
**Tubing, Electric Welded or Oxy-Acetylene Welded**
Tube Co. of Canada, Toronto, Ont.
**Tubing, Flexible**
Dunlop Tire & Rubber Goods Co., Ltd Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
**Tubing, Seamless Steel**
Tube Co. of Canada, Toronto, Ont.
**Tubing, Seamless Steel, Brass and Copper and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Steel Products Co., Brantford, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.
**Tubing, Welded**
International Nickel Co. of Can., Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.
**Tubing, Welded Steel**
Tube Co. of Canada, Toronto, Ont.
**Turbines, Water**
Kennedy & Sons, Wm., Owen Sound, Ont.
**Turret Heads**
Ackworthie, Ltd., John, Birmingham, Eng.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
**Turret Machines (See Lathes, Horizontal Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Cook Co., Asa S., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Stemle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.
**Turrets, Tool Post**
Gisholt Machine Co., Madison, Wis.
**Unions, Pipe**
Crane Ltd., Montreal, Que.
**Universal Joints**
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
**Valves**
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Crane Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
**Vises, Drilling Machine**
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
**Vises, Metal Workers'**
Aikenhead Hardware, Ltd., Toronto, Ont.
Columbia Hdwe. Division, Cleveland, O.
**Vises, Milling Machine**
Brown & Sharpe Mfg. Co., Providence, R.I.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
**Vises, Pipe**
Columbia Hdwe. Division, Cleveland, O.
Greenfield Tap & Die Corp., Galt, Ont.
**Vises, Planer and Shaper**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Superior Machine Co., London, Ont.
**Vises, Wood Workers'**
Columbia Hdwe. Division, Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Oliver Machy. Co., Grand Rapids, Mich.
Victor Tool Co., Waynesboro, Pa.
Parmenter & Bulloch Co., Gananoque, Ont.
**Voltmeters**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.
**Wagon Loaders**
Can. Link-Belt Co., Toronto, Ont.
**Washers**
Barnes Co., Wallace, Bristol, Conn.
Diamond State Fibre Co., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.
**Washers, Rubber**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
**Welding Apparatus, Oxy-Acetylene**
L'Air Liquide Society, Toronto, Ont.
**Welding, Electric**
All-Weld Company, Toronto, Ont.
Carter Welding Co., Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
**Welding Filler Rods**
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
**Welding Machines, Oxy-Acetylene**
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
**Welding, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Prest-O-Lite Co. of Can., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.
**Welding Rod, Tobin, Manganese Bronze and Aluminum**
Tallman Brass & Metal, Ltd., Hamilton, Ont.
**Welding Supplies**
British Smelting & Refining Co., Ltd., Montreal, Que.
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Canada, Ltd., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.
**Wheels, Cast, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
**Wheels, Industrial**
American Pulley Co., Philadelphia, Pa.
Hull Iron & Steel Foundries, Hull, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
**Winches, Electric**
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.
**Winches, Headgate**
Kennedy & Sons, Wm., Owen Sound, Ont.
**Winches, Stoplog**
Kennedy & Sons, Wm., Owen Sound, Ont.
**Wire**
Barnes Co., Wallace, Bristol, Conn.
Canada Metal Co., Ltd., Toronto, Ont.
Dennis Wire & Iron Works, London, Ont
Greening Wire Co., B., Hamilton, Ont.
Northern Electric Co., Montreal, Que.
**Wire Cloth**
Can. Wire & Iron Goods Co., Hamilton, Ont.
**Wire Coiling Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.
**Wire Rope**
Can. Wire & Iron Goods Co., Hamilton, Ont.
**Wire Straightening and Cutting Machinery**
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Schuster Co., F. B., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
**Wire, Welding**
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.
**Wires, Special**
Dennis Wire & Iron Works, London, Ont.
Greening Wire Co., B., Hamilton, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.
**Woodworking Machinery**
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
**Wrenches, Drop Forged**
Armstrong Bros. Tool Co., Chicago, Ill.
Canada Foundries & Forgings Co., Welland, Ont.
**Wrenches, Machinists'**
Armstrong Bros. Tool Co., Chicago, Ill.
Canada Foundries & Forgings Co., Welland, Ont.
**Wrenches, Pipe**
Canada Foundries & Forgings Co., Welland, Ont.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
**Wrenches, Tap**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
**Wrought Iron Pipe**
Steel Co. of Canada, Ltd., Hamilton, Ont.


# Special Machinery Manufacturers

We have frequent requests from manufacturers in the United States for information regarding Canadian firms who are equipped to manufacture their line.

We would like to receive, therefore, the names of any firms who might be interested in inquiries of this kind. We desire the following information:

Name of firm and full address.

Description of shop and equipment.

Particulars regarding regular line, if any.

Class of work interested in securing and best equipped to handle.

Foundry equipment or connection.

This information will be filed and other necessary particulars forwarded to American manufacturers who are likely to be interested.

CANADIAN MACHINERY

143 University Ave. TORONTO



## ELECTRICAL HEAT-TREATMENT

A HEAT that is not only clean and even but a heat that is exactly under control.

A HEAT that leaves the steel clean and free from scale, free from distortion and hardens every piece to the same degree of hardness.

A HEAT that will decrease the cost of your tool department from 20 to 50%.

THE HEAT produced by

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**WALKERVILLE, ONT.**

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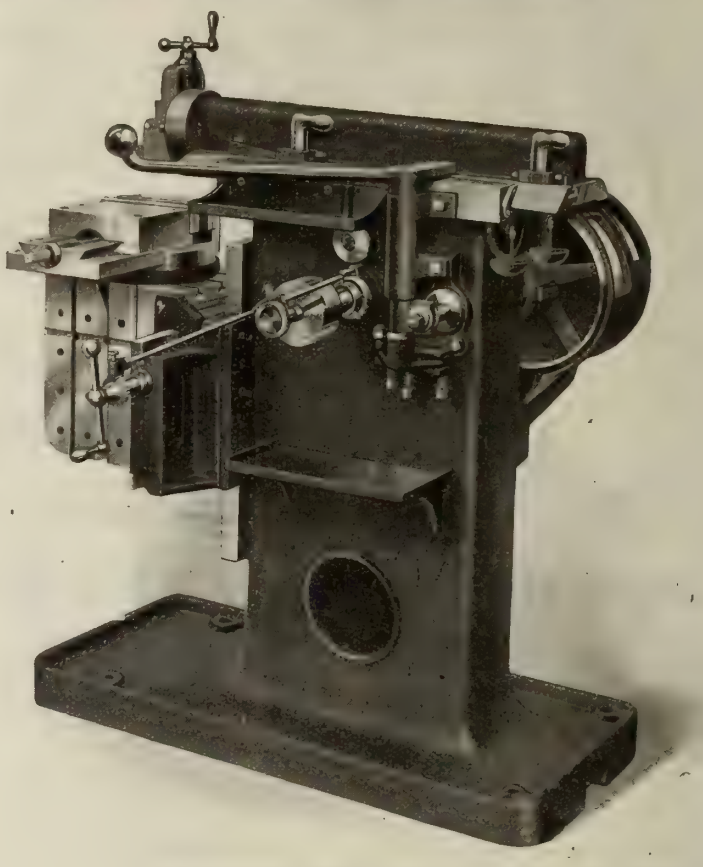
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# 15-INCH PILLAR SHAPER

*Will End Your Search For a Thoroughly Dependable Shaper*



In designing a machine with the speed, accuracy and rigidity of this Hendey Pillar Shaper, special attention was required to avoid complicated construction.

The simplicity and handiness of all adjustments are great advantages in securing economical volume production—features well worth considering.

One of these days you'll be searching for a thoroughly dependable pillar shape. Bear this Hendey in mind when that time comes—it will end your search.

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**Torrington, Conn., U.S.A.**

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**LATHES — SHAPERS — MILLERS**

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**STANDARD**

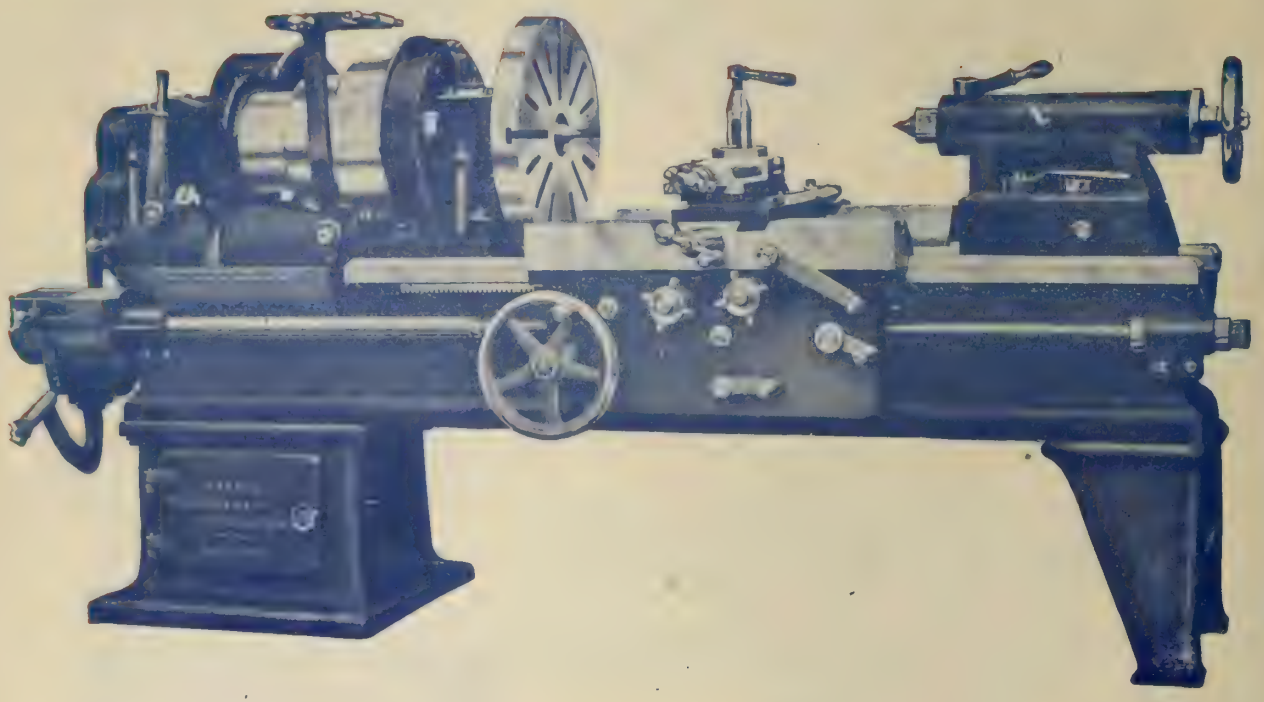
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## with quick change gears

is of the latest design and equipped with the up-to-date features of Lathe construction. It is fully equal in every respect, if not superior, to any Lathe of domestic or foreign build on the market to-day.

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The spindle and bearings are considerably larger than are usually supplied on a Lathe of this size. The spindle has a 1¼" hole bored from the solid through its entire length.

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## AND MANUFACTURING NEWS

Vol. XXV., No. 14 | Published by the MacLean Publishing Company, Limited, Toronto | April 7, 1921 | $4.00 a Year Subscription Price


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FORD-SMITH

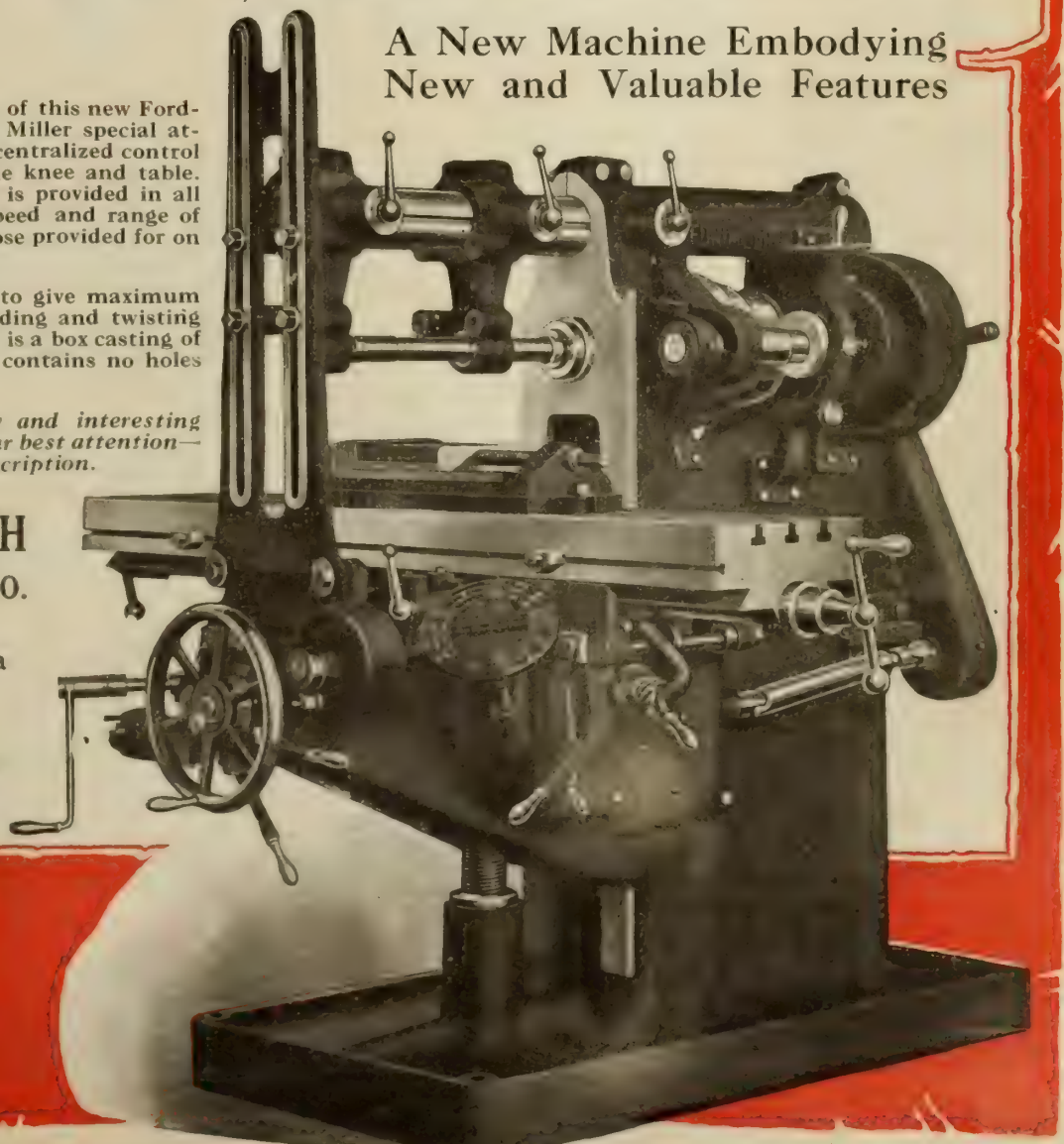
NO. 4 PLAIN MILLER

A New Machine Embodying New and Valuable Features

IN the construction of this new Ford-Smith No. 4 Plain Miller special attention is given to centralized control of all movements of the knee and table. Rapid power traverse is provided in all directions and the speed and range of coarse feeds equal those provided for on geared millers.

The knee is designed to give maximum rigidity under the bending and twisting stress of the cutter; it is a box casting of the solid top type and contains no holes at the top or sides.

*There are other new and interesting features worthy of your best attention—write for complete description.*



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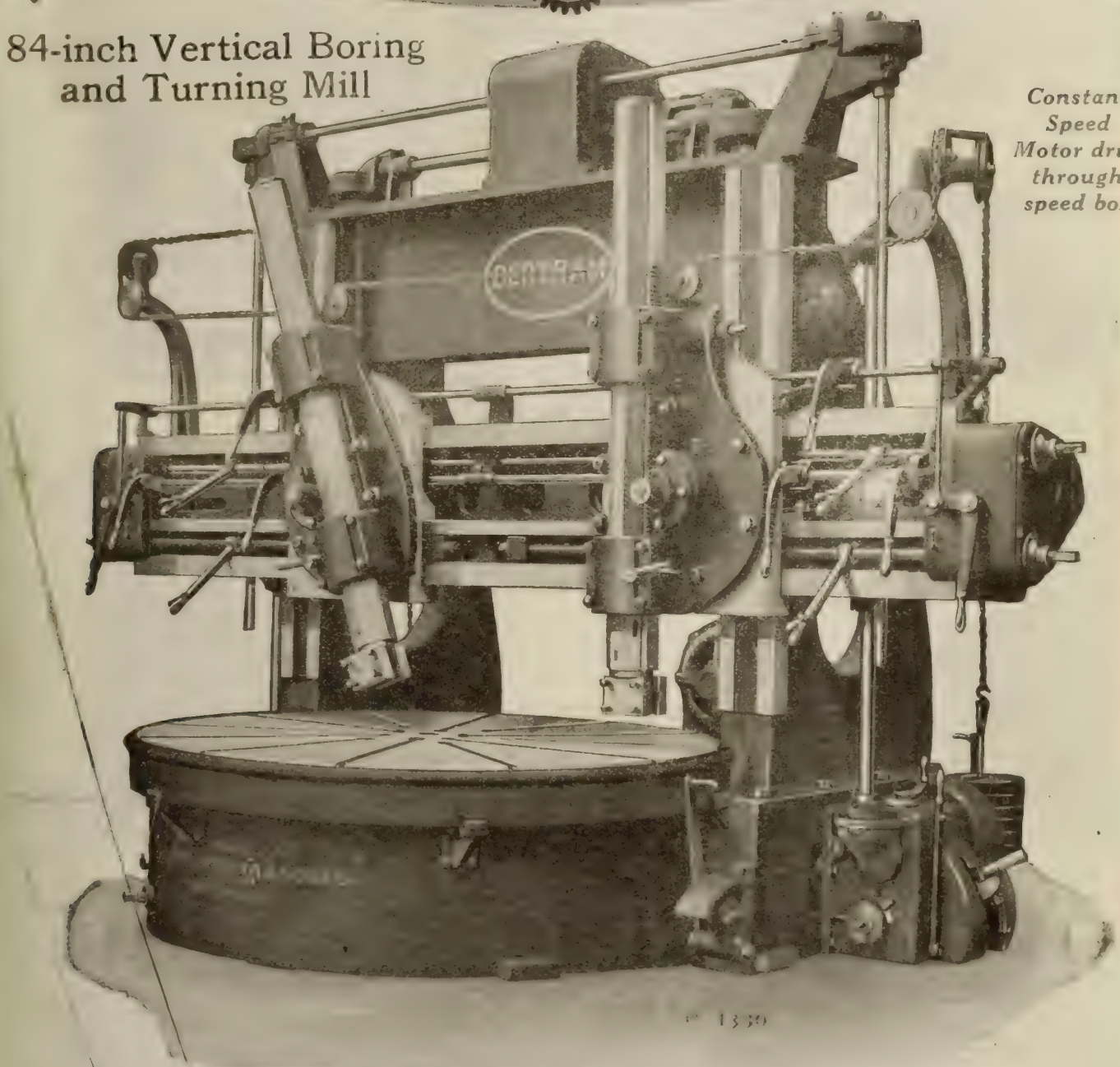


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## MACHINE TOOLS

84-inch Vertical Boring and Turning Mill

*Constant Speed Motor drive through speed box*



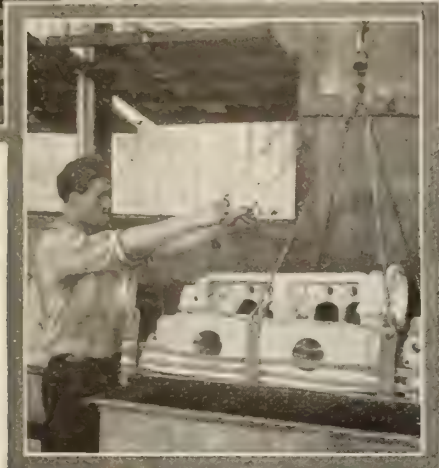
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## The John Bertram & Sons Co., Limited

DUNDAS. ONTARIO. CANADA

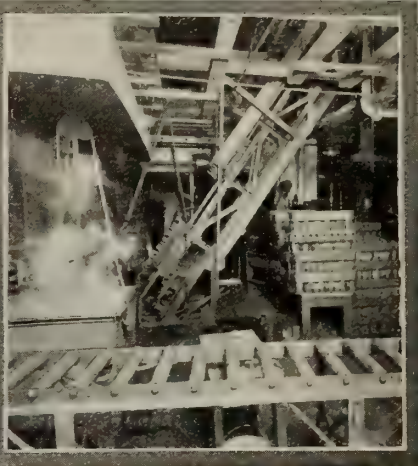
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# Clean Metal Surfaces Pay Big Dividends-



Aluminum crank cases made a ticklish cleaning job until Oakite arrived on the scene. The flaky appearance that resulted when an alkali cleaner was used, was at once eliminated and reports show better, quicker cleaning at lower cost.

No trouble to clean these large truck chassis parts. Illustration shows tank filled with Oakite cleaning solution and two or three dips made the metal surfaces chemically clean.



Another of the many motor car plants that find it economical to use Oakite materials for cleaning metal parts. Here is shown the Oakite tank wherein oil and grease is removed from cylinder blocks.





Above: The removal of tempering and quenching oils is a man size job. This plant gets 100 per cent. clean surface by using Oakite for removing long standing oil from heat treated taper rolls. Two or three plunges of basket in tank filled with Oakite solution—and the job's done.

Below: Cleaning and electroplating the base metal in one operation is a favorite stunt in plating shops that use Oakite Platers' Cleaner. This plating department secured 100 per cent. perfect plating results on automobile parts.



Here's a cleaning trick employed by an axle maker. The parts are washed in tank containing Oakite materials—then instead of the usual rinse—the parts are stored away for further use—and the protecting film left on the parts prevents rust.





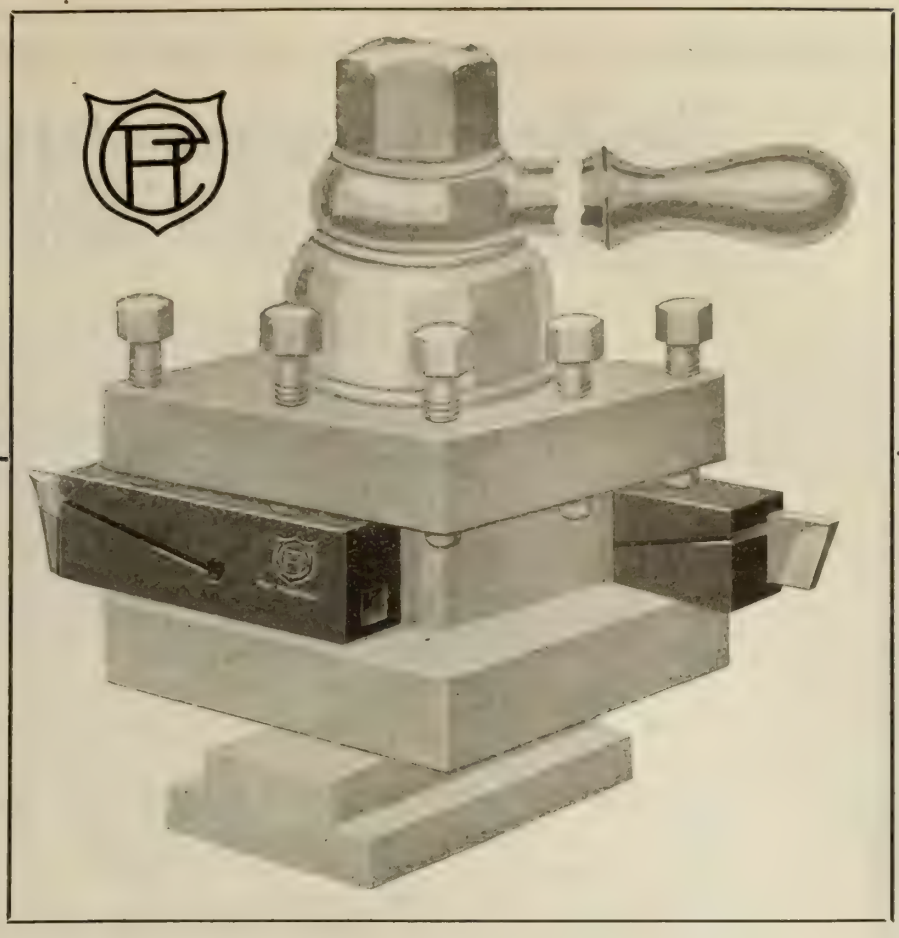
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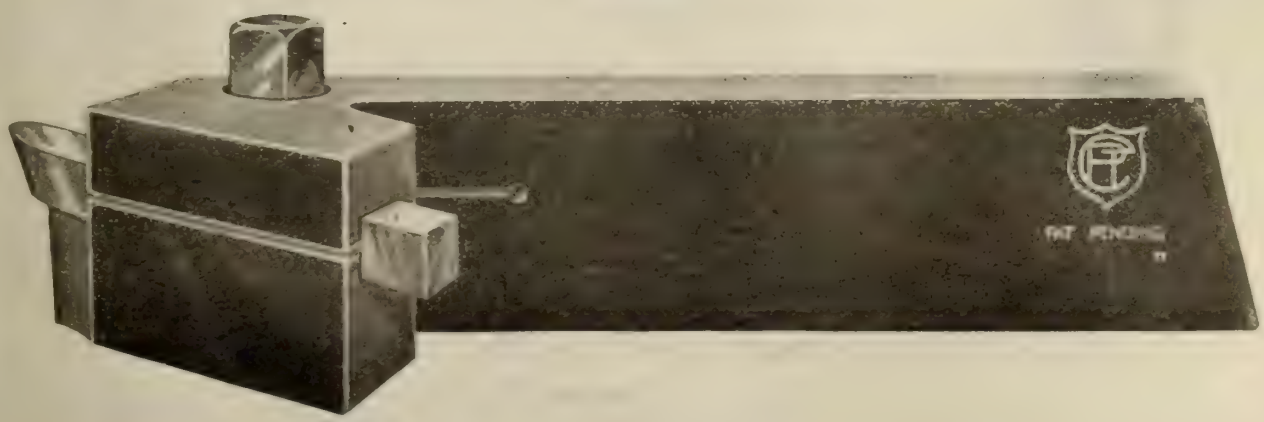
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### WALKERVILLE, ONTARIO, CANADA

Manufacturers of High Grade

# Tool Holders

***Send for Catalogue***



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# The New Canadian-Detroit Double-D Rolled Drill



***Made in Canada***

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The fluted drill is reheated and twisted in a specially designed automatic machine. The twisting process is held absolutely uniform, giving the same increase in helix angle from shank to point, 27° to 32°. This standard has been adopted on our milled drills and has been proven by exhaustive experiments to be the most efficient.

The DD has increased production and cut drilling costs in many of the finest plants in Canada. A fair test will convince you.

Manufactured and carried in stock at Walkerville in all sizes from ½ inch to 1½ inches.

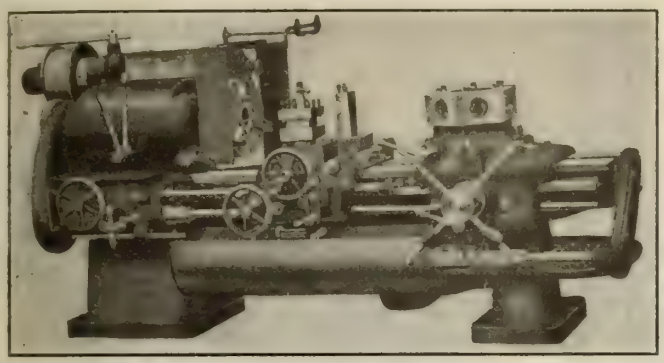
We also manufacture and carry in stock all sizes and types of high speed and carbon milled drills.

## CANADIAN-DETROIT TWIST DRILL COMPANY, LIMITED

**Walkerville, Ontario**

# PRODUCTION TURRET LATHES

## STOCK DELIVERY



No. 9 Alfred Herbert Combination Turret Lathe.

| | |
|---|---|
| Swings Over Bed | 20″ |
| Admits Through Spindle | 3½″ |
| Flange of Spindle to Face of Turret | 48″ |
| No. Spindle speeds Forward | 16 |
| No. Spindle speeds Reverse | 16 |
| No. Feeds to Turret Slide | 18 |
| No. Feeds to Carriage | 9 |

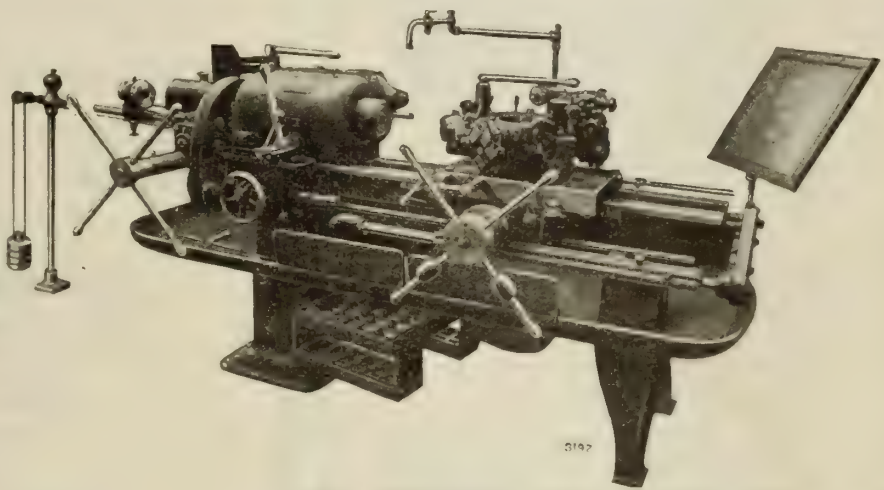
### No. 9 Combination Turret Lathe

possesses not only the rigidity and power to remove metal at high speeds and coarse feeds, but also has and retains that exactness of alignment which enables it to take fine sizing cuts with consistent accuracy.

### No. 1 Hexagon Turret Lathe

is built for bar work and constructed to permit large reductions at high speeds and feeds at one operation. It is especially adapted for quantity production where fine limits and high finish are desirable.

*Bulletins No. 307-A and No. 309-A Sections E 5 & J respectively contain full information and complete specifications of these machines.*



No. 1 Alfred Herbert Hexagon Turret Lathe

| | |
|---|---|
| Largest Bar Admitted | 1⅝″ |
| Greatest Length Turned | 27″ |
| No. of Spindle Speeds | 8 |
| No. Feeds | 6 |

*Production Times Will Be Furnished on Receipt of Dimensioned Blue Prints*

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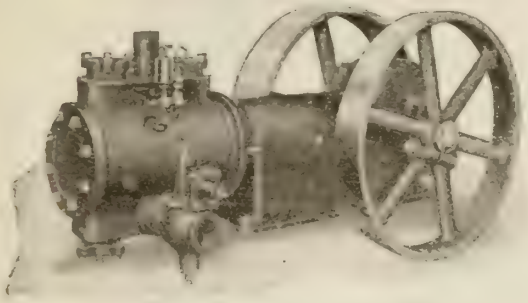
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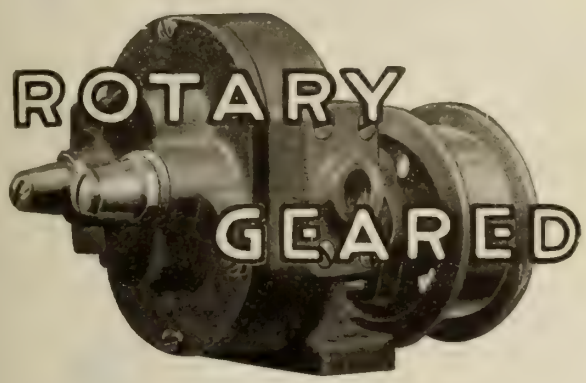
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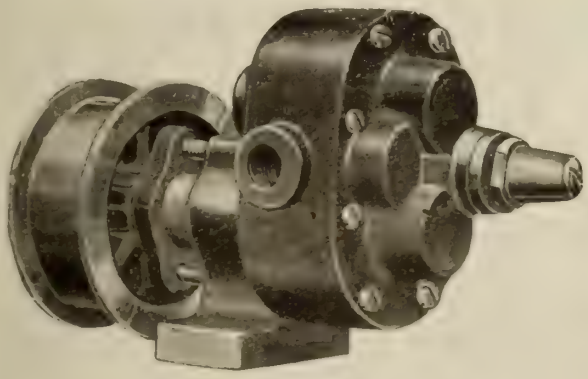


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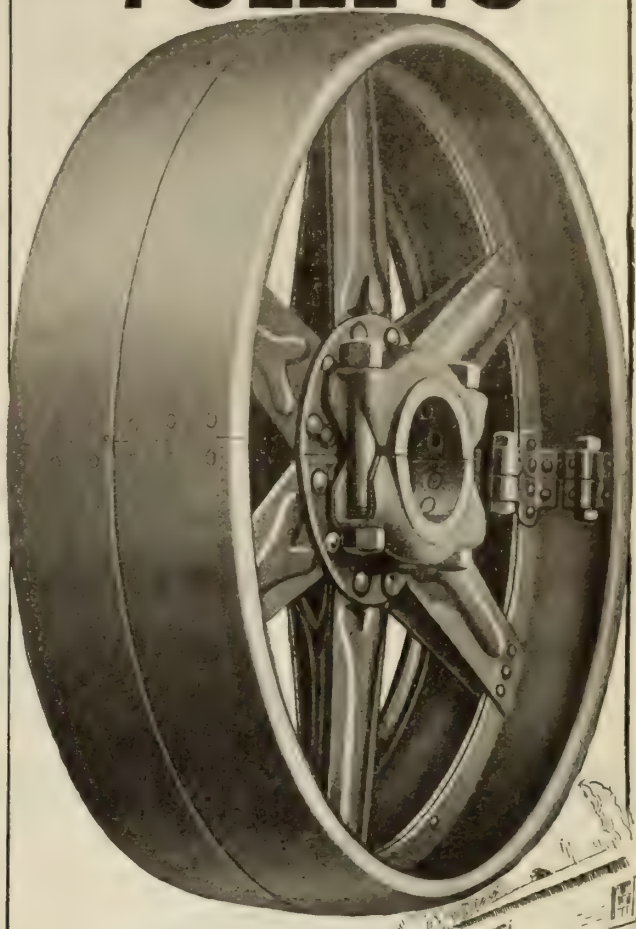
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***It explains in full.***



**TRAHERN PUMP DIV.**
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# AMERICAN STEEL SPLIT PULLEYS



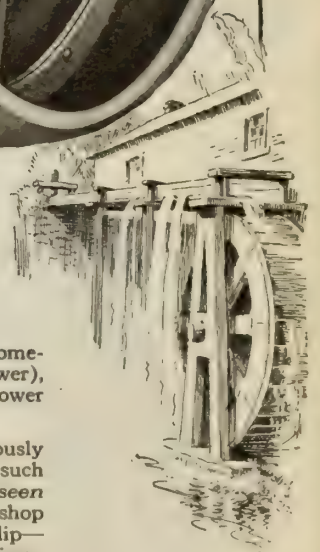


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THE old sluiceway sometimes leaked water-(power), but who cared? That power was cheap—yet

Today, with tremendously expensive power costs, just such wastes are occurring *unseen* in the average machine shop through excessive belt slip—excessive friction in bearings, dead weight of pulleys that consume power.

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# THE JOHNSON FRICTION CLUTCH

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The old familiar countershaft drive, through cross belts and tight and loose pulleys, stands accused of the following offences against efficiency.

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1. Involves needless equipment.
2. Costs too much to set up.
3. Prevents economical and systematic use of space.
4. Operates sluggishly.
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Modern practice has discarded the antiquated countershaft for the simplicity and efficiency of the clutch drive direct from lineshaft.

**Adopt the Johnson Lineshaft Drive**

The economical, efficient and durable method of power transmission through friction control.

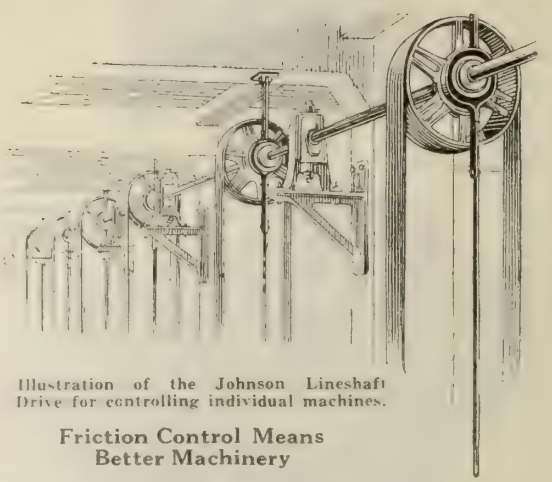
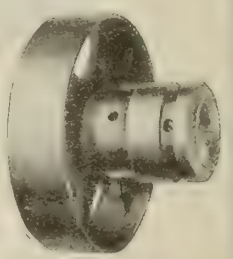


Illustration of the Johnson Lineshaft Drive for controlling individual machines.

**Friction Control Means Better Machinery**

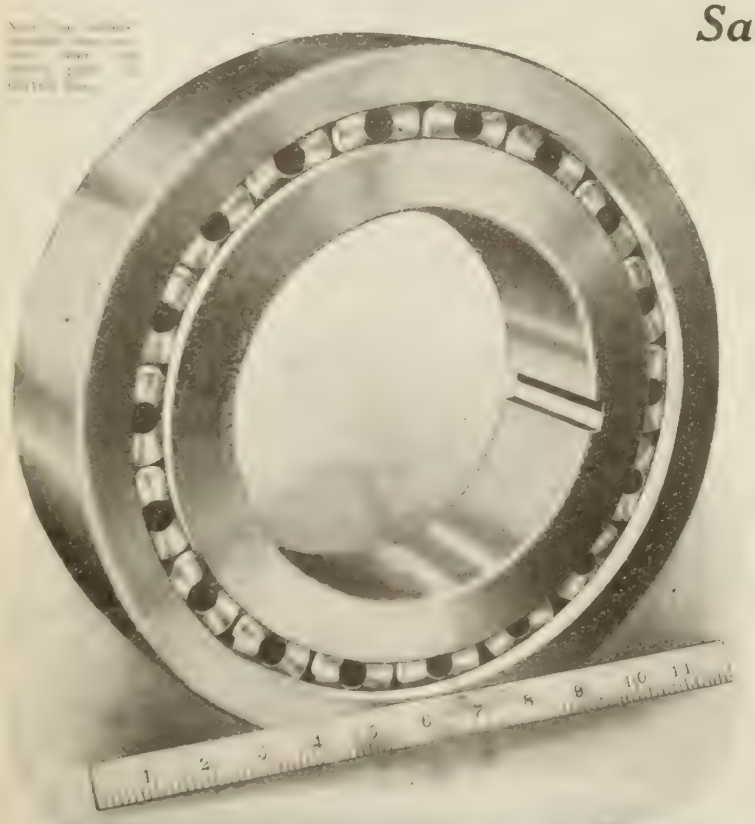
Whether it is applied overhead or in the machine itself.

Write for our Booklet, "Clutches As Applied To Machine Building" and our Yellow Catalog.



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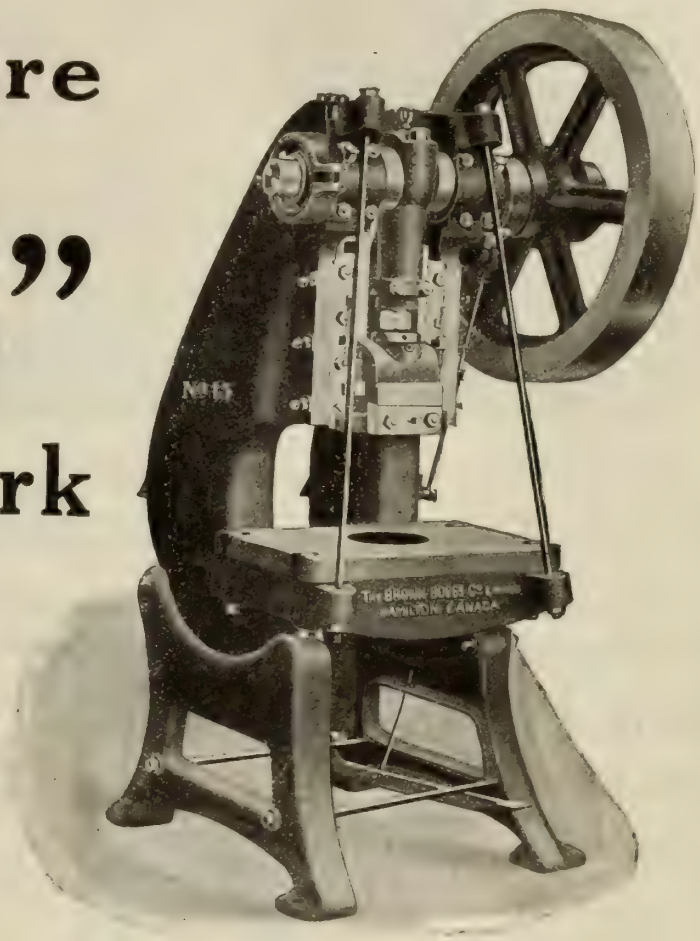
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## Make Sure of the "B-B" Trade-Mark

*It is a Guarantee of Reliability*



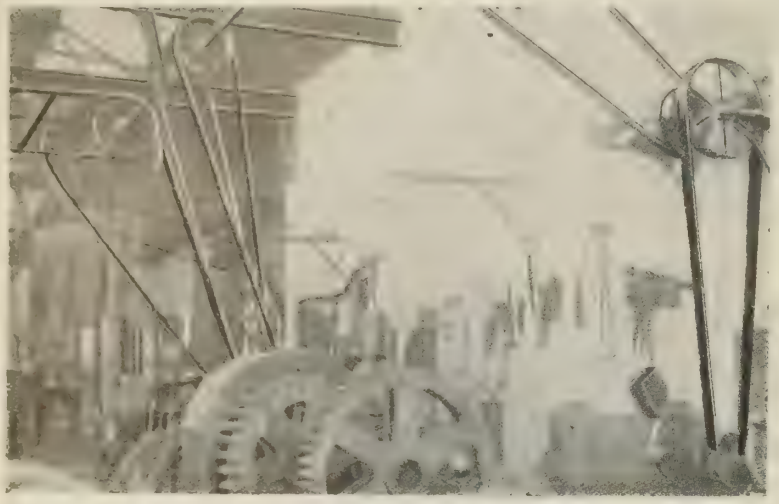
The "B-B" trade mark on power presses, shears, tinsmiths' tools and canners' evaporators, and sheet metal working tools of every description, is an iron-clad guarantee that it will give satisfaction on the work for which it is built. And because every tool before it leaves the factory is rigidly tested, we *know* that its merit is beyond question.

We shall be glad to send you catalogs fully describing those machines in which you are interested.

## THE BROWN-BOGGS CO. LIMITED

HAMILTON, CANADA.

# Solid Woven Belting



Solid Woven Hair Belting
Driving Heavy Machine Tools

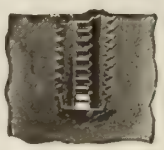
## Solid Woven
## Cotton
## Hair
## Twintex

*These beltings will solve your driving problems and save you money.*

**SUMNER & CO.**
108 WORTH ST.
NEW YORK

Representative for Eastern Canada
GEORGE F. SHEPPARD
702 Southam Bldg., Montreal

## Buried in the Work and Broke!



Next time a tap breaks below the surface of a large casting, don't let some makeshift method of removing it injure the thread and waste half an hour of valuable production time. Instead—



## Walton it Out in a Jiffy

And save the casting.

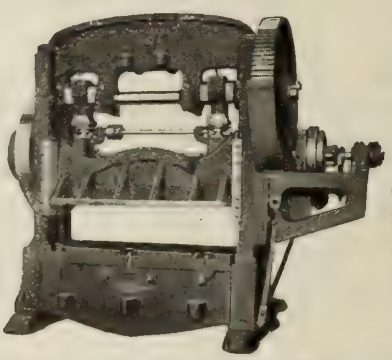
Special analysis steel fingers of the Walton Extractor drop into the flutes of the broken tap—and grip. Then a few turns of a wrench applied to the squared end of the Extractor backs out the buried tap.

Sixty-day trial offer proves the Walton Extractor pays for itself.

Write.

**The Walton Co.**
Hartford, Conn.

## The "TOLEDO" Double Crank Presses



Built in over 200 sizes, weighing from 4,500 to 500,000 pounds, straight-side and gap, and overhanging frame types. Adapted to general sheet metal and drop-forged work.

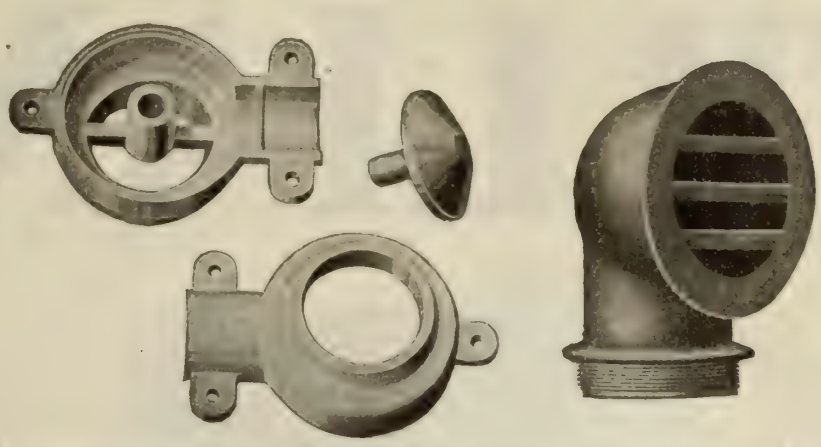
Rigid strength, durability and low upkeep, speed and accuracy have won throughout the entire continent, recognition of their merit.

Let us place the details of construction of these or other of our presses before you.

**THE TOLEDO MACHINE & TOOL CO.**
TOLEDO, OHIO

# DIE-CASTINGS

DOEHLER PROCESS



MADE IN CANADA

Note the smooth appearance of the Die-Castings in the illustration. No burrs—no rough spots. Cored holes are perfectly round and centred. Require practically no machining

SEND BLUE PRINTS TO US FOR ESTIMATES

*Manufactured by*



Tallman Brass & Metal Limited
HAMILTON, ONT.



# LA SALLE

## Has an Advantage Over Other Grinders

There is some outstanding feature of all La Salle Grinding Machines that lends it exceptional productive ability.
The American Drill Grinder is especially adaptable for grinding twist, flat and three-lipped drills, because it has automatic lip rest and caliper jaw device, which assures proper clearance on all sizes of drills automatically. Send for descriptive matter covering our entire line of grinding machinery.



American Drill Grinder
For Wet or Dry Drill Grinding 1/8" to 2¼". Also 1/8" to 3½" dia.

## LA SALLE TOOL CO.

La Salle, Illinois, U.S.A.

Represented in Canada by

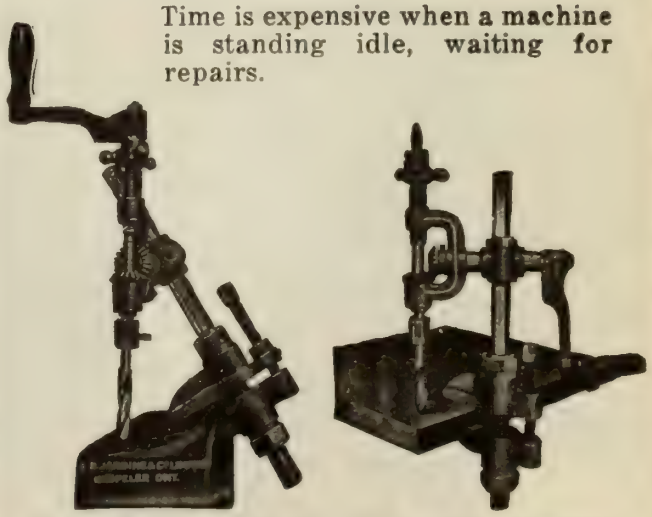
## A. R. Williams Machinery Co., Ltd.

64-66 Front Street W., Toronto

Halifax St. John, N.B. Montreal Winnipeg Vancouver

# Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.

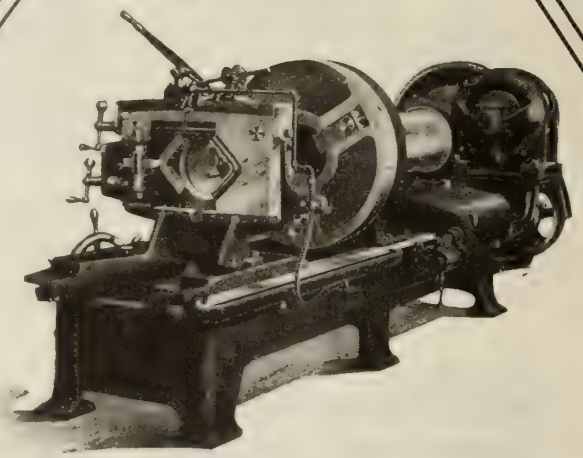
Sold by all Machinery and Supply Houses.

## A. B. JARDINE & CO., Limited

HESPELER, ONTARIO


*If interested tear out this page and place with letters to be answered.*

# WILLIAMS



# PIPE MACHINES

***Outstanding Features:***

1—Single Pulley Drive, through.
2—Dodge Friction Clutch, on machine.
3—Clutch Lever at operator's left hand.
4—Rigid Bearing Bracket on drive shaft.
5—Gear Box Drive away from operator.
6—Individual Adjustment for each bearing.
7—Large Spindle Bearings are ring oiling.
8—Compact Control Levers on operator's side.
9—Large Die Cabinet and Tool Tray.
10—Substantial Oil Trough around top of ways.
11—Specially constructed Reservoir and Filterer.
12—Low-down Sliding Head.
13—Rotary Geared Pump reversible for left-hand thread.
14—Specially designed Carriage to drain off oil and cuttings.
15—All Gears amply protected.

*Send for Catalog of Various Styles*

## WILLIAMS TOOL CORPORATION

of Canada, Limited - Brantford, Ontario

*Successors to*

JOHN H. HALL & SONS, LIMITED

# Speed PLUS Precision

In the design of Starrett Tools, *convenience* as well as accuracy is kept well in mind.

Mechanics who use fine tools prefer Starrett Tools not only because of their accuracy, but because of their durability and convenience.

This combination of qualities—characteristic of Starrett Tools—adds *speed* to precision in making the fine measurements of modern shop practice.

**Catalog No. 22 "3" sent free on request**

**THE L. S. STARRETT CO.**
*The World's Greatest Toolmakers*
*Manufacturers of Hack Saws Unexcelled*
**Athol, Mass.**

**Starrett Bench Micrometer Caliper:**
For measurement by thousandths or ten-thousandths up to one inch. Made with heavy base; very rigid and accurate.



# Starrett Tools

STARRETT TOOLS

STARRETT HACK SAWS CUT QUICKER LAST LONGER

42-164

# Gear Cutting With the "IFS" Left Out

## The Gear Shaper Way

A production manufacturer knows that he will secure good gears IF he has an accurate cutter, an accurate machine and a machine working on the correct principle. The whole question of good gears is resolved in this one little word "IF."

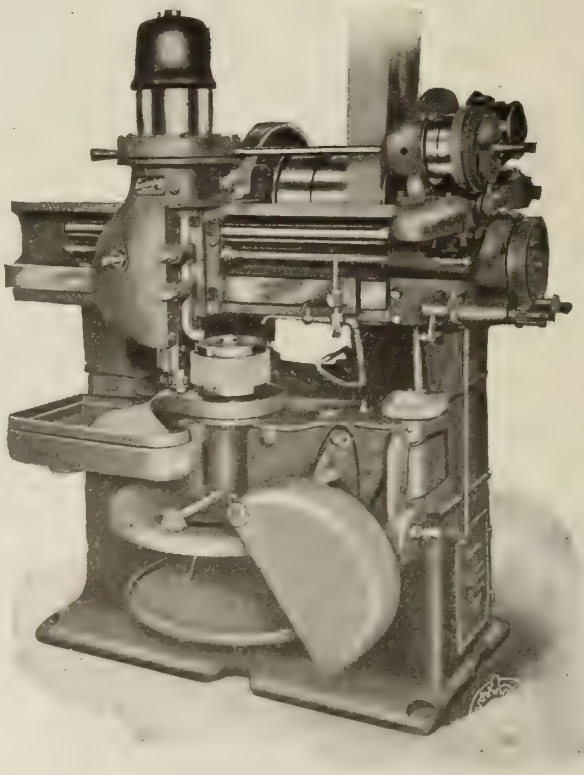
When the Gear Shaper was originally designed, the question of "IF" was taken into consideration and every possible means known to mechanical engineering was employed to eliminate the "IFS" from gear cutting.

That we have been successful in solving the problem is evidenced by the fact that each ensuing year sees a larger number of manufacturers adopting the Gear Shaper method.

How the Gear Shaper has accomplished this is clearly explained in our general catalog "Commercial Gear Cutting," which is a treatise on the subject of:—

Gear Cutting with the "IFS" Left Out.

**Send for your copy to-day.**

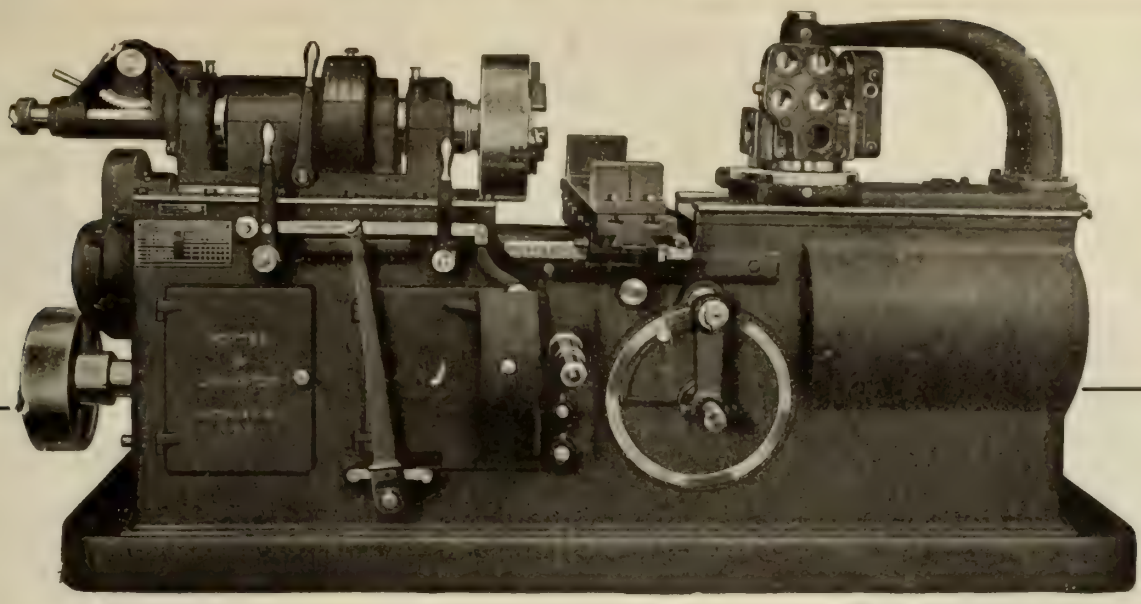


The Fellows Gear Shaper—the machine which has taken the "IFS" out of gear cutting.

# The Fellows Gear Shaper Company

## Springfield, Vermont, U.S.A.

FOREIGN AGENTS:—Alfred Herbert, Limited, Coventry, England; Societe Anonyme Alfred Herbert, Paris, France; Societa Anonima Italiana Alfred Herbert, Milan, Italy; Alfred Herbert, Limited, Yokohama, Japan; Societe Anonyme Alfred Herbert, Barcelona, Spain; Societe Anonyme Belge Alfred Herbert, Brussels, Belgium; Alfred Herbert (India), Limited, Calcutta, India.



# Manufacturing Automatics

If you have work of this kind you can depend on the P. & J. machines to handle it right.

One man attends to three machines in the shop where this photograph was taken.

The material is Cast Iron.

Turning—Thickness of stock removed—1 1-16 in. Finished diam.—10 inches. Depth of cut 1 1-16 inches.

Facing—Rough Face, 3-32 inches taken off both sides.

Boring—1⅛ in. hole from ⅞ in. cored hole.

Reaming finished diam.—1⅛ inches.



*Canadian Offices:* POTTER & JOHNSTON MACHINE CO.

## ROELOFSON MACHINE & TOOL CO., LIMITED

*Head Office and Showrooms:*

**11 Wellington Street East, Toronto, Canada**

*If interested tear out this page and place with letters to be answered.*

## A FEW MONEL USES

**VALVES—**
Seats
Rings
Guide Stems
Clappers
Wedges
Spindles
Dash Pots
Pistons

**PUMPS—**
Pump Liners
Runners
Valve Seats
Trim
Hand Hole Covers
Plunger Rods
Stuffing Boxes
Plungers

**METERS—**
Cylinders
Bushings
Valves
Valve Parts
Spindles
Screws
Gears
Wheels

**GAS & OIL ENGINES—**
Valves
Ignition Chambers
Ignition Tubes
Fuel Filters
Scavenger Valves

**TURBINES—**
Poppet Valve Parts
Blading

**GAUGES—**
Pins
Pivots
Diaphragms

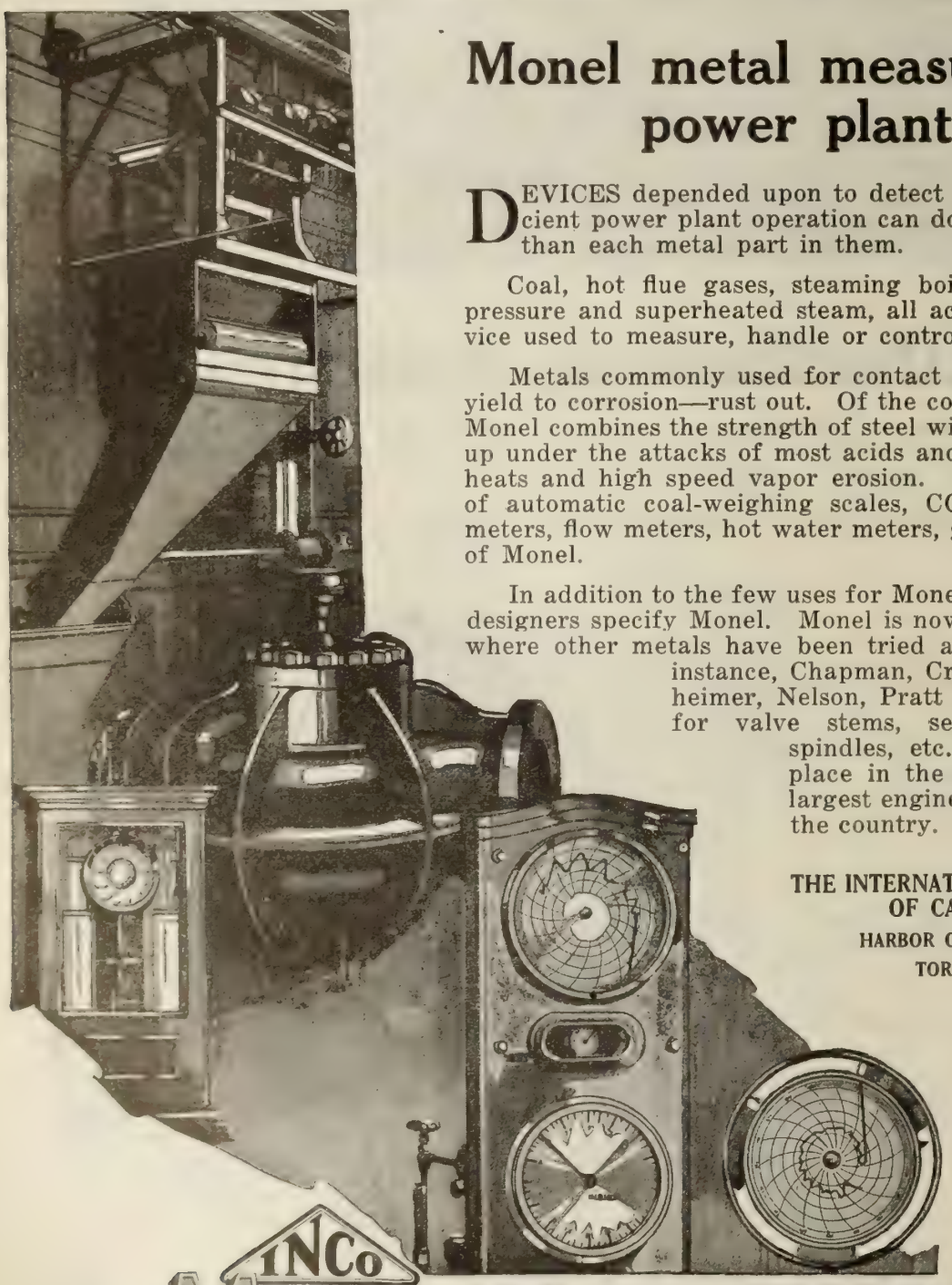
**CONVEYING APPARATUS—**
Chains
Buckets
Hoppers

**AIR COMPRESSORS—**
Valves

**BLOWER FANS—**
Blading

**THERMOMETERS—**
Bulbs

**SPECIAL APPARATUS—**
Watchman Recorders
Watthour Recorders



# Monel metal measures power plant efficiency

DEVICES depended upon to detect and "show up" inefficient power plant operation can do their work no better than each metal part in them.

Coal, hot flue gases, steaming boiler feed water, high pressure and superheated steam, all act to wear out the device used to measure, handle or control them.

Metals commonly used for contact parts in these devices yield to corrosion—rust out. Of the commercial metals, only Monel combines the strength of steel with the ability to stand up under the attacks of most acids and alkalies and of high heats and high speed vapor erosion. Therefore, vital parts of automatic coal-weighing scales, $CO_2$ Recorders, Venturi meters, flow meters, hot water meters, gauges, etc., are made of Monel.

In addition to the few uses for Monel listed above, leading designers specify Monel. Monel is now used in many places where other metals have been tried and have failed. For instance, Chapman, Crane, Jenkins, Lunkenheimer, Nelson, Pratt & Cady use Monel for valve stems, seats, rings, clappers, spindles, etc. It has a prominent place in the specifications of the largest engineering organizations in the country.

**THE INTERNATIONAL NICKEL COMPANY OF CANADA, LIMITED**
HARBOR COMMISSION BUILDING
TORONTO, ONTARIO

The name Monel identifies the natural nickel alloy—67% nickel, 28% copper and 5% other metals—produced by The International Nickel Company. Monel products include Monel blocks, Monel rods, Monel castings, Monel sheet, Monel wire, Monel strip stock, etc.

INCo Monel metal

THE INTERNATIONAL NICKEL COMPANY

INCo MONEL METAL INCo NICKEL




# Canadian Hart Wheels

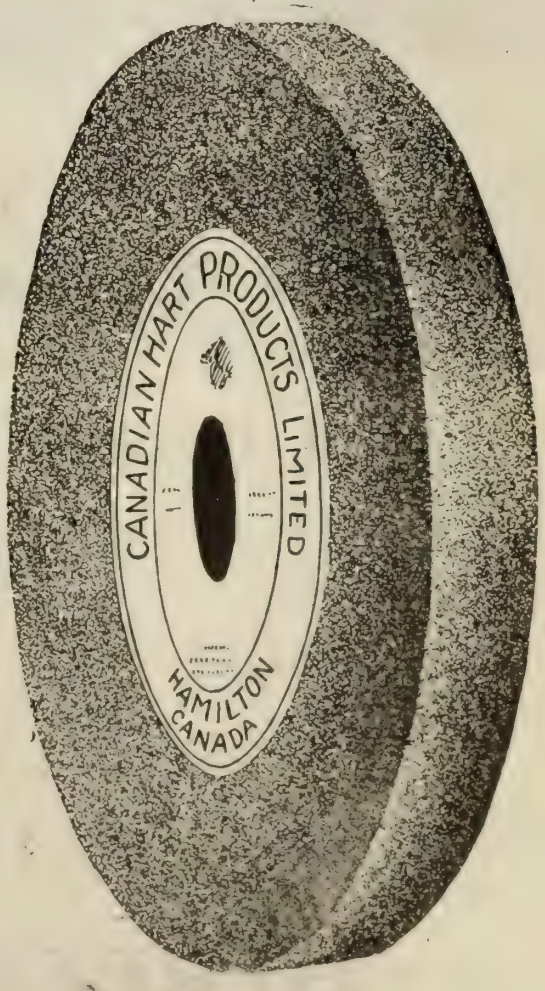
## *Vitrified — Silicate — Shellac*

TELL us what you want to grind and we will tell you the wheel to use for the best results.

**Canadian Hart Vitrified Wheels**—recommended for the majority of grinding jobs. May be used wet or dry; give better all-around satisfaction and have a longer life.

**Canadian Hart Silicate Wheels**—can be made in twenty-four hours and are often substituted when it is inconvenient to wait the required length of time for Vitrified Wheels.

**Canadian Hart Shellac or Elastic Wheels**—indispensable for slotting work where a thin wheel is required, or for work requiring a special finish. Can be operated wet or dry.




## Canadian Hart Products
LIMITED

Hamilton - Ontario

Made in Canada



# A FOLDING STEEL TRIPOD

Fitted with a Morris Triple Gear or Worm Gear Chain-block and used for setting machinery and making the occasional difficult lifts around your plant, will soon pay for itself and will occupy but little space when not in use.

## THE HERBERT MORRIS CRANE & HOIST CO., LIMITED

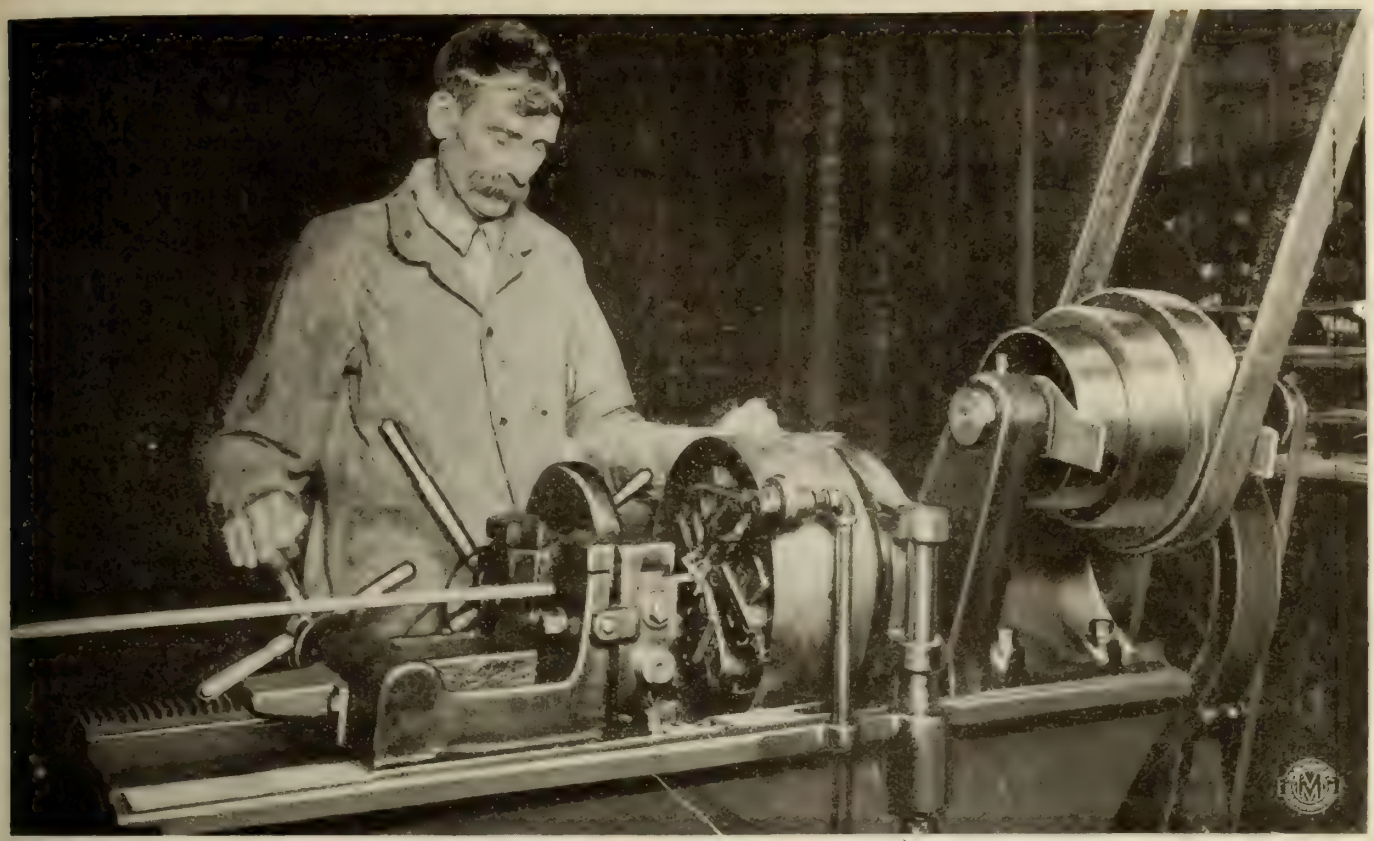
HEAD OFFICE and WORKS

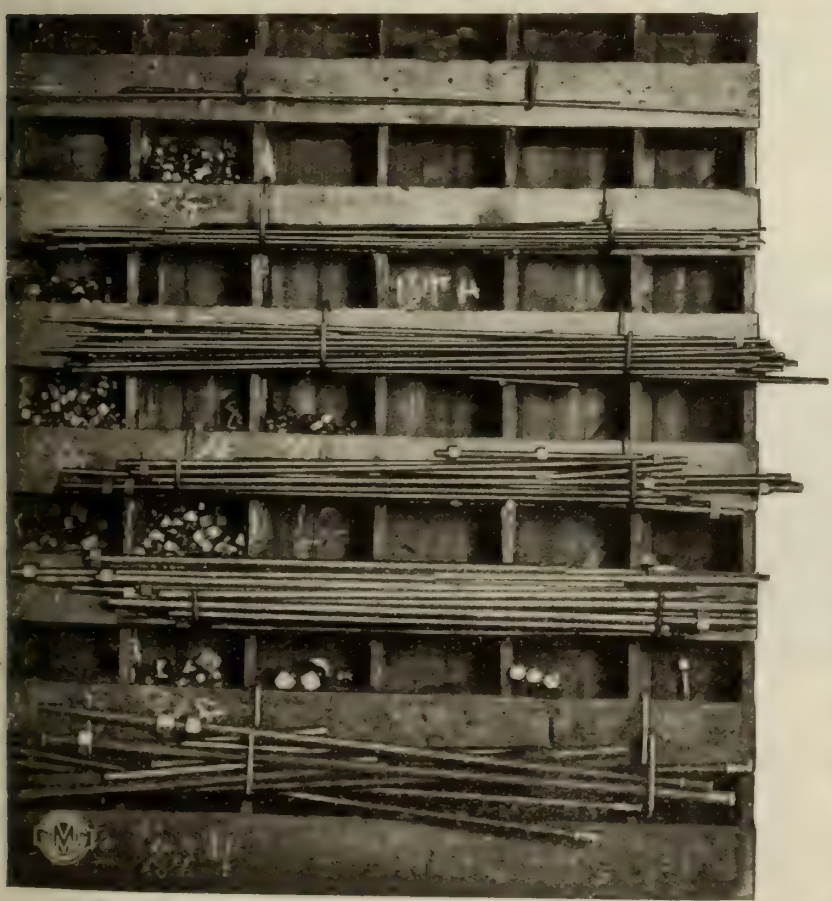
NIAGARA FALLS, CANADA

Specialists in the design, manufacture and application of lifting machinery and material handling equipment.

# HERBERT MORRIS

## Cranes and Chain Blocks





# LANDIS
## *Threading Machine*

A Paying Proposition on the "Short-run" Job.

Everybody knows, of course, that for high speed quantity production the Landis Threading Machine is a record breaker. Now comes the P. H. & F. M. Roots Co., Connersville, Ind., and says that on the "short-run" job it's just as good because of the ease with which the set-up may be changed for different diameters of work, and the long-lived chasers.

Use the Landis Threading Machine for every threading job. You'll find it a paying proposition from the first.

Ask us for illustrated catalogue showing the complete Landis line.

# LANDIS MACHINE COMPANY, INC.

**WAYNESBORO, PENN., U.S.A.**

*Exclusive Canadian Agents:* CANADIAN FAIRBANKS-MORSE, CO., LIMITED

# 1/3 to 1/2 Reduction in Milling Cost

This will be the result of taking small milling jobs from your big millers and putting them up to



## The U.S. MILLER

*The Miller for Small Work*

A small machine takes up less space, requires less power, is easier to operate and is more accurate.

**The Paramount Miller of its size.** Drop us a line for full details.

**United States Machine Tool Company**
Cincinnati, Ohio, U.S.A.

# MAPLELEAF

## MOTOR TRUCKS

**The Joint that Saves the Snap**

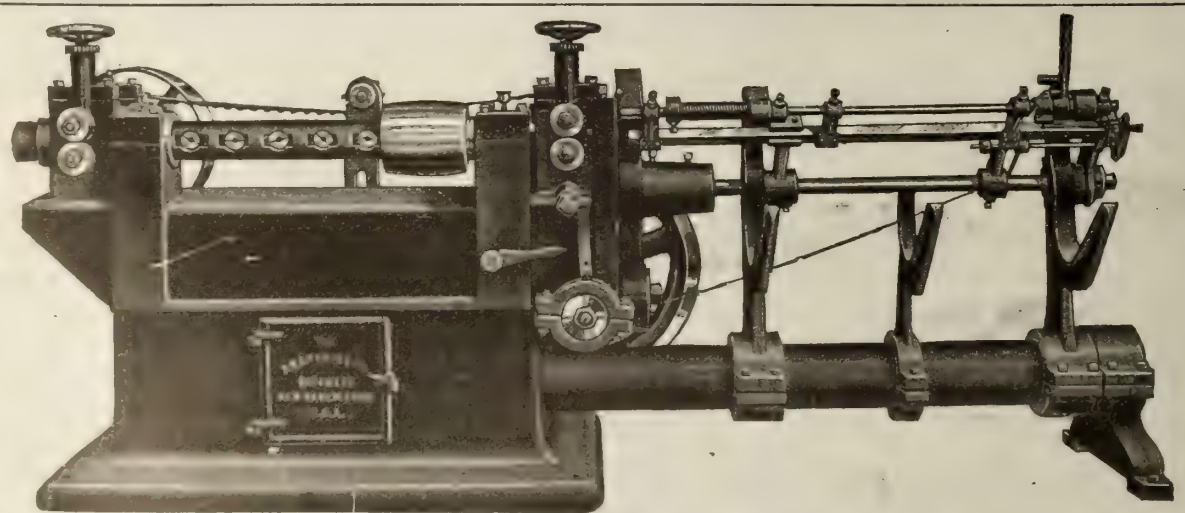
Deep ruts and heavy loads bring a tremendous strain on the joints of the propeller shaft of any truck.

In a Mapleleaf Truck these joints have the largest bearing surfaces made. They are positively dust-proof and positively lubricated; which means that they hardly ever have to be replaced.

Then again, the propeller shaft is so designed that even when fully loaded they have practically no bend.

That is just one of the reasons why the wearing qualities of a Mapleleaf Truck are so remarkable.

**Mapleleaf Manufacturing Company, Limited.**
MONTREAL : CANADA



**Perfect Wire Straightening Quickly and Profitably Done on Our**

# Automatic Wire Straightening and Cutting Machine

Just put your coil of wire on the reel, adjust the rolls and dies, and set the gauge for the length you want. The machine does the rest—thousands of feet per day, perfectly straight and cut to accurate lengths.

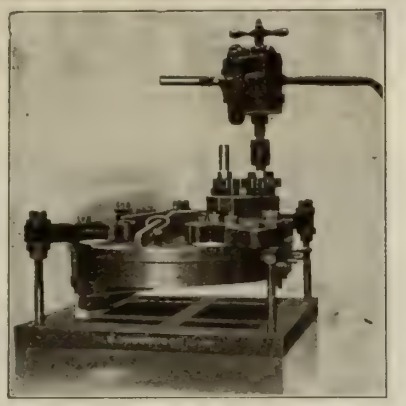
Catalogue tells more about them, and we will be glad to send you a copy.

# THE F. B. SHUSTER CO., New Haven, Conn.

FORMERLY JOHN ADT & SON ESTABLISHED 1886
*ALSO MAKERS OF STRAIGHTENERS FOR SQUARES, HEXAGONS, FLATS, ETC.*

# Portable Valve Seat Planer

*Constructed to Stand Heavy Work*



Our latest Portable Valve Seat Planer is of a rigid construction capable of withstanding heavy work without spring or strain. It will easily plane as heavy a cut as is required for valve seat work—facing off, at one cut, deeply worn valve seats.

Full particulars of this and any other Underwood machines will gladly be forwarded upon request.

**H. B. UNDERWOOD CORPORATION**
1025 Hamilton St., - Philadelphia, Pa., U.S.A.

# WHY EXPERIMENT ?
## WE DID IT FOR YOU YEARS AGO



## IMPERIAL GENUINE




For Heavy Engines and Extraordinary Hard Work

## HARRIS HEAVY PRESSURE

THE COPPER COATED CAKE

For Donkey Engines, Saw Carriages, Small Motors, Transmission Line Shafting and all steady heavy pressure duty.



## Matchless

Suitable For Slow-Moving Bearings

Write For Prices

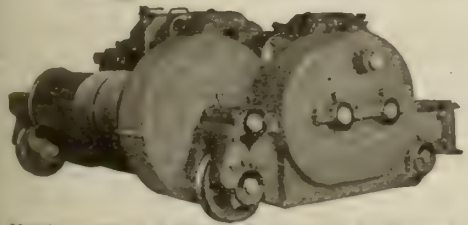
**THE CANADA METAL CO., LIMITED**
TORONTO HAMILTON MONTREAL
WINNIPEG VANCOUVER

CANADIAN MADE CANADIAN MADE

# Electric and Hand Traveling Cranes

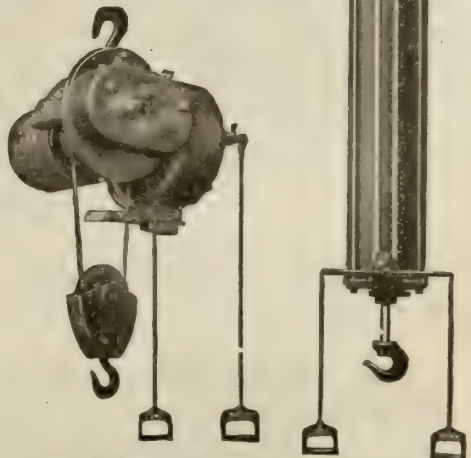


Type E—3-Motor Electric Traveling Crane, 2 Tons to 100 Tons.



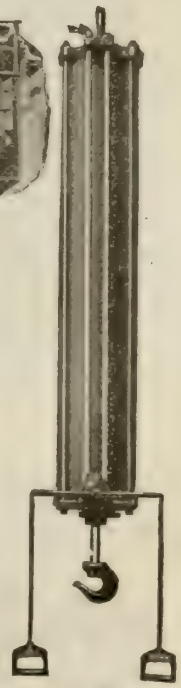
Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada.

We make a wide range of CRANE and HOIST designs. All sizes and capacities, 1 ton to 100 tons.

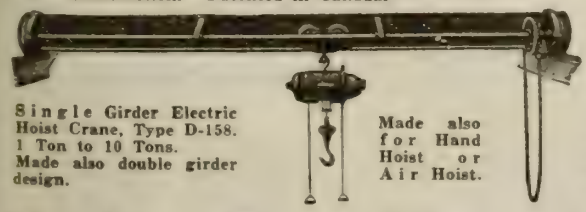


Type D Electric Hoists—½ to 10 Tons.

Air Hoists, Trolleys and Tracks



Type No. 20 Air Hoists.



Single Girder Electric Hoist Crane, Type D-158. 1 Ton to 10 Tons. Made also double girder design.

Made also for Hand Hoist or Air Hoist.

Get our prices and specifications before you buy.

In asking prices, state SERVICE CAPACITY, SIZE OR SPAN POWER, and, if electric, KIND OF CURRENT.

Catalogs free.

## Northern Crane Works, Limited

Walkerville, Ontario, Canada


*If interested tear out this page and place with letters to be answered.*

*The Sign of Efficiency* *The Sign of Durability*

# MORSE DRIVES

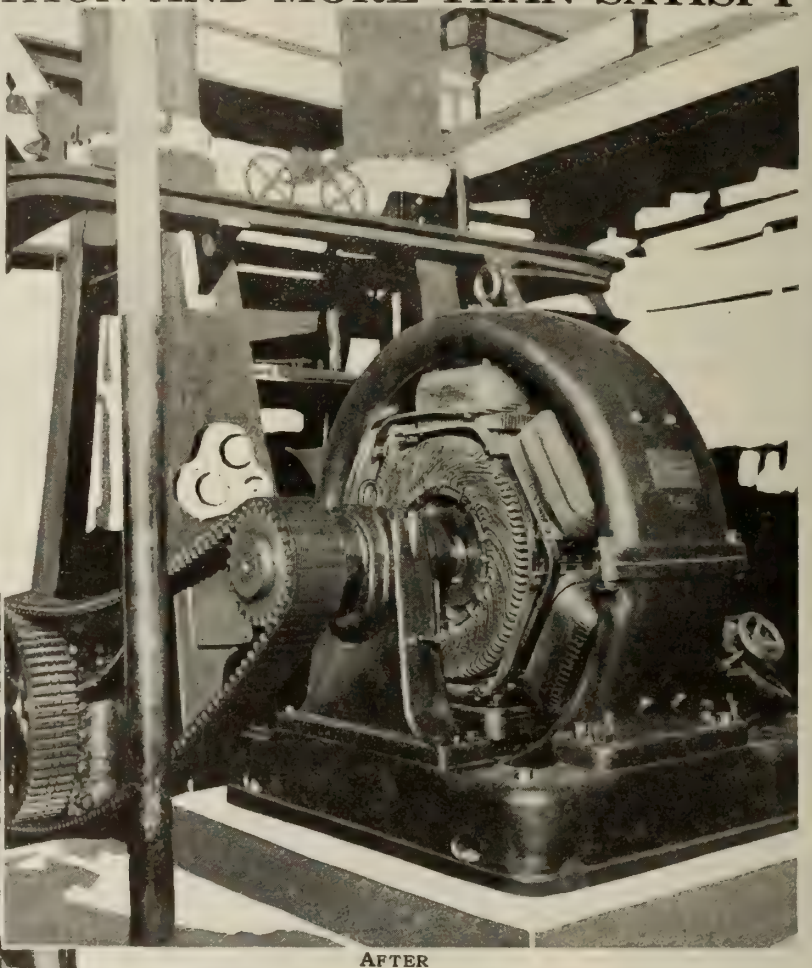
THE MORSE "ROCKER JOINT"

*Positive as Gears* *Flexible as a Belt*

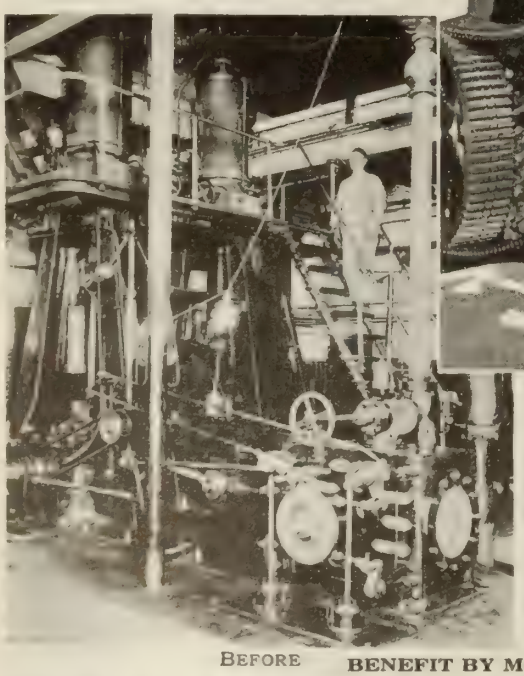
*Longer Life*

## SAVED THE SITUATION AND MORE THAN SATISFY

PRODUCTION and Cost confronted this well known Meat Packing House in Baltimore. They contemplated taking out Corlis Engine driven Ammonia Compressor and installing a new direct connected set. The engineers consulted "MORSE ENGINEERING SERVICE" and thru the use of MORSE Silent Chain Drives, this expense was cut down, floor space saved, efficiency increased, and a still more satisfactory operating compressor maintained.



AFTER



BEFORE

*100 H. P. Drive, 106" Centers, 8" Wide, 2" Pitch, 25—69 Teeth, 150—54 R.P.M.*

**No Slip, 98.6% Efficiency. Oil Baths not Required**

Are you looking for improvement in power transmission, the saving of fuel, the saving of floor space by short centers, fixed speed ratios, improved quality, increased production, lower maintenance cost, longer life and dependability, the increase of profits now lost through slipping belts? Investigate MORSE Silent Chain Drives. Let MORSE Engineers give your conditions their careful research.

**BENEFIT BY MORSE SERVICE AS OTHERS DO**

*Write Today for Booklet*

## MORSE CHAIN CO., ITHACA, N. Y.

*Morse Engineering Service*

LARGEST MANUFACTURERS OF SILENT CHAINS IN THE WORLD

*Assistance Without Obligation*

*Address Nearest Office*

MORSE CHAIN COMPANY ITHACA, NEW YORK

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NEW YORK CITY ..... 50 Church St., Hudson Term. Bldg.
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SAN FRANCISCO, CALIF. ..... Monadnock Bldg.
ATLANTA, GA., Earl F. Scott, M. E. ..... 702 Candler Bldg.
CANADA ..... Jones & Glassco, Reg'd.
MONTREAL ..... St. Nicholas Bldg.
TORONTO ..... Traders' Bk. Bldg.
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ST. LOUIS, Mo., Morse Engineering Co. ..... Chemical Bldg.

MORSE CHAIN COMPANY ITHACA, NEW YORK

**"Morse" is the Guarantee Always Behind the Efficiency, Durability and Service**

# Small Machine Shops, Auto Repair Shops Welding Companies

## *Do you want a business like this?*



A day's work laid out at the repair shop of Geo. H. Woodwards, San Francisco

### Opportune Time

There is no business to-day that has the possibilities and which fits so nicely into a small machine shop, automobile repair shop, or a concern doing welding, as the regrinding of worn or scored cylinders.

Many companies would have had to close their doors this Spring but for the business obtained through regrinding. It does not require skilled mechanics for operators, and the profit received on the capital invested is unusually large.

### The Field for Regrinding

There were over 9,000,000 commercial and pleasure cars registered during last year. Truck and tractor cylinders require attention once a year. Passenger cars should be looked over at least once every two or three years. Figure out for yourself what your chances are with only approximately 350 concerns properly equipped for such work. Consider also the fact that three 4-cylinder blocks a day will bring profitable returns.

### Advantages to the Automobile Owner

Reground cylinders fitted with new pistons and rings will give the motor as much, if not more, power and pep than when it was new. It cuts the oil and gas consumption in two and stops all excessive smoking.

### Necessary Equipment

Eighty-four per cent. of all pleasure cars, and ninety-one per cent. of all commercial motors manufactured are ground, and Heald Machines are used exclusively. The Style No. 55 is built expressly for regrinding work. It is simple, moderately priced, self-contained, and has a very large capacity and range, easily taking care of singles, doubles, four and six en bloc cylinders.

In addition, to handle the work satisfactorily, one should have a small lathe and drill press, bench and hand tools. A small external grinder would be convenient for finishing pistons, thus enabling the shop to purchase semi-finished pistons and grind them to the oversize required.

**Now is the logical time to get started. If you want figures, in addition to the above facts, write, wire or 'phone**

## The Heald Machine Company

**51 New Bond Street** **Worcester, Mass.**

**Branches at New York, Philadelphia, Buffalo, Cleveland, Detroit, Chicago, Cincinnati**

*If interested tear out this page and place with letters to be answered.*



# This is what Larcul did for us:

*"On a Gould & Eberhardt, also B. & L. Milling Machines. Milling Cutter 6" diameter, 28-tooth, 8" wide. Stock 60 degrees carbon, 16% tungsten. Cutter speed 157 feet per minute. Milling cut across cutter 8", time—8 minutes. Finish glass smooth and sharp. Needless to say, we are very much pleased with results."*

This is only one of the many letters we receive from enthusiastic users of

## LARCUL CUTTING OILS

Your production line takes a big upward sweep when you start to use LARCUL. More individual pieces can be turned out in a day, because your machines run faster, without overheating the tools. As LARCUL positively carries off the heat, tools hold their cutting edge longer and hence do not require frequent re-sharpening, with its consequent delays—another saving in time that helps to boost production.

LARCUL AMBER, a transparent cutting oil for high carbon, vanadium, chrome nickel and tungsten steel; and LARCUL EBONY for open hearth, low and high carbon steel.

*A demonstration entails no obligation. Write us about your cutting problems—To-day!*

**Cataract Refining Company**
Limited
TORONTO ONTARIO

SCIENTIFIC LUBRICANTS for SCIENTIFIC LUBRICATION

## GENUINE EMERY

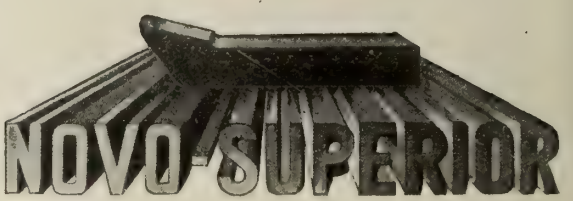
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Swedish Lancashire Iron

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**PILOT STEEL & TOOL COMPANY,**
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*Sole Agents for*
JONAS & COLVER, LIMITED
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# GREY IRON CASTINGS

*Also*

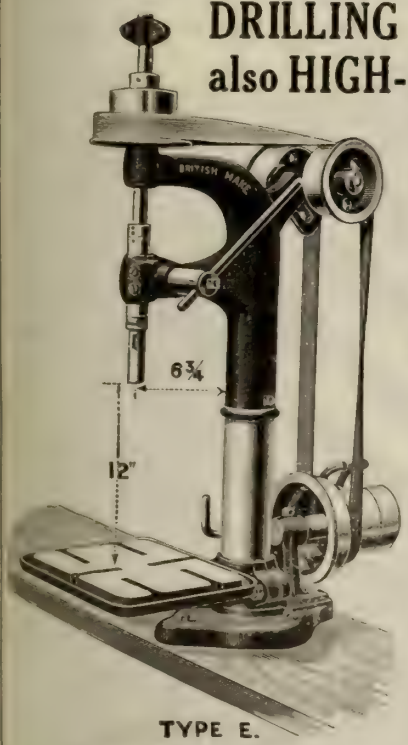
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*AGENTS WANTED*

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Franklin Die-Castings for Domestic Devices

## Making Housework Easier

HOUSEWORK no longer represents the drudgery of the past. The revolutionizing of every field of labor has affected the home as well as the factory.

The Die-Casting Process has done its share in developing many domestic devices unheard of 50 years ago—such as vacuum cleaners, coffee percolators, and washing machines. These appliances have aided the housewife in her daily tasks, shortened her hours, lightened her duties, and added to her comforts.

In 1892 we originated the Die-Casting Process, and for nearly thirty years we have been reducing costs and simplifying production in many fields of industry. The addition of the Standard No. 12 Aluminum to the Tin, Lead, and Zinc base alloys already in use has enabled us to meet a still wider range of individual needs.

*We quote from samples or blueprints. Write for booklet, "Franklin Die-Castings in Many Fields."*

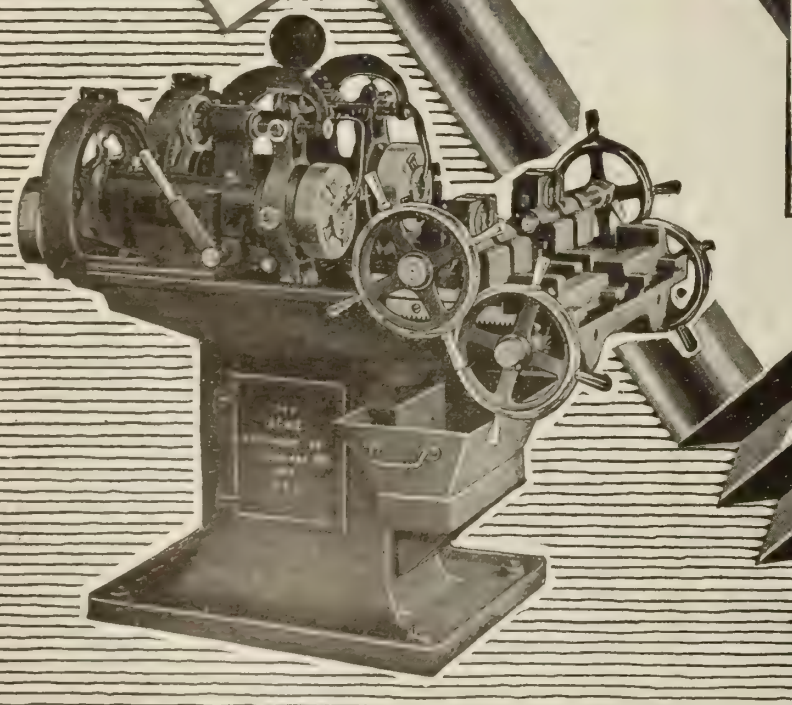
**FRANKLIN DIE-CASTING CORPORATION**
Gifford and Magnolia Streets
Syracuse, N.Y.

**FRANKLIN DIE-CASTINGS**


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# BOLTS

## SQUARE HEXAGON TEE-HEAD



**Cut Them In Your Own Plant**

***and Save Money on Cost and Delay in Deliveries***

## ACME BOLT CUTTERS

are made in various sizes for cutting bolts from ¼ to 1 in. diameter. Their heads allow micrometer adjustments while they are in motion. The dies can be changed from one size to another in less than one minute and produce clean, accurate, highly-finished threads.

**May we send catalog?**

**The Acme Machinery Co.**

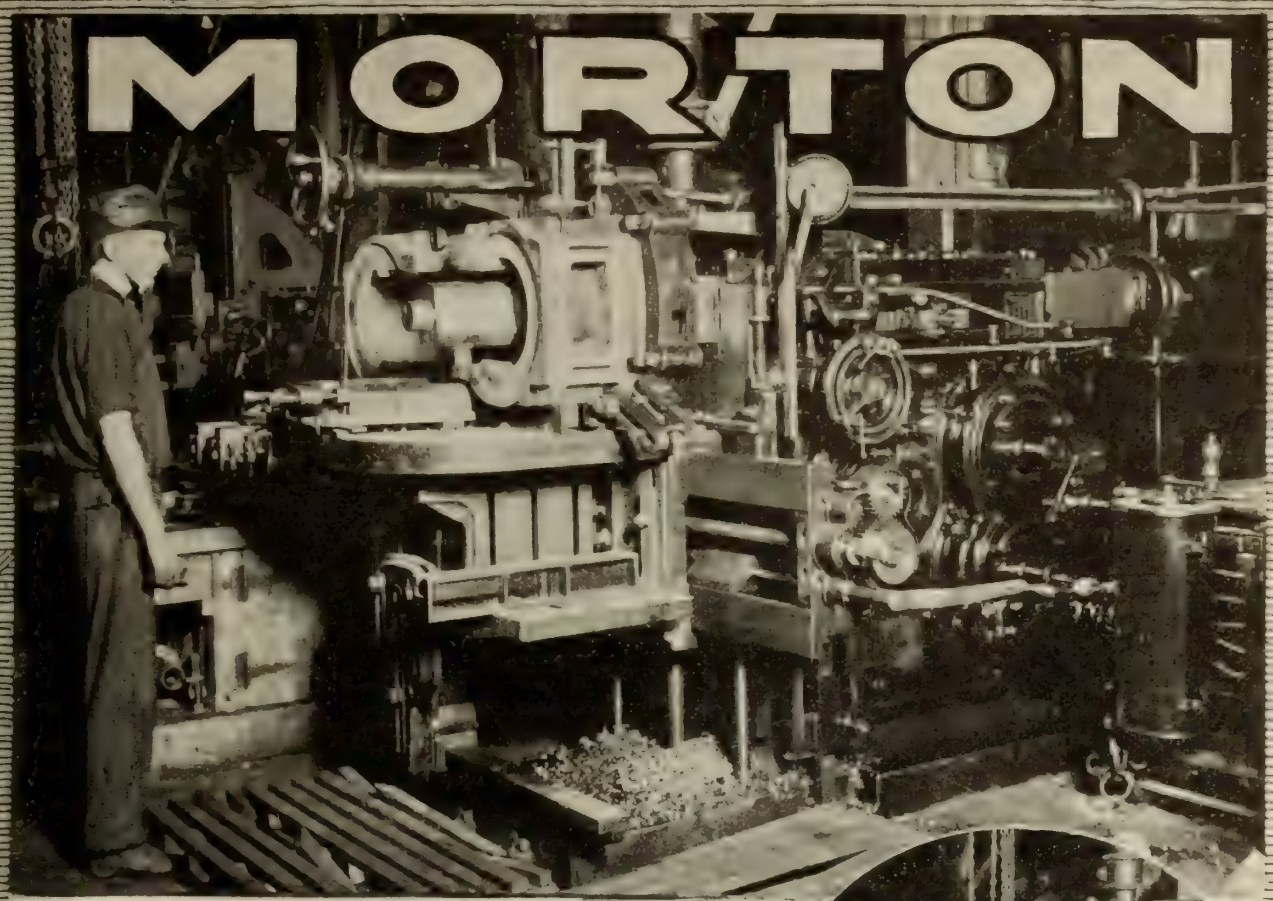
**4530 St. Clair Ave. Cleveland, Ohio**

We make a complete line of Bolts, Rivet, Heading, Upsetting and Forging Machines, Bolt Cutters, Hot Pressed Nut Machines, Hammer Heads, Bolt Pointers, Nut Tappers.

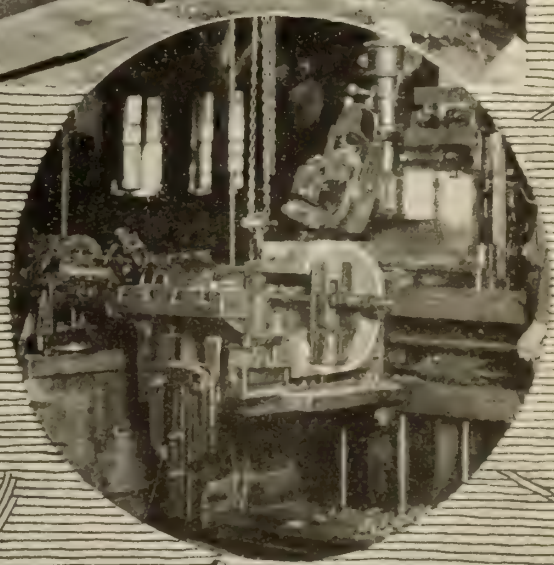
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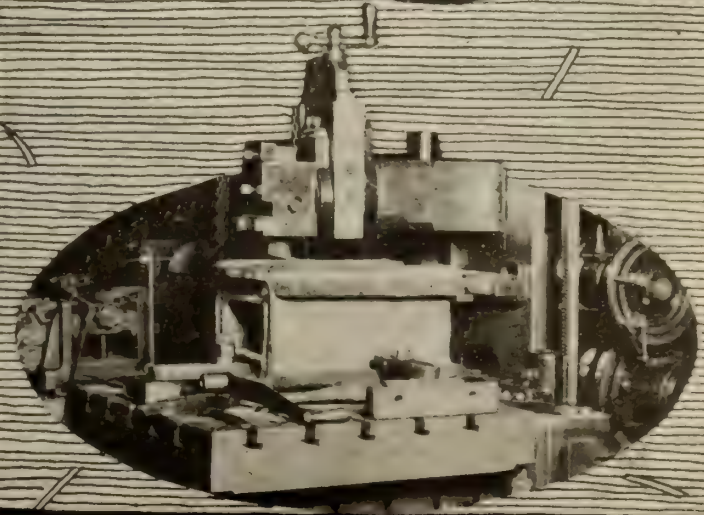
# ACME BOLT CUTTERS

# MORTON



# Increased Driving Box Repairs Forced the Purchase of this Morton Draw Cut Shaper





Delays to output were traced direct to driving box repairs in this busy shop. Time element and shortage of man power were considered and the installation of this "Morton" reflects the good judgment of these thoughtful officials to install machines of guaranteed production power.

This Morton handles all the machine work on driving boxes—planing to thickness, planing shoe and wedge faces and crowning for bearing brass. It simplifies handling and reduces machine time.

May we send Bulletin A-6 explaining numerous points of merit?

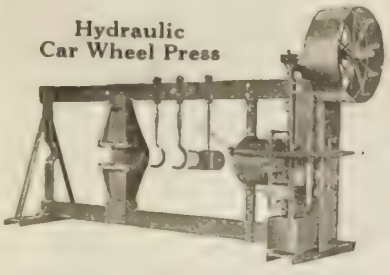
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**For Every Purpose Requiring Pressure**

Hydraulic Car Wheel Press



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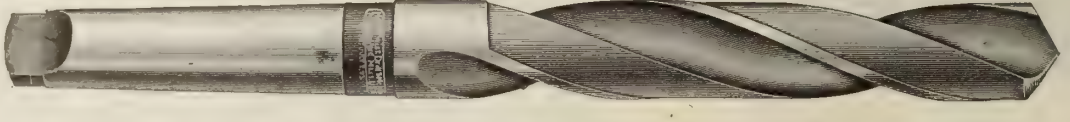


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SPRINGFIELD, ILLINOIS, U.S.A.

There's

# No Argument
# You want Good Service



AND

# "MORSE" DRILLS

WILL

# GIVE IT

Morse Twist Drill & Machine Co.
New Bedford, Mass., U.S.A.

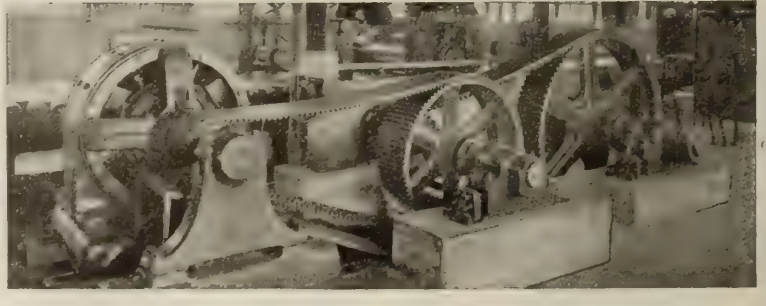
## THE MORSE CHAIN CO.

are the
Largest Manufacturers in the world
of
High Speed Silent Chains

Why?

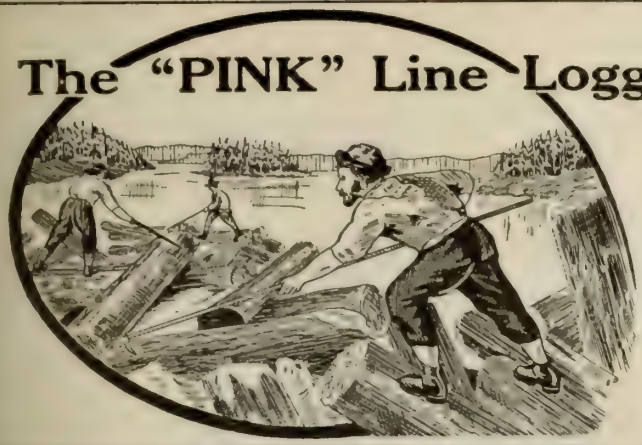
Morse Chain possesses the exclusive
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Frictionless—Requires no Oilbath.

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80 H.P. Morse Drive to Rolls, reverses direction every 45 seconds

# The "PINK" Line Logging Tools and Handles



**MADE-IN-CANADA Products---Headquarters for British Empire for all Lumbering Tools**

In every lumber camp in Canada you'll find PINK'S famous lumbering tools. They are the favorites there and have won the esteem of all woodsmen through their superior merit. They are world-renowned and are extensively used in Australia, New Zealand and other countries where the lumbering industry thrives.

**EXPORTERS TO EUROPE**

We export the same good quality of lumbering tools that have made PINK'S TOOLS a by-word in the matter of good tools in all Canadian lumber camps. Enquiries cordially solicited.

**Thomas Pink Co., Limited**

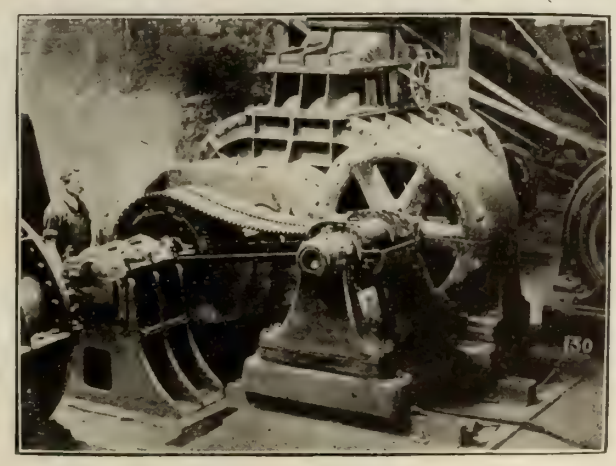
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# RENOLD DRIVING CHAINS

(THE CHAINS OF UNIVERSAL REPUTE)

ONE
QUALITY ONLY—
**THE BEST**

OUR POLICY SINCE
1879



RELIABLE, COMPACT,
EFFICIENT and DURABLE

Note particularly compact features of 350 H.P. Renold Silent Chain Drive to Roots Pressure Blower.

If YOU are interested in increasing YOUR Production, also improving the Quality of YOUR product, YOU MUST consider

**RENOLD DRIVING CHAINS FOR POWER TRANSMISSION**

WRITE FOR BOOKLET NO. 200/5—"NOTES ON SELECTION OF CHAIN GEAR."

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Three Sizes of

# HUNTINGTON STAR DRESSERS

For quick action, and for use on the largest and hardest grinding wheels, the Desmond-Huntington is unequalled.

All Desmond-Stephan Cutters are made of high-grade steel hardened and toughened to give the best results. Write for catalog of the complete Desmond-Stephan line of Dressers.

**The Canadian Desmond-Stephan Mfg. Co., Ltd.**

HAMILTON - ONTARIO


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# Alloy Steels

The manufacture of Commercial Alloy Steels is our business; our plant and organization were designed and built with this idea in mind.

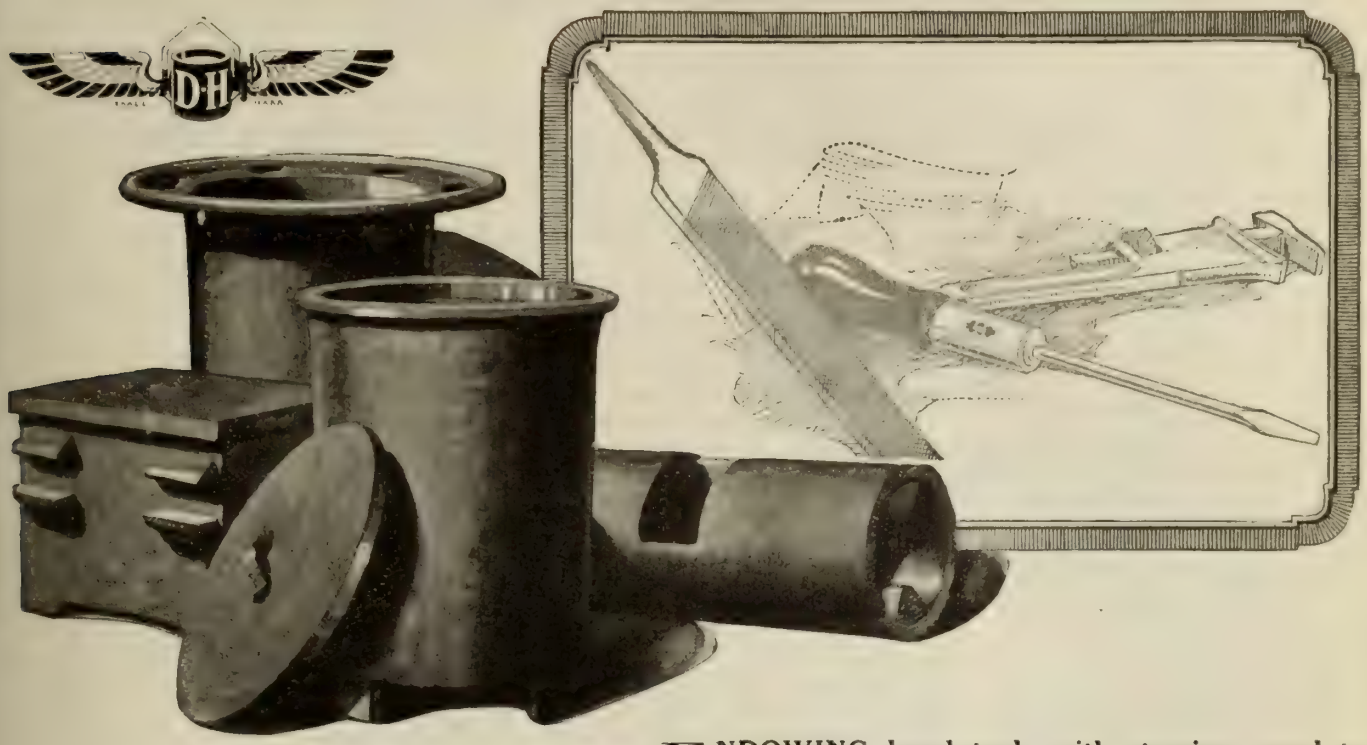
Our experience started with the very beginning of the Alloy Steel industry; we really were the *pioneers* in the manufacture of Commercial Alloy Steels.

One of our ideals is comprehensive service to all steel users; we assist in the selection, treatment and working of Alloy Steels.

Whether you buy steels from us or from someone else, we invite you to avail yourself of our consultatory service.

**UNITED ALLOY STEEL CORPORATION**
**CANTON, OHIO**

DETROIT NEW YORK CHICAGO
SYRACUSE INDIANAPOLIS SAN FRANCISCO
CLEVELAND PORTLAND



# Putting Backbone into Hand Tools

*Bulletin N-21 shows how*

# Heat Treating Containers of

# Cast Nichrome

ENDURE IN HIGH TEMPERATURE

ENDOWING hand tools with stamina equal to the daily use and abuse they get calls for more than haphazard methods of hardening, tempering, annealing, carbonizing, etc.

Manufacturers who have attained the highest average of uniformity in quality, and whose wastage is down to the lowest point, know the value of containers, racks, muffles, retorts, etc., that give uniform service.

This is one reason why the use of Cast Nichrome is constantly increasing. The longer life of Cast Nichrome (guaranteed for thousands of hours at 1800° F.), the shorter heats and lower fuel consumption further contribute to an economy that no man who is responsible for results can resist. Shall we show you some results—and Cast Nichrome Service records?

*Manufactured under HENDERSON Patents*

CANADIAN DRIVER-HARRIS CO.
WALKERVILLE, ONT.
American Office and Works
Chicago-Detroit Harrison, N. J. England-France

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# Is Merchandise Properly *SOLD* To You?

YOU recognize the direct connection between production methods and the cost and quality of the goods; you have a right to know that goods are properly made. Yet the manufacturing, important though it is, is but the first lap on the journey to the consumer. Merchandise must be sold; sales cost is just as legitimate as manufacturing cost, and it has *just as direct a bearing upon the final cost to you.* If needless expense is incurred, it means either higher prices or a decrease in quality or service.

Obviously it will pay you to recognize efficient selling service. With this simple truth clearly in mind, permit us to enunciate an established, proven sales principle—

**—The seller who advertises in the Business Papers, reaching *only* the class interested in his message, is using the most direct and economical method of helping you maintain an intelligent contact with your sources of supply.**

This kind of advertising bears the same relation to the sales department that an improved machine does to the production department. And if the sales methods are wasteless and efficient, you seldom need worry about the goods. Each acts as a support and stimulus for the other.

On the other hand, the practice of buying circulation by the million in the hope of influencing a few thousand possible customers, is open to question. The best machine is a source of waste when improperly used, and this is no reflection on the machine. Concentration beats scatteration, and costs less. The right tool in the right place is a principle of as much importance to selling as to production.

There are many other reasons why discriminating buyers are giving preferred consideration to the concerns which tell them their business story in the buyer's own business paper, *especially* if that paper has subscribed to the high standards of practice of The Associated Business Papers, Inc.

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*Each has subscribed to and is maintaining the highest standards of practice in its editorial and advertising service.*

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Coal Age
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JESSE H. NEAL, Executive Secretary

HEADQUARTERS: 220 West 42nd Street NEW YORK CITY

# *CANADA'S ELECTRICAL AGE*

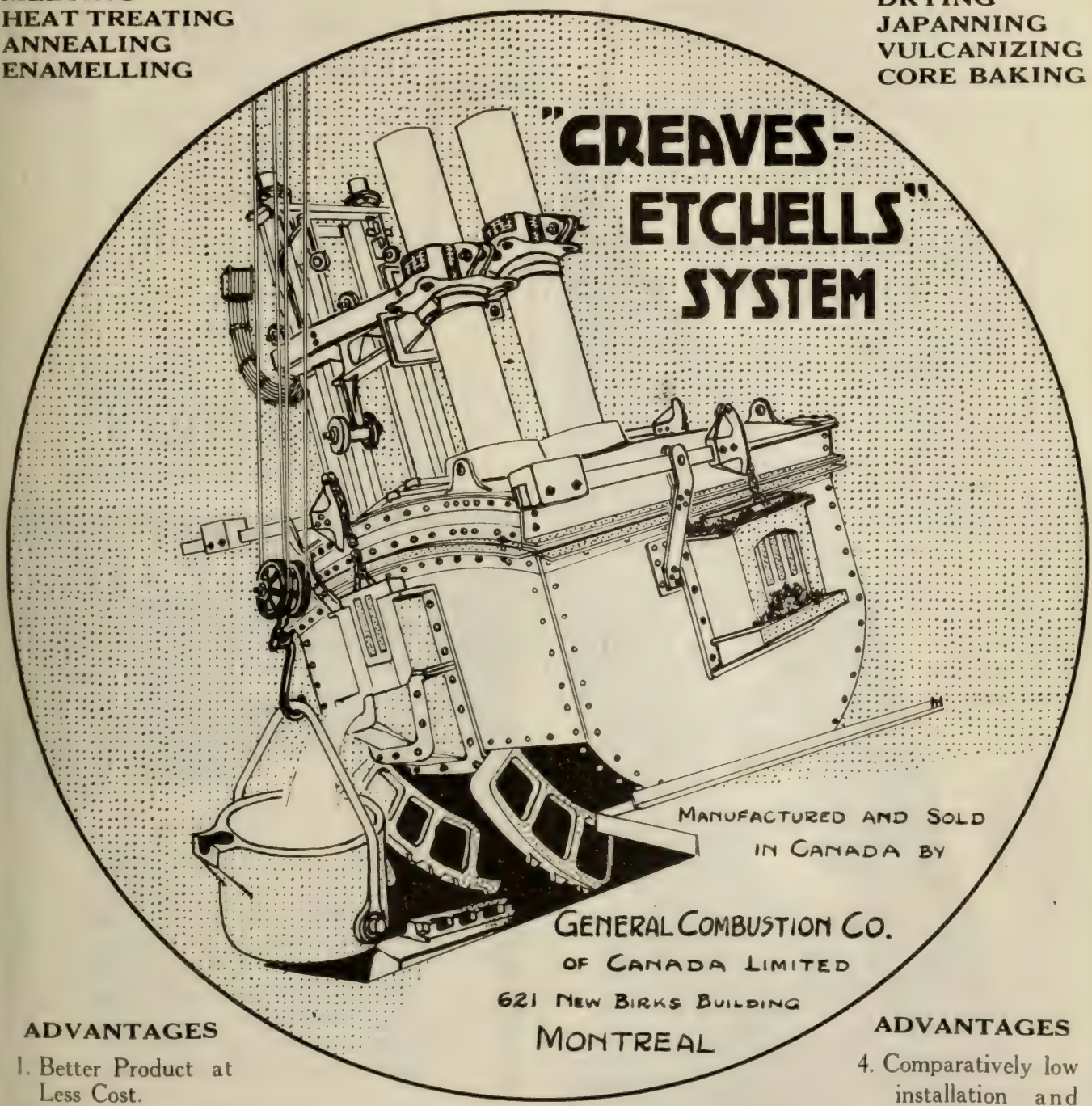
## YOUR FURNACE PROBLEMS OUR SPECIALTY

## *DO IT NOW*

## INVESTIGATE ELECTRIC FURNACES

**MELTING**
**HEAT TREATING**
**ANNEALING**
**ENAMELLING**

**DRYING**
**JAPANNING**
**VULCANIZING**
**CORE BAKING**




**ADVANTAGES**

1. Better Product at Less Cost.
2. Adaptability to all class of material with perfect temperature control—resistance type, 300° F. to 2000° F.; arc type, 2000° and up.
3. Small floor space with ease of operation.

**ADVANTAGES**

4. Comparatively low installation and maintenance cost.
5. Saving in labor of operation.
6. 100% perfect stock.
7. Ideal shop conditions.

***Our staff of highly trained Engineers is at your service, without cost or obligation to you. Consult us.***

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# VENUS PENCILS

*The World's most famous Pencils*

FOR the clean, even lines of intricate mechanical drawings, or the graduation of tones that make the perfect illustration, there is a VENUS degree that exactly meets the engineer's requirements. VENUS Pencils have set a world standard for exactness and uniformity of grading.

Graphite, washed by a unique process; lead scientifically compressed; selected smooth-grained cedar; always uniform throughout.

**17 Black Degrees—3 Copying**

For bold heavy lines, 6B-5B-4B-3B
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**Plain ends, per doz. $1.50**
**Rubber ends, per doz. $1.75**

*At stationers and stores throughout the world*

**American Lead Pencil Co.**
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*also London, Eng.*




*The largest selling quality pencil in the world*



P X H

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**Increased Output**
and
**Lower Operating Costs**
follow the use of
**P.H. and IMPERIAL FILES.**

*"They Cut Faster and Wear Longer."*

**Be File-Wise.**

**INGERSOLL FILE COMPANY, LIMITED.**

John Morrow Screw and Nut Company Limited,
Sole Distributors,
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**INGERSOLL**

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ROTARY GRINDER

**Ten pounds lighter, yet more rugged than other types with same power and speed—free from vibration, which insures endurance in operator and tool—ample power to sustain speed under load—are the salient features of the NEW Keller-Master Rotary Grinder.**

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*QUICK DELIVERIES*

**High Carbon Steel**
**Manganese Steel**
**Chrome Steel**
**Mild Steel**

*QUALITY GUARANTEED*

Sizes—½ lb. to 5,000 lbs. each

THE WILLIAM KENNEDY & SONS,
*LIMITED*
OWEN SOUND, ONTARIO
ESTABLISHED 1860

# CANADIAN ATLAS CRUCIBLE STEEL Co. LIMITED

Made in Canada

## L-XX HIGH-SPEED
## ATLAS TOOL STEELS
## ATLAS ALLOY STEELS

Hot Rolled, Forged Blocks and Discs
Cold Drawn Steel and Drill Rod

GENERAL SALES OFFICE:
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THERE is as much difference in the various makes of High Speed Steel as there is in men—

The practice and methods of manufacturers differ widely in every mill and anyone who is at all familiar with the manufacture of High Speed Steel thoroughly understands this

# "Red Cut Superior"

*The Nationally Known—First Quality*

## HIGH SPEED STEEL

is the best for all Machine Work

ARE YOUR TOOLS MADE OF "Red Cut"?

## VANADIUM-ALLOYS STEEL COMPANY

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*If interested tear out this page and place with letters to be answered.*




## Each Man a Giant

His strength, magnified, is the power that holds each mighty load. Crushing weights are mere playthings in his grasp. He handles them with confidence, knowing that his ally cannot fail.

Men are conscious of this power. They know that each movement of the hand chain will result in raising or lowering the load. They work with confidence, knowing that their FORD TRIBLOC cannot fail.

**TRIBLOCS are all equipped with a Loop Hand Chain Guide, which prevents the hand chain gagging or overriding the flange. A FORD TRIBLOC may be worked from any angle, with speed, efficiency, and safety. You could doubtless use one or more. Let us send you prices.**

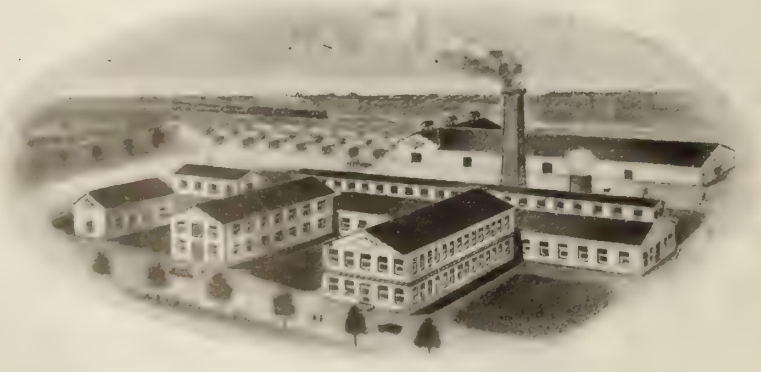
**FORD CHAIN BLOCK CO.**
2ND & DIAMOND STREETS PHILADELPHIA, PA.

OVER SEAS REPRESENTATIVE
ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA
51 CHAMBERS ST NEW YORK U.S.A.

PARIS BRUSSELS TURIN BARCELONA RIO DE JANEIRO

2180-D

# "BERNARD"
# TRANSMISSION APPLIANCES



*Put them to the test*

have achieved an enviable reputation in the Industrial World. Their performance under every conceivable working test has proved their dependability, and they are the most economical because of their durability.

We stand back of our products and will give Dealers every assistance.



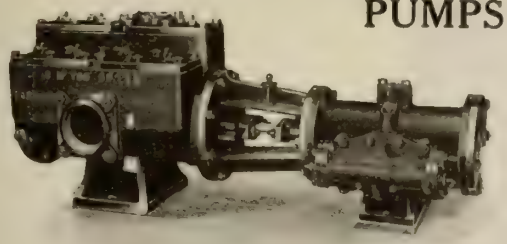
## The A. Bernard Industrial Co.

*Manufacturers of High-Grade Power Transmission Appliances*

Offices and Works: FORTIERVILLE, Que., Canada

# HEPBURN

## VACUUM PUMPS



***Self-Draining--Efficient***

Hepburn Patent Vacuum Pumps are the only Self-Draining Pumps made in Canada. Note the simple, sturdy construction of the Pump above. There are no levers, no tappets and the long strokes produce an efficiency not attainable with pumps of shorter strokes. Let us give you fuller particulars.

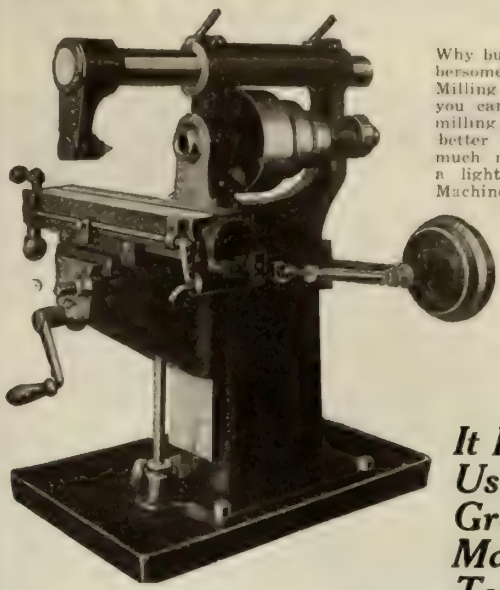
We have other lines—Vertical Engines, Winches, Cut Gears, Power Presses, Derricks, Cranes, Brick Machinery, Blacksmith Work, Acetylene Welding and General Machine Work.

**JOHN T. HEPBURN, LIMITED**

*Engineers and Iron Founders*

**18-60 Van Horne St., Toronto, Ontario**

# This Power Feed Miller $220



Why buy a heavy, cumbersome and expensive Milling Machine, when you can do your small milling operations to better advantage and much more rapidly on a light Burke Milling Machine?

Catalog shows other sizes of Milling Machines with hand or power feed, with or without overhanging arm, either bench or column type.

***It Pays to Use High Grade Machine Tools***

**THE BURKE MACHINE TOOL CO.**

**520 Sandusky St., Conneaut, Ohio, U.S.A.**

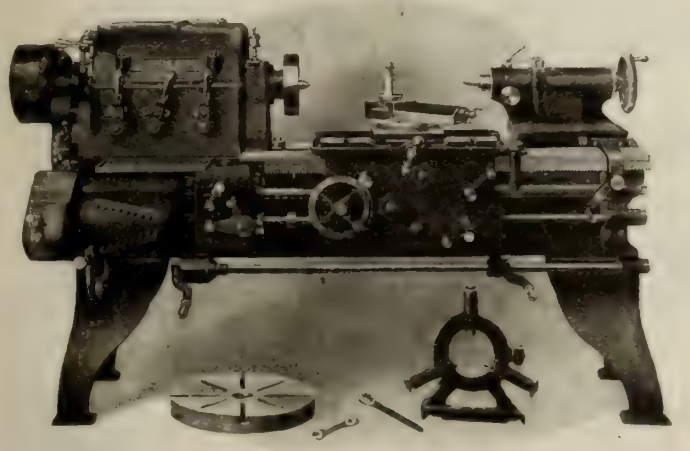
**Canadian Dealers:—H. W. Petrie Ltd., National Machinery & Supply Co., A. R. Williams Machinery and Supply Co., Canadian Fairbanks-Morse Co., Williams & Wilson, Garlock-Walker Machinery Co., Yeates Machinery Co., Cope & Sons, Geo. F. Foss Machinery & Supply Co.**

# The "Lehmann" Improved Selective Head Lathes

**(Patents Pending)**

**SIZES—14" to 24" SWING**

On account of its simplicity of construction, great driving power and rigidity, ample range of speeds, moderate tooth travel of its gears, compact and shapely appearance, the "LEHMANN" Selective Head Engine Lathe stands to-day in a class *ahead* and *alone*. Some of the features of construction are:



Sixteen Spindle Speeds in correct geometrical progression obtained with the use of only ten gears.

Improved Friction Clutches (Patents Pending) running in oil, requiring no adjustment and giving forward and reverse control to spindle.

Heat-treated or Hardened Steel gears.

All Shafts, except spindle, running on ball bearings.

Spindle of alloy steel, hardened and ground at the bearings and running in phosphor bronze boxes.

Head Casting forms oil-tight case enclosing all running parts.

In addition these lathes embody all features such as the patent quick change mechanism, the tailstock spindle locking device, the rod and screw shift, etc., forming part of the "LEHMANN" Cone Head Lathes which have acquired an enviable reputation for accuracy and production.

***Let us describe more fully this Exceptional Lathe and its Distinctive Advantages***

## Lehmann Machine Company - St. Louis, U.S.A.

**Chouteau Avenue at Grand**


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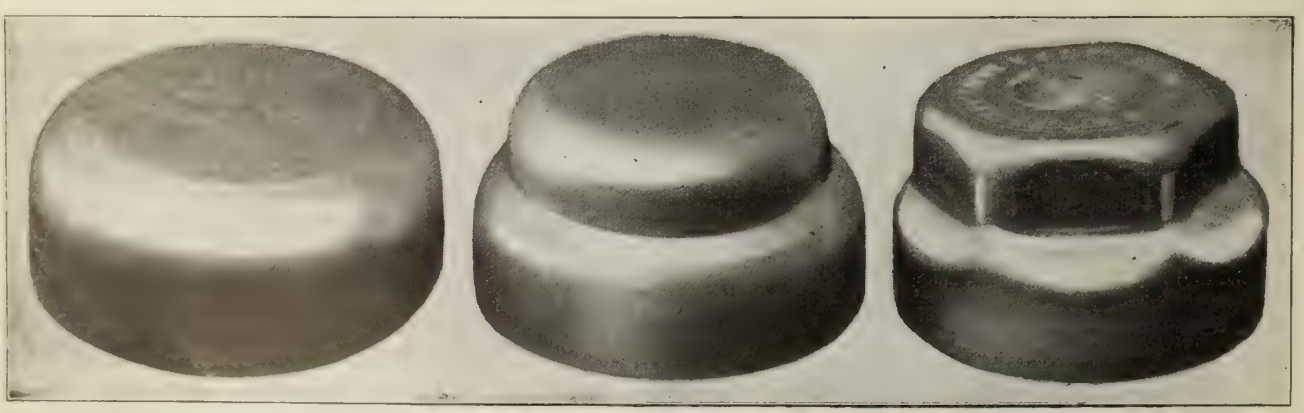
# Forming Hub Caps—Three Operations



Hub Caps for Velie Motor Cars are blanked, drawn and embossed in three operations on "BLISS" No. 76½ Straight Side Presses in the shop of Worcester Pressed Steel Company, Worcester, Mass.

The illustrations show the three stages of this process. The first shows the shell after blanking and first draw, the second shows the shell after cupping, the third shows the shell after the final operation of forming the hexagonal sides and embossing the end.

Production rate—900 per hour, each operation.



BLISS 1857

## E. W. Bliss Company

BLISS 1921

*Main Offices:* BROOKLYN, N. Y., U. S. A.

*American Factories:* BROOKLYN, N. Y.; HASTINGS, MICH.; CLEVELAND, O.; SALEM, O.

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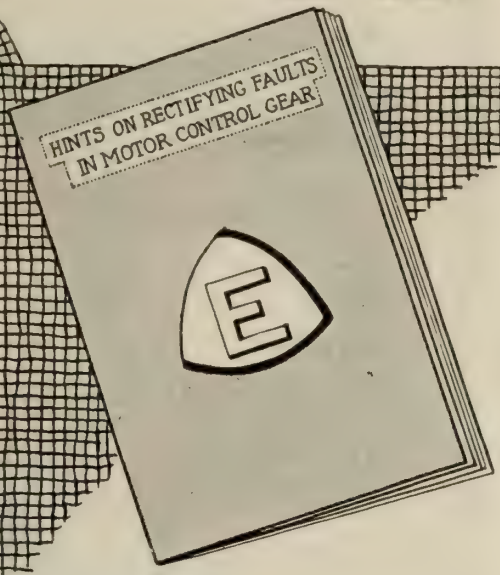
FOREIGN SALES OFFICES *and* FACTORIES

LONDON, ENGLAND, Pocock Street, Blackfriars Road, S. E. PARIS, FRANCE, 100 Boulevard Victor-Hugo, St. Ouen

No. 128

# USERS of ELECTRIC MOTORS

## should write for a copy of this Booklet




# A Manufacturer's Publication

Packed full of practical wisdom and knowledge based upon prolonged experience, designed expressly to furnish the maximum amount of information to the reader who uses the apparatus of which it treats.

*Extract from Electrical Review (London)*

***Write for Hints Booklet "C"***

# GEORGE ELLISON

**Mechanical and Electrical Engineers**
**Makers of Electric Control Gear**

**WORKS: PERRY BARR, BIRMINGHAM, ENGLAND**
**LONDON (and Export) 25 VICTORIA STREET, WESTMINSTER, S.W.1**

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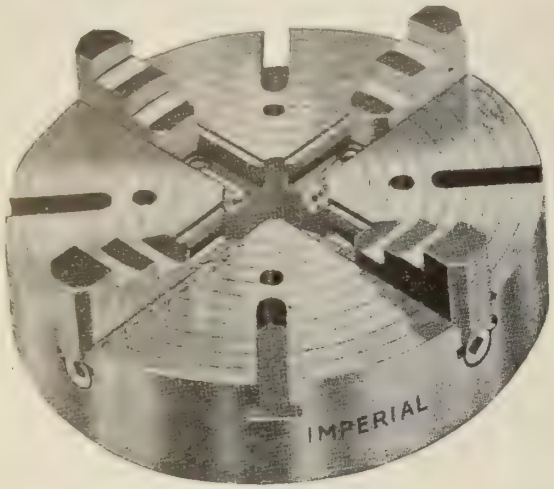
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# IMPERIAL LATHE CHUCKS

*Highly Endorsed by Canada's Best Manufacturers*

Sturdy long-wearing "Made-in-Canada" Chucks that are making good everywhere.

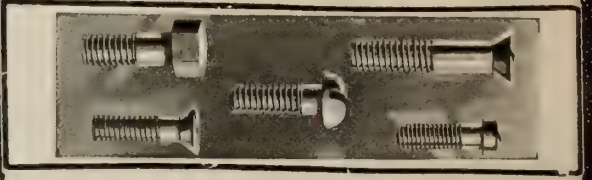
Specify them in your next order.




**Ker & Goodwin Machinery Co.**
BRANTFORD, Ont. LIMITED

# Wood Screw Making Machinery

SEND FOR CATALOGUE
Series



For sixty years we have constantly manufactured machinery for making screws, always studying to improve and refine our product.

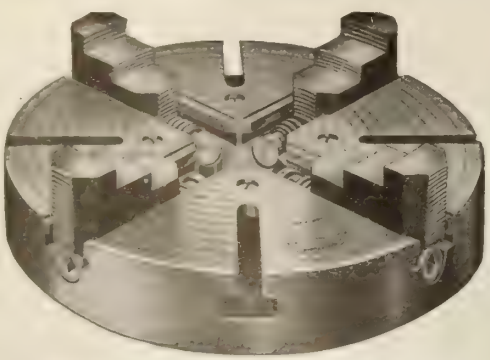
**Write or Wire us.**

Cable address: "Cook,"
Hartford, U.S.A.
Codes: Liebers
Western Union

**Asa S. Cook Co.**
**Hartford, Conn.**

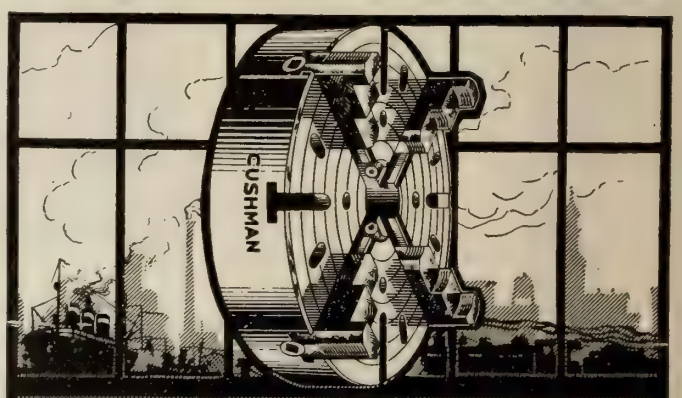
ALL STEEL
# INDEPENDENT CHUCKS

are not an experiment — they have come to stay. They are a necessity with the modern machinery and high-speed steel cutting tools.



THE UNION STEEL BODY CHUCKS
are well designed and have all the elements of strength and durability for which they are designed. We make other types in steel also, including the Geared Scroll Chucks and the Geared Scroll Combination—all designed for heavy work and hard usage.

**UNION MANUFACTURING COMPANY**
New Britain, Conn.
*New York Office:* 26 Cortlandt Street
*Makers of a complete line of chucks*




# THE CHUCK WITH A REPUTATION TO MAINTAIN

"CUSHMAN" CHUCKS 1862

THE CUSHMAN CHUCK CO.
HARTFORD, CONN.

# NAMCO
## DIES & TAPS

The men who build NAMCO Tap and Dies know that the cutting of accurate threads continuously is one of the big problems of every shop foreman.

That is why the best material and careful workmanship go into every NAMCO Threading Tool—in order that each and every one shall be "built for service."

**The National Acme Company**
Cleveland, Ohio

New York, Boston, Chicago,
Detroit, Buffalo, Windsor, Vt.
Montreal

*CATALOG?*

*Built for Service-*






## LEARNED From EXPERIENCE

WHEN *ARMSTRONG* earned his living by RUNNING A LATHE he often wished he could get a set of Lathe Dogs which would stand up to the work. The Screws especially were a constant source of trouble, points upsetting and threads stripping.

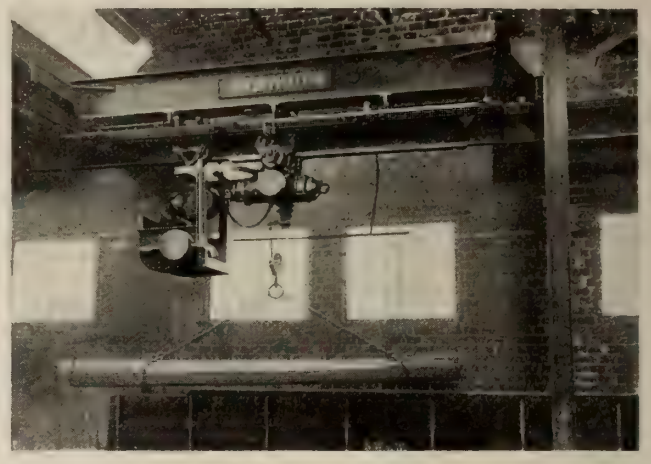
His practical experience is the basis upon which the *Armstrong* line of Dogs and Clamps is built. The bodies are Drop Forged of a special grade of steel selected for its high degree of stiffness and great tensile strength. Screws can't be beat for long lasting qualities; they are made of Chrome-Nickel Steel, given a special heat treatment, and the points are hardened.

***Specify Armstrong when ordering and get the best.***

**Catalog mailed free upon request.**

**ARMSTRONG BROS. TOOL CO.**
"THE TOOL HOLDER PEOPLE"
306 N. FRANCISCO AVE. CHICAGO, U.S.A.
STRONG STRONG

**SHEPARD**
ELECTRIC CRANES & HOISTS



## Shift to a "Shepard"—

Put your rehandling—"picking up," carrying, and "putting down" in the hands of ONE MAN, the operator of a Shepard Electric Crane or Hoist. Release the "gang" for productive activity.

Rehandling with a "Shepard" means economy, speed, and efficiency, otherwise unattainable.

Shepard Engineers are capable to advise you in the selection of the proper hoisting and carrying equipment for your plant. Their services do not obligate you.

***Shepard Electric Traveling Cranes are made in capacities of 1 to 50 tons; Electric Hoists ½ to 30 tons.***

**Shepard Electric Crane & Hoist Co.**
426 Schuyler Ave., Montour Falls, N. Y.

*Canadian Representative:*
Rude!-Belnap, Montreal Agents in Principal Cities

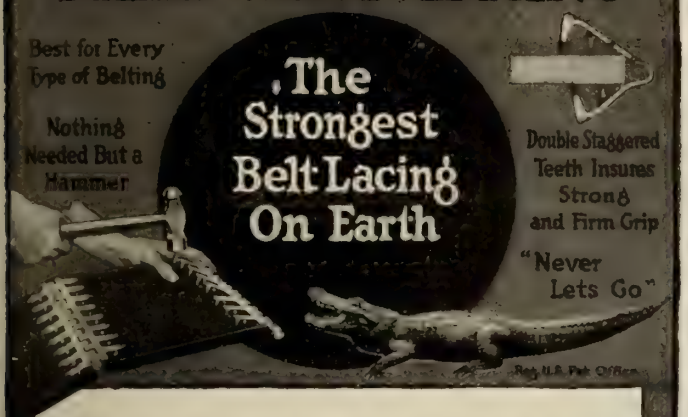
*Member Electric Hoist Manufacturers' Association.*

2135-S

# ALLIGATOR

TRADE-MARK REG. U.S. PAT. OFFICE

## STEEL BELT LACING




## How the "ALLIGATOR" Line Builds Business for Jobber and Dealer

Read these features on which ALLIGATOR Steel Belt Lacing will increase your sales to users of power and conveyor belting.

ALLIGATOR Steel Belt Lacing is easy to apply. Requires no tool but a hammer and only three minutes average time. Anyone can put it on.

Makes a permanent hinged joint **that can be run on both sides,** and works equally well on **any** size or kind of belting from tape to 5/8-inch thickness.

The staggered teeth (see illustration) penetrate lengthwise through the belt and clinch on to the sides leaving burden carrying fibres intact. The sectional rocker hinge pin is serviceable under all conditions.

Everywhere in all industries where belting is used, ALLIGATOR is chosen because of its superiority over other types. The decision of hundreds of thousands of belting users influence you to stock it. ALLIGATOR, the best lacing proposition for the trade.

Besides these reasons: Quick application, belt saving powers, economy and general satisfaction—ALLIGATOR Steel Belt Lacing is being brought to the attention of master mechanics, shop superintendents, purchasing agents, etc., in a large list of national and local publications devoted to various commercial and industrial pursuits.

**FLEXCO-LOK**
Reg. U. S Pat. Office
**Steel LAMP GUARDS**



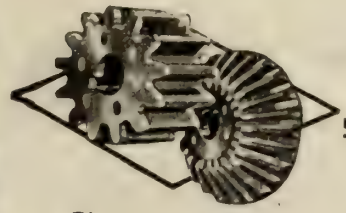
Protects the lamps from breakage and theft — property from fire. An efficient, inexpensive security against danger, losses and delays.

Made in all styles and sizes with reflectors and handles if desired. Patent lock prevents theft. Sold at a distinct economy to the purchaser. Write on letterhead for free samples, price, etc. Not in stock in London.

**A size and type for every power or conveyor belt. Write on letterhead for samples and trade prices.**

FLEXIBLE STEEL LACING CO.
4610 Lexington Street, CHICAGO, ILL., U.S.A.
135 Finsbury Pavement, LONDON, E.C., ENG.
**Stocked by the Best Supply Houses throughout Canada**





# Gears

## that give better Service

THE secret of the universal satisfaction given by Diamond Fibre Gears is in the special grade of Fibre used in their manufacture. Its dense mixture, high tensile strength, unusual wearing qualities, low cost and slight elasticity make it a wonderfully serviceable gear material.

Diamond Fibre Gears are noiseless. They combine the efficiency and regularity of an all-metal gear-drive with the silent, smooth operation of a belt transmission. In your own interests be sure to specify

## DIAMOND FIBRE GEARS

New uses for Diamond Fibre are being discovered daily in the industrial, mechanical and electrical field. Even if you cannot think just now in what possible way Diamond Fibre can interest **you,** let us send you our new illustrated catalog. It is interesting and instructive and may show you some way in which the use of Diamond Fibre will decrease your production costs and increase your production.

***Your copy is ready now—write for it***

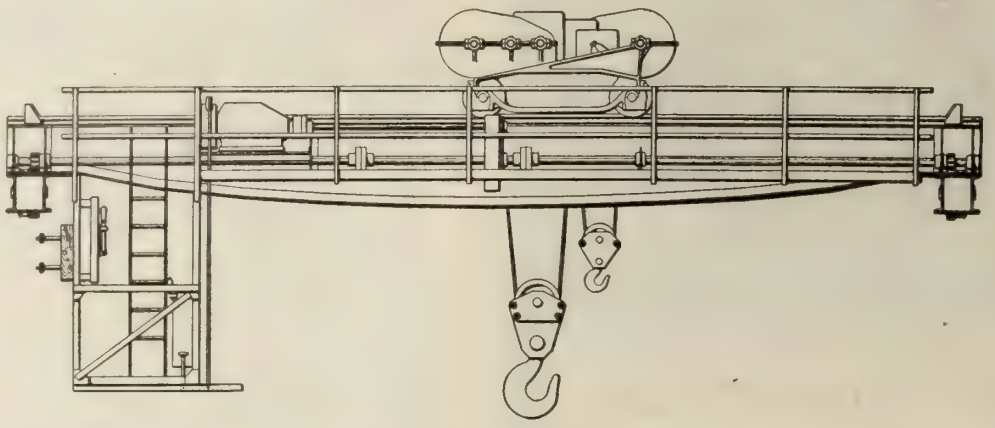
DIAMOND STATE FIBRE COMPANY OF CANADA, Limited

Wrigley Building
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Diamond·F

# CRANES

## ELECTRIC AND HAND OPERATED



**DOMINION BRIDGE COMPANY LIMITED**

HEAD OFFICE & WORKS: MONTREAL BRANCHES:-OTTAWA, TORONTO, WINNIPEG

# HYDRAULIC TURBINES AND PUMPS

Our shops are equipped for building TURBINES of the largest sizes —also high speed PUMPS of large capacity for medium and low heads. Two turbines of 20,000 H.P. are now under construction.

# PAPER MILL MACHINERY

Pulp Drying Machines.
Millspaugh Suction Rolls.
Millspaugh Shower Pipes.
Davies Oscillating Suction Boxes.
Press and Felt Rolls.
Brass Covered Rolls.
Pulp Digestors.
Barking Drums.
P.A.P.A. Screens (Spangenburg System) for pulp and paper.

**DOMINION ENGINEERING WORKS, LIMITED**

MONTREAL - QUE.

# General Adaptability

The Landis Horizontal Boring, Facing and Milling Machine is especially useful for such work as boring cylinders for steam engines, pumps, engine frames and a great variety of operations found on heavy and cumbersome castings in railway shops and ship yards.

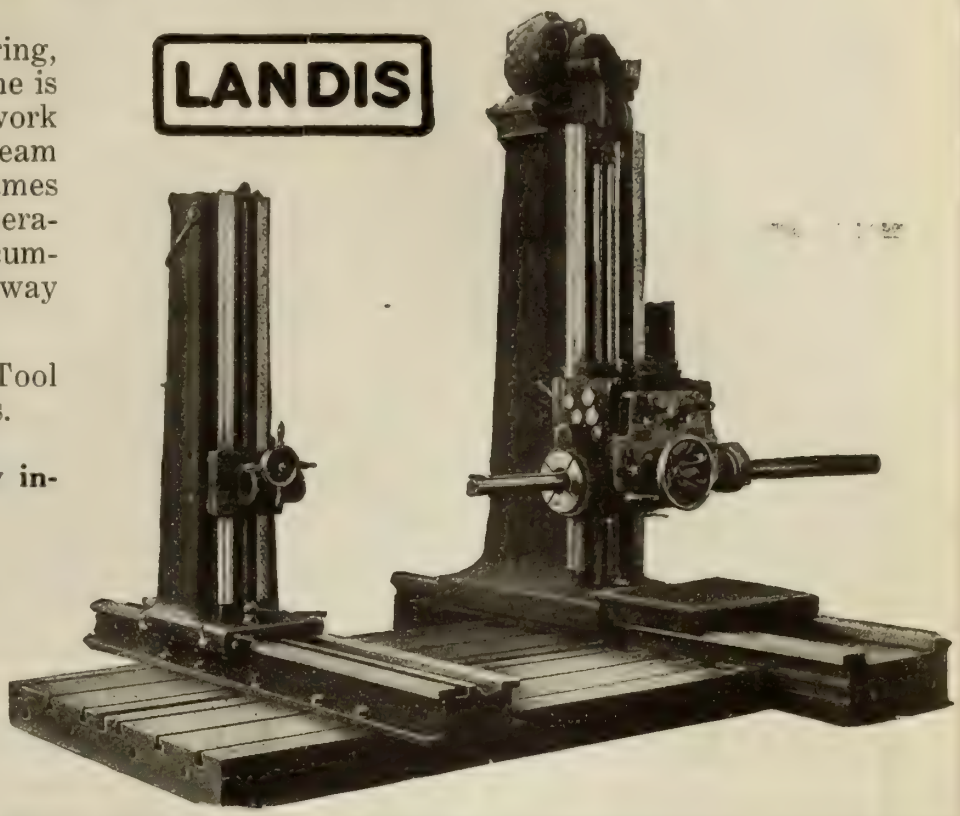
You will like this Landis Tool because it produces results.

**Our catalogue gives many interesting details.**

**Landis Tool Company**
**Waynesboro, Pa.**

**New York Office: 51 Chambers Street**

AGENTS:
Dewstoc Machine Co., Birmingham, Ala.; Harron, Rickard & McCone, San Francisco and Los Angeles.




# Open a Bank Account in Canada

The present abnormal exchange situation between Canada and the United States is affecting trade relations between the two countries. Exporters in the United States can meet this by opening Bank Accounts in Canada.

**This Bank has 727 Branches, of which 625 are located in Canada from the Atlantic to the Pacific Coast. Write for a complete list of Branches and for terms respecting a Canadian account.**

# THE ROYAL BANK OF CANADA

**Capital and Reserves $40,000,000** **Total Resources $544,000,000**

***Head Office:*** **MONTREAL**


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# One Man at the Air Drill

IN the boiler shop of the Canadian plant of a great American industry the men said no staybolt tap made could be driven easily enough to require but one man at the air drill —said they'd strike before they'd obey the order to use only one man on each staybolt tap.

But the answer came back from headquarters in "The States" that the *"Maxi"* Staybolt Tap made by the GTD Corporation was different; that only one man was needed and that only one man must be used in Canada.

Headquarters even sent photographs to prove their statement but they thought the photos must be fakes, and so the Railroad Union sent a committee to see it done—and they saw and were convinced.




This is one of the best arguments we can give you on the *"Maxi"* Staybolt Tap. The saving in labor is not the only argument that there is, however.

The *"Maxi"* Staybolt Tap has the *exclusive* features of a *pilot point*, which finds the hole in the inner plate immediately, and guides the tap into it—a *chip breaker*, which prevents accumulation and wedging of chips —an extra long taper threaded section—specially designed flutes.

Consequently the *"Maxi"* cuts many more threads than any other staybolt tap on the market.

*Let us tell you more about this remarkable tool. Clip the coupon and send it in. No obligation, of course.*

GREENFIELD TAP AND DIE CORPORATION
OF CANADA, LIMITED GALT, ONTARIO

Successors to
WELLS BROS. CO. OF CANADA, LIMITED
London Office: 139 Queen Victoria Street, E.C. 4

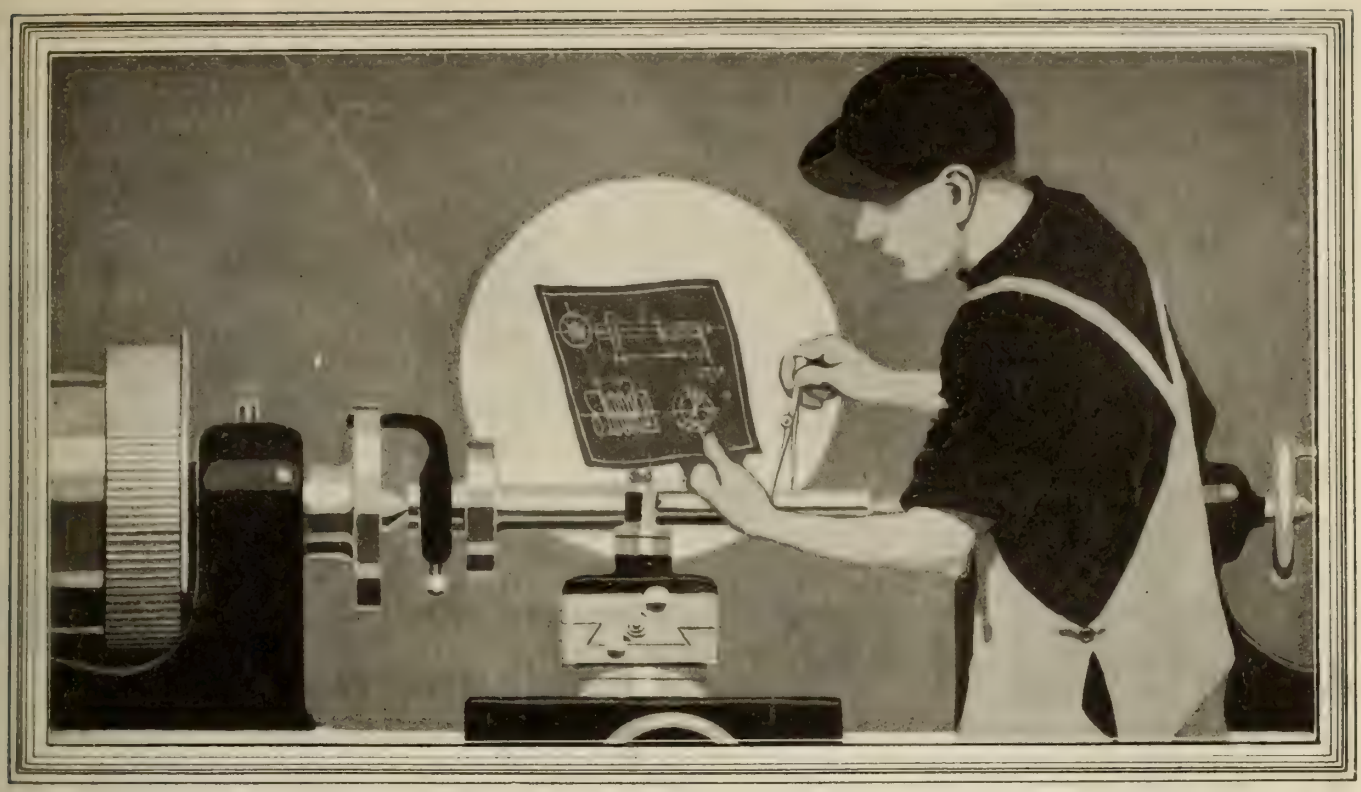
GTD Screw Plates, Taps, Dies, Reamers, Gages, Pipe Wrenches.




GTD
Corporation of Canada, Limited, Galt, Ontario

I am interested in cutting threading costs on boiler work. Please send me your circular the "*Maxi*" Tap and put my name on your mailing list to receive additional screw-threading information as issued.

Name _____
Position _____
Firm _____
Address _____ C.M. 204



# His Work Guide is a PHOTOSTAT Print

(REG. U.S. PAT. OFF.)

## *Speed Up Your Production Too*

The whole world sorely needs every helpful effort.

This machinist is working from a Photostat print made direct from a pencil sketch.

Hours and often days are thus saved in putting work into and through the shop.

In the office, too, the Photostat is invaluable because it makes facsimile copies of blue prints, maps, charts, progress sheets, sales sheets, advertising layouts, etc.

Send for our booklet in which some of our customers tell in their own way how the Photostat is used both for standard and special work.

The Photostat is made by the Eastman Kodak Co., exclusively for the

## Photostat Corporation, Rochester, N.Y.

Boston Chicago New York City Philadelphia San Francisco Washington

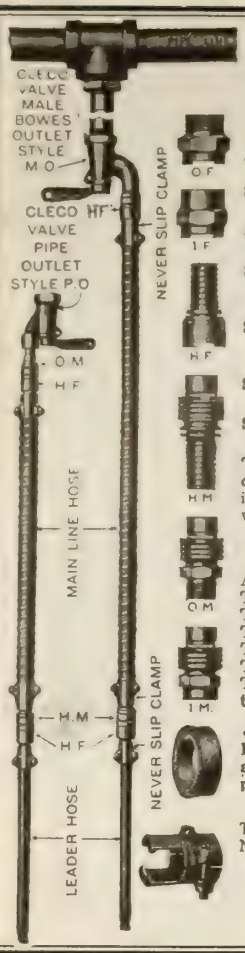
EXECUTIVE OFFICE: PROVIDENCE, R. I.

# PHOTOSTAT

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# Cleco Pressure-Seated Air Valves

## Bowes Air Hose Couplings—Cleco Never Slip Hose Clamps and Cleco Grooved Hose Nipples and Hose Clamp Tool




**STYLE O.F.** is an Outside Thread Female Pipe End. Made in sizes ⅜-inch to 1½-inch.

**STYLE I.F.** is an Inside Thread Female Pipe End. Made in sizes ¼-inch to 1½-inch.

**STYLE H.F.** is a Female Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-inch to 1½-inch.

**STYLE H.M.** is a Male Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-inch to 1½-inch.

**STYLE O.M.** is an Inside Thread Male Pipe End. Made in sizes ¼-inch to 1½-inch.

**STYLE I.M.** is an Inside Thread Male Pipe End. Made in sizes ⅜-inch to 1½-inch.

The Male and Female Ends of Bowes Couplings interchange in sizes ¼-inch to ¾-inch. Sizes 1-inch and 1¼-inch interchange. The 1½-inch ends interchange only with themselves.

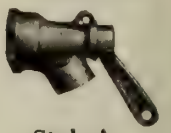
### BOWES COUPLINGS

Are instantly connected or disconnected.
They are absolutely air-tight under all pressures.
They quickly pay for themselves by stopping costly leaks.
They interchange in sizes most commonly used.
They have no loose parts to be mislaid or lost.
They are made of brass and will not rust.
The U-shaped Gasket interchanges in couplings ¼-inch to ¾-inch.

### CLECO VALVES


Style P.O.


Style M.O.


Style A.

Style P.O.—Made in sizes ¼ in., ⅜ in., ½ in., ¾ in., 1 in., 1¼ in., 1½ in., 1¾ in., and 2 in. Pipe Outlets. Inlets are one pipe size larger.
Style A—30° Angle Valves, are made in sizes ½ in., and ¾ in.
Style M.O. Valve—Has 1 in. Inlet and Bowes Coupling Outlet, Connects with Bowes sizes ¼ in. to ¾ in.

### CLECO GROOVED HOSE NIPPLES




Grooved Nipples when attached to the Hose with Wire Clamps as illustrated cannot "blow out." Wire clamp tool shown below applies the wires to hose.

**The Lightening Hose Clamp Tool** illustrated applies wire clamps at a cost of 1½ cents each.




**In stock:** Riveting and Chipping Hammers, Air Drills, Emery Grinders, Sand Rammers, etc.

**Use Annealed Wire No. 14**

**IMPORTANT:—The Small Leaks in your "AIR LINE" mean serious loss in DOLLARS. Have you any idea of the amount of "Air" wasted in small leaks at your connections? Air Leakage through 1-16 in. opening equals 5.32 cu. ft. per minute at 80 lbs. It will pay you to install Bowes Couplings and Cleco Valves, which will stop costly leaks.**

**Bulletins Nos. 43, 44, 46 and 48 mailed on request.**

**THE MODEL HOSE LINE** illustrated shows correct styles of couplings and valve to use and proper way to attach the Cleco Never Slip Hose Clamps to Bowes Couplings. No "blow-offs" can occur when "Cleco" Clamps are used.

## CLEVELAND PNEUMATIC TOOL CO. OF CANADA, LIMITED

**84 Chestnut St., TORONTO, ONT.** **337 Craig St. W., MONTREAL, QUE.**



TRADE MARK

MAGNOLIA ANTI-FRICTION METAL

MAGNOLIA ANTI-FRICTION METAL

TRADE MARK

*New Truths and Old Fallacies*

# Hardness of Alloys—*Continued*

We have referred several times to the compression test of alloys made by the American Society for Testing Materials, and we give the figures below:

| No. | Copper | Tin | Antimony | Lead | Deformation of Cylinder 1¼" dia. x 2½" high at 70° Fahr. At 1,000 lbs. per in² | At 5,000 lbs. per in² |
|---|---|---|---|---|---|---|
| 1 | 3 | 96 | 1 | — | 0.0000 | 0.0010 |
| 2 | 3 | 80 | 17 | — | 0.0000 | 0.0015 |
| 3 | 3 | 81 | 16 | — | 0.0010 | 0.0045 |
| 4 | — | 75 | 12 | 10 | 0.0005 | 0.0025 |
| 5 | 2 | 63 | 15 | 18 | 0.0010 | 0.0030 |
| 6 | 3½ | 20 | 36 | 40½ | 0.0015 | 0.0050 |
| 7 | — | 4 | 1 | 75 | 0.0010 | 0.0050 |
| 8 | — | 2 | 1 | 80 | 0.0020 | 0.0090 |
| 9 | — | 1 | 6 | 85 | 0.0040 | 0.0120 |
| 10 | — | 1 | 7 | 85 | 0.0010 | 0.0100 |
| 11 | — | — | 4 | 87 | 0.0010 | 0.0100 |
| 12 | — | — | 4 | 90 | 0.0025 | 0.0170 |

In analyzing these figures it should be remembered that metals have no ultimate crushing strength, as they spread when the load goes beyond a certain point; also that tin base metals are more resilient than lead base metals and that the former will resume their original form, partially or altogether, when the pressure is removed, whereas a lead base metal will become permanently set under a comparatively light load, and the value of the above figures are somewhat dependent upon whether measurements were made before or after the load was removed. This thought was suggested by the apparently anomalous difference shown between formulas Nos. 1, 2, and 3. If formulas 1 and 2 did not resume their original form under the 1,000 lbs. pressure and partially resume it under 5,000 lbs., then all preconceived ideas are upset as to the value of copper as a hardener, as shown by comparison with the No. 3 formula, which contains a greater quantity of both copper and antimony.

(Continued next month)

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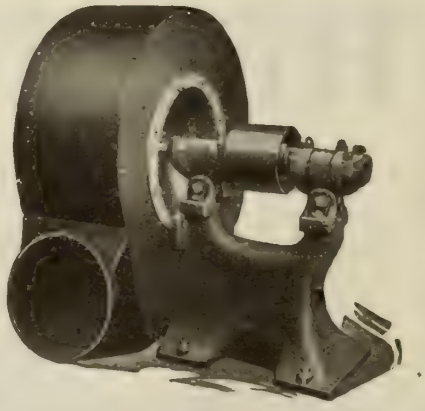
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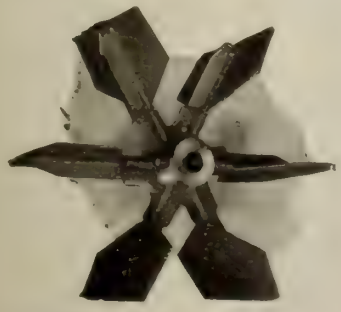
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## *Handle Any Material*



The Canadian Standard Mill Exhausters will handle any kind of material efficiently—sawdust, shavings, cotton lint, or stringy material, gases, fumes, smoke, etc.



They are adjustable to any angle of discharge instantly —have universal type of wheel and carefully constructed, self-aligning oil-ring bearings.

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## *Also BUTT SEAM TUBING*

We have a thoroughly equipped plant for Welding by Electric and Oxy-Acetylene processes. Butt Seam Tubing is also one of our specialties. Tubing made hot or cold rolled finish.

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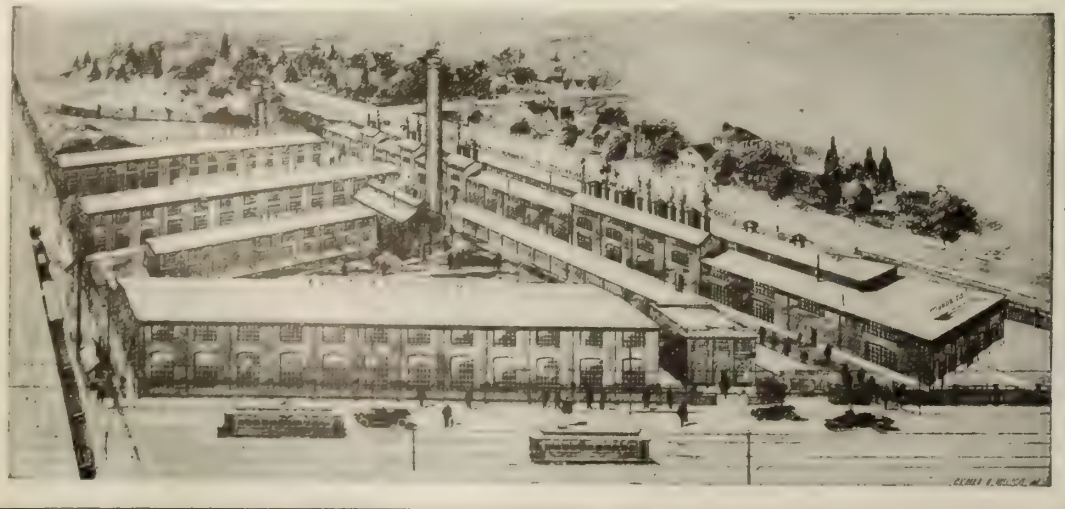
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Into the design and construction of Universal Shapers have gone the united knowledge and best efforts of a staff of specialists in the tool, jig and machine tool field.

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It planes parallel in the heaviest cuts.

It planes accurately—horizontally as well as vertically.

It handles efficiently a wide range of shaper and planer jobs—particularly those considered awkward by **both** these machines.

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Should troubles arise, if you have difficult problems to solve, if only you think your production might be speeded, or quality improved—

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If your difficulties are beyond our district and road engineers, we'll put the factory engineering staff at work to solve your problems.

Send us blue prints and specifications and we'll tell you what a Modern can do on your job.

Modern Plain Grinding Machines are built in 8 sizes—8″x18″ to 16″x60″, all full self-contained—ready for work when set.

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Bear the oak leaf in mind the next time you are buying belting —it will guide you to better belt service.

A leather belt will transmit 25% more power than the same sized belt of other material.

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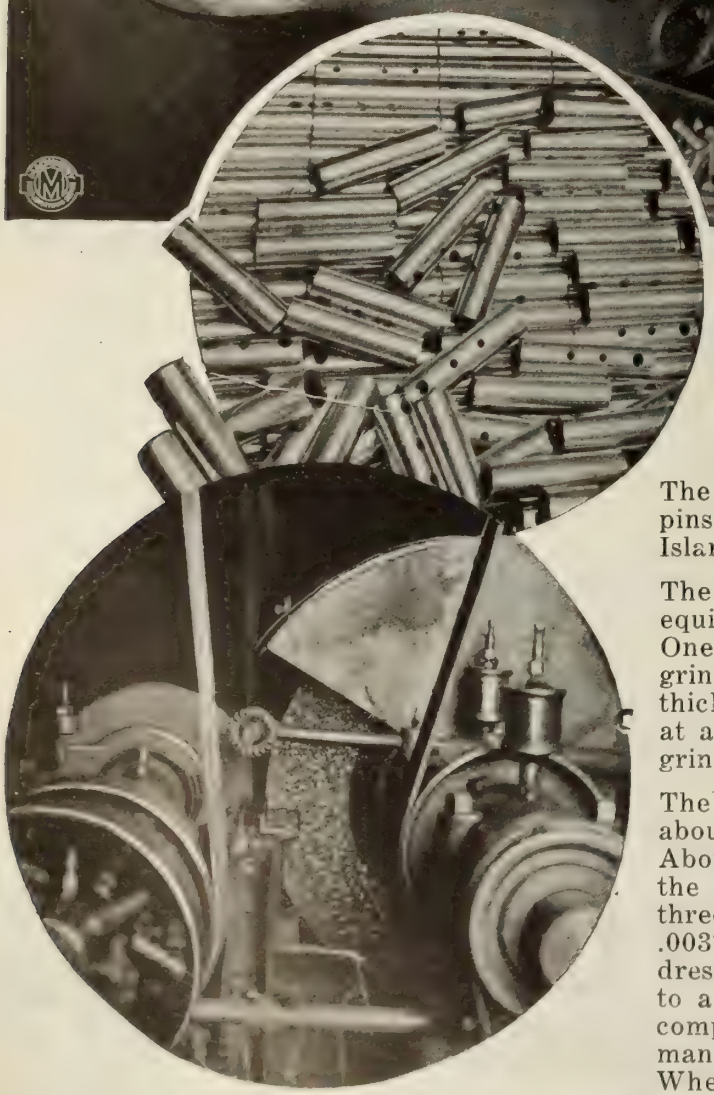
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## Satisfactory for both Roughing and Finishing on this Centerless Grinding Operation

The photographs show the grinding of steel wrist pins at the Houpert Machine Company, Long Island City, New York.

The machine is a Sanford Centerless Grinder equipped with two Waltham Grinding Wheels. One 120—2½ Alowalt, 20″ in diameter, 3″ thick, grinds the parts, the other of the same grade and thickness but only 10″ in diameter and working at a much lower speed feeds the pins to the grinding wheel.

The pins are .678″ in diameter by 2⅞″ long, with about .020″ left on the diameter for finishing. About .004″ of this surplus is removed each time the pin is passed between the wheels—about three or four times or until the diameter is within .003″ of the finished size. The wheels are then dressed and adjusted and the pins are finished to a limit of .0003″. Production averages 50 completely finished pins per hour—and the foreman gives much of the credit to Waltham Wheels.

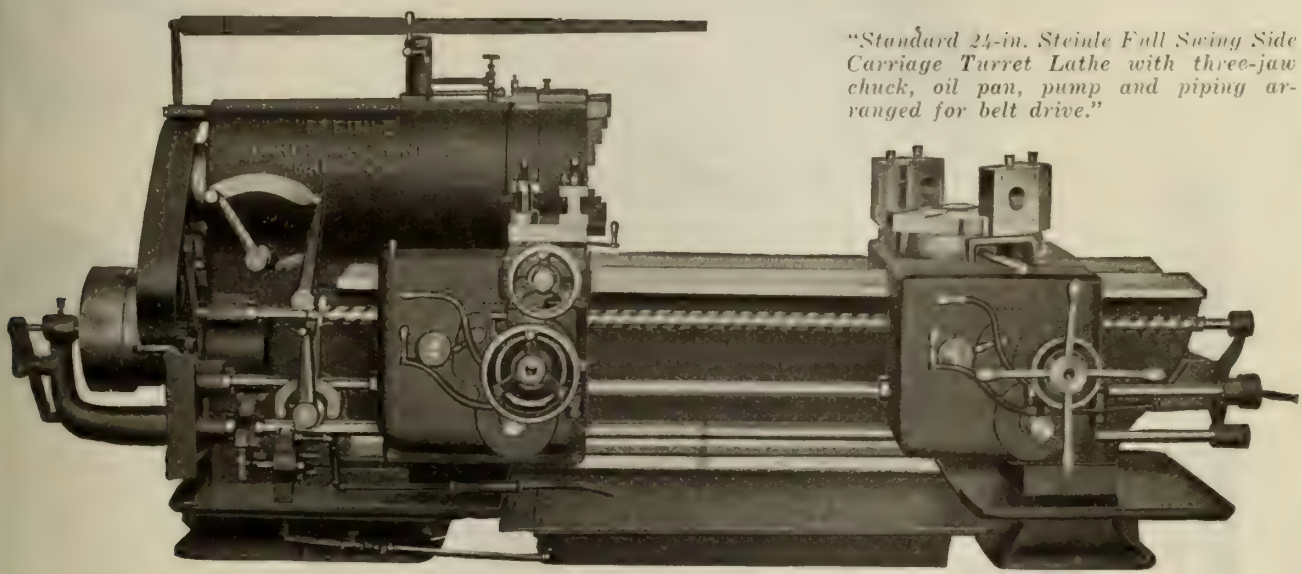
*If you have a unique or difficult grinding job try a Waltham Grinding Wheel. There's one for every class of work and the right one is bound to be satisfactory.*

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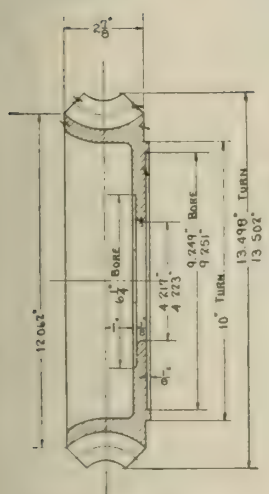
# STEINLE

## Full Swing Side Carriage Turret Lathes



*"Standard 24-in. Steinle Full Swing Side Carriage Turret Lathe with three-jaw chuck, oil pan, pump and piping arranged for belt drive."*

## *Chucking Problems for Steinle Solution*




Material: Cast Iron
Time: 17 Minutes

In a large New England plant a battery of six Steinles is engaged in producing a wide range of parts, of which the one shown is a representative illustration of the rapid production obtained.

The gear is of cast iron and the operations completed include boring, counterboring, forming, shoulder, facing both sides of rim and forming gear diameter.

PERFORMANCE COUNTS, and that is why this manufacturer has just ordered two more Steinles.

***"Send us drawings of your work so that our Engineering Department can estimate Steinle production, or ask to have a representative call upon you to determine what work can be produced to advantage on our machines."***

## Steinle Turret Machine Company

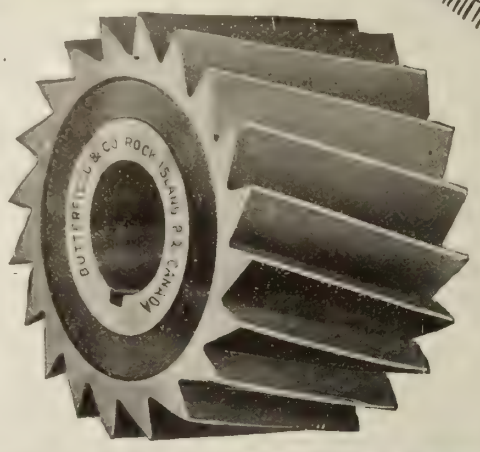
*Originators of the Full Swing Side Carriage Turret Lathe*

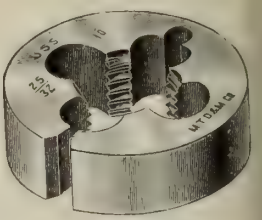
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AGENTS—Machine Tool Engineering Company, Singer Building, New York City; Cadillac Tool Company, Dodge Power Building, Detroit, Michigan; L. G. Henes, 75 Fremont Street, San Francisco, California, and Title Insurance Building, Los Angeles, California. FOREIGN—Leo C. Steinle, 53 Victoria Street, London, England.

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# BUTTERFIELD



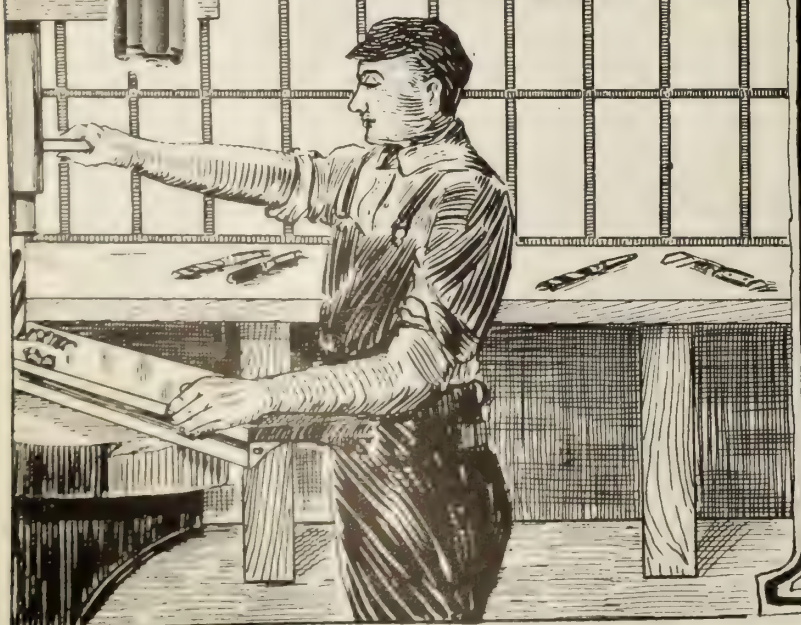








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THE workman who is supplied with Butterfield tools tackles his various jobs with confidence; he does his work deftly and quickly, and at the end of the day can show far greater production than if he used an indifferent line of tools. Butterfield Taps and Dies, Drills, Reamers, and Milling Cutters are noted for their strength and keen cutting qualities. **"They are the Tools You Buy Again."**

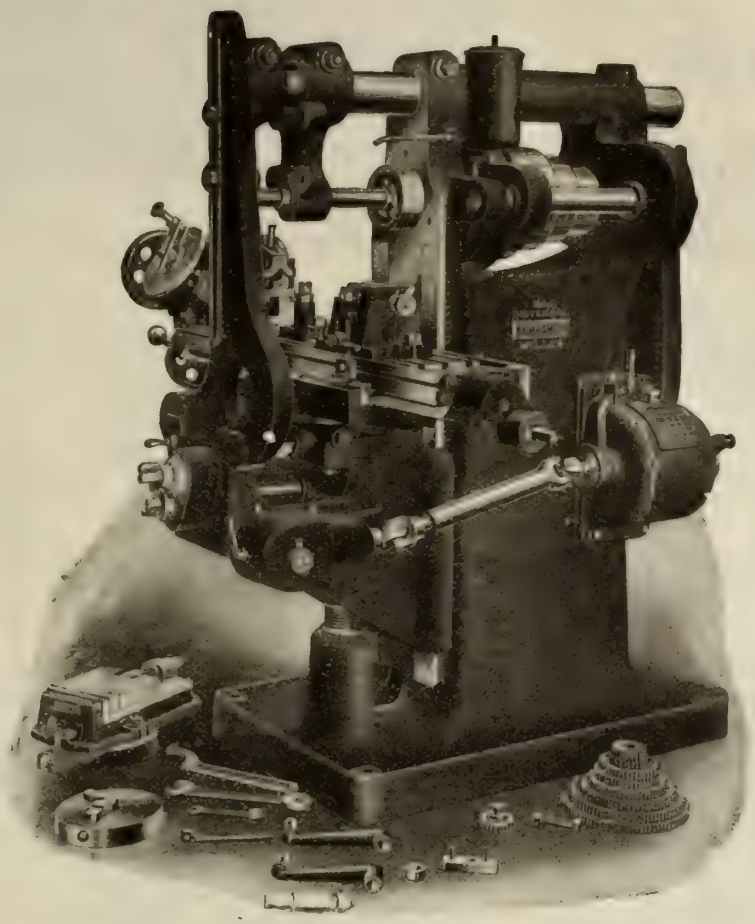
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It has always been, and will continue to be, the purpose of the Kempsmith Company to produce machines of the highest quality only, suited to the most advanced practice.

Every machine, whatever size or type, is put to test under cuts and conditions purposely more severe than it will encounter in even the most progressive shops, and when it leaves our factory it has our positive and definite guarantee back of it.

***Literature will be gladly sent upon request.***

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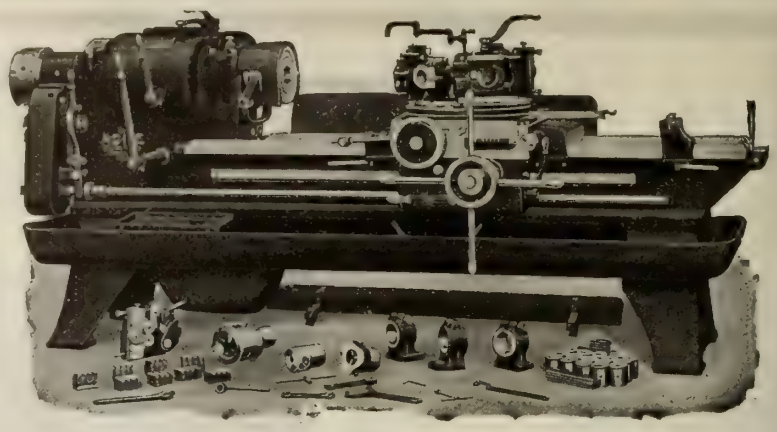
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# The Cincinnati Acme



## *A Flat Turret Lathe that Speeds Production*

Right now in your shop the greatest demand of a lathe is for accurate speed. For speed means economical, efficient production. Cincinnati Acme Flat Turret Lathes are built for just this purpose and are designed for both bar and chuck work.

The head is cast solid with the body. The whole construction is remarkably rigid and compact, insuring at all times fast, reliable service. And only the gears doing the actual work run, a fact which means power bills cut to the minimum.

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# Heat Under Accurate Control

Here is an important factor in the heat treatment of metals. An intense heat, rapidly developed, and always under accurate control of the operator, is a feature that distinguishes

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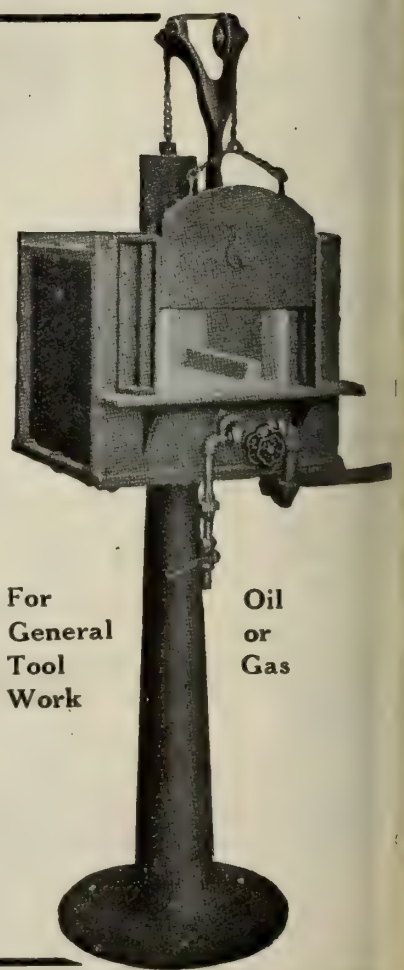
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Combustion is perfect and no flames come in contact with material. Built to stand the highest temperature. Doors are properly counterbalanced. In every way BELLEVUE FURNACES meet with the demand for durability, efficiency and convenience.

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**Oil or Gas**

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Milled or Twisted

From the raw materials entering the steel to the finished drill a rigid inspection is given after each operation, which assures a superior product.

*Prompt Deliveries on Special Sizes*



## High Speed Twist Drills

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*All Standard Sizes Carried In Stock.*

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More Speed
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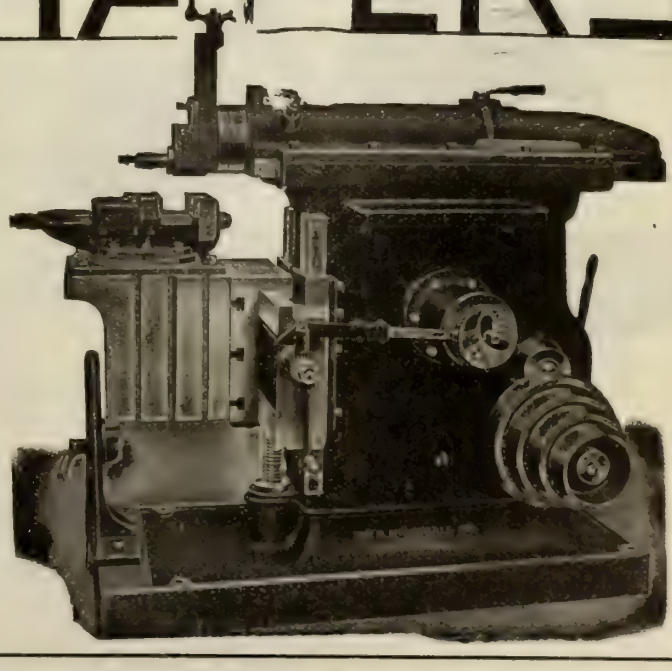
16 and 20 inch Crank

# McDougall SHAPERS

Modern methods of manufacture require modern tools. McDougall 16 and 20-inch Shapers embody the best features of all machines which have been placed upon the market and can be depended upon to produce work accurately and fast.

An important feature is the column. It is massive in construction, well braced and reinforced internally. Has ample opening under ram for keyseating or other long work. Bearings for ram extend beyond vertical line of column both front and back. The ram is of exceptionally strong construction.

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## The R. McDougall Co., Limited

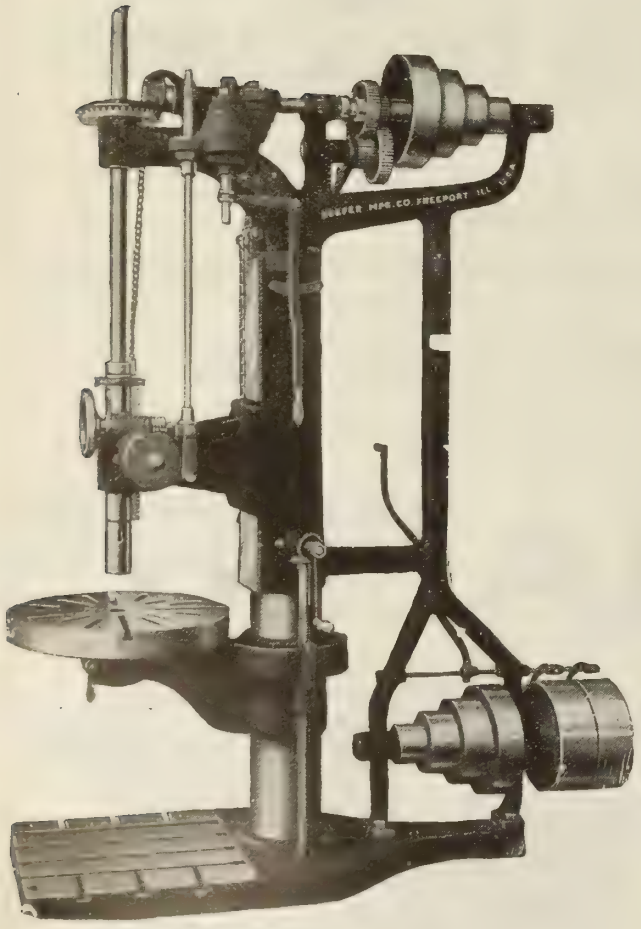
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THE CANADIAN FAIRBANKS-MORSE CO., LIMITED
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## A driller service worth consulting




The value of any service depends on two things: the practical knowledge behind it and the spirit in which it is offered.

Hoefer Driller Service is worth consulting because of its helpfulness judged by **both** standards.

The practical knowledge behind Hoefer Service embodies a driller-manufacturing experience of over 25 years. But it includes more than that. Every Hoefer Salesman is first of all a shop man. He learned his subject in a shop, he used drillers long before he started to sell them, and he is capable of giving you suggestions of real value, based both on his own experience and that of the many up-to-date shops using Hoefer Drillers.

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Try out Hoefer Service on your present or proposed drilling operations—it may point the way to unexpected possibilities for saving.

28

*Send for the Hoefer Catalog.*

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# Norton Alundum Grinding Wheels for Economy

*When you are grinding on production work it is essential that you obtain the best wheel for each particular job.*

*The price of the wheel is only one element in the matter.*

**The factors that govern the costs on production work are:—**

Pieces Ground or Weight of material removed — Per Hour

Pieces Ground or Weight of material removed — Per Wheel

Labor Cost

Overhead Cost

When these figures are obtained and compared you will find that you can use Norton Alundum grinding wheels to advantage.

You can expect the same results on wheels for general shop work even though such figures are not available.

We are ready to help you in any way possible, and if you will advise us the job you are doing—we will recommend both wheels and methods.

## NORTON COMPANY OF CANADA, LIMITED

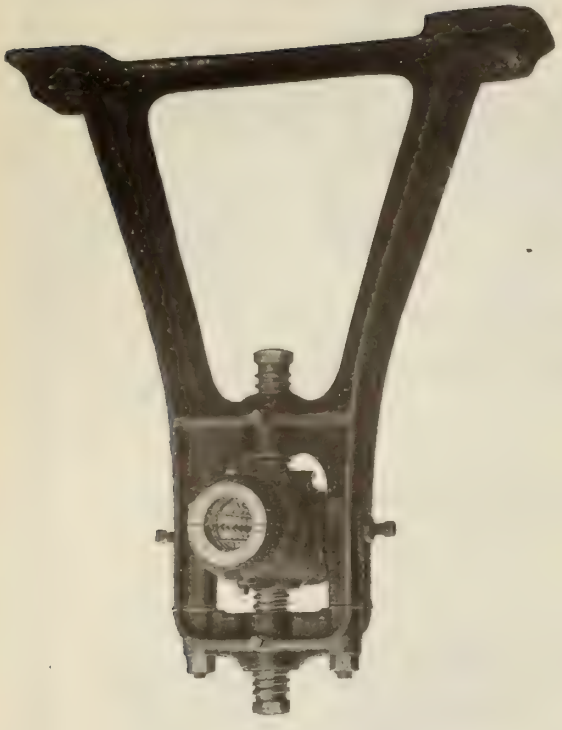
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## Roller Bearing Hangers Increase Production

Instead of absorbing power in rubbing friction, as plain bearings do, Hyatt Roller Bearing Hangers transmit power to the machines where it can do useful work.

Shafting supported by Hyatt Roller Bearing Hangers turns so easily that at least 15% more power is sent to the machines, increasing production at least 15%.

With power costs steadily increasing it will pay you to install Hyatt Roller Bearing Hangers and turn more of your power into salable products.

The Fairbanks-Morse catalogue contains valuable information regarding Hangers, Pillow Blocks and all shafting and transmission material. Consult the catalogue and write our nearest branch for any special information you may need.

**If it isn't here —write us**

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# Continuous Milling

Uses of Drum—Rotary and reciprocating types of continuous millers. Milling end, top, and bottom of automobile parts.

*By J. H. Moore*

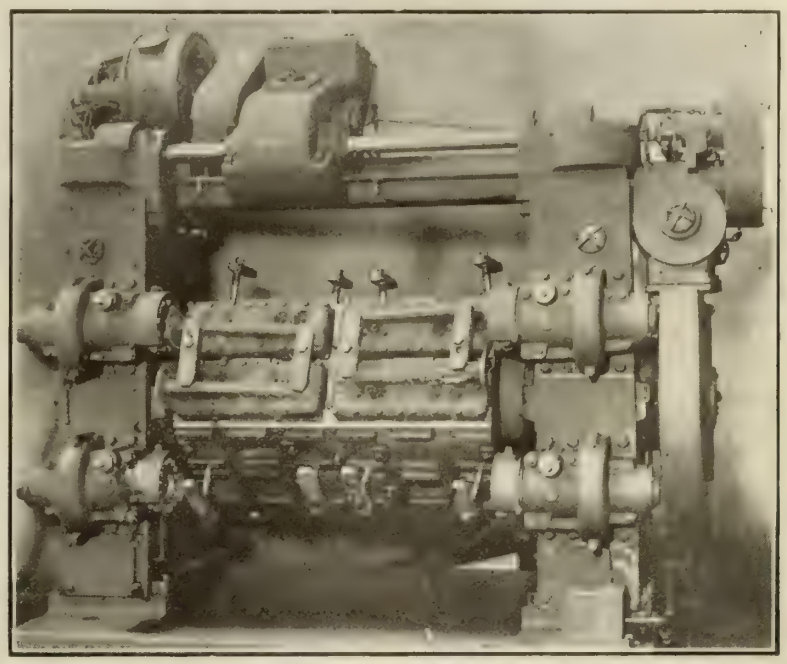
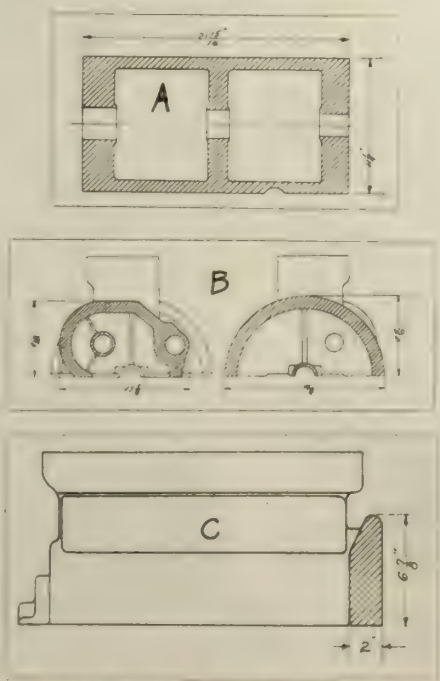


FIG. 4.—MILLING END OF CYLINDER HEAD FOR TRACTOR MOTOR

"A MACHINE that, while holding the work, operates upon it with a revolving cutter or mill may be termed a milling machine." These words are taken from a rather old text book simply to illustrate the fact that milling machines have developed wonderfully within the past few years, and while the above words still convey the principle of milling, they are rather weak in applying to the modern miller.

Walk through an up-to-date manufacturing plant today and what do we find? Batteries of milling machines, large, medium and small, each type of miller being especially adapted to certain classes of work, and where conditions permit continuous millers are used which practically eliminate the human element. All this has taken time. The first miller produced was very rough in character, yet had the correct principle behind it. Since that time improvement upon improvement has taken place, until at the present time we have work being performed on millers that was unthought of a few years ago.

The automotive industry has been largely responsible for this development, as their problem soon became one of quantity production, plus interchangeability. The various automobile concerns soon realized that if they were to be successful in producing cars at a minimum price, they must have ideal production facilities. This of course led machine tool designers away from the beaten path, special machines being the ultimate result. The value of a machine specially equipped to produce a standard product in quantity soon become apparent, and today it is a common occurrence to order a machine to produce some certain part. In other words, the machine is built around the piece, and specially adapted to the design of the part to be produced. True, this may only mean a standard machine with certain attachments or changes in design, but in many cases it means a brand new development.




EXAMPLES OF WORK PERFORMED.

### Continuous Millers

One of the machine tools that has received a great deal of attention lately is that of millers, especially the continuous type. As the name implies such machines make possible the performing of duplicate operations without loss of time for loading or unloading of fixtures.

Through the courtesy of the Ingersoll Milling Machine Co., Rockford, Ill., we are able to illustrate in the present article certain types of continuous millers that have been produced by them for various purposes. With each photograph we will embody definite data regarding the machine and the product being manufactured, so that, in a way, the article will be a lesson on continuous milling practice.

It is of course easily understood that

milling machines of the continuous type do not always offer decided advantages over the more conventional styles used in the average plant. Each has its proper place, but there are unquestionably operations in large production plants where continuous milling can be adopted at considerable saving. However, let us leave this phase of the question for the present and consider one type of machine as used in continuous milling.

### The Drum Type

Referring to Fig. 1, we see a drum type continuous milling machine that was built to mill the ends of a heavy duty tractor motor at the rate of 30 per hour. The large drum is mounted on a heavy axle and is driven from each side by huge worm wheels. It will be noted that the drum is six-sided, and that each side is fitted with a fixture to hold one casting.

The principle of such machines is briefly this: The drum, which in reality is the table, holds the castings and revolves past the spindle heads which are mounted on the housings at each side. In the machine shown at Fig. 1 there are two sets of heads, the upper heads carrying roughing cutters, and the lower ones finishing cutters. The operator stands at the rear of the machine, and as the drum revolves up past him, he removes the finished work and replaces the same with rough castings. The operation of the machine is continuous as the operator merely loads and unloads the fixture. The rate of feed is fixed, also the spacing of the fixtures, this determining the interval between cuts. In other words, maximum production has been carefully planned and the operator has no control over this factor.

It is easily understood that such a machine must be extremely heavy and rigid. The work is at a considerable distance from the axis of the drum and must be supported rigidly in order that an accurate, heavy cut can be taken. For this reason these machines are very rugged in design and the one illustrated at Fig. 1 weighs approximately 40,000 pounds.

By studying the photograph it will be seen that the heads may be adjusted vertically on the housings if so desired. Each head is also fitted with a special quill so that the cutter can be adjusted in or out as required. The drum itself is so arranged that it can be removed from the axle and replaced with another drum to accommodate different work, should such a change be necessary. As a general rule, however, this is seldom done, for, after all, such a machine as shown is a single purpose tool, and is not used except where there is enough work on some standard operation to warrant its installation. An outline drawing of the surface being milled is shown at A in Fig. 2, and a finished casting is produced every two minutes.

The drum travels at the rate of one revolution every twelve minutes, and it revolves continuously. In the case of the machine shown, the castings are brought to, and away from, the machine on a belt conveyor. The castings are machined within .002 inch of both square and parallel. The machine is 118 inches high overall, occupies a floor space of only 64 square feet and is driven by a motor mounted on a top plate, which is, of course, concealed in the photograph. The drum is mounted on an axle 13⅜ inches diameter, and is driven from each end by huge worm and worm wheels 29 inches in diameter. These figures show clearly the massive proportions of the machine.

Another example of the drum type is shown at Fig. 3. In this case the machine has a 42-inch worm wheel drive and was built to mill the top and bottom of a passenger car cylinder block at the rate of 240 every eight hours. The drum as before is six-sided, and in this particular machine the weight is 25,000 pounds.

One might go on indefinitely illustrating different applications of this type of miller, but let us merely show one more.

At Fig. 4 is shown a machine that was built to mill the end of cylinder heads on a farm tractor motor. The weight of the machine in this case is 27,000 pounds, and it is driven by a 42-inch worm wheel. It has a five-sided drum, the surface of which is designed to accommodate fixtures for twenty castings. As will be noted the castings are arranged in two rows, four on each side of the drum. The photograph was taken while the machine was idle, and shows only one side of the drum loaded. One hundred and forty castings are finished every hour on this machine. These machines can be built in almost any form, so that it is impossible to give in a short article of this kind more than a few installations.

### Rotary Type

There are a number of continuous millers based on the principle of a revolving table turning beneath a column which contains fixed spindle heads, but the type shown at Fig. 5 is what is

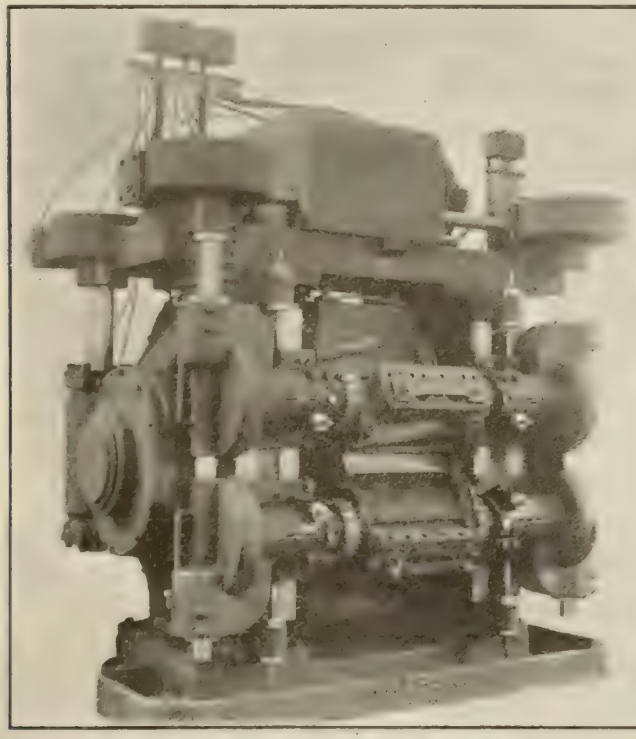


FIG. 1—DRUM TYPE MACHINE MILLING ENDS OF HEAVY DUTY TRACTOR MOTOR.

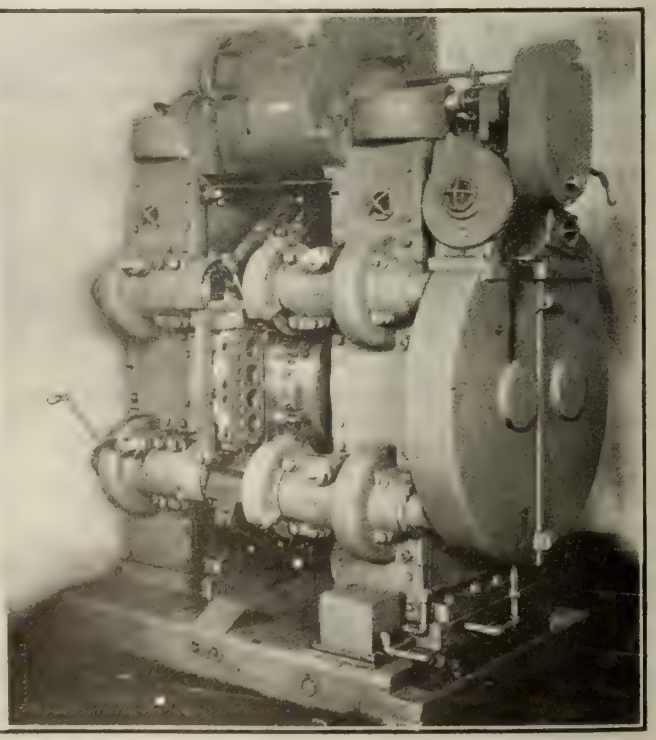


FIG. 3—ANOTHER DRUM TYPE MACHINE. OPERATION IS THE MILLING OF TOP AND BOTTOM OF PASSENGER CAR CYLINDER BLOCK.

known as a rotary table miller. This style machine is built with one or more spindles, and Fig. 5 illustrates a single station, two spindle type machine. It will be noted that two cutters are used, one for roughing and one for finishing. The work being accomplished is the milling of the top and bottom of a cylinder head for a four-cylinder motor, and with the equipment shown 30 castings per hour are produced. The machine depicted weighs 10,000 pounds and occupies only 24 square feet of floor space. The fixtures used hold two castings in the first operation and two in the second.

The next illustration, Fig. 6, depicts what is known as a single station circular table machine. It will be noted that in this case the table revolves around a centre column, which also supports the head carrying the spindles. The machine illustrated was designed for milling the bottom of passenger car cylinder blocks, two cutters being used for roughing and one for finishing.

The roughing cutters are at the rear of machine and a portion of one of these can be seen in the photograph. Eight-inch cutters are used for roughing, and a 14-inch cutter, as shown in front of photograph, is used for finishing. The table of the machine is 60 inches diameter, and is fitted with five fixtures. The surface milled is shown in diagram form at B in Fig. 2.

This type of machine requires only a single operator. He merely unloads and reloads the fixtures as they revolve past him at the station beyond the finishing cutter. This machine is particularly useful where both roughing and finishing cuts have to be taken on pieces that are comparatively long, whereas a multiple station machine of the same type will give better results where the surfaces to be milled are shorter.

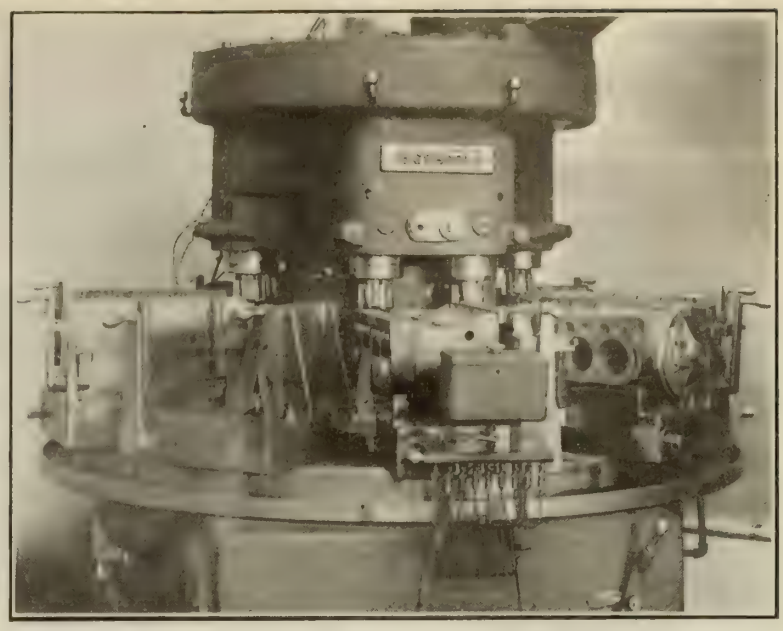


FIG. 7—THREE-STATION MACHINE DESIGNED FOR MILLING SMALL SURFACES ON THE SIDES OF CYLINDER BLOCKS.

Such a machine is shown at Fig. 7. Here we have a miller with six spindles, and three stations, yet requiring only 45 square feet of floor space. The work being done is the milling of a starter bracket pad on the side of an automobile cylinder casting. Both roughing and finishing cuts are taken, each station having a set of two spindles. Nine fixtures are fitted to the table and three men are required to unload and reload the work. Each man takes care of the output from his own particular set of spindles.

The amount of floor space saved by the use of such a machine is self-apparent and, as we know only too well, floor space in a manufacturing plant is a very necessary thing. Such a machine is well adapted to work of this nature, in fact to any work where a small pad at one side of a comparatively large casting has to be milled. Forty castings are produced every hour with this equipment, and the surface milled is clearly shown at C, Fig. 3.

**Reciprocating Type**

A rather interesting style of continuous miller is shown at Fig. 8, this being known as a two-spindle reciprocating type. This machine was designed for milling the pads on two surfaces of a transmission bell housing. Thirty castings are completed every hour, and the

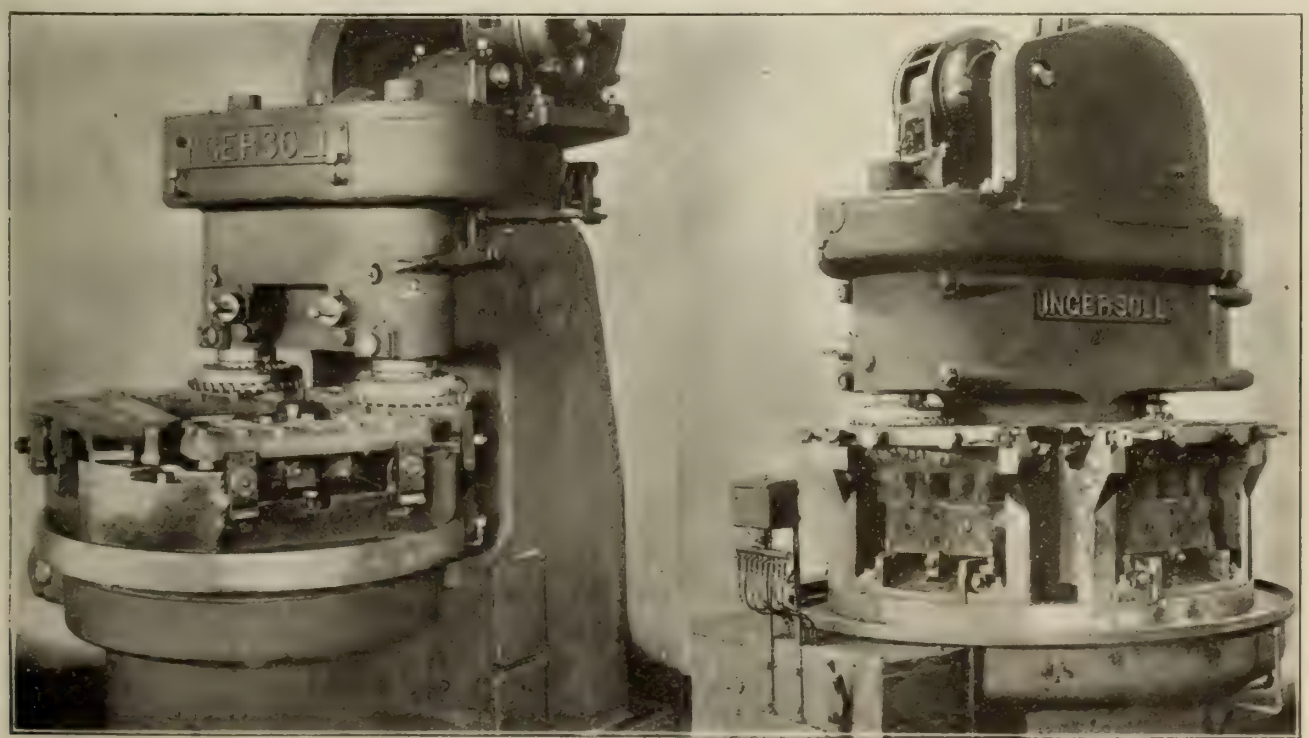



FIG. 5—A SINGLE STATION TWO-SPINDLE MACHINE MILLING TOP AND BOTTOM OF CYLINDER HEAD

FIG. 6—A SINGLE STATION CIRCULAR TABLE MACHINE MILLING THE BOTTOM OF PASSENGER CAR CYLINDER BLOCKS

machine itself weighs about 9,000 pounds, and occupies 36 square feet of floor space.

It will be noted that in this type of machine the continuous feature is not obtained through any revolving table or heads that carry the spindles. In this case the table is of conventional style, and is fed longitudinally and alternately in opposite directions. The table feeds, however, are automatic and continuous. Two fixtures are placed on the table, and while one casting is being milled the other fixture is unloaded and refilled with a rough casting.

The operation of this type of machine is very simple. After the first casting has been placed in the fixture, the table feed is thrown in. This takes the table forward at a high rate of speed until it approaches the cutter, when the speed is automatically reduced to the working speed, and continues to feed the work into the cutter at this rate until it has cleared the piece. When this cut is being completed the other fixture is being loaded.

The first piece being completed, the table feed is automatically reversed at a high rate of speed until the casting in the second fixture is brought up to the cutters. Again the feed is automatically reduced to working speed, and the same cycle repeated. The time of these changes is so arranged that the operator has ample time to load and unload his work, but should it be necessary to stop the machine for any reason, a throw-out lever is ready at hand.

### Fixtures and Cutters

It will have been noticed throughout the description of these machines that merely a passing remark has been made regarding the fixtures and cutters used. This was done, not because of their unimportance, but through a desire to leave this subject to the last. It is easily understood that to make any machine efficient, the very best fixtures should be used. The operator can handle a well-designed fixture quickly, feeling sure at the same time that the piece is located properly. In other words, the operator requires confidence in his fixtures. The human element is practically eliminated, in as far as the machines themselves are concerned, so that in continuous milling, or in fact in any production work, it is equally important to make fixtures as foolproof as possible. This is said in all due respect to the operator, the idea being to help the workman, rather than cast any reflection on his ability. The concern whose machines we have illustrated tell us that they themselves lay no great claim to standardization of fixtures. As they put it, "We make each fixture to suit the work, as after all each is a special job in itself."

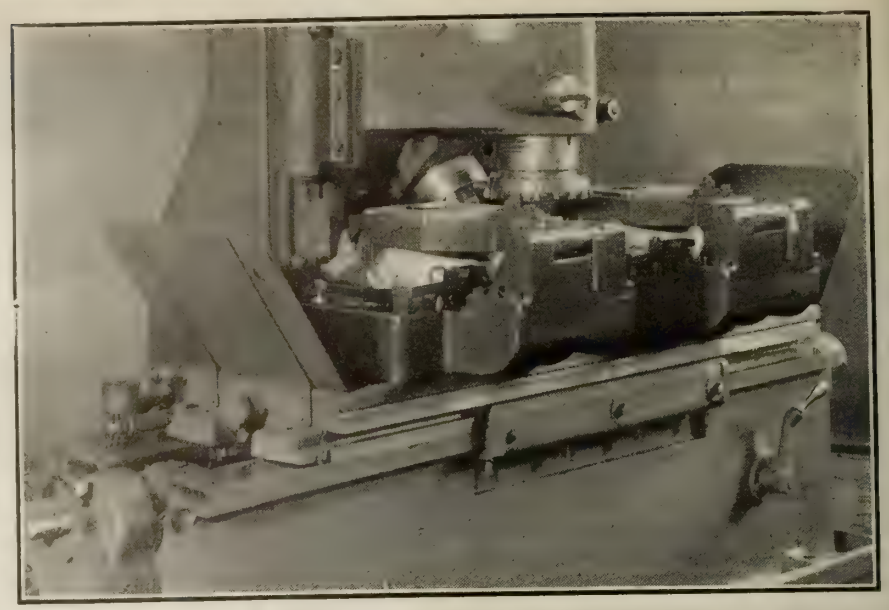


FIG. 8 TWO-SPINDLE RECIPROCATING TYPE OF MACHINE, USED FOR MILLING THE PADS ON TWO SURFACES OF A TRANSMISSION BELL HOUSING.

There are occasions in jig and fixture work where standardization of fixtures is a good thing, but in cases such as we have illustrated, and where the work is of a varied nature, each proposition requires different handling.

Of equal importance with the fixtures is the cutters. A cutter that will produce satisfactory results on one job will not always do on another. As a rule, however, a standard form of cutter will cover the majority of cases. The inserted tooth cutter is perhaps the best of any for work of the nature we have been describing, and Fig. 9 gives a good idea of the form of such cutters. As stated before, however, there are cases where it is wise to make special cutters to suit the nature of the work. After all, it is largely a matter of experience, and in a case where one is undecided they can readily call on the aid of the manufacturers themselves, who through experience are more familiar with such problems. There was a time when manufacturers were not so free with their advice and information, but this change is only another sign that we are waking up to the fact that it doesn't pay to build a stone wall around ourselves, for, if we do, we not only keep others out, but keep ouselves in as well. There is no reason why anyone should fail in a manufacturing problem to-day with the splendid advice at hand on all sides. This applies not only to continuous milling, but to all other manufacturing operations as well.

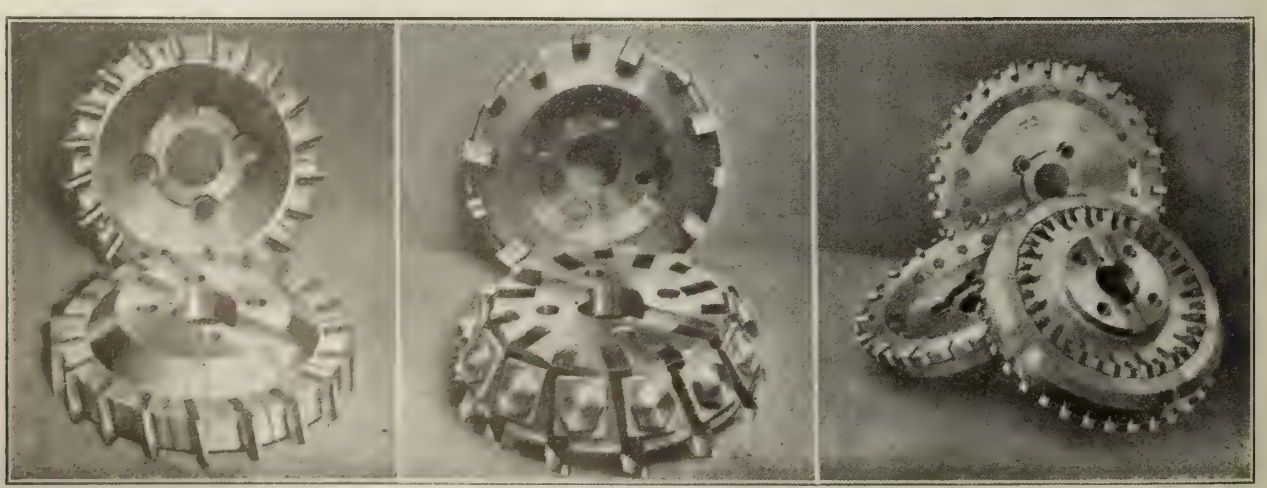


FIG. 9 SOME OF THE STANDARD INSERTED TOOTH CUTTERS. READING FROM THE LEFT THEY ARE KNOWN AS TYPE A, B AND Y.

# Continuous Milling of Six-Throw Crankshafts

## Milling of Shafts to Definite Length—Milling Both Ends of Six-throw Crank Shaft—Machining a Cast Iron Frame of Extremely Light Section—Milling Cylinder Block on Top and Base

IT is, of course, easily understood that we cannot attempt, in the space at our command, to treat the subject of continuous milling from every angle. In fact, we are lucky if we even hit the high spots. The subject could be talked about indefinitely, and still some new example of its use would be sure to crop up.

However, let us present some further examples of such work, and in this case we are indebted to the Newton Machine Tool Works, Inc., Philadelphia, Pa., for the illustrations shown. As we have already covered the main idea of continuous milling, viz., larger production, with a minimum of lost time, let us proceed to the illustrations.

Fig. 1 depicts the milling of 1⅝ inch diameter shafts to a certain length. These pieces are produced at the rate of 250 per hour, and the work is accomplished on a continuous type of machine specially adapted for facing work of varied nature. In this particular operation the intermittent feed and rapid traverse mechanism is used. That is to say, when the pocket containing the pieces has passed the cutters, the feed automatically trips and engages the rapid traverse, this advancing the work holding drums at a ratio of 10 to 1. Just before the next pocket containing the shafts comes into place, the rapid traverse is tripped, and the feed motion is re-engaged.

The loading of the drums is performed on the opposite side to that shown on the photograph, and the declampage, and unloading of the drum in this particular operation is automatically performed. It will be observed from the photograph that the clampage is obtained through a toggle lever. As the drum rotates, this lever is released by coming in contact with two studs that are bolted to the housing of machine. This allows the shaft to roll on to the pans, which have an inclined surface as shown. From here they go into a tote box, and in some cases on to a roller conveyor. In the application shown there are ten stations or pockets on the drum, each holding three shafts.

Fig. 2 depicts the same type of machine set up for milling both ends of a six throw crankshaft. It will be noted that the jig locates the shaft by the plungers in the center, and that they are placed alternately, this bringing them so close that the jump mechanism, as used on Fig. 1, is not necessary. The production on this work is 90 shafts per hour. The shaft overall is 33 31-32 inches in length, and the large flange end is 5 1-64 inches diameter.

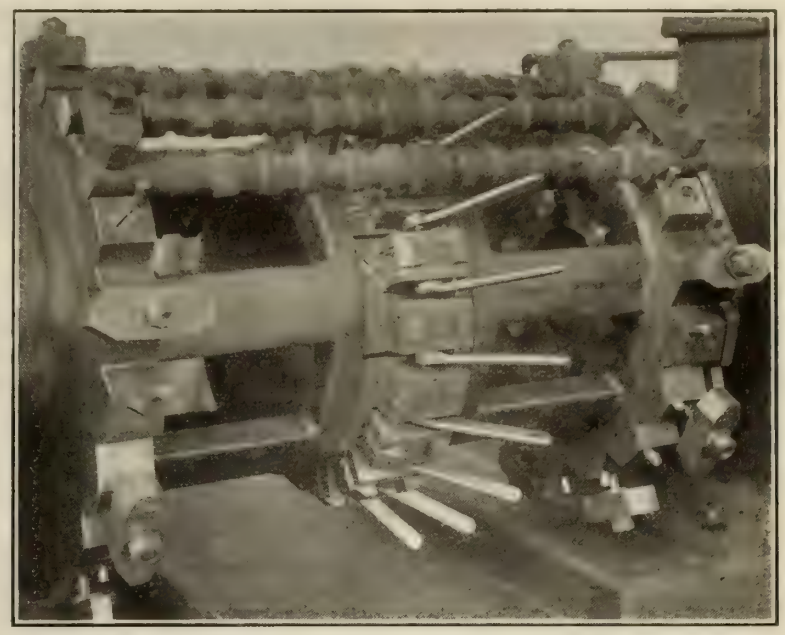


FIG. 3 DOUBLE FACING CAM SHAFTS.

### Another Example

At Fig. 3 is shown another double facing operation, the work in this case being a cam shaft. In this jig you will notice that the cam shaft is located by a universal chuck in the center, this working from the center bearing. The pieces are again placed so close together that the jump feed is not necessary. The production in this case is 180 per hour, the shaft being 1 5-16 inches diameter and 30 29-32 inches long.

The next operation, Fig. 4, is the machining of a cast iron frame of very light section. The piece is clearly shown on the photograph, and owing to its peculiar shape it requires rather elaborate jigging to ensure the piece being machined without distortion. It is ma-



FIG. 1—MILLING 1⅝" SHAFTS TO A DEFINITE LENGTH.

FIG. 2 THE SAME TYPE MACHINE MILLING BOTH ENDS OF A SIX THROW CRANKSHAFT.

chined on both ends, and is 4½ inches deep in section by 18 15-16 inches long. Forty-five pieces per hour are produced.

All these examples are produced on the same type machine, and briefly here are the chief points that will interest the designer especially. One head of the machine is mounted stationary at the end of the base, while the other head is adjustable so as to take care of work of varying lengths.

There is individual adjustment to each cutter spindle for setting the depth of cut, and for accurate work both roughing and finishing cuts are taken. The bearings of machine are oiled by a cascade system of lubrication, so that the machine does not require skilled help in its operation. The chief point is to learn the method of inserting the parts in the jig.

The cutter spindles are driven by worm and worm wheels, and the drum spindles are revolved by gears, both of which are driven by a common pinion, so that there is no possibility of their being out of register one with the other.

### Drum Type

Next let us view an example of work on the drum type machine. This class of milling is especially adapted for machining surfaces, and can be utilized for machining one surface on two castings, or two surfaces on one casting at the same time. The photographs shown illustrate the milling of two surfaces on all castings, as, by so doing, one handling operation is avoided. In other words, if two castings are placed side by side, and only one operation performed on each, it will require double the amount of handling.

In Fig. 5 is shown a cylinder block being machined both on the top and base. Note that two small cutters are used for roughing, and one large cutter for finishing the surface of the block. It will also be observed that these cutters are not operating upon the same section simultaneously. By machining both operations at the same time absolute parallelism is obtained, whereas if these surfaces are machined separately a certain inaccuracy is almost certain, not to speak of the loss of time.

All spindles on this type machine have individual adjustment and are driven by worms and worm wheels, so arranged that the cutting speed of the finishing cutters is 80 per cent. of the cutting speed of the roughing cutters. Various speeds to the cutters are obtainable by pick-off change gears. The drum is rotated by herringbone gear through worm and worm wheel at predetermined rates which are also variable by the use of pick-off change gears. The drum spindle is of double taper bearing construction with very fine adjustment to prevent any end motion, the other bearing of the drum spindle being provided with a take-up bushing of the split taper type.

It will be observed that all gearing, splined shafts and revolving parts are fully enclosed and run in a bath of oil, pumped from the reservoirs on either side of the machine, to which, of course, the oil returns after having passed through the various bearings. All slow running bearings, such as the spindles, which are lubricated by pipe connections, have a special system of oiling in order that they do not become flooded. In the chucking of the piece, one clamp with a double bearing is used which simplifies the handling operation. Machining the top and the base of the cylinder block is accomplished at a production of 25 pieces per hour. This production has been very considerably exceeded in test operations, but the figures given are production figures only.

Various other photographs have come to the writer's attention on this particular class of machine, but enough has been shown to illustrate its possibilities. Here are a few production figures that we have gathered as average cases. Surfacing the ends of a cylinder block, 35 per hour. Machining both ends of a gear case, 40 per hour. One big feature (which has already been mentioned in the first article in the issue, but which is well worth repeating) is the saving of floor space by the use of such machines. It is claimed that in some cases as high as 80 per cent. of floor space has been saved, 40 per cent. of labor cost and 20 per cent. by machining both sides of pieces at one time.

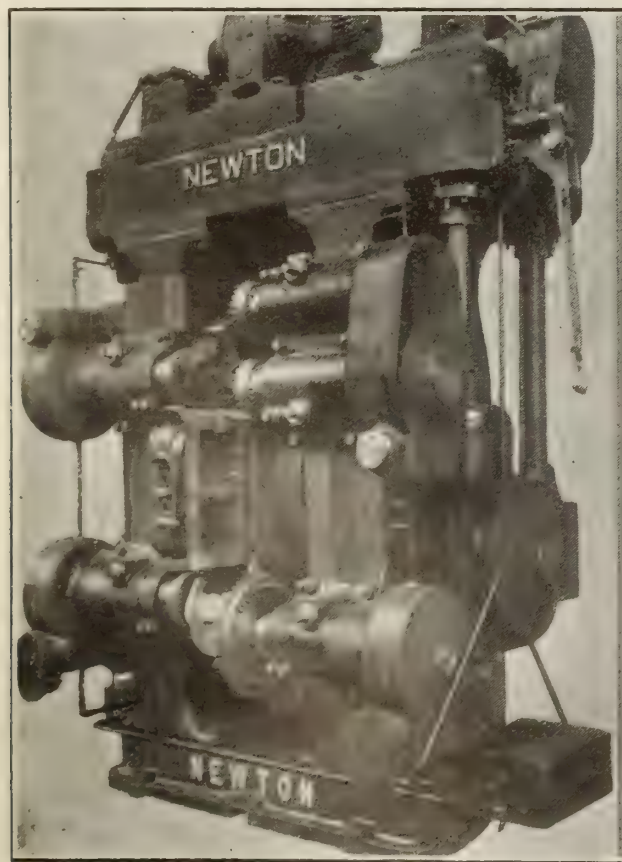



FIG. 5 MILLING TOP AND BASE OF CYLINDER BLOCKS ON DRUM TYPE MACHINE.

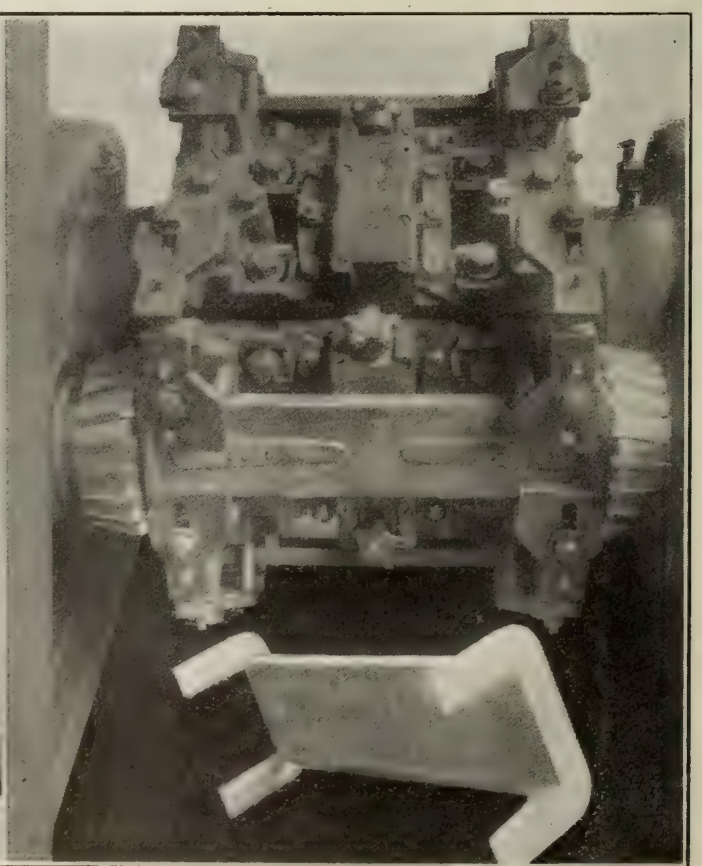


FIG. 4 MILLING A PECULIAR LIGHT SECTION PIECE WITHOUT DISTORTION.

# Auxiliary Drill Heads As An Aid to Production

## The Benefit of Having an Auxiliary Head for Some Special Job—Construction of Common Type of Drill Spindle—Sectional Views Showing Design of Drill Heads—Capacity of Drive Important

By F. SCRIBER.

BY F. SCRIBER

AMONG production units are often found the so-called auxiliary drill heads, these being used as an aid to production. The word **auxiliary** is used presumably because these heads are attached to the spindle, or spindles, of drill presses and have a number of small drill spindles contained in them so that two or more holes may be drilled simultaneously. These heads are usually made specially to accommodate some particular job that is made in sufficient quantity to warrant the expense of making such a drill head. There are, of course, heads on the market that have adjustable spindles that will drill two or more holes at various center distances within the capacity of such auxiliary drill heads. The purpose of the present article is to explain how these heads may be attached to drilling machines, and a few examples of drill head construction are likewise shown.

By referring to Fig. 1 a clear idea of the general construction of a common type of drill spindle may be had. In this illustration A is the drill spindle, B is a ball bearing which takes the thrust of the drilling, this thrust in turn coming against the quill C in which the drill head spindle is revolvably mounted. At the top of this quill is placed a collar D. This holds the spindle in place, while a

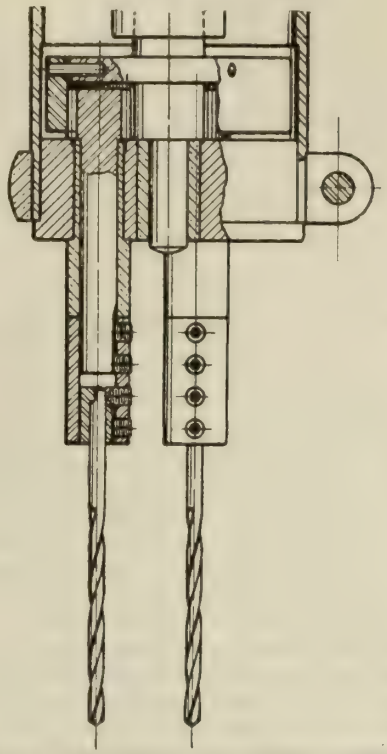


FIG. 1 THREE-SPINDLE FIXED CENTER DRILL HEAD.

rack E is also attached to this quill for feeding purposes. Through the bracket of the drilling machine is placed a stud to which a gear F is mounted. Handle G revolves this shaft, thus turning gear F and moving quill C as required to do the drilling. Spindle A is caused to revolve by having a pulley mounted at end X, while at H is shown the tapered hole in the spindle with what might represent a drill shank inserted therein, all of which is common to one type of drill press, most drill presses being constructed either with single spindle along the same lines, or with a number of units that correspond.

### Three Spindles

A three spindle drill press is shown in Fig. 2, in which this construction is embodied. This illustrates how belts A Fig. 2 drive the spindle and is used to amplify the description which follows.

In Fig. 3 is illustrated a modification of the quill and spindle shown in Fig. 1, where it will be noticed that the quill A Fig. 3 is made of hollow tubing with bushings B and C mounted therein. In these bushings are placed suitable bronze bushings D and H in which the drill spindles revolve and at F and G are shown the gear and operating lever together with the rack E, these being substantially the same as in Fig. 1. The particular feature to be noted in this construction is that the main driving

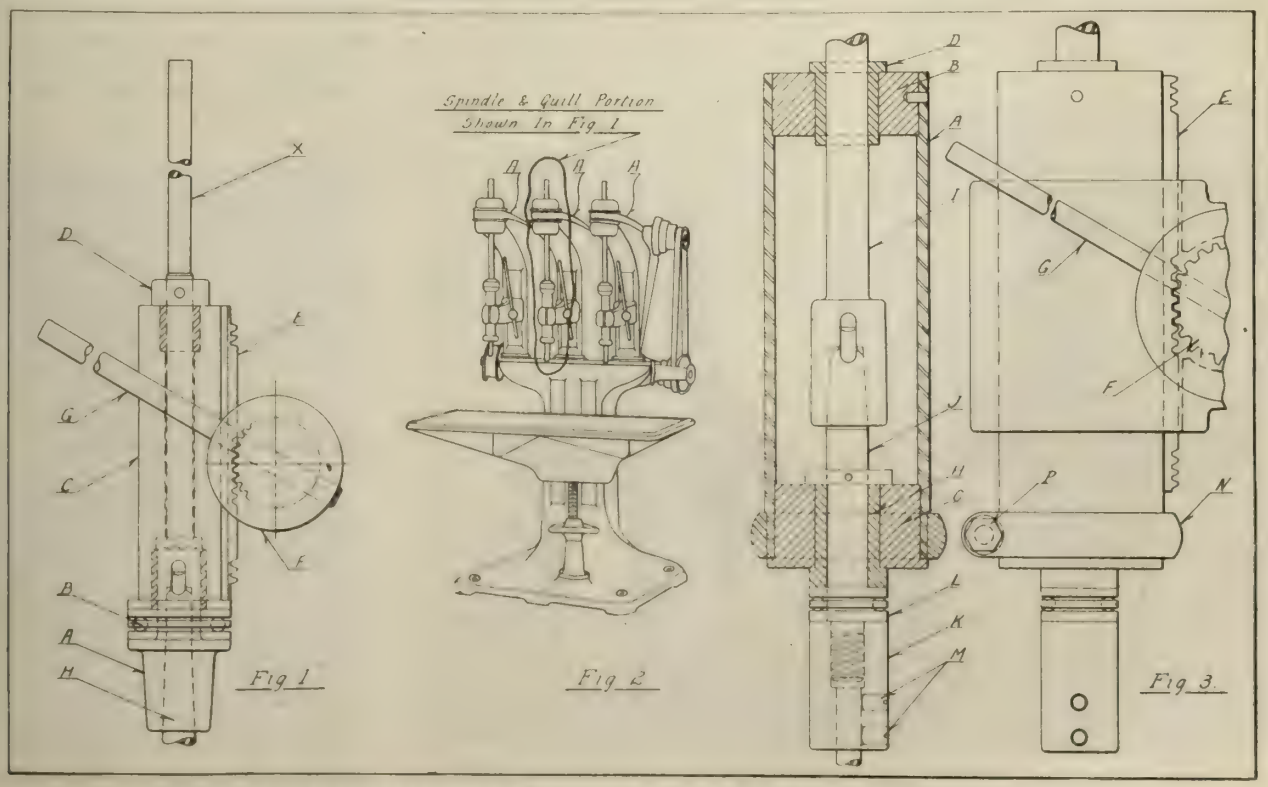



FIG. 1. GENERAL VIEW OF DRILL SPINDLE CONSTRUCTION.
FIG. 2. SHOWING HOW MULTIPLE DRILL HEADS ARE APPLIED.
FIG. 3—SINGLE SPINDLE WITH QUILL ARRANGEMENT.

spindle I ends inside of the hollow quill, and a small spindle J with a tapered shank on it is inserted in the end of the main spindle to which is mounted a drill holding sleeve K, this sleeve being threaded in place with the ball bearing L above it to take the thrust of drilling, while two screws M hold the drill in place. The lower end of the hollow quill has a slot cut in it, and a collar N is mounted on the lower end, this having a set screw P as shown. The object of this collar and screw is to clamp the bushing C securely in place.

In this construction one spindle only is shown, but should it be desired to put in two or three small drill spindles, the bushing C may be removed and a new bushing containing the desired number of small spindles inserted in its stead. These spindles will be geared together on the upper side of the bushing and when thus arranged would be driven by a center stud entering the drilling spindle I in substantially the same manner as is employed for driving the one shown. Fig. 4 gives a good idea of how this can be accomplished, although in this particular construction the spindle of the machine was not made as a hollow quill, but the two drill spindles were mounted in a sleeve. This sleeve was clamped to the regular quill on the machine, and moved up and down with the same in the usual manner.

To further amplify the last construction, and as a means of showing one type of adjustable drill head, let us refer to Figs. 5 and 6. Here are views showing a three spindle adjustable drill head in two extreme positions. Fig. 5 illustrates the drills set at their closest center distances, while Fig. 6 illustrates the same drills set to their greatest center distances. In this construction the drills A are mounted in chucks B, the ball bearing C taking the thrust of the drilling. The drill in the center at D is fixedly mounted to the body of the drill

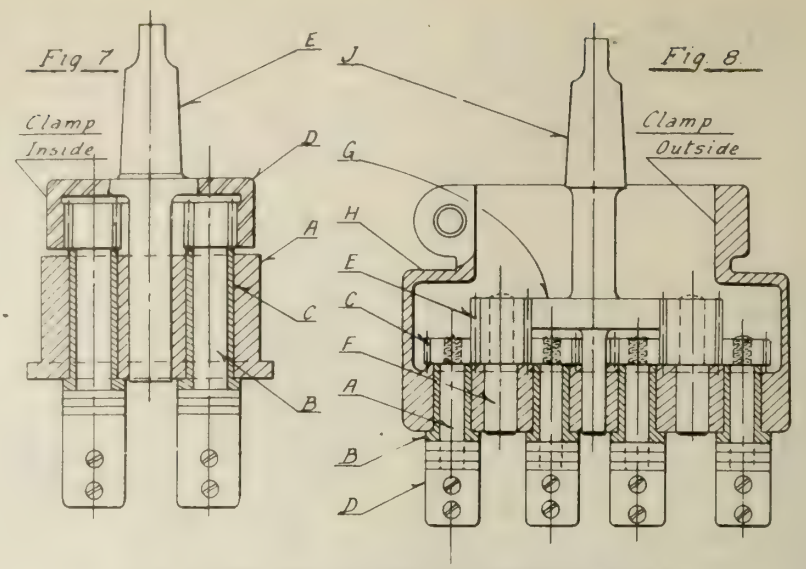


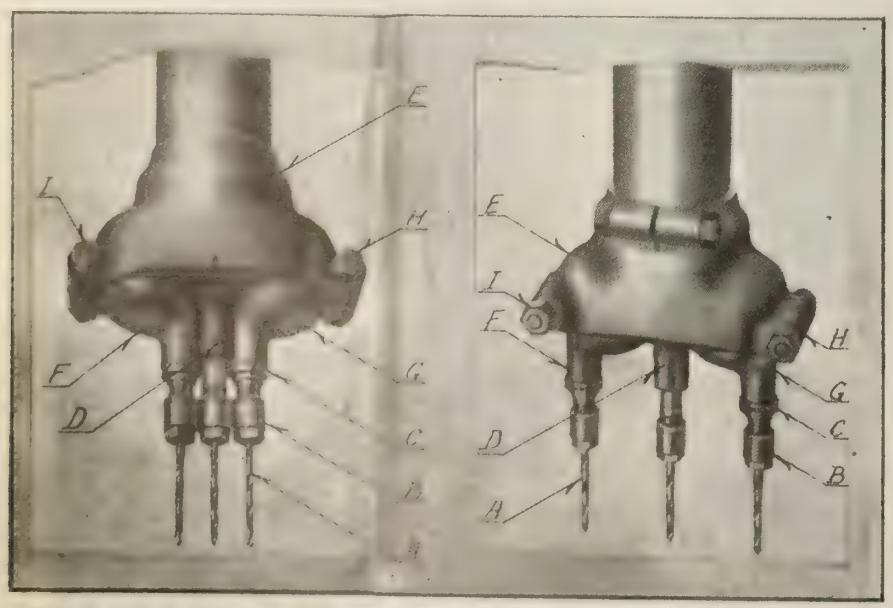

FIG. 7 TWO OR FOUR-SPINDLE INTERNAL DRIVE.
FIG. 8 FOUR OR MORE SPINDLE INTERNAL DRIVE.

head E, while the two outer drills are mounted in carriers F and G in such a manner that they are allowed to pivot about a central point and when set to the required centers may be locked by screws H and I, it being obvious that if two holes only are to be drilled the center drill may be omitted from its chuck, thus leaving only the two outer drills to do the work. If the required centers are closer than what can be obtained by this method, one of the outside drills could be omitted. It is obvious that more than two carriers could be mounted in an auxiliary drill head body, in fact the number of spindles which could be carried is only limited to the driving power of the machine and its practical working capacity. This auxiliary drill head is clamped to the quill of the drill press and travels with the same in the regular manner as if the drill spindle was only making the hole.

Fig. 7 shows a bushing A which contains two drill spindles B and C. These spindles have gears mounted on the top, the gears being driven by an internal gear D. The internal gear is made with a shank on it at E. This entire arrangement is suitable for insertion in the hollow quills shown in Fig. 3, or Fig. 4, and can be used for drilling two or more holes, this depending of course on the capacity of the quill, although it is to be understood that holes drilled with this arrangement of gears would be equal distance from a common center, as there is no adjustment.

To complete the general description, Fig. 8 has been drawn with four drill spindles fixably mounted at different center distances, the four spindles being represented at A, and mounted in bushing B, with gears C, at the top to drive them. The drills are held in chucks D at the lower end of the spindles. Between these spindles are located two gears at E, which revolve on studs F, and a gear G drives these two intermediate gears, which in turn drive the drill spindles. This arrangement of spindles and gears is contained in a casing H, which is clamped on the outside of the drill press quill, while the tapered portion J on the center gear fits into the drill press spindle and is driven thereby.

If the gears in an arrangement of this type are not made to drive all of the spindles in the same direction it will be necessary to use drills having right or left hand spiral grooves depending on the direction of rotation. These drill heads are most advantageously used when made to work with jigs to do one definite class of work and are made with so called straight line drives, or with holes located in a circle or staggered, it being necessary to exercise considerable judgment in devising tools of this type to make sure that more drill spindles are not incorporated in the design than what the capacity of the machine will drive.




FIGS. 5 AND 6 SHOWING THE TWO EXTREME POSITIONS OF A THREE-SPINDLE ADJUSTABLE DRILL HEAD.

# Do You Tolerate Any Dead Time in Your Plant?

## The Importance of Watching How Material is Handled—It Pays to Devote a Fair Share of Time and Thought To The Subject—Added Production at Lower Cost Will Follow

By M. R. MELDRUM *

CUTTING down the dead time is a matter of first importance to every owner of a machine shop, large or small. Consequently the superintendent or foreman who is alert and keen will be constantly on the watch for means to reduce the time spent on anything which is not actual production. It is strange, however, that so much time and energy is devoted to saving seconds on machining operations—time-studies, moving-picture studies, cost analyses, etc.—while a great source of lost time and lost motion remains almost untouched in the average plant.

Machine shops equipped with batteries of the most modern machine tools representing a capital investment of many thousands of dollars are regularly losing a large proportion of their carefully planned economics for lack of intensive study of material handling. What is the advantage of saving ten seconds on a milling operation when the workman has already wasted ten minutes in getting the job into the machine? Where is the saving effected by using a second head on a boring mill when a "helper" must be employed to assist in lifting fly-wheels or gear blanks on to or off the face plate? This article is intended to suggest to the progressive manager a few of the many places around a machine shop where a few hundred dollars invested can earn as much dividend as a much larger amount spent on the actual productive equipment.

Take the hack saw or cutting off machine. A piece of round bar is to be cut up for turning and key-seating. The bar weighs perhaps 500 pounds. Two men are told off by the foreman to get it from the stock rack and put it into the saw. It is heavy lifting, and, quite apart from the risk of serious accident, the men feel entitled to stand and chat for a few minutes after the bar has been set up, leveled, and the saw put in motion. Say five minutes each, ten minutes lost time in all. A length of I-beam hung from the roof, a trolley running on the lower flange, a chain-block suspended from the trolley, and one man can do the job unaided. The danger is eliminated, fatigue is avoided, and one opportunity for a chat has not been presented.

### The Case of the Grinder

Now let us take a look at the grinder. How seldom does one see a quick-acting hoist placed where it will assist the operator to hold a heavy piece steadily at just the right height and with just the right amount of pressure on the wheel. And yet the grinding machine can absorb more time, produce more rejected parts and cause more nasty accidents than almost any other tool in a machine shop. Think of the emery wheels burst through misuse, think of the fingers and arms damaged by the man slipping with an awkward shaped piece. With a chain-block conveniently hung, the casting is balanced so that the operation can be correctly performed, the work checked and re-checked as metal is progressively removed and time is saved because the operator has confidence in his equipment.

### The Lathe

A lathe is more commonly supplied with a chain-hoist than most of the other machine tools, perhaps because so many manufacturers realized during the war the time-economy on shell production resulting from the installation of proper handling devices. But the relative merits of a jib-crane, an overhead crane or a length of overhead track are not always sufficiently considered. The rig that is right for handling shells is not necessarily correct for wheels, shafts, armatures or flanges. The routing of the material, the form of the tote-box and many other factors should be allowed to influence the selection of the handling equipment.

### The Planer

The planing machine is another tool which is often sadly neglected. Because it is a stately looking machine, with relatively slow, ponderous movements, is no reason why it should be allowed long seasons of rest between jobs. On the contrary, when the table is quickly unloaded and as quickly recharged, the percentage of saving is often a surprise as well as a delight to the manager. In the illustration shown, the planer in the background is fed by means of the overhead crane. No special construction was required. The crane runway was simply suspended from the roof and the crane runs on the bottom flanges of the beams. The bridge beam extends almost to the columns supporting the roof so that every inch of floor space is available.

Now let us take a look at the boring mill. This tool is fitted with a turret head holding cutter bars, reamers and turning tools, with a self-centering chuck, quick power traverse and a foot-brake, all to hasten production. The addition of a speedy little electric hoist, conveniently swung from a jib-crane, makes the installation complete and prevents the time gained in machining from being frittered away in handling. But the hoist must be compact, for most shops have insufficient head room for a long, cumbersome hoist. It must have

*President, Herbert Morris Crane and Hoist Co., Ltd.



THE USE OF THE CHAIN BLOCK IS OFTEN FORGOTTEN WHEN IT COMES TO THE LOWLY HACKSAW.



RELIEVE THE STRAIN AT THE GRINDING WHEEL IN THIS MANNER.

a large factor of safety, because very few machinists can accurately gage the weight of a casting without doing some figuring. It must have such safety devices as a self-centering controller and a limit switch designed to cut off the current when the hoisting hook threatens to run into the overhead gears. The lubricating system should be very simple so that the machine operator can fill up the reservoirs at the same time and with the same lubricant as he employs on his machine tool.

In nearly all of the foregoing applications of mechanical hoisting equipment, an almost indispensable adjunct is a trolley with a short piece of track. The trolley should be very free-moving so as to be quickly responsive to the will of the operator. For this reason roller bearings are a necessity rather than a luxury. For good results, both as to ease of running and long life with low maintenance cost, the rollers should be large in diameter, completely enclosed and perfectly lubricated. It is a mistake to suppose that a bundle of steel wires can possibly constitute a roller bearing in the sense that they will eliminate friction.

The best form of track or runway is undoubtedly an I-beam, though two channels, back to back, will serve almost as well, provided that the bolts or rivets connecting them do not project so far as to interfere with the use of a standard trolley.

Sometimes a roof beam or the tension member of a roof truss may be utilized to advantage. But care should be taken to check up the strength of the structure before applying a load which was probably not included in the architect's calculations. It is also poor economy to use an existing structural member unless it happens to come just in the right place to serve the machine efficiently .

Occasionally a flat-bar track offers advantages in lower first cost as compared with the I-beam. This occurs mainly when the roof or ceiling is supported on wooden joists at 16-inch centres. The hangers can then be closely spaced and the light track well supported at short intervals. Otherwise it may be necessary to provide a wooden supporting beam over the full length of the rail, and the economy of first cost immediately disappears.

The question of suspension by means of suitable hangers is worth a little study to ensure that the building will not be damaged and that the track will be properly supported so as to provide a strong, stiff, straight and level path for the trolley. Standard hangers are obtainable and they offer the advantage of facilitating erection by avoiding the need for drilling holes either in the track or in the structure.

Standard twelve-foot lengths of track, complete with hangers, end-stops, trolleys and lifting gears offer a very easy solution to many a handling problem for the busy executive. The only equipment still required is a suitable sling or bale, and even these accessories have been developed to a highly practical extent on thoroughly standardized lines. A well-designed grab or sling is like a giant hand to aid the workman: it takes hold instantly, grips the piece firmly and releases promptly; a good sling completes the equipment of labor-saving machinery.

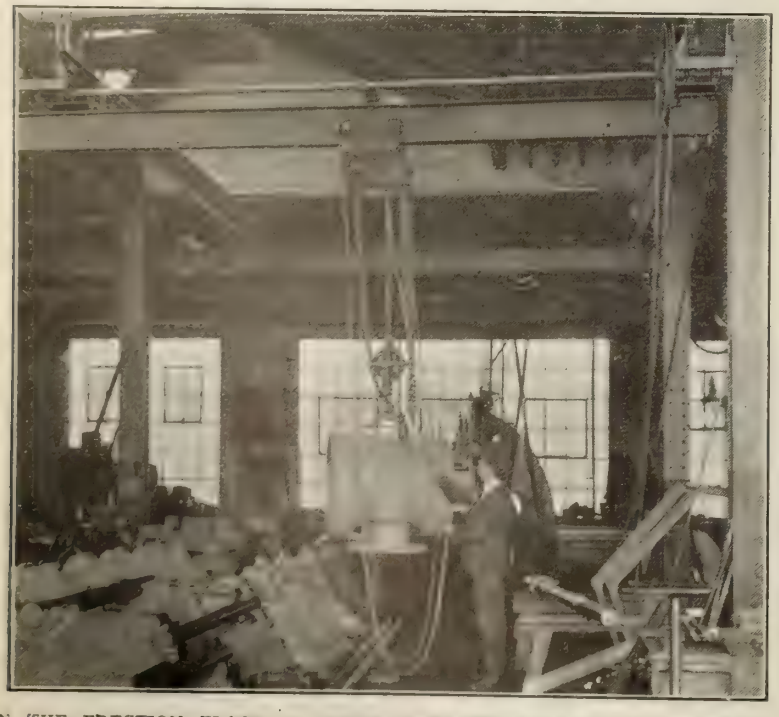
Many superintendents are allotting to this subject a fair share of their time and thought, and we think that enough has been said to show that it is an important function of shop management. Adequate handling facilities will not in themselves make money for the owner, but they will at least permit him to keep the money he makes in the use of his productive plant.

## DANGER TO BE AVOIDED

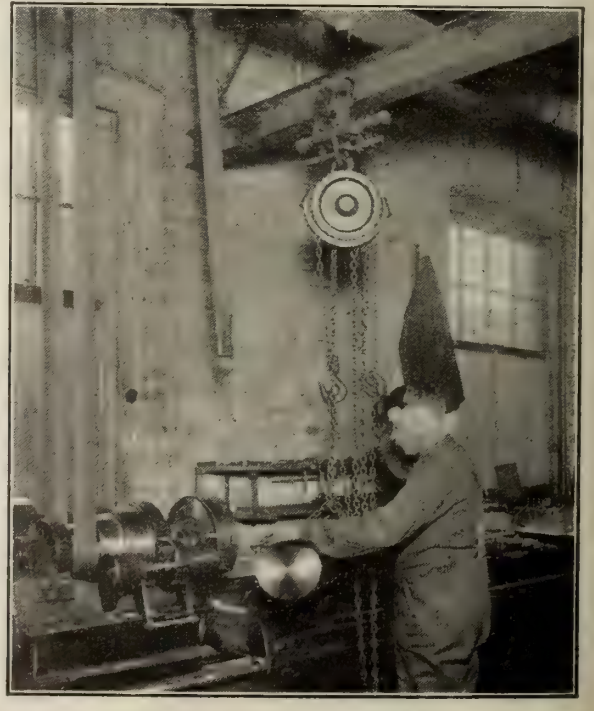
Greasy floors in machine shops are always a possible source of danger, and should, as far as possible, be prevented. In any case really dry sawdust should be used to absorb as much as possible of oil and grease, and sharp sand should also be applied from time to time to give a foothold, but this material should not be used in excess. Sawdust from non-resinous wood should be used for absorbent purposes where obtainable, as the grease passes into the fibre in such cases.

## HINTS OF VALUE

Shortly after a fire in a certain plant in England the following hints were given: Don't store oily cotton waste in a warm place at all, and don't store it where firing will cause danger anywhere. Under favorable conditions oily waste, as well as some other things, will oxidize rapidly, and in the presence of air will ignite through the heat engendered; and this should be thoroughly knocked into the heads of people handling the stuff in workshops, as it is quite easy to have a fire from some "unknown cause," or of which the "origin unknown" report is given by the fire brigade. Of course, as a waste product, greasy waste has some small value, but it is better to burn the stuff right away than to have a fire during a busy time. These hints, in a way, seem unnecessary, yet, strange to state, we still forget these simple precautions.



ON THE ERECTION FLOOR A CRANE IS PRACTICALLY INDISPENSABLE.



AN ARRANGEMENT AS SHOWN CANNOT HELP BUT AID PRODUCTION ON THE LATHE.



# WHAT OUR READERS THINK AND DO



# What is Your Opinion Regarding This Job?

## A Case Where the Salesman of a Firm Differed With the Superintendent of a Plant in Regard to Production of Cross Head Pins—Give Us Your Views on Making Pump Rods

By J. H. RODGERS.

THE superintendent of a certain railroad shop in Montreal was called upon some time ago by the representative of a well-known turret lathe manufacturer, and during the interview the question of cross head pins came to the fore. When it was learned that the company was taking an hour to produce one of these pins, from the bar, the salesman showed his surprise and intimated to the superintendent that it was possible to turn these out at the rate of one every twenty minutes; as a matter of fact, the machine had been advertised to do this. The superintendent was more than interested and sent for the machine shop foreman, who, when he came in, was made acquainted with the salesman of the —— company. This particular foreman was not a native of Missouri, but nevertheless was the kind that had to be shown. This the salesman seemed willing to do, and the twain adjourned to the shop and to the turret lathe used in machining the pins.

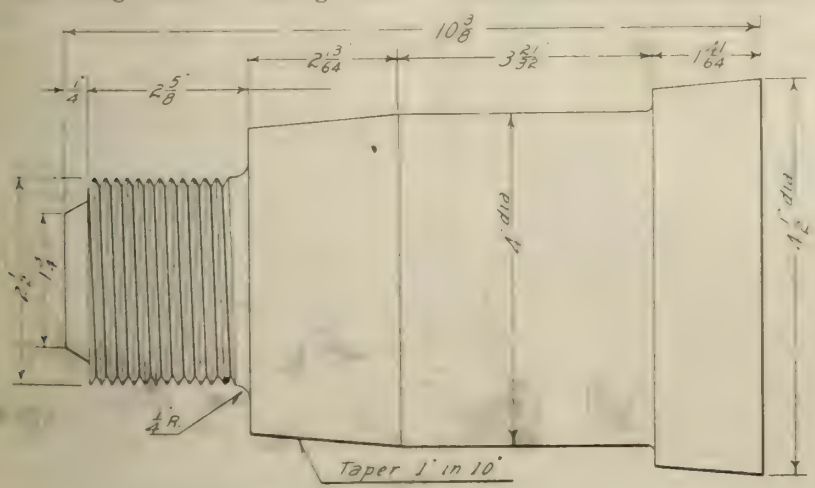
The salesman recognized the machine as one of their own, but of a design several years old. However, he was convinced, in his own mind, that too long a time was being taken in making these pins. Looking over the equipment he stated that it would be necessary to make a few slight changes before starting on the work. As it was then late in the day the representative said he would be in the first thing in the morning to commence work. The foreman asked him how long it would take him to do the first pin, and the reply was reluctantly given as "about an hour," and 20 minutes for those following. The foreman noted this on his pad.

Nine o'clock the following morning the salesman appeared. The machine operator had been busy for two hours cleaning up and getting things ready for him to start. The machine had been stripped and thoroughly cleaned, the bar ready, with the necessary tools and equipment neatly arranged on the floor in front of the machine. When the "20-minute man" saw the layout he turned on the foreman with the remark:

"You were making these pins last night. Why did you strip the machine?"

"The machine is generally this way when we commence a job," replied the foreman. "You will remember I asked you how long it would take you to do the 'first' one."

The foreman was not desirous of taking any mean advantage of the salesman, but he realized the position he might be placed in should the representative's efforts coincide with his statement of "20-minute pins."




DETAIL OF THE CROSS-HEAD PIN.

The salesman was given full scope to show what he could do, and his labors were finally rewarded. Four hours passed before he delivered the first pin —and it might be here stated that this one would not pass inspection. Before the day closed he succeeded in finishing a few others, and the best time for one pin was about 68 minutes. However, he apparently showed little disappointment and took refuge behind the statement that "he would send a man from the factory who would do them in 20 minutes." Several weeks later a man made his appearance at the shops.

"Are you Mr. Foreman?"

"Yes, sir."

"I'm from the ——— company."

"Here in connection with the cross head pins?"

"Yes. Could I see the machine?"

This fellow was a regular "dummy," and when he was taken out to the machine, he had nothing to say, just moved from one position to another, watching every move of the operator, saying never a word. This continued for several hours. At last he seemed satisfied, and turning to the foreman, who had just come up, he remarked:

"You have a 90 per cent. man there." (It might be mentioned that the operator had been tipped off and that he was doing his utmost.)

"Can you make the pins in 20 minutes?" asked the foreman.

"I think not, but I could cut your time considerably."

"Show me," said the foreman.

"I'll start in the morning," was the parting remark of the conservative talker.

This fellow must have retired early that night as he made his appearance shortly after seven the following morning. Without any waste of time or

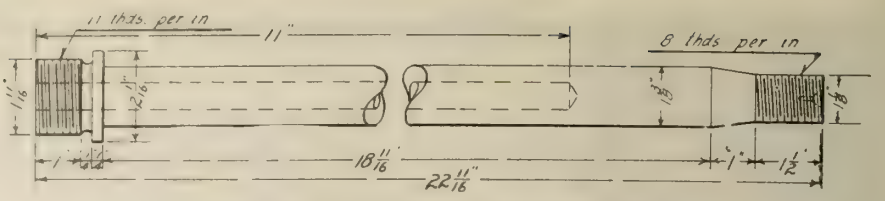
words he started in, and to see that chap work would have put an old-time slave to shame, and have made Lincoln sit up in astonishment—if he were alive. The man seemed to be everywhere at once, and, after the machine was set up, he performed his work systematically, using his entire body in manipulating the various wheels and levers; arms, legs, hips, and probably his head, all apparently going at the same time. He came out of the mixup and succeeded in making a pin in 48 minutes. He told the foreman that he could do still better, but that he did not want to show up the workman.

"Never mind the operator," said the foreman, "show us the best you can do—the very best."

This he consented to do on the understanding that no mean advantage would be taken of the workman. "Go ahead," replied the foreman, "the time has been set at one hour, and it will remain at that, no matter what you may do."

Again the physical distortions started and with even more strenuous efforts—but the "best one" took him 68 minutes. He had a little trouble with his tools breaking. The average time the demonstrator made ranged from 48 to 60 minutes. The shop time remained at one pin per hour.

That the readers may have some idea of the pin in question a detailed sketch is given herewith. Opinion of readers on the production of these pins (or similar work) in quantity, from bar stock, would be appreciated, and would doubtless be very interesting to those working on such problems. The time under discussion is that required to completely turn the pin and cut the thread, ready for insertion in the cross head, with the exception of the drilling of the pin hole and the cutting of the keyway. Complete turning time, not just roughing.




HOW WOULD YOU MAKE THIS PUMP ROD?

### Another Piece

A query has come in from one of our readers as to what time it should take to make pump rods similar to that shown in the sketch. These are made from cold rolled stock, and the dimensions given are finished sizes. It is required to know the time taken to finish this piece from the bar, in readiness for insertion in the pumps. The time must be that taken for all roughing and finishing operations. Give details of tooling.

Editor's note.—We particularly desire readers to answer these queries, for by so doing they will be rendering a real service. We shall pay for all accepted material at regular space rates.

### STORAGE OF DRAWINGS

Whenever the subject of drawing storage is brought up, discussion is sure to follow. In discussing the subject Practical Engineer comments as follows:

So far as is possible all drawings should be made to some suitable scale which is uniform throughout the whole of the work done, and fixed sizes of paper should be used for the general sizes of drawings made, although occasionally a larger or smaller sheet may be required, and also it may be necessary to use a larger scale occasionally for the sake of greater clearness in the workshop. Many drawings are not of permanent interest and, sepaking generally, are not worth saving, but some things have to be kept and referred to for years. In such cases drawers should be provided slightly larger than the standard sizes of paper used, and in these drawers the drawings should be stored flat, the creasing or rolling of any drawing of a permanent character not being at all desirable.

Even cloth tracings are best kept flat, although they suffer less from rolling than does paper. Tracings on tracing papers should be always kept flat and uncreased, while the new paper should never be creased or folded, as the ink will spread and run in a disconcerting manner. Beyond this most tracing papers must be kept air-tight or they lose their transparency and become useless for practical purposes.

### NEAR PRIZE WINNERS

Here are the other ten readers who came so near to landing a scale: O. F. Anderson, Hartford, Conn.; Wm. Smith, New Liskeard, Ont.; W. K. Mulock, Winnipeg, Man.; P. J. Ryan, John Morrow Co., Montreal; William M. Plummer, Bolton, Ont.; B. Back, Hamilton, Ont.; Chas. E. Mars, Brantford, Ont.; E. W. Todd, Penetanguishene, Ont.; George Land, Peterboro, Ont.; Harry Browrigg, Stellarton, N.S.

Letters patent have been issued this week changing the name of the National Steel Car Co., Ltd., to that of Hamilton Car Co., Ltd.

## *Milling Machine Extension*

During these times, when work is none too plentiful, it makes one think a little before turning any jobs away from the shop. The writer received an order for quite a number of bevel gears which were so large that the table of the milling machine would not drop low enough to allow the wheel blank to pass by the cutter, after being tilted to the angle required by the dividing head. We decided to raise the spindle of the milling machine after the same manner often adopted on the lathe. The sketch, Fig. 1, shows the layout of the machine rigged up for the job. This fixture is composed of two castings, A and B, an enlarged view of one of these being shown at Fig. 2. The front casting, A, is bored and faced to suit the spindle C, the spindle being bored to take the taper arbor of the miller. The two gears D and E are used to drive the spindle, the gear E is threaded to suit the spindle proper, the gear D being keyed to the top spindle C; the overhanging arm is the one belonging to the machine. The change is easily made by taking off the caps of the bearing and inserting the two extensions and bolting in position. The machine is driven in the usual manner. This advice has given entire satisfaction and will be used for large spur gears in future.

*By G. Barret*

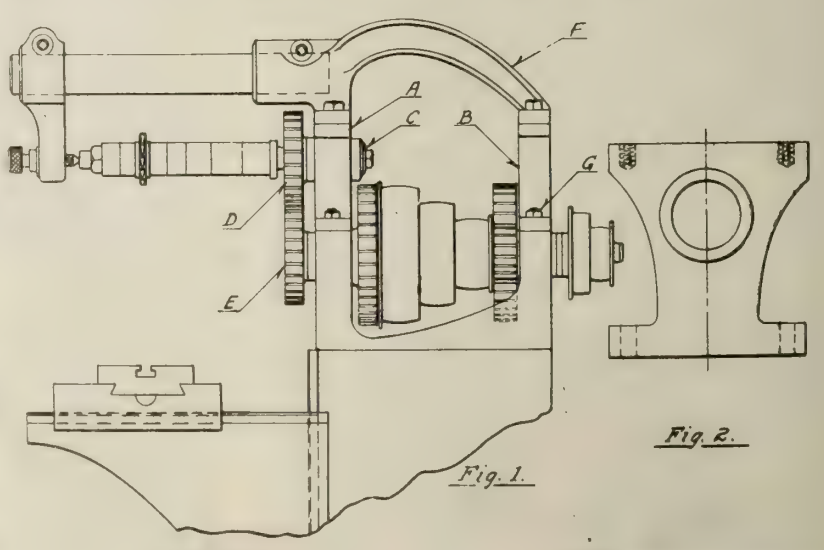



Fig. 2.

Fig. 1.

*Canadian Machinery*

WATCH FOR THESE PANELS. FILE THEM AWAY, FOR THEY ARE SURE TO COME IN HANDY.



# DEVELOPMENTS IN SHOP EQUIPMENT



### DRILL AND REAMER HOLDER

The Woodall-Basch Tool Co., Syracuse, N.Y., have placed on the market a drill and reamer holder as shown in the illustrations. These merely depict two of its uses. Briefly here are its characteristics.

The holder consists of a centre sleeve with a large head through which a T-slot is milled at right angles to its centre line.

This sleeve can be fitted to any taper or left straight as the need may be. It has a taper reamed hole to receive a centre that takes the place of the regular centre of the machine where the holder may be used.

Fitted to float freely in its T-slot is a head for holding drills or reamers, which consists of a malleable iron casting in the form of a collar connected at one end to a bar which is at right angles to the collar. This bar is the part that floats in the T-slot in the sleeve. In one side of the collar end of this head a "V" is formed and lined with hardened steel plate against which the tools are held by means of a headless screw. A hardened and ground steel centre is fitted to the taper of the sleeve and projects through an opening in the bar into the opening back of the collar. This centre takes the place of the regular centre and locates the tools on centre line.

The use of this holder is not confined to any one class of lathe, for practically all styles, even including turret and screw machines can make use of the device. It can also be used on drill presses with good success.

### ROTARY PISTON PUMPS

The St. Louis Pump & Equipment Co., St. Louis, Mo., have placed on the market four different styles of their duplex rotary piston pumps.

Briefly, the pump consists of twelve principal parts, these being the pump case with dividing partition, two end plates, a steel shaft with two eccentrics mounted thereon, two pistons, two rocker arms and two checks.

Two chambers or cylinders with shaft passing through centre of each—two eccentrics, directly opposite in throw or 180 degrees apart, mounted on the shaft. Surrounding these eccentrics are the two pump pistons. These pistons are pivoted to the rocker arm, which serves to produce the reciprocating movement of the piston through the action of the eccentrics.

In this way a composite reciprocating and rotary motion of the pump piston, without actual contact of piston and cylinder walls, is obtained. The clearance, however, is so small that a liquid seal results, and so positive is its action that after long service it is said to pull better than 29 inches of vacuum.

The piston check is the only moving part touching the cylinder wall, and this functions only at the point of transition at the end of the pumping suction movement or stroke to the beginning of a new stroke. The wear on this check is taken up automatically. While the piston is discharging, it is acquiring fresh liquid on the opposite or suction side, and the piston in the opposite chamber is functioning conversely, thus giving balanced action and continuous flow.

The head at one end of pump case is blind—that is, the shaft does not extend through. This eliminates packing. At the other end, a gland which holds the packing material is bolted to the head. This gland is separate from the bearing bushing. The gland is designed to act simply as a gland, and the bearing bushing to serve solely as a bearing.

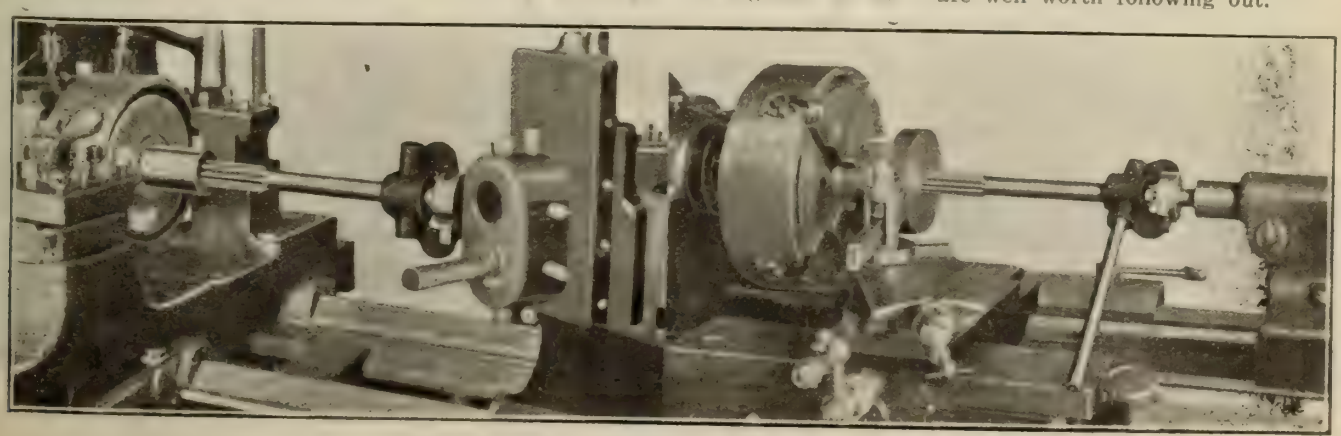
The pump is very compact, light in weight and is said to be practically free from vibration. It is also self-lubricating.

Various accessories and variations from standard equipment can be attached, these including pressure gauge, air chamber, by-pass and relief valve, foot valve, strainer, flanged pipe connections, electric remote control, etc. One style will pump lubrictaing oils from the lightest to the heaviest, in fact the pump is said to be able to pump any liquid of a non-volatile nature that can be handled in metal. The other types are, of course, for varied purposes, but as stated before we have not the space to enter into detail.

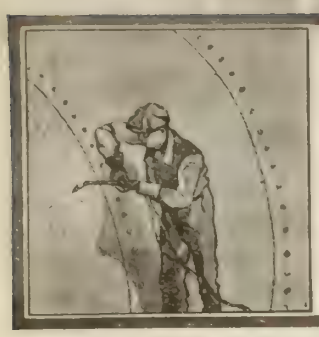
### ELECTRIC SOLDERING IRON

The use of the electric soldering iron to manufacturers in general is too self-evident to require any comment, and a new type of such an iron has been offered to the trade by the Vimy Supply Co., 567 College St., Toronto, Ont.

This iron has been approved by the H.E.P.C. and Canadian Machinery has had an opportunity of handling one. It is very compact, has a push button control in the handle, and the copper bits are readily removed and new or larger bits inserted if required. This is accomplished by means of a suitable socket. The iron heats up very quickly, and the control button in handle regulates the heat. One button is painted red. By pushing this in the circuit is made through the element. With every iron is given a guarantee for one year, also a few hints to iron users in general that are well worth following out.



TWO EXAMPLES OF THE DRILL AND REAMER HOLDER IN USE



# WELDING AND CUTTING



# An Efficient Method of Welding Pressure Vessels

## The Aim is to Secure Better Rating on the Welding Of Such Vessels—Preparing the Work—Testing the Strength of the Tank—Pressure From 500 to 1,800 Pounds Applied

By ANDREW OLIVER.

ONE of the most important projects of the American Welding Society is that of securing a better rating on the welding of pressure vessels by the Boiler Code Committee of the A. S. M. E. In the Standard Oil Company plant at Whiting, Indiana, we have experimented with autogenous welding of all sorts of pressure vessels. Some of the most important work that we have done is shown in the photographs.

Figure 1 shows one of our tanks before welding. This is one of the first methods of preparing the work that we used. To the left of the tank is seen one of the ends all ready to be inserted. This flanged head was prepared in a manner similar to the standard boiler makers' practice. Then it was inverted and welded.

Figure 2 shows the result of this weld. Note that the head is perfectly flat. The principal problem was to find a means of testing the strength of the tank. We had only one set of pumps with pressure enough to make a reasonable test. The tank was filled with hot oil and pressure was applied to 500 pounds. The tank was then tested by hammering and showed no defect. The pressure was then increased to 1,000 pounds and a slight bulge was noticed. When the pressure was again increased to 1,500 pounds the tank bulged quite a bit more, but did not break. Further attempts at increasing the pressure resulted in stalling our hydraulic pump at 1,800 pounds without any noticeable effect on the tank. Before releasing the pressure this tank was tested by stout blows with heavy sledge hammers, and no leaks developed.

Another tank somewhat similar to this one is made of 15-inch extra heavy steel pipe, tested to 1,000 pounds per square inch and put in service under working pressure of 300 pounds. In service the heat has burned holes in these tanks, but no heads have blown out.

Our experience in pressure welding is not limited to these tanks. We keep ten or twelve locomotives in repair all the time and do a great deal of tube welding and we have had no failures of any consequence during the past six years. In the construction of stills we are now starting to increase the application of welding every week. Our former practice was to use a double row of rivets on these stills. In the future we plan to make a lap joint, insert a single row of rivets and then double weld them. At this point these questions were asked:

"In beveling these longitudinal seams, do you make a double 'V'?"

"No. We make a double bevel: that is, one side only is beveled to an angle of 45 degrees on each side of the seam."

"What is the reason for welding on the inside?"

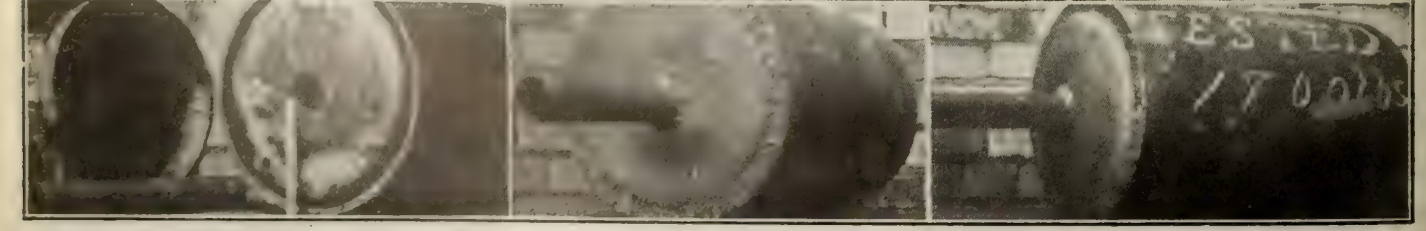
"The weld on the inside is simply a wash weld to make the joints smooth."

"Do you make the entire outside weld first, then come back and weld it again on the inside?"

"Yes."

Since this first experiment many different types of pressure vessels have been welded in our shops. Figure 4 is diagram of one that we make in great numbers. This tank has to stand a working pressure of 100 pounds to the square inch and is constantly subjected to a temperature of 750 degrees Fahr. The tank is 44 inches long and 20 inches in diameter and is made of one-half inch plate throughout. The diagram shows clearly the difference in construction of the head. This difference in construction lowers the cost of material and of preparation, and this head stands as much pressure as the flanged head shown in the other illustrations. The heads are dished with a hammer and beveled with a torch. The side seam is beveled to a 45 degree angle with the torch before welding. When the oxy-acetylene process is used, the seam is welded both outside and inside. The head is inserted about half an inch below the head of the cylinder. This gives the welder a better chance to get at the work in such a way as to make sure of thorough penetration. The method of operation is to weld three or four inches lightly, fill to the top, and so on, to the end of the seam or weld.

After welding, these tanks are subjected to a pressure of 600 pounds per square inch with cold water and tested with a sledge. The first one of these



FROM LEFT TO RIGHT—FIGS. 1, 2, AND 3.—THESE VIEWS SHOW PREPARATION, COMPLETION, AND TESTING OF THE TANK.

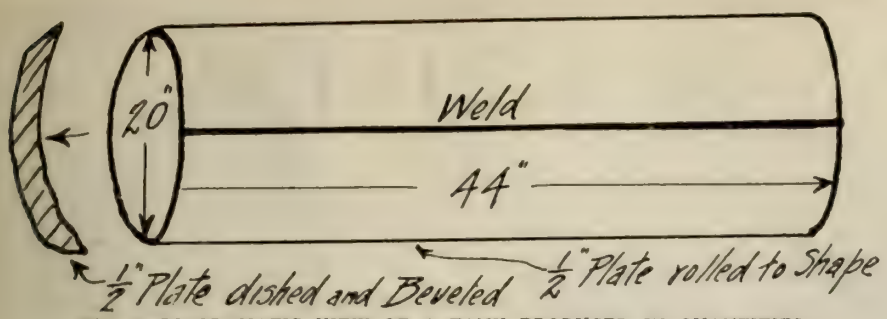



FIG. 4—DIAGRAMATIC VIEW OF A TANK PRODUCED IN QUANTITIES.

to be constructed in this manner has been in daily use for four years, subjected to both heat and pressure, and is still giving good service.

**Further Questions.**

Following this, several other questions were asked, and for convenience we will head the paragraphs Q. and A., these, of course, representing the questions and answers.

Q. Doesn't this, in the case of the oxy-acetylene weld, have a tendency to set up a strain?

A. This has never been noticed.

Q. How do you allow for the expansion and contraction?

A. When the welding is started, an opening of ⅝ inch for every foot of length of stem is left at the far end.

Q. How do you keep the crack open?

A. With a wedge.

Q. Will this spreading change the dimensions of the tank?

A. No; the weld contracts and closes the sheet to proper dimensions.

Q. Isn't it true that the greatest contraction occurs when the welder is working at the centre of the seam?

A. Yes.

A. Does the process (gas or electric) used make any difference in the amount of opening?

A. Yes, there is more radiation in gas welding, so, when using the electric arc process, not quite so much opening is required.

Q. Which process is used in making the tanks just described?

A. Both.

Q. How much reinforcement is made on the seam weld?

A. Just a trifle over the surface. The added metal is made to lap over about ⅛ inch on each side of the "V."

Q. Is it necessary to support the weld during the operation by placing a flat bar under the weld?

A. No.

A. How many amperes do you use, and what size wire when you make these welds with the arc?

A. Two hundred amperes of current. The first weld is made with 5/22 or 3/16 wire, then followed with a ¼-inch wire.

Q. What is the usual speed when welding the head?

A. Four to seven feet per hour with heavy wire.

Q. Is any attempt made to clean the electric welds?

A. Not to any extent. Any drops that are left by the arc can be chipped off with a chisel.

Q. Do you test your welders before starting them on this work?

A. Yes. The foreman keeps a careful check on the new men and makes sure they can do first-class work before giving them this kind of a job.

In connection with the discussion on the amount of opening to be provided before starting to weld, reference was made to the following extract from a paper, "Welding," read by Charles Hollup before the American Society of Refrigerating Engineers, Milwaukee, Wis., June 7, 1917:

**Longitudinal Seams.**

In welding longitudinal seams on round tanks, it is first necessary to have a perfectly round shell; that is, the joining ends of the sheet shall not have a flattened section, as customary when coming from the bending rolls. That flat and peaked-looking joint has a tendency of rounding out under pressure, and, in so doing, has a wedging action on the weld, which is often the cause of rupture. The edges of the seam should be beveled as in all other butt welds.

Before proceeding to weld a seam of this kind, expansion and contraction must be considered. These are vital points in welding, and only too often lost sight of. Starting on one edge of the seam, it is necessary to have the edges of the sheet on the far end spread apart. The object is to allow the molten metal, which is then at its most expanded state, to shrink and gradually bring the edges together as the weld is progressing, thereby avoiding shrinkage strains as much as possible. For the same reason I advocate that a seam of that kind should be made at one filling in if possible, or if the sheet is too thick that the heaviest fill be made while the other end is still open. The proper amount of this opening for acetylene welding should equal the thickness of the sheet per foot of length. In other words, a ¼-inch thick sheet 6 feet long should be 6 x ¼, or 1½ inches open on the far end. For electric arc welding about one-half of this is enough.

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In preparation for the closing down of the plant due for May 1, the British American nickel plant at Deschanes is gradually reducing its staff. Last week about three hundred men were let go.

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# CANADIAN MACHINERY
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## Then They All Rush Together

WHY is it that it is easy to sell equipment to plants when they are booming along and making money, and why is it that much of this equipment arrives about the time the boom is over, when it is as good as useless for serving the purpose for which it was purchased?

The Federation of Engineering Societies, of which Herbert Hoover is president of the executive, is seeking a solution to this question, and a point is brought out in their findings that has been emphasized many times in the columns of Canadian Machinery:

> "Our studies of industries as a whole show that we usually expand our equipments just at the periods of maximum demand for their products, instead of doing our plant expansion during periods of slack consumption. That is one of the factors in our great unemployment problem to-day."

The trouble is that even in our industrial plants, in too many cases we are speculators rather than investors and builders for the future.

When we see things moving, our courage rises. When we see orders starting to come, we get ready to handle them. When we are swamped with business, out go orders for equipment that would have prevented the swamping.

It is a fact that in a season of high productivity, capital is easily interested in enterprises of various sorts. In the great majority of cases it is then, and only then, that the necessity for increased equipment most impresses men's minds, and it is the enthusiasm of these periods that brings expansion, and not the cool, deliberate planning and calculation of less prosperous periods.

The Federation of Engineering Societies may turn this question up on edge, and bore holes in it, but they will not settle it. In the smaller circle of men's lives, we never repair the furnace until the day we want to light it, nor do we think of sharpening the lawn mower until the grass is crowding six inches in height.

The price one pays for a piece of equipment is neither here nor there, if that equipment is going to earn its way when the call for production goes forth.

The trouble is that the request for equipment goes out after many other calls have gone out for similar machines. Then comes the shipping schedule, extending over five, six, or ten months, and in that time the "late-ordering" firm simply has to sit back and watch the business go by.

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It might be well if some person with a faculty for turning out pointed phrases would come to the aid of the scrap metal trade. Dealers in recent months have called trade "rotten," "stagnant," "dead," "sluggish," "fierce," etc., with the result that it is now almost impossible to describe conditions without monotonous repetition.

## Relation of Prices to Sales

THE U.S. Steel Corporation is being rapped on the knuckles for not pruning its selling schedule and chances are, were the truth known, the same corporation is being entreated not to let its price list get out on the skids.

Were the Corporation to put up the argument that it cannot afford to lower prices, it would immediately meet with the statement that it can.

The National City Bank of New York seems to be of the opinion that the Steel Corporation should lead in the procession toward lower prices and states that "nobody thinks bottom prices have been reached."

Forbes' Magazine, in this connection, goes this far: "The judge's plea that a reduction in prices would not increase demand a single ton has evoked expressions of astonishment throughout the whole industrial and business world, so unsound and indefensible is his reasoning."

Not so fast, here. Can Forbes' Magazine trace the progress of the price slashing of the independents, and see their order books becoming more and more barren as the price cutting proceeded and yet come to any other conclusion than that stated by Judge Gary?

The experience of the steel market does not bear out the idea that cut prices bring in a greater tonnage to the books of the mills.

When a manufacturer wants steel he does not buy because it is cheap or expensive, but because he wants it. He is going to make something with it. If the steel market finds business coming its way on any other basis, it is something new to this paper.

It is a fact that Canadian warehouses are selling less bar mill material to-day around 4c per pound than they were a year ago at 5.75. Were they to drop prices over night to 3c per pound, we doubt very much if orders would start to come.

If low prices bring sales, what is wrong with the scrap metal situation? Go down to-day and you can almost name your own price. Values are away down and even steel mills and foundries are not buying, although they know that when things start to move prices are sure to stiffen.

It is easy to sell in a rising market. Under such conditions the big idea is to get under cover before the next rise comes.

It is equally hard to sell in a dropping or stagnant market.

In the main, we are very much inclined to believe that Judge Gary is quite right when he holds that a cut price brings no more tonnage to the steel mill or the blast furnaces.

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A table of figures showing present and 1913 prices in British trade brings out the comparative value of 1913 with 1920 prices. Coal, as declared in 1913, was £6,000; in 1920, it would seem that imports must have increased because they are shown as $27,000, wherein, in reality, at 1913 values, the 1920 imports would show a value of £3,000.



# MARKET DEVELOPMENTS



## The Liquidating of Stock Takes up Attention

### Nothing Heard Definitely From the Steel Corporation About Change in Prices—Toronto Warehouses Anxious to Get Out of Certain Lines in Which They are Overstocked

THE work of liquidating stocks is being carried on, even to rather severe lengths, in a good many Canadian warehouses, carrying steel, iron, small tools, various lines of equipment, etc. The idea seems to be to get cleared out in order that they may take advantage of any new market standards that are coming out from time to time. It is a fact that a number of warehouses are right now acting as commission merchants, in that they find it possible, with factories making immediate deliveries, to send orders direct to the makers, instead of putting in stock for the purpose of filling them. It means that stocks in many lines are being reduced to the smallest possible margin, and that there must be considerable buying done for purposes of replenishment when the business tide turns toward a buying movement of any proportions.

The move toward lower prices seems to have been halted for the present, although some items have been marked down this week. In the steel market, prices are about where they were a week ago, although a number of them are subject to revision according to the size of the order in sight, and the urgency of the buyer for more favorable consideration. Then, again, there are lines which warehouses are rather eager to see move out, and if a buyer shows on the business horizon looking for these particular lines, he is almost certain to get a price well below market levels.

Buying is done in the machine tool market in small lots, and the demand for used equipment seems to occupy the first place in much of the trading.

The scrap metal market is still running in poor luck. Business is about as well fagged out as could be possible. Dealers are not taking on anything, and although prices are very low just now, the customers show no inclination to come out of their hiding, and cover their future requirements.

## COMPETITION IS KEEN—ORDERS COME ONLY AFTER KEEN BIDDING

Special to CANADIAN MACHINERY.

MONTREAL, April 7.—Industrial activity in this district still reflects the depression of trade generally, although nature has stepped in to remove some of the tension in the way of unemployment. The opening of the harbor and the work in connection with port developments has helped in reducing the ranks of those "out of work." Considerable replacement and improvement to the service is planned by the Montreal Tramways; this will mean work for several hundred men. The new Mount Royal Hotel, a large office building for the Canada Cement Co. and the new addition to the head office of the Sun Life Assurance Co. are a few of the large construction works that will be carried out this year. Operations will be resumed in the large railroad shops this week, but no assurance has been given of permanent work, owing to the light requirements for repairs and equipment. The metal situation continues quiet, with little movement, but prices are holding relatively firm, tin alone showing a slight decline, the current price being 36 cents per pound. There is a feeling that coppers will strengthen in the near future.

**Slight Improvement in Some Quarters**

There is an old saying that "coming events cast their shadows before." The remark of a steel dealer here, last week, was of such a cheering nature that it looks as if "the coming of sunshine dispels the gloom of the past." When asked regarding summer outlook, this dealer replied: "I do not mind telling you that our business during the past two weeks has shown gradual improvement. The previous week was the best we had experienced since the beginning of the year, and last week was even better. Friday's orders alone exceeded any two previous days this year. I would not care to say that this will continue but there is every indication that consumers are going from day to day with no more than they actually need. We were asked the other day for some cold drawn stock of a certain size. The customer took the few bars we had on hand, requested immediate shipment of some we had on order, and further instructed us to deliver 125 bars as soon as possible. Much of our business of late has been due to 'rush' wires, showing that the need is urgent."

What tends to substantiate the statement that increased activity is taking place in the automobile industry is the greater inquiry and demand for cars in many quarters. Officials of the automobile association in this district intimate that greater interest is being taken this year than last, and this is reflected in the larger sales of nearly every make of car. This is a development that, in itself, may have no great effect upon the steel operations, but the improvement in motor activity will indirectly affect other lines of enterprise. The rumored revision of prices by the United States Steel Corporation, to take effect later in the month, has created a feeling of expectancy in many quarters, and has likewise caused some exhibition of nervousness. It is thought that this has been timed to coincide with the action of the railroads, in their attitude towards labor, as it is generally recognized that the wage question must be adjusted before normal industrial activity can be resumed. The steel situation here is unchanged generally, but with some dealers reporting slight improvement, consumers buying conservatively. No

nual statement for wiping some of this material out, and it has been moving now. The result is that the customers are getting good close prices, and the warehouse is being enabled to get rid of material without liquidating at a loss. One sign that the smaller shops are doing some buying is the increase in the call for carbon drills. In the larger shops high speed steel is called for almost entirely.

### In the Steel Market

"Looking back over the business of the month of March, we found that sheets had been about the best selling line we had," stated one steel merchant. "This refers to both black and galvanized. A number of industries contributed to this result." The movement in sheets is helping warehouses to get rid of their stocks, which are still fairly heavy, but well assorted.

The total volume of business done in tubes for the first quarter of 1921 has been disappointingly small in many cases, but the season should still be good. Buying is being done on a very small basis. There are cases, some of which we heard about in the market this week, where several large boilers should be attended to, but the proprietors are holding back hoping for a better price, which, considering the amount of tubing in a good-sized boiler, would amount to quite an item.

This week has its fresh crop of rumors about prices on steel being raided by a new price to be brought out by the Steel Corporation. Rumors have been so numerous of late that the chances are that they have little bearing on the market. Neither warehouses nor manufacturers have been buying freely. The general feeling is that the Steel Corporation is the only agency that can stabilize the steel market, and until some move is made by the Corporation, affairs in the steel world will be more or less uncertain.

There seems to be a tendency on the part of dealers to hold prices up pretty well to their schedule. This depends largely on whether there is a desire to get rid of a line, or whether they can afford to carry it along. For instance, iron bars are quoted around 4.25, while some sales are being put through at 4c. Where a warehouse is heavily stocked in a line that he is not desirous of retaining at the present tonnage, one might get a figure as low as 3.75, but that would not represent the market. The bulk of the sales are being made between 4c and 4.25c.

### Selling Small Tools

Small orders for small tools seems to describe the situation, if one is to accept all the stories of the dealers who are out scouring the markets for orders. Complaint is also made that selling schedules are being pruned at all corners in order to secure orders.

Dealers in the scrap metal business have plenty of time to discuss the situation in their field just now, for they have little else to do. There is nothing to show any improvement in their lines. Yards generally are loaded with copper to such an extent that they will be busy getting out from under as best they can for some time. The small dealer is more or less out of the running entirely, especially the man who goes around the country doing his own collecting. Prices are all against him, and he is sorely tempted to drop out until things turn for the better.

# PITTSBURG BELIEVES THE STEEL BREAK HAS ALREADY SEEN ITS CLIMAX

Special to CANADIAN MACHINERY.

PITTSBURGH, April 7.—The iron and steel situation is now clearly defined. Any doubt there may have been as to the nearby future of the trade is resolved, as there has been buying in the past few weeks and the character of the buying is well established. When there was a complete absence of demand there was naturally doubt as to what would be the character of the demand when any developed.

Practically the universal experience of the steel producers is that of doing a carload business. That is true of the Steel Corporation quite largely when it receives releases on orders previously held up, though the Corporation does receive some releases of larger volume, and it is the usual experience of the independents when receiving new orders. It is only occasionally that a good sized order is placed, this being for some piece of construction work. The regular manufacturing consumers, as well as the jobbers, are calling for material in carload lots. In many cases the specifications show that the material called for is required to piece out on stocks already in hand. Some jobbers and manufacturing consumers have gotten to the point where they need to take steel in general, but in most cases it is a matter of rounding out stocks, which have been getting ragged.

There is nothing that can be called a "spring demand" and that is distinctly disappointing. There was no occasion for disappointment in January, when predictions made in December that there would be a revival in demand after the turn of the year failed of verification, for such predictions had not been well founded. January is not a month in which steel demand normally increases. March is such a month. The rate of steel consumption at the beginning of April does not appear to be larger than the rate at the beginning of January, and probably it is less. It is true that some industries are more active, much stress being laid upon this fact in various reports, but on the other hand many industries are less active, and not much is said about that.

### Steel Prices

There is no deadlock on steel prices. Buyers give no intimation that there is any price at which they would really take hold. If there were any large demand to be developed by reducing prices the United States Steel Corporation would undoubtedly make the reductions it is certain to make eventually. The majority of the Steel Corporation's customers seem to be well satisfied with the Corporation's policy of holding to the Industrial Board schedule, and they could hold this view for no other reason than from having stocks of raw or manufactured material they wish to liquidate on the best terms possible. Of course those who are in the market to make fresh purchases secure the lowest quotations obtainable, but their buying is of small volume. While the total quantity of material now being specified is small, the probability is that the bulk of it is in the form of specifications against old contracts or releases for shipment against orders previously held up. In the case of the Steel Corporation this business is, of course, at the regular Corporation or Industrial Board prices, while in the case of the independents there are probably adjustments to the existing independent market as commonly quoted.

Bars remain quotable at 2c for carload lots with desirable specifications, shapes and plates being correspondingly 2.10c. These prices were possible a month ago, but concessions obtainable on large lots are probably smaller now than then. Seeing that it is two months since the independent market broke, and there has been no actual decline in these three important commodities for a month, it is plain that the break is over. The independent market is more or less stabilized, and the next important development will probably be the Steel Corporation's reduction, which may occur very soon or not for several months. While it is always somewhat dangerous to prophesy, there is reason for making this prediction. With their very light operation the independents have high costs, much higher than they would have with the same wage rates and raw material costs. They could reduce their production costs by having a larger operation, and that would be an incentive to cut prices further, but if much more business were to be obtained by making prices the Steel Corporation would be influenced by the condition as well, and would reduce its prices. Hence it seems reasonable to conclude that the independents are unlikely to reduce their prices much if at all until the time comes for the Steel Corporation to make its reduction. The common view is that when the Cor-

price changes are recorded and those quoted are more or less nominal. The surcharge on freight shipments for the current period is slightly improved, it being 8 per cent. in place of 9 per cent., the new rate being effective on April 1.

Commenting on conditions here as compared to those in the States, a business man associated with the machine tool activity stated last week that he believed that Canada was better off, just now, than any other country in the world. Industrial conditions in the States are much worse than here and the outlook for the summer is still uncertain. Another dealer remarked that business had been better, especially in contractors' supplies for construction work. Metal working machine tools were not in heavy demand, and supply requirements of the smaller order had been light. "It is a market where competition is pronounced," said a salesman, "if you keep everlastingly at it you will get results, but you have to be prepared to 'meet the other fellow.' Just last week we had an inquiry for some material made in Hamilton, for which we were quoting 6½ cents; Toronto was asking 6¼ cents. We closed at 6¼." Consumers and users of tools are keenly alive to the situation and endeavor and usually succeed in getting the very best price.

### No Scrap Export Now

The war has effected some surprising changes in business conditions, and not the least of these is that shown in the movement of old materials. When asked what influence the opening of navigation would have on the scrap market, one dealer here replied: "Very little. Before the war we did considerable business shipping scrap overseas, but this is now only a memory. The accumulation of scrap in England and Europe is past calculation and it will take years before conditions get back to what they were, and there is a possibility that this time may never come, owing to the complete change of the industrial outlook. Come down in the basement and I'll show you something." He escorted me to the cellar and confronted me with a pile of copper bands that had been made for 8 and 9-inch shells, but which had never been used. At a rough estimate there was upwards of 50 tons in this pile and he said there was more. The price paid for these bands was in excess of what could be realized on the market to-day. The continued dullness in steel activity has resulted in a further softening of prices and quotations on heavy melting steel and old rails have been marked down from $15 to $12 per ton. Machine shop turnings are now quoted at $6, a decline of $2 per ton. Other steel scraps are unchanged but nominal. Non-ferrous scraps are moving lightly with prices easier. Coppers are showing weakness, crucible declining ½ cent to 11 cents per pound. Heavy lead is likewise quoted ½ cents off at 4 cents per pound.

## POINTS IN WEEK'S MARKETING NOTES

**New York expected a couple of weeks ago that a buying movement was fairly well under way, but it has fallen off sharply since.**

—

**Export trade in machine tools for United States builders continues to be very dull. Japan navy and arsenal have been doing some buying.**

—

**Announcements of reductions this week come from a maker of planers and another from a radial drill firm. Chain blocks are also marked down about 15 per cent.**

—

**Pittsburgh goes as far as to claim that the break in the price of steel is over, although the announcement of the Corporation on its prices is yet to come. Others hold that it will call for a cut in prices and in wages at the same time.**

—

**Selling out present stock is the one big idea of a good many of the warehouses in Toronto. Sizes not required are being let go at a close figure.**

—

**Dealers claim that a fair amount of business is now coming from small shops that have not been buying anything for a long time because travellers had been passing them by.**

—

**Small tools, particularly drills and in some cases files, are being sold at close figures, and complaint is being made that makers are selling at closer prices than the jobbers.**

—

**The scrap metal market has few bright spots. Dealers are waiting for the turn, welcoming anything that comes, in the belief that it cannot be worse, and therefore must be for the better.**

## MOVING STOCKS THE PROBLEM

**Warehouses for the Present Prefer to Send Orders Direct to the Manufacturer**

TORONTO.—One of the outstanding features of the market in this district, especially in iron, steel and many lines of tools, is the feeling that prices quoted in the various lines are not stable enough to warrant much business being placed on the strength of them.

Several of the machine tool men claimed that during the month of March there had been a slight improvement in the general tone of business, and when the figures for the month had been totalled up, it was found there had been a very fair volume of trade.

Firms handling used equipment as well as new seem to be having the edge on the others in securing the volume of trade just now. There continues to be a demand for used material, and there is still a large amount of this available. Several of the war shops were never entirely cleared out, and steps are being taken now to dispose of equipment in these.

### Thinning Out the Stock

Getting rid of the stock seems to be the problem of warehouses in many lines of business, in fact those that have anything they are not willing to talk price on are very much in the minority at the moment. The manager of a large selling agency in Toronto showed a representative of this paper through a number of the departments of that business. In many departments one could see the red tags on the bins, which would, under ordinary circumstances, mean that their supply had run out of that particular line, and orders should be placed at once for sufficient to last from three to six months. Just now the firm seems to be particularly pleased with the increase in these red tags, as they are not placing orders as soon as a red tag shows up.

Speaking to Canadian Machinery of their present selling and buying policy, the manager stated: "We find that we can get along for the present without putting in large stocks. When we got on the basis of sufficient for a month only, we found that by the time the shipment would come in there would be an accumulation of orders, and the stock seemed to come in and get right out again. Then there are other lines where we can get very ready service from the manufacturers. Orders can be sent along from our customers, and until prices get a little more stabilized it is just as satisfactory for us to send orders direct to the makers, and have shipments made from there to our direction. We are busy getting rid of stock, not taking more on."

This is true of several lines of business, and while for the present it does not mean large buying, it does mean that stocks all over are running very low, and when demand quickens there will be very heavy buying done.

### Changes in Demand

Another very odd thing has come to light within recent weeks, viz., that several lines are being moved which have been standing still for a long time, in some cases for years. In some cases salesmen are calling on shops again which they have missed for a long time. They were not in the war work rush, and only recently have salesmen, in their chase for orders, looked them up. Their buying is not large, but it has called for some lines that have been standing still. In one place, we know that a certain amount has been written off in the an-

poration acts on prices it will endeavor to make one reduction that will cover the whole ground.

The market on standard steel pipe has become decidedly irregular, following the slight shading reported a week ago. Extra concessions of 2½ or 5 per cent. that were formerly given only to the very largest trade are now more or less common property with carload buyers, and, of course, there is ground for supposing that the large buyers could get extra concessions. Line pipe, which has been shaded for quite a while, is going at closer and closer figures as inquiries develop.

The sheet market is lower by about $2 a ton on black and $4 on galvanized, at 3.75c for black and 4.80c for galvanized. These prices can be done on carload lots if the specifications are attractive. On large lots the concessions from the carload price are less than when the carload market was higher, and it is not altogether certain that any concessions could be secured, except on the heavy gauges of galvanized, the difference in production cost between heavy gauge and 28 gauge being greater than the gauge differentials in the standard list.

### Coke Developments

The coke market at last shows approximately where it stands, a sale of 500 tons a day for five or six weeks having been made by one of the largest operators to the furnace at Portsmouth, O., which is to go into blast and needs Connellsville coke for a while, until it gets its by-product coke plant in operation. The old claim was that it cost $5 a ton to make furnace coke. A few weeks ago one of the large operators made a wage reduction, announced to average 18 per cent., and some other operators made reductions. About a fortnight ago it became known that some other operators intended to reduce wages and some of those who had made reductions intended to make a further reduction. Apparently at the last moment word went around and practically all the independent operators announced the restoration of the scale of November 10, 1917, effective April 1. This seems to make the wage rate uniform, except that the H. C. Frick Coke Company (Steel Corporation) has taken no action, its intention evidently being to act when the Steel Corporation makes its general wage reduction at the furnaces and mills.

The independent scale now in force is approximately 30 per cent. below the old scale, which went into effect last year, and of course materially reduces the cost of production, this accounting for the $3.75 sale reported above, which is the most important business done since it became settled that the 1917 wage scale was to be restored. Foundry coke for spot shipment remains quotable at $5 to $6, according to brand, but is likely to settle some in sympathy with furnace coke.

Pig iron remains quotable at $25, valley, for Bessemer, foundry and malleable and $23 for basic. These prices could possibly be shaded a trifle on inquiry for a fair-sized lot.

## THE NEW YORK MARKET SPOTTY

**Hopes of a Revival in Machine Tool Circles Prove To Be Rather Short Lived**

Special to CANADIAN MACHINERY.

NEW YORK, April 7.—Hopes which the machine tool trade entertained about two weeks ago of a moderate resumption of buying have apparently gone a-glimmering, for the moment, at least. The past week has been exceedingly dull locally. Some of the companies which have come into the market for shop equipment appear to be in no hurry to buy, and wherever possible are scaling down their estimated requirements. For example, the General Electric Co., which inquired a few weeks ago for about 30 machines for its Schenectady shops, found that by moving machines from one department to another it could eliminate many of the items on its list. The American Sugar Refining Co., which inquired for about 50 tools for its Baltimore refinery repair shop, has bought a few fabricating machines and pipe machines, but the rest of the list being held up, temporarily at least. Nor have orders been received here from the Batavia Car Works, Batavia, N.Y., which issued a list of about 25 machines a few weeks ago.

Railroad inquiries, which have covered only a few machines in each instance, are mostly being held up, but the Bangor & Aroostook Railroad bought a 600-ton car wheel lathe. The list of the Virginian Railroad, comprising about ten or twelve machines, is being held up indefinitely.

The Western Electric Co. has been a fairly consistent buyer of late, both for its domestic plants and for its plant in Japan. The Japanese Government, which has already bought a considerable number of machines for its navy, is also reported about to buy for its arsenals. On the whole, export trade continues very dull.

The Singer Manufacturing Co., New York, manufacturer of sewing machines, is in the market for locomotive cranes, travelling cranes and machine shop equipment for a plant in Canada. Little is known here as to its exact requirements, it being stated that the equipment will be purchased in Canada.

Further price reductions are announced. A leading manufacturer of planers has reduced about 10 per cent. and radial drills have been cut a like amount.

## Pig Iron Market

In most centres pig iron sellers have been able to check the downward trend of prices on moderate tonnages, but further weakness has developed at Cleveland and Chicago.

The little spurt of activity of a week ago has subsided as quickly as it developed. A fair number of small lot orders for foundry iron for prompt shipment have been placed generally at $25, valley furnace, for No. 2 grade. Some makers of this grade are not disposed to go below $26, but the willingness of others to accept business at $25 makes it difficult to sell at a higher figure.

The pig iron market at Chicago still lacks stability, but the downward trend of prices is less marked than heretofore, possibly because producers are getting down to bed rock costs.

An increasing number of melters in the New York district, who have refrained for a long time from buying, are being compelled to come into the market, and are placing orders for early delivery. This does not mean heavy buying, but a little improvement over recent extreme dullness can be noted.

The situation in New England in foundry pig iron is somewhat clarified by cash readjustment on contracts, a general practice of late. There is a better demand and slightly less than 1,000 tons reported as being sold the past week.

Foundries generally are melting somewhat more iron than they have been and the Belleville, Ill., stove foundries have opened up on orders received, while the St. Louis stock foundries report that new orders are coming in and causing interest in pig iron to meet the contracts that are in prospect.

Philadelphia reports that although the foundry iron market had settled to a basis of $25 furnace on any attractive orders, most of the business taken in the past week has been nearer $26 furnace. The Brooke furnace will go out of blast within a week or ten days, leaving only two regular merchant furnaces, Warwick and Swede, in blast in eastern Pennsylvania.

### CHINA LOOKING TO THE FUTURE

The Government of the Chinese Republic has inaugurated a Bureau of Economic Information for the dissemination of information relative to economic, commercial, financial and industrial development within the boundaries of the Republic of China. This information is being published semi-monthly, in pamphlet form, the first of the series showing the date of January 25th, 1921. Communications from outside countries should be addressed to Government Bureau of Economic Information, Box 653, American Post Office, Shanghai, China.

# India As a Market For Canadian Iron and Steel

## Some Canadian Steel Lines Have Been Fairly Well Established in Those Markets—Greater Care is Necessary in Packing And Studying the Likes and Preferences of the Buyers There

THE markets of India as a possibility for Canadian iron and steel goods is dealt with at length by H. R. Poussette, director of the Canadian Commercial Intelligence Service. Where reference is made to money it should be noted that the nominal value of the rupee is now two shillings or one-tenth of the gold contents of a sovereign. Its actual present value is about 1s. 4d. to 1s. 5d.; just over a year ago it was 2s. 10d. A lac of rupees is 100,000 rupees, and is written 1,00,000; a crore equals 100 lacs. In India the rupee is divided into 16 annas, and the annas are further subdivided into 4 pice. In Ceylon the rupee is divided decimally.

Iron and steel in various forms is imported into India in exceedingly large quantities, as a reference to statistics will show. At the present time there are three producing companies organized in India; the Tata Iron and Steel Company, a very important concern which manufacture at Jamshedpur, about 150 miles west of Calcutta; the Bengal Iron Company, which make iron, ferro-manganese and iron products at Kulti, some 140 miles from Calcutta on the East Indian railway; and the Indian Iron and Steel Company, which it is expected will commence manufacturing pig-iron about the middle of 1921.

India contains fairly large quantities of coal, mostly situated in the provinces of Bengal and Bihar, and deposits of iron ore, which are said to be almost inexhaustible, are found in Singhbhum district, Chota Nagpur, and in which very large claims have been staked out by the three Indian companies already mentioned. The iron ore is said in certain locations to have a depth of from 2,000 to 3,000 feet, part of which is below and part above sea level.

### Iron and Steel Products

Very little is heard of Canadian steel in this market, although a certain amount has found its way to India. One firm in Madras stated that they were importing both iron and steel from Canada, and this was one of the few instances where mention was made of Canada in this connection. Considering the huge business which the United States have worked up in India in iron and steel products, there seems no reason why the Dominion, particularly now that direct steamship connections have been established, should not be able to do a considerable amount of business in this market. The imports of steel angles and springs in the fiscal year 1919-20 amounted to over Rs. 52 lacs, and the imports of steel bars and channels to over Rs. 2 crores, of which the United States exported no less than Rs. 1,08,00,000, or about £1,000,000. Of the total of bars and channels imported, the United Kingdom supplied to a value of about Rs. 74 lacs. The trade for April and May, 1920—the first two months of the financial year—amounted to 28,421 tons, of which the United Kingdom supplied 18,000 and the United States about 4,500 tons.

Canada has competed in Japan and China in steel bars, and is possibly doing so today; accordingly our steel mills should be able to do equally well in India. It is very likely that the supplies sent into this country will continue to be heavy if not to expand over a number of years. One firm stated that if they could be assured of receiving supplies from the Dominion they would be prepared to take 30,000 tons of mild steel a year, spread over girders, bars, angles, tees, rods, plates and sheets. Importers stated that there is a very good market for tool steel in squares, rounds, flats, hexagonals and octagonals, ¼ inch to 3 inches. There is a certain amount of faggot steel imported into Burma, and possibly into other parts of India. In the former country these are manufactured into big knives called dahs, which are almost always carried by the jungle natives. These knives are also made of bar iron and edged with Milano steel.

In connection with the steel business, it should be mentioned that a good deal of it is done on a consignment basis—in fact, the head of a very large importing house stated that practically all British steel manufacturers do a consignment business in India, and the same remark applies to wire rope.

American steel manufacturers appear to be very determined to make themselves supreme in the Indian market, and some of them have opened up their own offices. It is understood that the largest of these will carry heavy stocks, and supply their customers from their own godowns, as is their practice in other parts of the world. This is undoubtedly a sound as well as an aggressive policy, and one that will probably be very well rewarded in the future.

### Canadian Wire There

Canadian wire is well known in this market, but appears to be considered by dealers to be somewhat dull in appearance. One large importer stated that the pre-war German wire was the very best he had ever handled, but in his opinion the article turned out in the United States today is exceedingly satisfactory, and one point upon which he was very strong was that the packing of the latter was the best in the world.

It is pleasing to note that Canadian woven wire fencing has firmly established itself on this market, and is probably more used than the make of any other country, although very few in India are aware of the fact. There is a certain, but by no means extensive, demand for wrought iron gates. One dealer was very interested in a gate which he had seen in Canada, which opened automatically on approach, and was anxious to obtain one.

Wire netting, which should be painted green, is in considerable request. This is imported from the United States in 12, 14, 16 and 18 mesh, 3 feet wide, and in rolls of 50 feet, and also 8 by 8 to the inch—which latter is used for rice mills. On tea estates a good deal of 19 gauge wire netting is employed in the withering houses, ½ and ¾ mesh and 3 feet wide.

### Bolts and Nuts

Bolts and nuts are made in India near Calcutta, but as the figures show, this local industry is not able by any means to supply the requirements. The imports for the fiscal year 1919-20 amounted to nearly Rs. 26 lacs, of which the United Kingdom supplied to the value of about Rs. 14 lacs, the United States about Rs. 10 lacs, and Japan a little over a lac. It is interesting to note how the trade of the United Kingdom jumped up in the year referred to, while that of the United States and Japan, and particularly the latter, fell away. Apparently Canadian bolts and nuts have come into this market, as one dealer stated that he had handled them, and that they were quite satisfactory. He mentioned that the packages were a little short in weight, being 112 pounds gross instead of 110 pounds net, the latter being the weight to which the Indian market is accustomed.

### Must Please the Eye

Canadian nails are very well known but are not thought so well finished or well polished as the American, which in a market like India, where appearances count for so much, militates against their sale. Very large stocks of wire nails are carried by the principal importers, and one of them pointed out in his godown no less than 12,000 kegs. Unfortunately several shipments of Canadian nails arrived here some time ago, and, owing probably to mishandling in transhipment, the kegs on arrival in Calcutta went to pieces. The consequence of this was that the importers suffered a considerable loss, one of them putting it as high as 50 per cent., although that is probably somewhat exaggerated. With regard to the appearance, the difficulty does not lie so much with the ultimate consumer as with the bazaar merchants, who profess fear that if the nails are not

# SELECTED MARKET QUOTATIONS

**Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.**

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $26 00 |
| Lake Superior, charcoal, Chicago | 40 50 |
| Standard low phos., Philadelphia | 41 50 |
| Bessemer, Pittsburgh | 28 96 |
| Basic, Valley furnace | 26 00 |
| Toronto price:— | |
| Silicon, 2.25% to 2.75% | 39 25 |

## IRON AND STEEL

| Per lb. to Large Buyers | Cents |
|---|---|
| Iron bars, base, Toronto | $ 4 25 |
| Steel bars, base, Toronto | 4 25 |
| Iron bars, base, Montreal | 4 25 |
| Steel bars, base, Montreal | 4 25 |
| Reinforcing bars, base | 4 25 |
| Steel hoops | 5 50 |
| Tire steel | 5 00 |
| Spring steel | 8 00 |
| Band steel, No. 10 gauge and 3-16 in. base | 4 75 |
| Chequered floor plate 3-16 and heavier | 6 50 |
| Bessemer rails, heavy, at mill | 2 35 |
| Steel bars, Pittsburgh | 2 10-2 25 |
| Tank plates, Pittsburgh | 2 65 |
| Structural shapes, Pittsburgh | 2 45 |
| Steel hoops, Pittsburgh | 3 05 |
| F.O.B., Toronto Warehouse | |
| Small shapes | 4 50 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 3.48 |
| Structural shapes | 3 58 |
| Plates | 3 78 |
| Small shapes under 3-in. | 3 48 |

## FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

| | C.L. | L.C.L. |
|---|---|---|
| Montreal | 58½ | 73 |
| St. John, N.B. | 84½ | 106½ |
| Halifax | 86 | 108 |
| Toronto | 38 | 54 |
| Guelph | 38 | 54 |
| London | 38 | 54 |
| Windsor | 35 | 50½ |

Current surcharge, 8 per cent.

## METALS

| | Gross. Montreal | Toronto |
|---|---|---|
| Lake copper | $18 00 | $17 50 |
| Electric copper | 17 50 | 17 50 |
| Castings, copper | 17 25 | 18 00 |
| Tin | 36 00 | 39 00 |
| Spelter | 7 75 | 7 50 |
| Lead | 6 50 | 7 50 |
| Antimony | 8 00 | 8 25 |
| Aluminum | 34 50 | 30 00 |

Prices per 100 lbs.

## PLATES

| | | |
|---|---|---|
| Plates, 3-16 in. | $5 25 | $4 75 |
| Plates, ¼ up | 4 75 | 4 25 |

## PIPE—WROUGHT

Standard Buttweld Pipe S/C

Per 100 feet.

| Size | Steel Blk. | Steel Galv. | Gen. Wrot Iron Blk. | Gen. Wrot Iron Galv. |
|---|---|---|---|---|
| ⅛ in. | $ 6 50 | $ 8 50 | $ .... | $ .... |
| ¼ in. | 4 89 | 6 99 | 5 91 | 8 01 |
| ⅜ in. | 4 89 | 6 99 | 5 91 | 8 01 |
| ½ in. | 6 50 | 8 03 | 7 95 | 9 48 |
| ¾ in. | 7 99 | 10 06 | 9 95 | 12 02 |
| 1 in. | 11 82 | 14 88 | 14 71 | 17 77 |
| 1¼ in. | 15 99 | 20 13 | 19 90 | 24 04 |
| 1½ in. | 19 11 | 24 06 | 23 79 | 28 74 |
| 2 in. | 25 72 | 32 38 | 32 01 | 38 67 |
| 2½ in. | 40 66 | 51 19 | ..... | ..... |
| 3 in. | 53 17 | 66 94 | ..... | ..... |
| 3½ in. | 67 62 | 84 18 | ..... | ..... |
| 4 in. | 80 12 | 99 74 | ..... | ..... |

Standard Lapweld Pipe S/C

Per 100 feet.

| Size | Steel Blk. | Steel Galv. | Gen. Wrot Iron Blk. | Gen. Wrot Iron Galv. |
|---|---|---|---|---|
| 2 in. | $29 42 | $36 08 | $35 71 | $42 37 |
| 2½ in. | 44 17 | 54 70 | 54 11 | 64 64 |
| 3 in. | 57 76 | 71 53 | 70 76 | 84 53 |
| 3½ in. | 69 46 | 86 02 | 85 10 | 101 66 |
| 4 in. | 82 30 | 101 92 | 100 83 | 120 45 |
| 4½ in. | 95 89 | 1 20 | 1 30 | 1 54 |
| 5 in. | 1 12 | 1 40 | 1 52 | 1 80 |
| 6 in. | 1 45 | 1 81 | 1 97 | 2 33 |
| 7 in. | 1 89 | 2 37 | 2 53 | 3 01 |
| 8L in. | 1 99 | 2 49 | 2 66 | 3 16 |
| 8 in. | 2 29 | 2 87 | 3 07 | 3 64 |
| 9 in. | 2 74 | 3 43 | 3 67 | 4 36 |
| 10L in. | 2 54 | 3 18 | 3 41 | 4 05 |
| 10 in. | 3 28 | 4 10 | 4 39 | 5 21 |

**Prices—Ontario, Quebec and Maritime Provinces**

## WROUGHT NIPPLES

4-in. and under, 50 per cent.

4½-in. and larger, 40 per cent.

4-in. and under, running thread, 20%.

Standard couplings, 4-in. and under, 20%

Dd., 4½-in. and larger, net.

## OLD MATERIAL

Dealers' Average Buying Prices

Per 100 Pounds.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $ 9 50 | $ 9 00 |
| Copper, crucible | 11 00 | 11 00 |
| Copper, heavy | 11 00 | 11 00 |
| Copper wire | 11 00 | 11 00 |
| No. 1 machine composition | 10 00 | 9 75 |
| New brass cuttings | 7 00 | 8 00 |
| Red brass turnings | 8 00 | 8 00 |
| Yellow brass turnings | 6 00 | 6 00 |
| Light brass | 5 00 | 5 00 |
| Medium brass | 6 00 | 6 00 |
| Scrap zinc | 4 00 | 4 00 |
| Heavy lead | 4 00 | 4 00 |
| Tea lead | 2 00 | 2 00 |
| Aluminum | 12 00 | 10 00 |

| | Per Ton | Gross |
|---|---|---|
| Boiler plate | $11 00 | $12 00 |
| Heavy melting steel | 12 00 | 14 00 |
| Axles (wrought iron) | 25 00 | 20 00 |
| Rails (scrap) | 12 00 | 14 00 |
| Malleable scrap | 20 00 | 20 00 |
| No. 1 machine cast iron | 30 00 | 25 00 |
| Pipe, wrought | 8 50 | 8 00 |
| Car wheel | 30 00 | 25 00 |
| Steel axles | 20 00 | 18 00 |
| Mach. shop turnings | 6 00 | 6 00 |
| Stove plate | 23 00 | 20 00 |
| Cast boring | 5 00 | 7 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, 7-16 and up | Net list |
| Carriage bolts, ⅜" and less | 15 |
| Coach and lag screws | —20 |
| Stove bolts | 55 |
| Wrought washers | —25 |
| Elevator bolts | Net |
| Machine bolts, 7-16 and over | —5 |
| Machine bolts, ⅜-in. and less | —30 |
| Blank bolts | Net |
| Bolt ends | —5 |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | +25 |
| Machine screws, fl. and rd. hd., brass | Net |
| Machine screws, o. and fil. hd., brass | Net |
| Nuts, square, blank | +25 add $2 00 |
| Nuts, square, tapped | add 2 25 |
| Nuts, hex., blank | add 2 25 |
| Nuts, hex., tapped | add 2 75 |
| Copper rivets and burrs, list less | 27½ |
| Burrs only, list plus | 10 |
| Iron rivets and burrs | 37½ and 5 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, bright | 67½ |
| Wood screws, flat, brass | 55 |
| Wood screws, O. & R., brass | 55½ |
| Wood screws, flat, bronze | 50 |
| Wood screws, O. & R., bronze | 47½ |

## MILLED PRODUCTS

(Prices on unbroken packages)

| | Per Cent |
|---|---|
| Set screws | Less 40% |
| Square and hexagon head cap screws | Less 30% |
| Round head cap screws | Plus 10% |
| Fillister head cap screws | Less 10% |
| Flat head cap screws | Net list |
| Button head cap screws | Plus 10% |
| Studs | Less 20% |
| Semi-finished nuts up to and including 1-in. | Less 35% |
| Semi-finished nuts 1⅛ to 1½" | Less 30% |
| Semi-finished nuts 1⅝ to 2 in. | Net list |
| Coupling bolts | Plus 10% |
| Taper pins | Less 40% |
| Planer bolts without fillet | Plus 40% |
| Planer bolts with fillet | Pus 50% |
| Patch bolts | Plus 80% |
| Hollow set screws | Plus 20% |
| Thumb screws | Less 35% |
| Thumb nuts | Less 65% |

## BILLETS

F.O.B. Pittsburgh.

| | Per gross ton |
|---|---|
| Bessemer billets | $43 50 |
| Open-hearth billets | 43 50 |
| O.H. sheet bars | 47 00 |
| Forging billets | 48 50 |
| Wire rods | 57 00 |

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails, base | $5 10 |
| Cut nails, base | 5 75 |
| Miscellaneous wire nails | 50% |

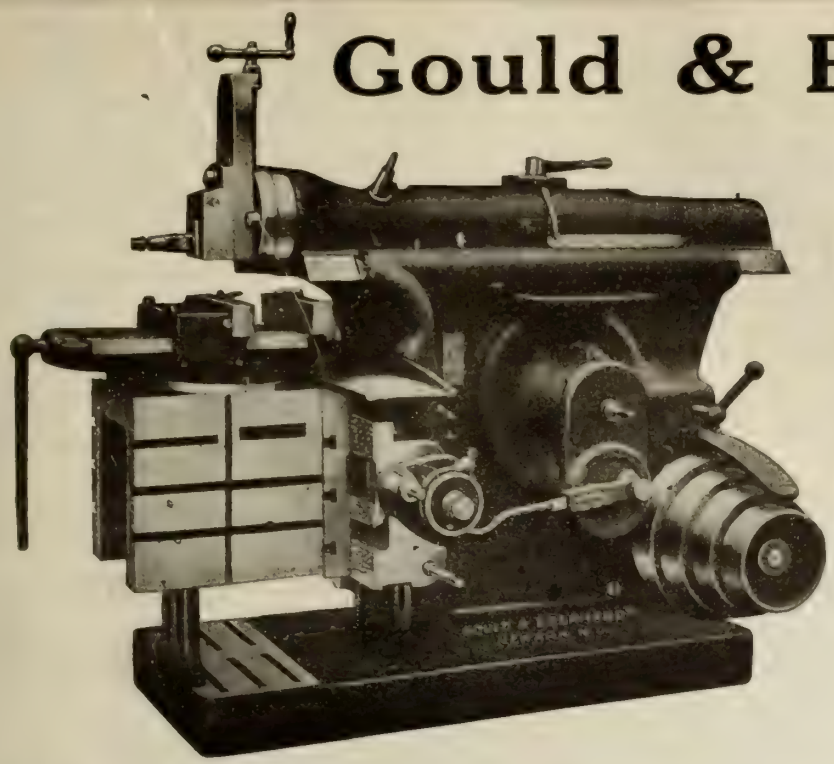
## ROPE AND PACKING

| | |
|---|---|
| Plumbers' oakum, per lb. | 0 10¼ |
| Packing, square braided | 0 38 |
| Packing, No. 1 Italian | 0 44 |
| Packing, No. 2 Italian | 0 36 |
| Pure Manila rope | 0 26 |
| British Manila rope | 0 20 |
| New Zealand hemp | 0 20 |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | Net |

# Gould & Eberhardt



## High-duty SHAPERS

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bright their customers will not take them off their hands.

There is a good market for nails for horse shoes and also for bullock shoes between 1¼ to 1½ inches.

All wire nails arrive on the market packed in kegs containing 100 pounds net, but it was stated by one or two importers that there seems no reason why they should not come out in cases of 45 to 50 pounds. Referring to American packing, one importer drew attention to some kegs of American nails to prove his point as to the excellence of their method. These kegs had wire hoops at the top and bottom, and other hoops four inches from each end. The ends of the wire were firmly twisted together and the hoops, which were fixed with staples driven in at intervals, had apparently been hammered over the ends of the keg. The breakages among American kegs are said to average not more than 1 per cent. Apparently the bazaar prefers wire nails with chequered heads.

## Scrap Metal Market

On the Pittsburgh scrap market prices continue to seek lower levels, due to the fact that few of the steel manufacturers are showing any interest in the market, and as the dealers who have yards see no immediate prospect of an improvement in business, they are reducing their bids against material for laying down on their yards. Heavy melting steel has been offered at $13.50 per gross ton delivered.

Prices on most grades have again dropped from 50 cents to $1 per ton on the Chicago market. Buying is at a standstill as both sellers and users are inactive. Railroad lists are also not attractive to carriers.

The chief activity at New York on the scrap market is in turnings, but these have declined $1, $9 delivered Phoenixville being about the best price obtainable.

There is a little activity in stove plate, cast and heavy melting steel on the Buffalo market, but not to be compared with a normal market. A tonnage of stove plate was recently bought at $19, but this was a top price. Ten dollars is the top price offered by a local consumer, which is not getting any heavy tonnage at this price.

The scrap market continues to be almost lifeless at Cleveland. A local mill is offering $13 for select heavy melting steel scrap to lay down in its yard, but with this exception consumers are staying out of the market. The supply is becoming somewhat more plentiful owing to the resumption of a few Cleveland plants making automobile parts, and this is having a tendency to make prices weaker. Dealers are showing some anxiety to the attitude of mills over the acceptance of high-priced scrap, a great deal of which they have on their order books at prices up to $30 or higher for heavy melting steel.

### POINTS FOR TWIST DRILL USERS

If the drill chips on the edge it indicates that the lip clearance is too great and fails to support the cutting edge. This may be because the drill is too hard. It is advisable to ease off on the feed and watch the grinding.

If it splits in the web, it is either ground with improper centre lip angle or the feed is altogether too heavy. The centre lip should be at about 45 degrees to the cutting lips of the drill. The drill is in best condition when the chip comes out in a close coil.

If the outer corners wear it shows that the speed is too high and it should be reduced. This is particularly noticeable in drilling cast iron.

Drilling cast iron can be done at a little faster speed than for steel, but the corners must be watched.

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | $ 0 25 |
| Solder, guaranteed | 0 27 |
| Soldering coppers, lb. | 0 62½ |
| White lead, pure, cwt. | 17 00 |
| Red dry lead, 100-lb. kegs, per cwt. | 13 00 |
| Linseed oil, boiled, single bbls. | 1 03 |
| Wood alcohol, per gal. | 2 75 |
| Whiting, plain, per 100 lbs. | 3 00 |

### CARBON DRILLS AND REAMERS

| | |
|---|---|
| S.S. drills, wire size | 40 and 5 |
| Can. carbon cutters, plus | 10 |
| Standard drills, all sizes | 40 and 5 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 and 5 |
| Bit stock | 50 |
| Ratchet drills | 10 |
| Pure turp., single bbls., gal. | 1 20 |
| Linseed oil, raw, single bbls. | 1 00 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 50 |
| Sleeves | 50 |
| Taper pin reamers | 25 off |
| Drills and countersinks | Net |
| Bridge reamers, carbon | 50 |
| Centre reamers | 5 |
| Gasoline, per gal., bulk | 0 42 |
| Chucking reamers | Net |
| Hand reamers | 10 |
| High speed drills, list net to plus | 20 |
| Can. high speed cutters, net to plus | 10 |
| American | plus 40 |

### COLD ROLLED STEEL

[At Warehouse]

| | |
|---|---|
| Rounds and squares | $7.00 base |
| Hexagons and flats | 7.00 base |

### IRON PIPE FITTINGS

| | Black | Galv. |
|---|---|---|
| Class A | 60 | 75 |
| Class B | 26 | 36 |
| Class C | 17 | 26 |

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 6 50 | $ 6 50 |
| Sheets, blue ann., No. 10 | 5 50 | 5 50 |
| Canada plates, dull, 52 sheets | 12 00 | 13 00 |
| Can. plates, all bright | 14 00 | ..... |
| Apollo brand, 10¾ oz., galvanized | ..... | ..... |
| Queen's Head, 28 B.W.G. | 10 75 | ..... |
| Fleur-de-Lis, 28 B.W.G. | 10 00 | ..... |
| Gorbal's Best, No. 28 | ..... | ..... |
| Colborne Crown, No. 28. | ..... | ..... |
| Premier, No. 28, U.S. | 8 75 | 8 50 |
| Premier, 10¾-oz. | 8 25 | 8 90 |
| Zinc sheets | 13 00 | 15 00 |

### PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13; 5-16, $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

### ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13; 5-16 in., $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

**Prices per 100 lbs.**

### FILES AND RASPS

| | Per Cent |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 32½ |
| Black Diamond | 27½ |
| J. Barton Smith, Eagle | 50 |
| McClennand, Globe | 50 |
| Delta Files | 20 |
| Disston | 40 |
| Whitman & Barnes | 50 |
| Great Western-American | 50 |
| Kearney & Foot, Arcade | 50 |

### BOILER TUBES

| Size | Seamless | Lapweld |
|---|---|---|
| 1 in. | $26 00 | $..... |
| 1¼ in. | 27 25 | ..... |
| 1½ in. | 26 25 | 29 50 |
| 1¾ in. | 29 75 | 27 00 |
| 2 in. | 29 25 | 24 50 |
| 2¼ in. | 33 00 | 28 50 |
| 2½ in. | 44 75 | 32 50 |
| 3 in. | 49 25 | 40 00 |
| 3¼ in. | ..... | 48 50 |
| 3½ in. | 63 50 | 43 50 |
| 4 in. | 85 00 | 55 50 |

Prices per 100 ft., Montreal and Toronto

### OILS AND COMPOUNDS

| | |
|---|---|
| Castor oil, per lb. | — |
| Royalite, per gal., bulk | 28 |
| Palacine | 31 |
| Machine oil, per gal. | 58 |
| Black oil, per gal. | 27 |
| Cylinder oil, Capital | 1.01 |
| Petroleum fuel oil, bbls., net | 11.2 |

### BELTING—No. 1 OAK TANNED

| | |
|---|---|
| Extra heavy, single and double | 15% |
| Standard | 15 and 10% |
| Cut leather lacing, No. 1 | 2 00 |
| Leather in side | 2 40 3 00 |

### TAPES

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES

| | |
|---|---|
| Polishing wheels, felt | $4 50 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, Turkish | 8¾ |
| Pumice, ground | 06 |
| Emery glue | 30 |
| Tripoli composition | 9½ |
| Crocus composition | 12 |
| Emery composition | 11 |
| Rouge, silver | 64 |
| Rouge, powder, nickel | 38 |

**Prices per lb.**

### ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | 8½ |
| Grits, 80 and finer | 6 |

### BRASS—Warehouse Price

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 30 |
| Brass sheets, 24 gauge and heavier, base | 38 |
| Brass tubing, seamless | 42 |
| Copper tubing, seamless | 44 |

| | | | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 19 |
| Peerless | 22 | X Empire | 15 |
| Grand | 21½ | Ideal | 18 |
| Superior | 21½ | X Press | 13½ |
| X L C R | 16½ | | |

### WASTE

**Colored**

| | | | |
|---|---|---|---|
| Lion | 13½ | Popular | 10½ |
| Standard | 12 | Keen | 9 |
| No. 1 | 14 | | |

**Wool Packing**

| | | | |
|---|---|---|---|
| Arrow | 35 | Anvil | 22 |
| Axle | 28 | Anchor | 17 |

**Washed Wipers**

| | | | |
|---|---|---|---|
| Select White | 20 | Dark colored | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

### RUBBER BELTING

| | | | |
|---|---|---|---|
| Standard | 10% | Best grades | 15% |

### ANODES

| | |
|---|---|
| Nickel | .55 to .60 |
| Copper | .38 to .40 |
| Tin | .70 to .70 |
| Zinc | .16 to .17 |

**Prices per lb.**

### COPPER PRODUCTS

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | $30 00 | $34 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 32 00 | 38 00 |
| Copper sheet, tinned, 14 x 60, 14 oz. | 38 00 | 42 00 |
| Copper sheet, planished, 16 oz. base | 44 00 | 48 00 |
| Braziers', in sheets, 6 x 4 base | 36 00 | 41 00 |

### LEAD SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $ 9 50 | $14 50 |
| Sheets, 3½ lbs. sq. ft. | 9 25 | 14 00 |
| Sheets, 4 to 6 lbs. sq. ft. | 9 00 | 13 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

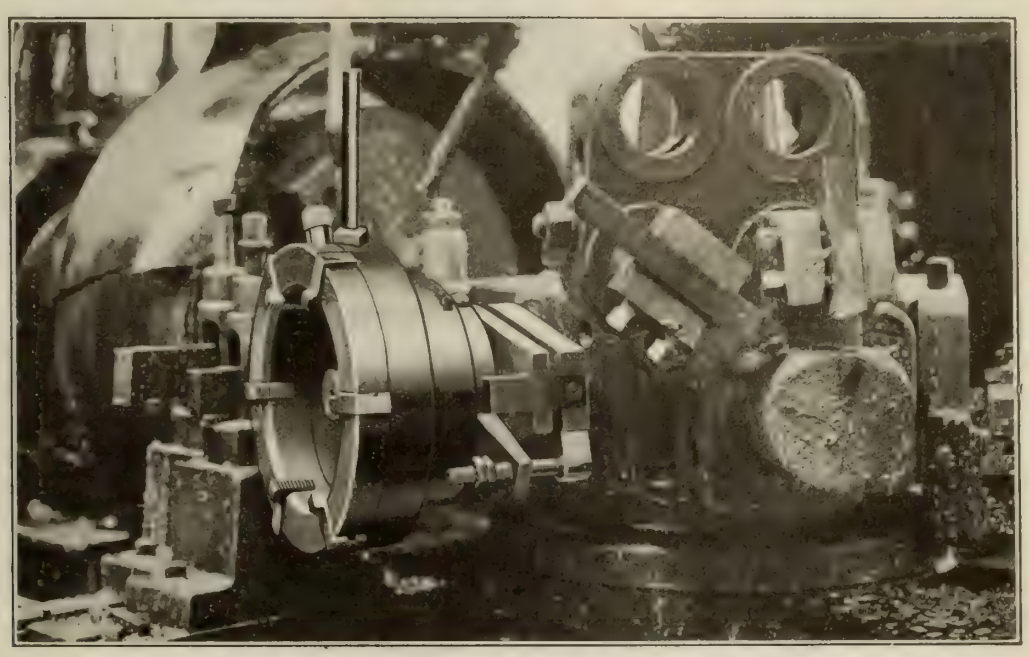
### PLATING CHEMICALS

| | |
|---|---|
| Acid, boracic | $ .25 |
| Acid, hydrochloric | .03¾ |
| Acid, nitric | .10¼ |
| Acid, sulphuric | .03¾ |
| Ammonia, aqua | .20 |
| Ammonium, carbonate | .23 |
| Ammonium, chloride | .22 |
| Ammonium, hydrosulphuret | .75 |
| Ammonium sulphate | .30 |
| Arsenic, white | .18 |
| Copper, carbonate, annhy. | .35 |
| Copper, sulphate | .10 |
| Cobalt, sulphate | .20 |
| Iron perchloride | .62 |
| Lead acetate | .30 |
| Nickel ammonium sulphate | 16½ |
| Nickel carbonate | .30 |
| Nickel sulphate | .17½ |
| Potassium sulphide (substitute) | .40 |
| Silver Chloride (per oz.) | 1.15 |
| Silver nitrate (per oz.) | 1.10 |
| Sodium bisulphate | .13 |
| Sodium carbonate crystals | .04 |
| Sodium cyanide, 127-130% | .39 |
| Sodium hyposulphite per 100 lb. | 6.50 |
| Sodium phosphate | .15 |
| Tin chloride | .80 |
| Zinc chloride, C.P. | .30 |
| Zinc sulphate | .08 |

**Prices per lb. unless otherwise stated**

Right on the Lead

# A Big Job
# And A Big Die Head To Cut The Thread



In less than one minute's time the big 5⅜-inch Geometric Die Head cuts the thread on the bearing plate of ball-bearing journal jacks, and then releases automatically and makes way for the next tool.

The Foreman of Tool Supply in that Shop says he knows of no other tool that will do the work as they require it done like a GEOMETRIC.

Geometric Screw-cutting Tools help the man at the Lathe and at the Screw Machine give the best possible showing on a day's work. These tools are built to fit the work —to handle it in the easiest manner and produce threads that are true in every particular.

**100 PER CENT. SATISFACTION**
**IS OBTAINED BY THE USE OF A GEOMETRIC.**

## THE GEOMETRIC TOOL COMPANY
**NEW HAVEN CONNECTICUT**

***Canadian Agents:***

Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.
Williams & Wilson Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, St. John, N.B.; Halifax, N.S.

*If interested tear out this page and place with letters to be answered.*



# INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES



## EXPECT TO GET ENGLISH ORDER

**Canadian Car Co. Officials Are Off To England To Secure Order For Canadian Shop**

Montreal—Negotiations for a large order for railway equipment have practically been completed in England with W. W. Butler, of the Canadian Car and Foundry Co., and W. H. Woodin, of the American Car Company, who have sailed for England to close the contracts.

Canadian railways, although short of equipment, have not ordered any new equipment recently, and a substantial Government order, which the Canadian Car Company has been expecting, has not materialized. Every effort, therefore, is being made by the car officials to book export business.

### Will Press Claim

Although little has been heard regarding the progress being made in connection with the company's claim for $6,000,000 of alien enemy money held by the United States Government to reimburse the company for the destruction of its Kingsland, N.J., shell plant during the war period, it is learned that the company is still pressing the claim and the consensus of opinion is that the verdict will be satisfactory.

### Work of Spies

It will be recalled that when the United States entered the war, the Washington authorities seized many millions in cash and property from German-Americans, and decided to employ whatever part of this was necessary to reimburse allied concerns for damage as the result of plots by spies and German agents. When Canadian Car's New Jersey plant was destroyed with tremendous loss proof was forthcoming that the explosion was the work of spies employed by the Germans and on this evidence the company is basing its claim.

### WHO WROTE IT?

On page 36, March 24th issue, we published a panel on cutting piston rings. This was credited to G. H. Unfortunately we lost the original name of the author. Will he kindly write us at once so that this matter can be straightened up?—Editor.

### TRADE GOSSIP

A factory for the manufacture of tins will be built by the Laing Produce & Storage Co., Ltd., Brockville, Ont.

The Canada Overseas Trading Co., Vancouver, B.C., has secured an order for 8,000,000 feet of ties for the Egyptian State Railway.

The erection of a refrigerator building is contemplated by Trottier & Mainville, 1091 Dorchester Street East, Montreal.

J. B. Nicholson, Ltd., Toronto, have been awarded general contract for the reconstruction of coal yard for Milnes Coal Co., foot of Church Street, Toronto.

The general contract for construction of coal-handling plant for Bridgeburg Coal Co. is placed with J. B. Nicholson, Ltd., Excelsior Life Building, Toronto.

The Princess Hotel at the corner of King and Princess Streets, Toronto, has been purchased by the Florentine Statuary Co. and will be converted into a factory.

J. B. Nicholson, Ltd., Excelsior Life Building, Toronto, has been awarded the general contract for the construction of grain elevator and workhouse for the Dominion Flour Mills, Ltd., Brantford, Ont.

Tenders are being called for new Y.M.C.A. building at the corner of Queen and Weber Streets, Kitchener, Ont. Plans and specifications for all trades may be secured on application at Y.M.C.A.

The Sterling Woodworking & Construction Co., St. Lambert, Que., whose premises were destroyed by fire in November, 1920, have nearly completed rebuilding, and the factory is now in operation. Sashes, doors, interior finish and general millwork will be manufactured by this firm.

### FIRES

Fire swept the business section of Capreol, causing a loss of $45,000 to $50,000.

The high school at Cayuga, Ont., was recently destroyed by fire. The loss is estimated at $30,000, with insurance of $10,000.

Fire destroyed the factory of the Johnson Rubber Goods Co. on Creighton Avenue, Mount Dennis, Ont. The loss is estimated at $15,000.

## STEEL OF CANADA ANNUAL REPORT

**Very Satisfactory Operations Were Carried On During the Year 1920**

A satisfactory showing, despite th many adverse factors which prevaile during 1920, is made by the report of th Steel Company of Canada for that pe iod which was made public. The e hibit shows gross profits well up to tho of the 1919 level. After deductin charges for repairs, maintenance, in provements and making provision f inventory, reserve and 1920 income ta the results of the twelve months' oper tions amounted to $3,924,041, as con pared with $4,000,940 in 1919 and $5 367,120 in the preceding year.

From the 1920 gross figures were d ducted an amount of $652,255 as a pr vision for excess costs of constructi due to the abnormal conditions existi during the year, as well as an allowan of $712,683 for depreciation. These pr visions, together with sinking fund r quirements and fixed charges, left n earnings of $1,855,404, against $2,382,1 in 1919, the latter year's showing in th respect being enhanced by the fact th no allowance was made for the writi off of any allowance for excessive buil ing costs.

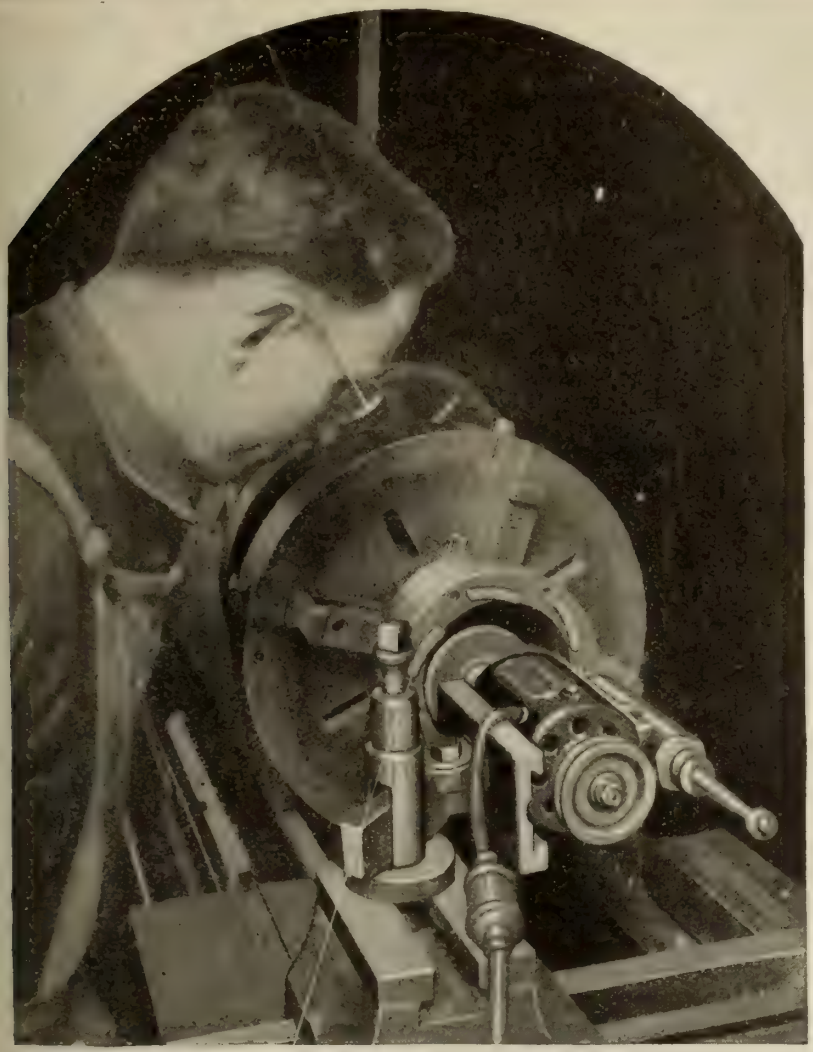
**Earning Capacity of 11.7 Per Cent.**

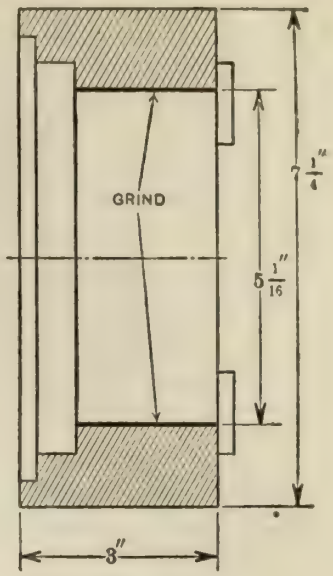
After the payment of dividends on t preferred stock of the company the was left available for application to t common shares a balance of $1,400,6 which, however, was reduced by $50,0 transferred to fire insurance reser leaving the net sum of $1,350,663, rep senting an earning capacity of 11.7 p cent. on the junior securities, compar with 14.6 per cent. in 1919, 15.8 per ce in 1918 and 19.5 per cent. in 1917.

The Record Foundry & Machine C Moncton, B.C., was destroyed by fire March 28. The damage to the wa house and shops is set at $70,000, fu covered by insurance.

### WANTS TO KNOW

A correspondent writes for informati on the subject of flour grinding ro Who can supply us with some inforn tion on this subject?






CAM
FOR DIE HEAD

Attached to the toolpost of the engine lathe on which this cam has been machined, the Dumore Grinder accurately grinds the hole without necessitating another "set up." The high efficiency standards of the Geometric Tool Co. (New Haven Conn.) make comment unnecessary on this method of handling the job. It is sufficient that the work of the Dumore is so satisfactory, the finish so fine, that all cams this size or larger, made in this shop are ground in this manner.

## The Average Shop Has Constant Use for Dumore Grinders

Dumore Grinders are made in types and sizes that can be attached to all classes of machines and used to successfully perform a wide variety of grinding operations.

Equally valuable for the important "odd jobs" that must be done in every shop and on some manufacturing work, they find a ready place in every part of every metal working plant—whether toolroom, factory or repair shop.

***Ask us about DUMORE Grinders—full details on request.***

## Wisconsin Electric Company

**2933 Sixteenth Street** **Racine, Wisconsin**

# DUMORE HIGH SPEED GRINDERS

*If interested tear out this page and place with letters to be answered.*

## TRADE GOSSIP

**C. M. C. New Office.**—Canada Machinery Corporation has moved its Toronto sales office from Brock Avenue subway to rooms 721-2, Bank of Hamilton Building, the new phone number being Main 745. W. J. Irving is in charge of the office, and J. W. Brown continues with the sales force here.

**Bought Premises.**—The British Canadian Tool and Machine Co., Ltd., Toronto, have purchased the property at 506 to 516 King Street East from the King Street Mission for $23,000. The lot has a frontage of 100 feet by a depth of 200 feet. This property was bought by the mission in 1912 with the idea of erecting a new building. The property is opposite the old car barns. The purchasers are erecting a $40,000 factory.

**Two Cuts Coming?**—It has been reported in New York that a cut by the United States Steel Corporation, in prices as well as wages, would be announced on the return of E. H. Gary from his western trip, probably on Thursday. The Steel Corporation officials admit that the matter has been under consideration, but that nothing will be made public until Mr. Gary's return.

**Making Steel Sash.**—Operations were commenced last week by Steel Sash, Ltd., London, makers of window sashes. This organization secured the Canadian patent rights from the American firm operating at Paterson, N.J. It is stated that total business in Canada for these products amounts to $2,000,000 annually, and the London plant expects to have a turnover of $200,000 in its first year. Three other plants make a similar line of products in Canada.

**New Power Plant.**—Parmenter and Bulloch, Ltd., Gananoque, Ont., are building a new power plant at a cost of $40,000. They have installed a Wickes boiler, 200 horse-power, also a Skinner engine, 150 horse-power (Unaflow type); Weber stack of reinforced concrete by the Weber Chimney Co., Chicago; Smith gas producer, 150 horse-power, by the Smith Engineering Co. This plant was designed and constructed under the supervision of W. Rees, M.E., who is also mechanical superintendent of Parmenter and Bulloch. J. S. McIntyre, who has been with Parmenter and Bulloch for the past fourteen years, is the operating engineer.

**New Windsor Plant.**—The new plant of the Toledo Scale Company at Windsor was opened recently, and the Canadian sales force is holding its convention coincident with the opening of the factory. The new building is of modern construction, with about 40,000 square feet of manufacturing space. The company proposes to do export business to other parts of the British Empire from its Canadian plant. An application has been made for a Dominion charter, and the name of the organization will be Canada Toledo Scale Company, Limited.

**Want Tenders**—The Canadian National Railways, eastern lines, are calling for tenders for the construction of eight concrete structures. W. A. Kingsland, C. N. R., Montreal, is receiving tenders and particulars can be had from the office of the engineer maintenance of way.

**Conditions Better.**—The Ontario Steel Products Co., of Gananoque, find that business has improved very appreciably during the past month. David Bain, who is general manager, when speaking to Canadian Machinery, stated that he is very optimistic about the business outlook as a whole, and looks for a general improvement in the very near future.

## SCOTIA STEEL HAVE ANNUAL MEETING

**Feeling Seems To Be That Worst Has Passed, and Future Is Faced Confidently**

New Glasgow.—The annual general meeting of the shareholders of the Nova Scotia Steel & Coal Company was held at the offices of the company in New Glasgow on March 30, at which the annual report of the company for the year 1920 was read and unanimously adopted. The president and management were congratulated by a number of the shareholders present on the excellent showing made during the past year, in the face of the none too promising prospects at the time of the previous meeting of the shareholders held in March, 1920, and all of those who spoke expressed the hope that although there was at present a world-wide trade depression, the worst had passed, and that the future might be looked forward to with confidence.

## PRICES BEING CUT IN CHICAGO

**Warehouses Are Out in an Effort to Get the Buyers to Come in and Take Hold**

Price reductions are announced by leading steel warehouse interests in Chicago on practically all grades of stock. Union Station Co. has placed the order for 7,000 tons of structural steel for the new railway mail postoffice with the McClintic-Marshall Co., of Pittsburgh. Price is understood to be slightly under $74 a ton comparing with $95 to $105, the prevailing level six months ago, and the pre-war range of $50 to $55.

The cut was made in the first place because auto interests and others were showing no tendency to come into the market.

About $15,000 damage was done to the New Toronto Leather Works in the recent fire. The loss is practically covered by insurance.

## RAILWAY SHOPS LET WORK SLIDE

**Claim Costs Are Too Great Too Keep The Rolling Stock In Proper Repair**

CHICAGO. — With their revenues so diminished that they are unable to earn operating expenses, the railroads have undertaken drastic measures of retrenchment. Blocked in their efforts to reduce wages and to change working conditions, the carriers have had but one course left to them, namely, the curtailment of their working forces. Wherever an employee can be dispensed with without actually interfering with the operation of trains, he is being laid off.

Railroad shops are fast being closed. Within the past few days the Delaware & Hudson has discontinued operations in its Colonies shops near Albany, N.Y., and this action will soon be followed by the closing of the Green Island, N.Y., and Oneonta shops of the same road.

The New York Central shops at West Albany have been shut down. These instances are typical of what is happening all over the country. As a result, necessary maintenance and repair work is being postponed indefinitely. It is estimated on good authority that ten per cent. of the entire freight equipment of American railroads is now in bad order, and this proportion is steadily being increased. When a car gets in bad repair, the railroad switches it on a siding, where it will remain until reduction in labor costs justifies its renovation.

### ALLOWANCES FOR RUNNING AND FORCE FITS

| RUNNING FITS | | FORCE FITS | |
|---|---|---|---|
| Diam. of Bearing | Diam. of Shaft | Diam of Hole | Diam. of Shaft |
| 1 | .999 | 1 | 1.001 |
| 2 | 1.998 | 2 | 2.003 |
| 3 | 2.997 | 3 | 3.005 |
| 4 | 3.9965 | 4 | 4.006 |
| 5 | 4.9963 | 5 | 5.007 |
| 6 | 5.996 | 6 | 6.008 |
| 7 | 6.9958 | 7 | 7.0085 |
| 8 | 7.9958 | 8 | 8.009 |
| 9 | 8.9957 | 9 | 9.01 |
| 10 | 9.9956 | 10 | 10.0105 |
| 11 | 10.9955 | 11 | 11.011 |
| 12 | 11.9954 | 12 | 12.0115 |
| 13 | 12.9953 | 13 | 13.012 |
| 14 | 13.9952 | 14 | 14.013 |
| 15 | 14.9951 | 15 | 15.014 |
| 16 | 15.995 | 16 | 16.0145 |
| 17 | 16.9949 | 17 | 17.015 |
| 18 | 17.9948 | 18 | 18.0155 |
| 19 | 18.9947 | 19 | 19.016 |
| 20 | 19.9945 | 20 | 20.017 |

Allowances for Drive Fits are one-half that of Force Fits.

# Aikenhead's Canada's Leading Tool Supply House

We are at all times able to fill your orders promptly—be they large or small. Our large stocks enable us to supply "Everything in Tools." When you require tools—think of Aikenhead's.



# Johansson

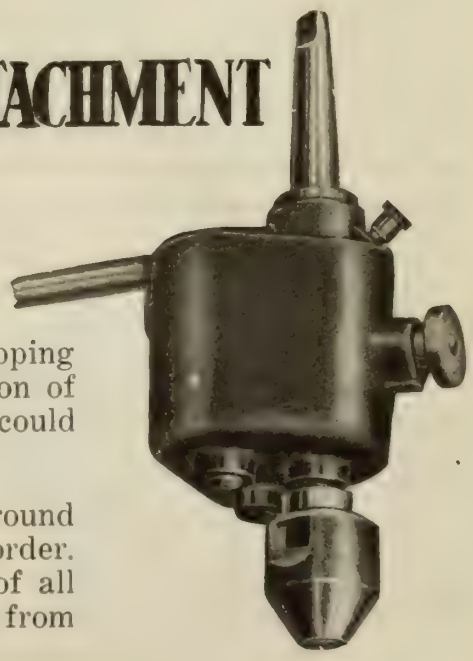
*The World's Standard of Accurate Gauging*

Introduce the "Limit System" into your shop with a set of Johansson Gauges. They assure equal results on all work, even in the hands of unskilled operators. They cut the time required for gauging in half—no inconsiderable item in these days of high production costs.

The Johansson book tells all about Johansson Gauges. If you haven't a copy, write to Aikenhead's for one to-day.

# Wahlstrom's Tapping Attachment

## *Ten Times as Fast*



Why stick to the old slow and expensive practice of hand tapping when you can do the same work in one-tenth the time with a Wahlstrom Automatic Tapping Attachment? It imitates the simple to-and-fro motion of hand tapping and will tap holes as squarely as they could be drilled.

The Wahlstrom is constructed of hardened and ground parts and has nothing whatever that can get out of order. It is manufactured in two sizes. No. 1 takes taps of all sizes from 5-40 to ½-inch standard. No. 2 takes taps from ¼ to ¾ inch.

## Aikenhead Hardware, Limited

**17 Temperance Street, Toronto, Ont.**

*If interested tear out this page and place with letters to be answered.*

# Have You Tried This Contest Yet? If not--- Do so Now

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.




The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

## What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

Eleven contestants sent in correct lists to the March 17th contest. We had again to resort to the elimination process, and Macklin Cunningham, Litchfield Conn., U.S.A., was the lucky one. This method of picking the winner is fair to everyone, for it does away with the distance problem. No matter how far away a subscriber lives, he has three weeks from the date of issue to send in his copy. On another page will be found the names of the other ten readers who forwarded correct lists.

**CONTEST FOR APRIL 7 ISSUE**

**Contestants are required to write us, stating to which advertisements we refer in this number.**

1 A case where brute strength pays.
2 How to get away from paying exchange.
3 A case where back draft is impossible.
4 How to protect your staff against disorganization.
5 How to ensure speed and easy manipulation.
6 A case where steers are very useful.
7 How to reap dividends quickly.
8 Something that contains no holes at the top or sides.
9 A product said to take the place of reamers.
10 Something that is always at your service.
11 A job that's done in less than a minute.
12 Something that is fully guaranteed.

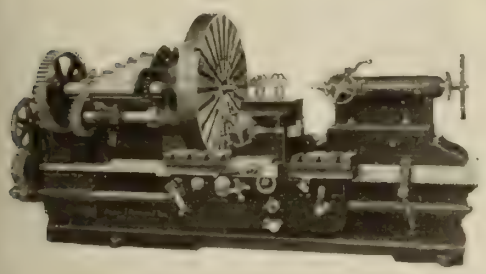
**These are Correct Answers for List from March 17th Issue:**

1—Roelofson Machine Tool Co. Ltd.
2—Kearney and Trecker Co.
3—Northern Electric Co. Ltd.
4—Ford-Smith Machine Co. Ltd.
5—C. E. Johansson, Inc.
6—The Toledo Machine & Tool Co.
7—The Holden Co. Ltd.
8—J. H. Williams & Co., Ltd.
9—E. C. Atkins & Co.
10—W. S. Rockwell Co.
11—J. Ackworthie, Ltd.
12—Independent Pneumatic Tool Co.

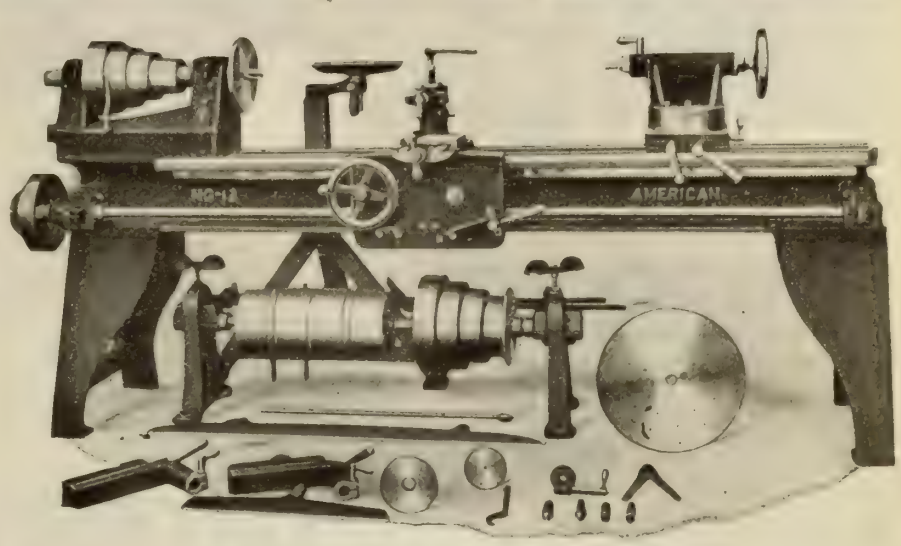
## Closing Date for This Contest is April 28th.

# GARLOCK-WALKER MACHINERY CO. LIMITED

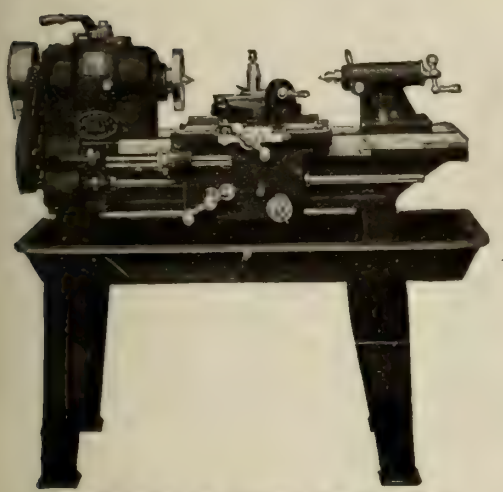
32 FRONT ST. WEST, TORONTO TELEPHONE MAIN 5346



Heavy Duty Engine Lathes, 36" to 54" swing, in stock.




A Lathe with various attachments for the pattern shop.



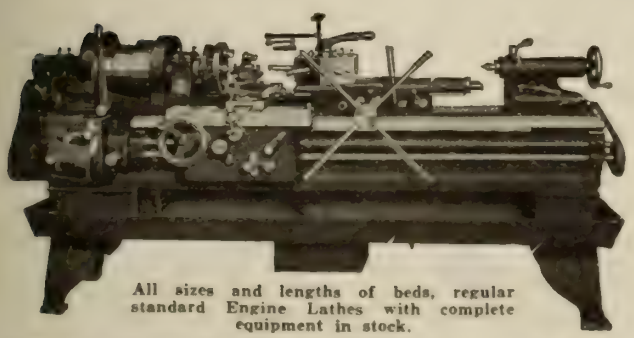
Small Lathes for garages, etc., also other lathes for production of duplicate parts.

## New and Used Lathes

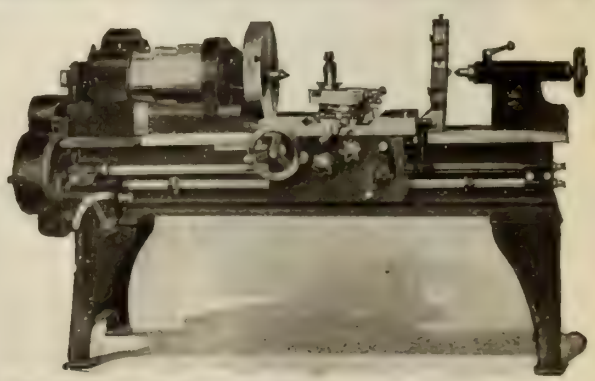
### *Good Opportunities*

DO you want to secure a lathe or other machine tool at a very attractive price? Get in touch with us now. We have an immense stock of **new** and **used** tools in our Toronto warehouse which you can secure at a price which will be bound to interest you. We have the lathe you want, the planer, the grinder, or other tool you want—Buy now.

**Quotations supplied on Equipment for any plant.**



All sizes and lengths of beds, regular standard Engine Lathes with complete equipment in stock.



Manufacturing Lathes with Turret equipment for heavy duty and production operations in stock.

## Garlock-Walker Machinery Company, Limited

32 Front Street West

MONTREAL TORONTO WINNIPEG

**METAL and WOODWORKING MACHINERY of all Kinds**

*If interested tear out this page and place with letters to be answered.*



**A Drinking Water Service that will last a LIFETIME**

What you pay for a [illegible] cups will meet the cost of one

**PURO** SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)

DRINKING CUPS ARE UNSANITARY [illegible]

PURO WILL SAFEGUARD THE HEALTH OF YOUR EMPLOYEES and pro- [illegible] Simply receives the ordinary [illegible] Puro.

Write us [illegible] for full information regarding [illegible] of installation of the "PURO" Sani- [illegible] Fountain Service.

**Puro Sanitary Drinking Fountain Co.**

*Canadian Agents:*
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888 F. St. Andre St., Montreal, P.Q., Canada




**N. SMITH BELTING**
138 YORK ST. TORONTO

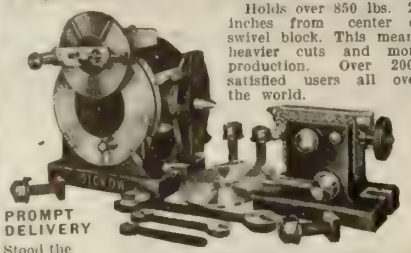
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Machine Springs, Valve Springs, Automobile Cushion Springs, etc., of a quality that defies competition. Tell us your requirements. Send sample or specification for price.

JAMES STEELE, LIMITED

**Why Reduce Your Production**

and waste money by using cheap, inaccurate Index Centers, when a few dollars more will buy a DICKOW INDEX CENTER, which is absolutely dependable, and guaranteed for its high degree of accuracy.



Holds over 850 lbs. 22 inches from center of swivel block. This means heavier cuts and more production. Over 2000 satisfied users all over the world.

PROMPT DELIVERY

Stood the test for 14 years.

Also Manufacturers of "DICKOW SUPERIOR EIGHT" Precision Lathes

Dependable and Accurate.

*Write us to-day for complete description.*

ACCURACY DICKOW QUALITY

FRED. C. DICKOW MACHINERY CO., Not Inc., 3504 W. Lake St., CHICAGO, ILL.

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**PATENTS**

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**HAMILTON ENGINEERING SERVICE**
LIMITED

*Consulting and Designing* — Tools, Jigs, Fixtures and Special Machinery. Let us shoulder your problems.

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Send us your blueprints and specifications. Entrust your requirements to experienced workmen and up-to-date equipment. Have your dies made in Canada. First-class workmanship guaranteed.

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Thorold Road, - St. Catharines, Ont.

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**OVENS**

Japanning and Varnishing Ovens heated by Gas, Electricity, Steam or Coal. Kernchen Siphonage Ventilators, Bakers' Ovens, trucks, casters, etc. Write for Booklet.

**Brantford Oven & Rack Co. Ltd.**
*Brantford, Canada*

BLACK DIAMOND OVENS

MACHINE AND BENCH **VISES**

Write for Prices

Superior Machinery Co., London, Canada

WHEN WRITING TO ADVERTISERS KINDLY MENTION THIS PAPER


# MONTREAL NOTES

The Oliver Engineering Co. are removing their Montreal offices and show rooms from 296 St. James Street to 307 St. James Street. This firm has recently installed some large hand operated cranes in the new power plant of the Montreal Harbor Commissioners and also in the plant of the Anglo-Canadian Wire Rope Co.

A large portion of the plant of the Record Foundry and Machine Co., at Moncton, N.B., was destroyed by fire last week; the damaged section is that of the warehouse and machine shop. Considerable stock was carried in the warehouse at the time of the fire. The loss was fully covered by insurance. Reconstruction work will be commenced immediately.

A. J. Hopkins, of 392 St. James Street, Montreal, has secured the Canadian agency for the Red Devil dolly jacks, and arrangements have been made for the manufacture of this line in Canada. Mr. Hopkins has likewise obtained the agency for the Billmont tools manufactured by the Edgar C. Guthard Co., of Chicago. This is a line of interchangeable sockets and wrenches.

The Corundo Steel Co., Ltd., have acquired the old Record Foundry and Machine plant at 17 Mill Street, Montreal. The purpose of the company is to establish a factory for manufacturing cutting and percussion tools from low-grade steel and by a special chemical heat treating process convert it into a product equal in quality to high-grade tempered steel, suitable for a variety of conditions. Oscar Schenk is managing director.

W. J. O'Leary, electrical engineer, of Montreal, has developed a new type of electrical motor, based on the utilization of harmonic vibrations for the source of power. The weight of the rotor is about one-sixth that in an ordinary motor of the same horsepower, and it is stated that a saving of from 20 to 50 per cent. is effected in current used. The invention has been patented in twenty-six different countries, and it is claimed that it can be applied to any machine requiring power for its operation.

An incorporated company to be known as the Prince Edward Island Light, Heat and Power Co. has recently been formed to supply light, heat and power by the use of electricity to all parts of Prince Edward Island, from one large central power station, using coal for generating purposes. It is expected that permanent employment will be provided for about 200 men. Noah A. Timmins, multi-millionaire, and W. J. O'Leary, electrical engineer, both of Montreal, are interested in the company.

The Black and Decker Manufacturing Co., of Baltimore, Md., are opening a new Canadian plant and sales office in Montreal. A. J. Hopkins, who for some

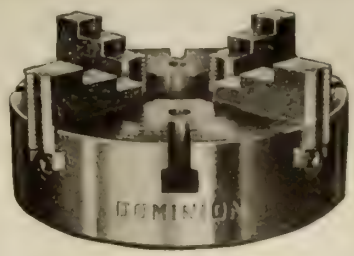
me. past has been connected with this rm, will assume the management of the anadian business. Mr. Hopkins has een associated with the machine tool rade for a number of years. The Mont-eal offices will be located at 392 St. ames Street.

E. McG. Quirk, of the Federal Labor epartment, is now in Cape Breton dis-rict on behalf of the Dominion Govern-ent for the purpose of investigating onditions relating to the steel industry. he primary reason for this move is the equest of the steel workers for a fed-ral inquiry into the situation existing n that section, particularly in connec-ion with the recent wage reductions ade by the steel companies.

The Department of Marine and Fish-ries announce that the laying of the 00 buoys in the St. Lawrence, between ontreal and Quebec, will be commenced his week; the completion of this work arks the official opening of the river or ocean vessels. While it is expected hat cargo vessels now in route may be iverted from their usual winter destina-ion, owing to the earlier opening of nland navigation, it is not anticipated hat any great change wll be effected in assenger traffic, as it would be inadvis-ble to interfere with the prepared chedule.

Canadian Vickers, Ltd., have an-ounced that the first launching of the eason will take place on Saturday of this week, when the Norwegian cargo teamer "Idefjord," constructed for the hipping firm of Den Norske Amerika-linje, of Christiania, Norway. Another essel for Norwegian register will be launched from this yard in the course of the next few weeks. Two Canadian Merchant Marine freighters, launched last fall, will shortly be turned over to the owners. The outlook for future building at this yard has been clouded by the prevailing high costs of con-struction work and the keen competition from yards in other countries.

With the passing of winter construc-tion work has again started on the large old storage plant being erected at the port of Montreal by the Harbor Com-missioners. It is expected that the structure will be sufficiently advanced this summer to enable the lower floor and basement to be used for the handling of perishable goods before the closing of the 1921 season. Work on the power house for operating the refrigerating equipment, and the transforming of power for use on the electrified rail-roads of the port, has proceeded through-out the winter, and this will be ready for operation in a very short time. An im-mediate start is to be made on continu-ing the work of electrifying the re-mainder of the harbor service, and it is hoped that this will be finished by fall.


DOMINION CHUCKS

STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY



All Screws Are Reversible

SCREWS are made of the best grade steel. Both ends are broached and are heat treated after machining. They are reversible, so that either end may be used, are large enough in diameter to stand the torsional strains applied by operator when setting up his work. They are made to give the best service—and may be depended upon to stand up under the hardest usage.

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Rubber Mill Machinery

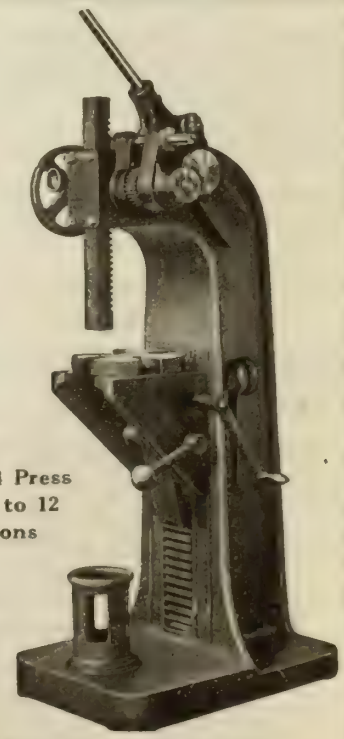
"Maple Leaf"
BRAND
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"Maple Leaf" brand costs less than leather, rubber and balata; has a positive grip on the pulley and is true running.




Have us send you samples and see just why "Maple Leaf" sets the standard in economy, strength and durability.

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No. 4 Press
10 to 12
tons

Write for complete information on Atlas Arbor Presses. All sizes for all purposes.

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Kalamazoo, Mich., U.S.A.
Canadian Representatives:
Chas. A. Strelinger Co., Windsor, Ont.

# Classified Opportunities

## PATTERNS

TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (ctfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

### Used Belting, Pulleys, Etc.

We carry right in stock a large quantity of used Belting, Pulleys, Hangers, Shafting, etc., in good condition, which we sell at half the price of new. Inquiries solicited. In writing mention sizes wanted. L. S. Tarshis & Sons, 92 Wellington St., Montreal.

### Modern Marine Machinery

Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

### Grey Iron Castings

Light and Medium-Bench and Floor Repetition Castings. Capacity 15 tons per day.
Expert Metal and Wood Pattern Work. Our advice and estimates will save you money.
Some finishing operations on Lathe or Grill on Castings supplied if required.
ASK US.
THE KATIE FOUNDRY, GALT, ONT.

PARTIAL LIST

### Machine Shop Equipment

*At Extremely Low Prices*

LATHES—All sizes and lengths of bed. Special price quoted on rebuilt 20 in. x 8 ft. C.M.C.

AIR COMPRESSOR—8 in. x 8 in. Chicago Pneumatic.

TANKS—10 Tanks 10 ft. 6 in. diam. x 29 ft. 6 in. long. 19,000 gals.
3 Tanks, 10 ft. 0 in. diam. x 39 ft. 0 in. long, 3/8 in. Heads. 22,893 gals.
Full line of other Steel Storage Tanks, open and closed, all sizes.

PUMPS—1 Triplex Power Pump, 1½ in. x 6 in. Hydraulic Machy. Co. Also 1 in. x 5 in. West Tire Setter.
1—Centrifugal Pump, 2½ in. x 1½ in. Gould.
1—Gould Triplex Power Pump, 2 in. x 3 in.

Milling Cutters and Reamers, full assortment, all sizes and shapes, at less than half price. Send us your enquiries.

**Standard Equipment & Tool Works**

Dept. K. 307 St. James St.
Main 2286 MONTREAL (20)

## FOR SALE

2 H.R.T. BOILERS, 72 IN. X 16 FT., 125 LBS. working pressure; suspended type.
2 H.R.T. BOILERS, 60 IN. X 14 FT., 120 LBS. working pressure.
1 H.R.T. BOILER, 42 IN. X 14 FT., 130 LBS. working pressure; rear suspended.
Box 766F, Canadian Machinery.

### REGO WELDING *and* CUTTING APPARATUS

Oxygen, Acetylene, and a complete line of Welding and Cutting Supplies.

**Carter Welding Co.**
**of Toronto, Limited**
**7-11 Sheppard St., Toronto, Ont.**
Phones: Adelaide 2841 and 1524 (TF)

### CLOSING TIME

Advertisements for this section must be in our composing room Tuesday morning prior to day of issue.

In order that the announcements of your wants, machinery for sale, etc., etc., shall not be delayed, please try to have them in our office with the Tuesday morning mail.

**Canadian Machinery**

### General Machine Pattern and Sheet Metal Work

If production is required

**Let our Battery of Bullards do it**

Large and small machine work our specialty. Our facilities assure first-class production with maximum efficiency. Before ordering get our estimates by mailing us your blue prints, or have our representatives call on you.

**Rubber Machinery Shops**
**Canadian Consolidated Rubber Co. Limited**
**Kitchener, Ont.**

## AGENTS WANTED

AMERICAN FIRM, SPECIALIZING IN OXY-acetylene welding and cutting equipment, is desirous of securing representatives and agents in Canada. Apply Box 763F, Canadian Machinery.

## POSITIONS WANTED

POSITION WANTED—MACHINE SHOP SUperintendent or general foreman. Acquainted with modern machine shop practice and heat-treatment of steel. Thirty years' experience. Production or contract work. Box 757, Canadian Machinery.

## MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

### MACHINE WORK WANTED

We are equipped to handle all kinds of general or special machine work. All operations in our plant are done under the most careful supervision and we can satisfy you as to price. Always available for consultation.

**PERFECT MACHINE COMPANY, GALT**
Builders of Reliable Machinery.

Phone Park. 3550 House: Coll. 9660W
197 Clinton Street, Toronto
**A. AUSTIN**
GENERAL MACHINE WORK
Turret Lathe and Automatic Screw Machine a Specialty. Let us quote on your work.
*With:* Garlock, Walker Machinery Co.
163 Dufferin Street.

### Re-Built Machinery For Sale

1—24" x 12' Canada Machinery Lathe.
2—22" x 10' Davis Lathes.
1—21" x 10' London Lathe.
6—20" x 8' C.M.C. Lathes.
1—18" x 8' Mueller Lathe.
1—18" x 8' London Lathe.
3—18" x 8' C.M.C. Lathes.
1—16" x 6' McDougall Lathe.
1—14" x 8' London Lathe.
1—14" x 6' Flather Lathe.
2—No. 1 Racine Hack Saws.
4—20" McDougall Drills.
1—22" Barnes Drill.
1—28" Barnes Drill.
1—D-1 H.D. Colburn Drill.
2—No. 24 H.D. Foote-Burt Drills.
1—16" C.M.C. Shaper.
1—24" Rockford Shaper.
2—2" x 26" Pratt & Whitney Turrets.
1—10" x 52" Plain Landis Grinder.

Specifications and prices sent upon request.

**Yeates Machinery, London**
Hale St., London, Ont.

# Classified Opportunities

## Steel Plant Equipment

6—Herault Electric Furnaces, 6 ton, tilting type, complete with transformers and auto regulators.

18—Williams Cut Off Machines, hollow spindle, taking up to 9½" bar stock.

1—Ajax Bulldozer, No. 12, jaw opening, 54" x 72" deep, approximately 12" stroke, sliding head.

6—Deane Horizontal, double plunger Pumps, 4⅛" x 18", capacity 200 gallons at 1,500 lbs. working pressure, being motor driven and complete with motors.

4—Kennedy Billet Shears, double head, 14" capacity.

1—Combined Punch and Shear, 10" throat.

8—New, Pittsburgh Ladles, cast steel, bottom discharge, 15 ton.

4—Used, Pittsburgh Ladles, cast steel, bottom discharge, 12 ton.

5—Used, Steel Plate Ladles, bottom discharge, 9 ton.

1—Used, Tilting Type, Ladle, capacity 6 ton.

**Wilson-McGovern, Limited**
LUMSDEN BUILDING - TORONTO

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**APRIL OFFERINGS AT SPECIAL PRICES**

1 26" x 10' C.M.C. Engine Lathe, 3 step cone, D.B.G., Q.C.G., complete.
1 22" x 10' Devenport, 3 step cone, D.B.G., Q.C.G.
1 21" x 10' Sidney, 3 step cone, D.B.G., Q.C.G.
1 20" x 10' C.M.C., 3 step cone, D.B.G., Q.C.G.
1 18" x 8' Greaves Klausman, 3 step cone, D.B.G., Q.C.G.
1 17" x 8' Sidney, 3 step cone, D.B.G., Q.C.G.
1—16" x 6' Rahn Larmon, 3 step cone, S.B.G., Q.C.G.
1 14" x 6' Screw Cutting Engine Lathe, 3 step cone, S.B.G., compound rest complete with chuck.
2½ x 24 Jones & Lamson, complete with collets and regular equipment.
3 x 26 Jones & Lamson, complete with collets and regular equipment.

**MISCELLANEOUS**

1—No. 9B Hendey Whitmore, Double End Punch and Shear, ⅝ in ⅜.
1 No. 4 Greenard Arbor Press, complete.
1 24" McGregor Gourley Shaper, B.G., power traverse.
1 No. 3 Ballantyne Self-feed Saw Table, 12" saw.
1—No. 1 Ballantyne Pedestal Shaper, 22" between spindles, complete.
1 16" Harper Jointer, square cylinder gauges, complete.
1 26" Harper Planer, complete with counter shaft.
1—8" Four-sided Cowan Moulder.
1 Cowan Horizontal Shaper.
2 Cowan Boring Machines, upright, foot treadle.
1 Cowan Disc Sander, wooden frame.
1—No. 2 Sutton Double End Punch and Shear, S.G., 8" throat, 4½" shear blade with 8" throat and ½" punch.
1—20" Barnes Drill, plain, wheel and lever feed, round table and base.
1 Ball Bearing Emery Wheel, pedestal type, 36" spindle, complete.
1—Perrin Hydraulic Press, ram 8" diameter, tight and loose pulley.
1—Air Compressor with two tanks.
1—66" x 14' boiler, complete with fire front grate and fittings.
1—New London Concrete Mixer, mounted on truck with engine and boiler.
1 10 x 24 Landis Grinder, complete with standard equipment.

The above is only a partial list of machines available and offered at prices that will convince the prospective buyer that they are saving money.

Send us a list of your requirements.

**R. S. HOLLY**
Suite 502, Kent Building, TORONTO, ONT.
PHONE ADELAIDE 3147

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MACGOVERN & COMPANY INCORPORATED POWER MACHINERY

### Motor Generator Sets

2—40 H.P. Ideal Electric Company Motors, 3 phase, 60 cycle, 550 volt, 39 amp., type A-22, mounted on base and direct connected to:

25 K.W. Battery-Charging D.C. Generators, type HR-22, 92 volts, 272 amps., 865 R.P.M. and with one 6 Circuit Switchboard, circuit breaker Field Rheostat.

1—45 H.P. Allis-Chalmers Motor, 3 phase, 60 cycle, 550 volts, 1160 R.P.M., 42 amps., mounted on base. Direct connected to:

Allis-Chalmers D.C. Generator, 125 volts, 420 amp., 1160 R.P.M., interpoles, 4 bearings.

3—14.3 H.P. Westinghouse Motor, 3 phase, 60 cycle, 550 volts, 1750 R.P.M.
Direct connected to:
9 K.W., type SK, 72 amp., 1750 R.P.M., 125 volt, A.C. shunt wound Generator.

**MacGOVERN & COMPANY, INC.**
285 BEAVER HALL HILL, MONTREAL
Offices: New York, Pittsburgh, Seattle. Plant: Linden, N.J.
Buyers and Sellers of New and Used Machinery

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STOCK SHIPMENTS

# STEEL

**Cold Rolled Strips and Bars**
**AUTO BODY SHEETS**
**Black and Galvanized Sheets**
**TIN PLATE CANADA PLATE**
**HOT ROLLED STRIPS**
TUBING---Seamless, Welded, Brass Cased, Flexible.

# BRASS

RODS (also Marine Bronze) TUBES SHEETS

# COPPER

RODS WIRE TUBES SHEETS

Quotations made for Mill or Stock deliveries on your requirements of Aluminum, Bronze, Monel Metal, Nickel Silver, Nickeloid, Phosphor Bronze, Tobin Bronze.

*WRITE US FOR PRICES.*

**ONTARIO METAL PRODUCTS**
CO., LIMITED
237 Dufferin St., TORONTO, Canada

# Classified Opportunities


## We Have
# Everything You Can Think Of
## In
# Mill and Shop Equipment

### MACHINERY (Metalworking)

Lathes
Planers
Shapers
Milling Machines
Screw Machines
Boring Mills
Tinners' Tools
Drilling Machines
Arbor Presses
Blacksmiths' Tools
Grinding Machines
Electric Motors
Electric Tools
Riveting Hammers
Pipe Machines
Metal Cutting Machines
Air Compressors
Heat Treating Furnaces
Pumps—all kinds
Precision Machinery

### MACHINERY (Woodworking)

Lathes
Planers
Borers
Jointers
Universal Woodworkers
Band Saws
Swing Saws
Moulders
Mortisers
Shapers
Knife Grinders
Saw Tables
Sanders
Wood Trimmers
Tenoners
Screw Driving Machines
Disc Grinders
Variety Saws
Dado Machines
Safety Devices

### TOOLS and Shop Supplies

Small Tools—all kinds
Cutting and Welding Torches
Belting
Pulleys
Metals—all kinds
Wire Rope
Manilla Rope
Grinding Wheels
Gears
Taps and Dies
Chucks
Vises
Jacks
Hoists
Shop Furniture
Brooms
Bolts—Screws—Rivets
Precision Tools

**THESE ARE ONLY A FEW OF THE MANY ITEMS WE HANDLE**

*Let us quote on your requirements*

## THE CHARLES A. STRELINGER CO.
## OF CANADA, LIMITED

126 Ferry Street Windsor, Ontario

# Classified Opportunities





**Canada's Dependable Machinery and Supply House**

## SMALL LIST OF SPECIAL MACHINES FOR QUICK SALE

10′ to 16′ **Bertram** Vertical Extension Type Boring Mill, swings 11′ when closed, 20′ when extended, takes 7′ 6″ under tools; two heads on rail and auxiliary boring head.

8′ Universal Radial Drill, spindle 4″ dia. with plain box table; base of T pattern 12′ x 4′ 3″; belt drive.

Two 12′ Wall Radial Drills (countersinking drills).

**Bertram** 6-Spindle Independent Feed Drill, spindles 2¼″ dia., feed 13″, table 12′ 3″ x 24″.

1,500-lb. **Bement** Double Frame Steam Hammer, complete with operating valve, anvil, etc.

30′ x 12′ x 8½′ **Smith, Beacock & Tannett** Planer, two heads on rail, table 29′ between pockets x 8′ wide, heavy cored section housings.

36′ x 36′ x 12′ **Belmer-Eames Planer,** two heads on rail, two side heads.

**Bertram** Double-end Punch and Shear, 42″ throat; will punch 1½″ in 1⅛″ plate, and shear 8″ x 1″ flat.

**Edwards** Double-end Punch and Shear; punch 38″ throat, capacity 2″ in 1″ plate, shear 30″ throat, with splitting blades 18″ long; angle shear in centre of frame for 6″ x 6″ angles.

**Cleveland** Style "C" Single-end Punch, 24″ throat; will punch 1″ in ½″ plate; architectural jaw.

**Bertram** Double-angle Shear, will cut 6″ x 6″ angles.

**Bertram** Horizontal Punch, capacity 1″ in 1″ plate, 16½″ gap.

**Lennox** Rotary Plate Bevelling Shear, capacity ¾″ plate.

**Beatty** Self-propelling Derrick Car, 30′ boom, derrick is "A" frame type, hoist 7″ x 12″ double cylinder, double drum, with link reverse; all mounted on 34″ x 10″ standard flat car.

Five-ton **Wilson** Revolving Locomotive Crane, standard gauge, 25-ft. boom, engine 7″ x 10″ double cylinder, truck frame 9′ 6″ x 6′ 6″ on four wheels.

42″ Style "A" **West Side** Power Feed Band Rip Saw; table 52″ x 42″.

54″ **McDonough** Horizontal Band Re-saw with bevel sliding attachment; has power feed and will take stock up to 30½″ wide x 12″ thick; takes 7″ saw.

No. 640 **American** Eight-roll **"Boss" Timber** Sizer; will surface all four sides on timber up to 30″ x 20″; has six rates of feed and is furnished with forged steel cylinders, chip-breaker, etc.; belt-drive.

***In our warerooms we have a large stock of new and used machinery of various sizes and makes.***

## H. W. PETRIE, LIMITED

**TORONTO and HAMILTON**

# PETRIE

# Canadian Machinery BUYERS DIRECTORY

**If what you want is not here, write us, and we will tell you where to get it. Let us suggest that you consult also the advertisers' index—last page of book, after having secured advertisers' names from this directory. The information you desire may be found in the advertising pages. This department is maintained for the benefit and convenience of our readers. The insertion of our advertisers' names under proper headings is gladly undertaken, but does not become part of an advertising contract.**

**Abrasive Discs**
Norton Co of Can., Ltd., Hamilton, Ont.
Oakey & Sons, Ltd., John London S.E., Eng
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Abrasive Materials**
Can. Hart Products, Ltd., Hamilton, Ont.
Dom Abrasive Wheel Co., Ltd , Mimico, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Acetylene, Dissolved**
L'Air Liquide Society, Toronto, Ont.

**Accumulators, Hydraulic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Stewart & Co , Duncan, Glasgow, Scot.

**Air Lifts**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Air Purifiers and Coolers**
Sturtevant Co., B. F., Boston, Mass.

**Analyses, Chemical**
Toronto Testing Laboratory, Toronto, Ont.

**Angle Bars**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Anvils**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Columbia Hdwe. Division, Cleveland, O.
Petrie, Ltd., H. W., Toronto, Ont.

**Arbors**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Cleveland Twist Drill Co., Cleveland, O.
Ford-Smith Machine Co., Hamilton, Ont
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Jacobs Mfg. Co., Hartford, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co , Milwaukee, Wis.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.

**Axles, Car**
Dom. Foundries & Steel, Hamilton, Ont.

**Babbitt Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
British Smelting & Refining Co., Ltd., Montreal, Que
Canada Metal Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont
Magnolia Metal Co., Montreal, Que.
Taliman Brass & Metal Co , Hamilton, Ont.

**Balls, Brass, Bronze and Steel**
Canada Foundries & Forgings Co , Welland, Ont.
Canadian SKF Co , Toronto, Ont.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co , Montreal, Que
Railway Roller Bearing Co , Syracuse, N Y

**Barrels, Tumbling**
Baird Machine Co., Bridgeport, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Bars, Boring**
Armstrong Bros Tool Co , Chicago, Ill.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co , Madison, Wis
Madison Mfg. Co , Muskegon, Mich.

**Bars, Boring, Portable**
Underwood Corp., H. B., Philadelphia, Pa

**Bars, Bronze Cored**
Moore & Son, Thos , Montreal, Que
Taliman Brass & Metal Co., Hamilton, Ont.

**Bars, Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Bars, Steel**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.

**Bearings, Ball**
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Railway Roller Bearing Co., Syracuse, N.Y.

**Bearings, Bronze**
Taliman Brass & Metal Co., Hamilton, Ont.
Railway Roller Bearing Co., Syracuse, N.Y.

**Bearings, Die-Cast**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Taliman Brass & Metal Co., Hamilton, Ont.

**Bearings, Journal**
Fisher Motor Co., Ltd., Orillia, Ont.
Taliman Brass & Metal Co., Hamilton, Ont.

**Bearings, Roller**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

**Belt Cement**
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que

**Belt Clamps**
Graton & Knight Mfg. Co., Worcester, Mass.

**Belt Dressings and Fillers**
Aikenhead Hardware Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.

**Belt Fasteners**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting, Co., J. C., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Belt Lacing**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que

**Belt Lacing, Steel**
Flexible Steel Lacing Co , Chicago, Ill.

**Belt Lacing, Hinged**
Flexible Steel Lacing Co , Chicago, Ill.

**Belt Lacing, Flexible Steel**
Flexible Steel Lacing Co , Chicago, Ill.

**Belt Lacing Machines**
Clipper Belt Lacer Co., Grand Rapids, Mich
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
McLaren Belting Co., J. C., Montreal, Que
Petrie, Ltd., H. W., Toronto, Ont.

**Belt Joiners, Conveyor**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Tools**
Graton & Knight Mfg. Co., Worcester, Mass.

**Belting, Chain**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco. Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Belting, Fabric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
McLaren Belting Co., J. C., Montreal, Que.
Sumner & Co., New York City

**Belting, Leather**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Smith Belting Co., Toronto, Ont.
Sumner & Co., New York City.
Tullis & Son, Ltd., John, Glasgow, Scot.

**Belting, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.
Quaker City Rubber Co., Philadelphia, Pa.

**Belts, Abrasive**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.

**Bench Countershaft Standards**
Ford-Smith Machine Co., Hamilton, Ont.

**Benches, Work**
Aikenhead Hardware Ltd., Toronto, Ont.

**Bending Machines, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bertrams Ltd., Edinburgh, Scotland.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Bins, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Blocks**
Ford Chain Block Co., Philadelphia, Pa.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Chain (See Hoists, Hand)**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Ford Chain Block Co., Philadelphia, Pa.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Die**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Blocks, Pillow**
Can. Link-Belt Co., Toronto, Ont.

**Blowers**
Can. Blower & Forge Co., Ltd., Kitchener.
General Combustion Co. of Can., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Sturtevant Co., B. F., Boston, Mass.

**Bolt and Nut Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Bolt and Nut Machinery, Automatic**
National Acme Co., Cleveland, Ohio.

**Bolts and Nuts**
London Bolt & Hinge Works, London, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Petrie, Ltd., H. W., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Bolt Threading Die Heads**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa

**Boosters**
Sturtevant Co., B. F., Boston, Mass.

**Boring and Turning Mills, Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.

**Boring, Drilling and Milling Machines, Horizontal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa.

**Boring, Drilling and Milling Mach., Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Boring Heads**
Aikenhead Hardware Ltd., Toronto, Ont.

**Boring Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Gisholt Machine Co., Madison, Wis.

**Brakes, Magnetic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Brass**
Brown's Copper & Brass Rolling Mills Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bricks, Fire**
Elk Firebrick Co. of Can., Ltd., Hamilton, Ont.

**Bridges**
Hamilton Bridge Works Co., Ltd., Hamilton. Ont.
MacKinnon Steel Co., Sherbrooke, Que.

**Broaching Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont

**Bronze**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bronze, Phosphor**
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bucket Carriers, Pivoted**
Can. Link-Belt Co., Toronto, Ont.

**Buffing or Polishing Machines (See Polishing and Buffing Machines)**
Blount Co., J. G., Everett, Mass.
Can Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.

**Bulldozers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Burners, Oil and Gas**
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

**Bushings**
Fisher Motor Co., Ltd., Orillia, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Cabinets, Oil**
S. F. Bowser & Co., Ltd., Toronto, Ont.

**Calipers**
Brown & Sharpe Mfg. Co., Providence, R.I.
Starrett Co., L. S., Athol, Mass.

**Cams**
Canada Foundries & Forgings Co., Welland, Ont.

**Can-Making Machinery (See Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

# BUYERS' DIRECTORY

Union Carbide Co. of Can., Ltd., Welland, Ont.

**Cars, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Castings, Aluminum**
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Brass and Bronze**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Copper**
Can Hanson & Van Winkle Co., Toronto, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Marine**
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Castings, Die Molded**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Ferro-Alloy**
Can. Steel Foundries, Montreal, Que.

**Castings, Iron**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Hyd. Press**
Can. Steel Foundries, Montreal, Que.

**Castings, Monel Metal**
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

**Castings, Naval Bronze**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Nichrome**
Can. Driver-Harris Co., Walkerville, Ont.

**Castings, Nickel**
Can Hanson & Van Winkle Co., Toronto, Ont.

**Castings, Semi-Steel**
Davidson Mfg. Co., Thos., Montreal, Que.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

**Castings, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Can Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

**Cements, Iron**
Smooth Mfg. Co., Jersey City, N.J.

**Centering Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Chains (See Sprockets and Chains)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chains, Driving**
Can Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chasers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chemists**
Toronto Testing Laboratory, Toronto, Ont.

**Chucking Machines**
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Chucks, Drill**
Jacobs Mfg. Co., Hartford, Conn.

**Chucks, Drill and Tap**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Lathe**
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Magnetic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**
Columbia Hdwe. Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

**Cleaners, Metal, Waste, General**
Oakley Chemical Co., New York, N.Y.

**Clocks, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Clutches, Friction**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**
Can. Link-Belt Co., Toronto, Ont.

**Collars, Shaft or Set**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

**Collets**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**
Can Hanson & Van Winkle Co., Ltd., Toronto, Ont
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compressors, Air**
Curtis Pneumatic Machinery Co., St Louis, Mo

**Compressors, Air and Gas**
Can Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**
Ford-Smith Machine Co., Hamilton, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Conveyor Belt Joiners**
Flexible Steel Lacing Co., Chicago, Ill.

**Copper**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Cored Bronze Bars**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Cotter Pins**
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Counterbores**
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Countershafts**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas Ont.

**Couplers, Car and Locomotive**
Can Steel Foundries, Montreal, Que.

**Couplings, Flexible**
Holden Co., Ltd., Montreal, Que.

**Couplings, Rigid**
Bernard Industrial Co., A., Fortierville, Que

**Couplings, Shaft**
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

**Cranes, Electric**
Bertram & Son Co., Ltd., The John, Dundas, Ont
Can Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y

**Cranes, Hand (See Hoists, Hand)**
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Sheffield Engineering Supplies, Ltd., Montreal, Que.

**Cranes, Locomotive**
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Cranes, Traveling**
Bertram & Son Co., Ltd., The John, Dundas, Ont
Can Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Crank Pin Turning Machines**
Garlock-Walker Mchy Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont
Underwood Corp., H. B., Philadelphia, Pa.

**Cutters, Flue**
Holden Co., Ltd., Montreal, Que.

**Cutters, Gear**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Milling**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Machine Co., Cleveland.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.

**Cutters, Stay Bolt**
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Thread**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.

**Cutting-Off Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Cutting-Off Machines, Pipe (See Pipe Cutting and Threading Machines)**
Landis Machine Co., Inc., Waynesboro, Pa.
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Cutting-Off Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Pilot Steel & Tool Co., Montreal, Que.

**Cutting Oil Filters (See Oil Filtering Systems)**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Cataract Refining Co., Toronto, Ont.

**Cutting, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

**Cutting, Oxy-Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Dealers, Machinery (See Searchlight Section)**
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Deckle Straps**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Diamonds, Black and Rough**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond, Carbon and Bortz**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond Tools**
Aikenhead Hardware Ltd., Toronto, Ont
Can. Desmond-Stephan Co., Hamilton Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Wheel Trueing Tool Co., Detroit, Mich.

**Diamond Crossings**
Can. Steel Foundries, Montreal, Que.

**Die-Castings**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Dies, Pipe-Threading**
Jones & Lamson Machine Co., Springfield, Vt.

**Die Sinking Machines, Automatic**
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

**Die Sinkers**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Screw and Thread Cutting**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio.

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

# BUYERS' DIRECTORY

**Dies, Forging**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St Catharines, Ont.

**Dies, Hammer**
Kimber & Hillier, St. Catharines, Ont

**Dies, Self-Opening, Adjustable**
Can. Fairbanks Morse Co., Ltd., Montreal
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Dies, Threading-Opening**
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt
Landis Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Disc Cement**
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill

**Dividing Heads**
Ackworthie, Ltd., John, Birmingham, Eng.
Dickow, Fred. C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Dogs, Lathe and Milling Machine**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drafting Boards and Tables**
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Drafting Materials**
American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Dressers, Grinding Wheel**
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Drill Holders**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drill Rods**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Drill Speeders**
Canada Machinery Corp., Galt, Ont.

**Drilling Machine Heads**
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

**Drilling Machines, Automatic**
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

**Drilling Machines, Bench**
Beacon Engineering Co., Tipton, England.
Can. Blower & Forge Co., Ltd., Kitchener
Can. Fairbanks-Morse Co., Ltd., Montreal.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Electric and Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Gang**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drilling Machines, Heavy Duty**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill
Rockford Lathe & Drill Co., Rockford, Ill

**Drilling Machines, Multiple Spindle**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

**Drilling Machines, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Drilling Machines, Portable**
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Radial**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Drilling Machines, Sensitive**
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Turret**
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

**Drilling Machines, Vertical**
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill
Rockford Lathe & Drill Co., Rockford, Ill
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng.
Swedger Co of Can., Ltd., Chas. A., Windsor, Ont.

**Drills, Center**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drills, High Speed Twist**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Drills, Twist and Flat**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.

**Dust Handling Equipment**
Can. Blower & Forge Co., Ltd., Kitchener.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Electrical Instruments**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Electrical Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O.

**Elevating Trucks (See Trucks)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Elevators and Conveyors**
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Emery Wheels (See Grinding Wheels)**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Hart Products, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Engines, Capstan**
Kennedy & Sons, Wm., Owen Sound, Ont

**Engineers, Mechanical**
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif

**Expanders, Tube**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Eyeglasses, Safety (See Goggles, Safety)**
Prest-O-Lite Co. of Can., Toronto, Ont
Willson Goggles, Inc., Reading, Pa.

**Fans, Electric**
Can. Blower & Forge Co., Ltd., Kitchener
Can. Fairbanks-Morse Co., Ltd., Montreal
Northern Electric Co., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Exhaust**
Can. Blower & Forge Co., Ltd., Kitchener.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Ventilating**
Can. Blower & Forge Co., Ltd., Kitchener
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que

**File Handles**
Ingersoll File Co., Ltd., Ingersoll, Ont.

**Files and Rasps**
Atkins & Co., Inc., E. C., Indianapolis, I
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Filing Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Filler, Iron (See Cements, Iron)**
Smooth Mfg. Co., Jersey City, N.J.

**Fire Extinguishers**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Fittings, Pipe**
International Malleable Iron Co., Guelph, Ont.

**Flexible Shafts**
Aikenhead Hardware Ltd., Toronto, Ont.

**Flux, Galvanizing**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Fluxes, Welding**
L'Air Liquide Society, Toronto, Ont.

**Forging Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.

**Forgings, Drop**
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd., Toronto, Ont.

**Forgings, Hammer**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Foundry Equipment**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Foundry Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Frogs, Spring or Rigid**
Can. Steel Foundries, Montreal, Que.

**Fuel Oil Burning System**
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Heat Treating Coal**
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Oil and Gas**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bellevue Industrial Furnace Co., Detroit.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces and Ovens, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces, Tempering and Annealing**
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furniture, Machine Shop**
Garlock-Walker Mchy. Co., Toronto, Ont.

**Gages, Comparator**
Jones & Lamson Machine Co., Springfield, Vt.
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont.
Perdue, W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass.

**Gages, Measuring (See Tool Work)**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont
Starrett Co., L. S., Athol, Mass.

**Gages, Recording**
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.

# You knew this Kid

You used to play with Jimmy on the sand lots—he was a speedy youngster, pitched an elegant game, but when it came to a really tough, hard-fought scrap he didn't have the strength—the bull dog *sticktoitiveness* to lick.

Of similar stuff are most high speed reamers—speedy but lacking in that thing called "guts." Their *backs* are weak—that's the reason. Their *bodies* are too brittle to stand up under long-continued pound and punishment.

That's because their bodies are made of high speed steel—the very *last* steel that belongs in the body of a high speed reamer.

## PEERLESS HIGH SPEED REAMERS

Peerless High Speed Reamers are the type of reamer you perhaps imagined couldn't be made—their bodies are extremely tough alloy—brute strength where brute strength is most needed—toughness where toughness measures the life of the tool.

Peerless blades, however, are of high speed steel—selected stock in fact. These blades are countersunk and anchored into the body and then brazo-hardened so that the tough body and the high speed blades become one eternal unit.

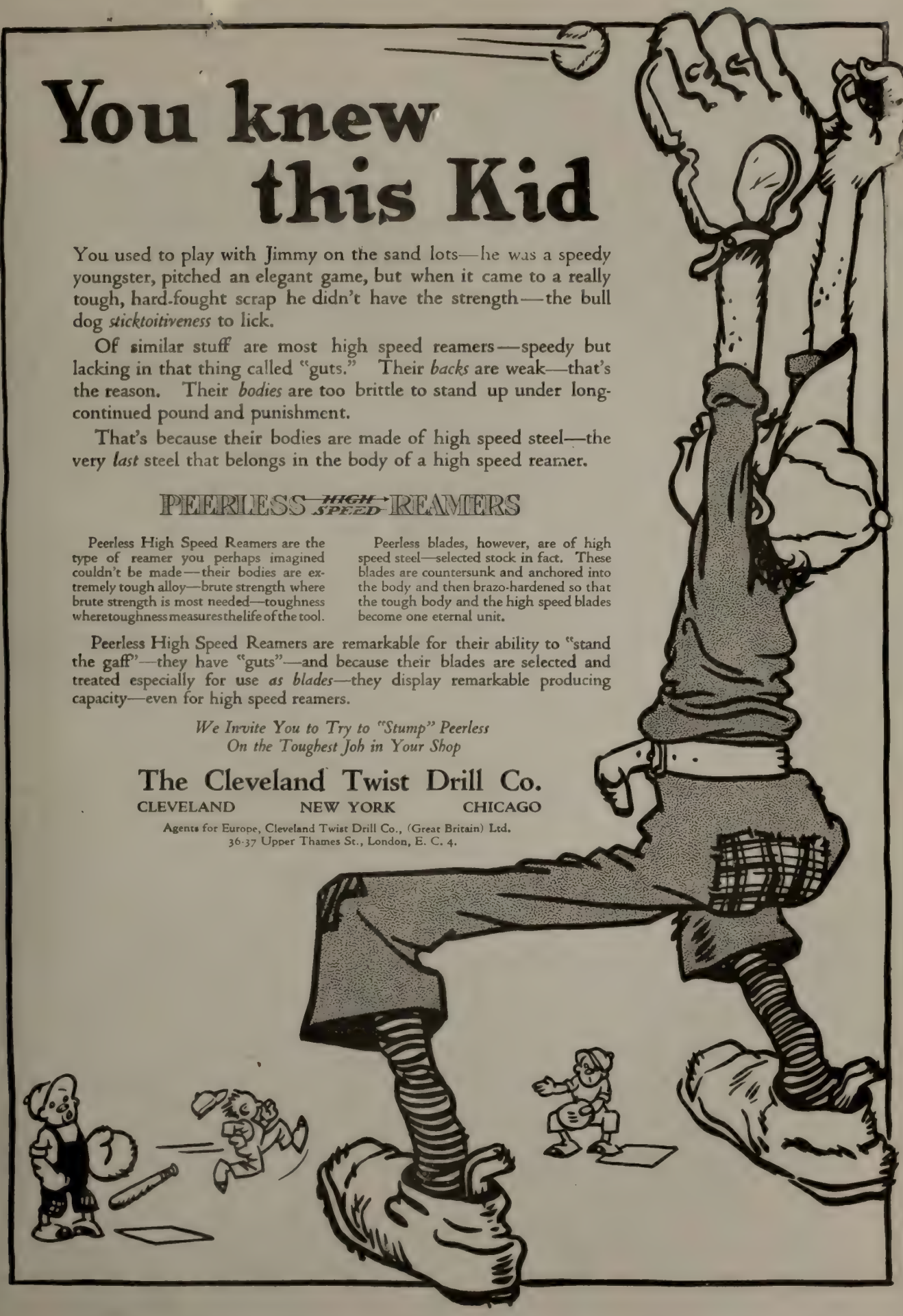
Peerless High Speed Reamers are remarkable for their ability to "stand the gaff"—they have "guts"—and because their blades are selected and treated especially for use *as blades*—they display remarkable producing capacity—even for high speed reamers.

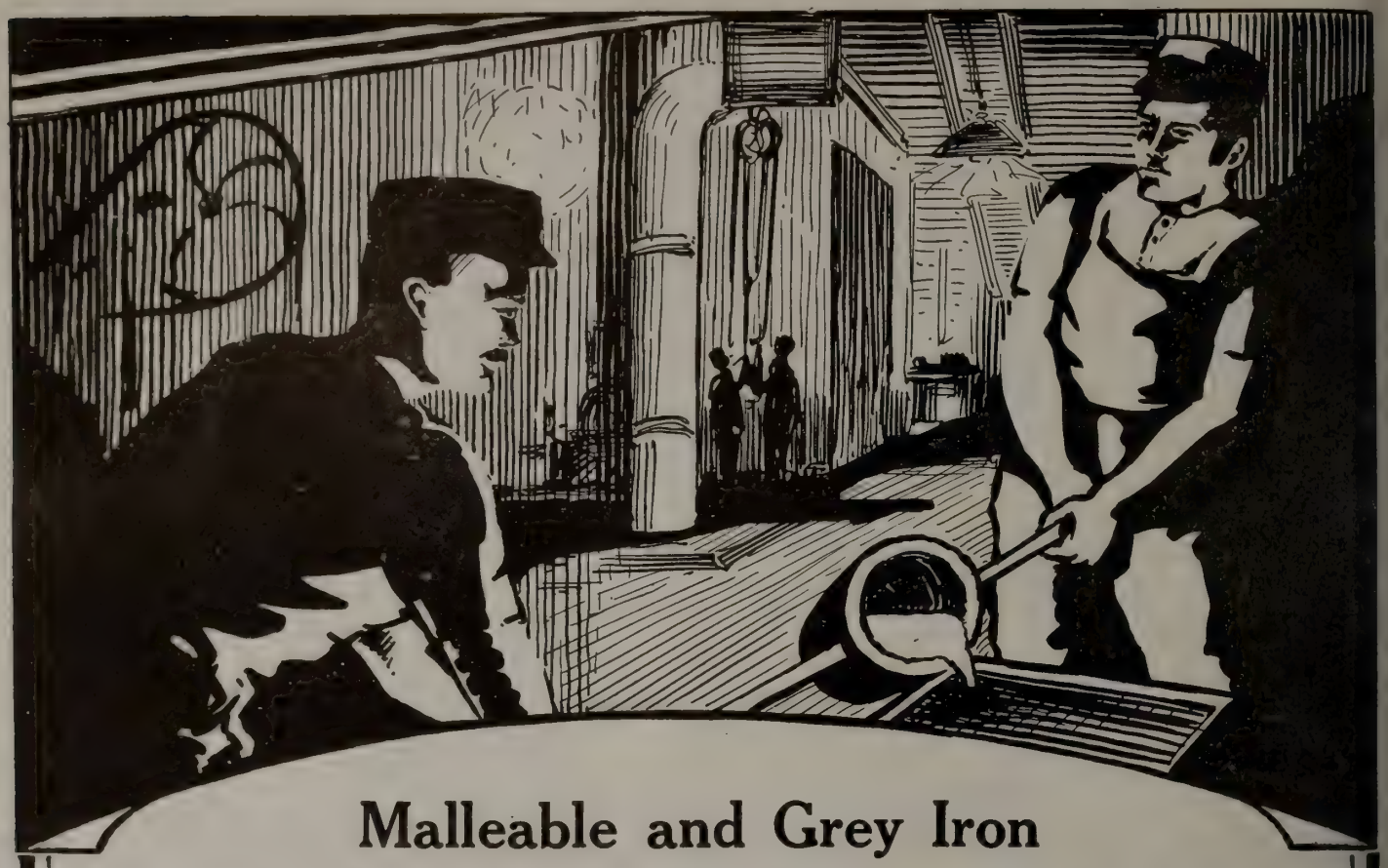
*We Invite You to Try to "Stump" Peerless*
*On the Toughest Job in Your Shop*

**The Cleveland Twist Drill Co.**

CLEVELAND NEW YORK CHICAGO

Agents for Europe, Cleveland Twist Drill Co., (Great Britain) Ltd.
36-37 Upper Thames St., London, E. C. 4.





Malleable and Grey Iron

# CASTINGS

Also
**Malleable**
and
**Cast Iron**
**Pipe**
**Fittings**

IM

## *Large Capacity--Quick Service*

The Machinery Manufacturer, the Agricultural Implement Maker, the Automobile Builder, and Specialty Manufacturer—can secure his Malleable and Grey Iron Castings quickly when he orders International Malleable Products. We have the facilities for making exceptionally good deliveries on the largest of orders.

Specify "International Malleable" on your next order for Malleable and Grey Iron Castings, and Malleable and Grey Iron Pipe Fittings.

In addition to quick service you secure reasonable price and quality products.

**INTERNATIONAL MALLEABLE IRON COMPANY**
**LIMITED**
**GUELPH, ONTARIO, CANADA**

# BUYERS' DIRECTORY

**Gages, Snap, Thread and Cylindrical**
Ackworthle, Ltd., John, Birmingham, Eng
Brown & Sharpe Mfg Co., Providence, R I
Can. Fairbanks-Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Standard**
Armstrong Whitworth Co. of Can., Lt Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis,
Johansson Inc., C. E., Windsor, Ont.

**Gages, Thread**
Ackworthie, Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Garnet, Emery and Flint Paper and Cloth**
Ritchey Supply Co., Toronto, Ont.

**Gas, Coal Compressed**
L'Air Liquide Society, Toronto, Ont.

**Gas, Compressed**
Prest-O-Lite Co. of Can., Toronto, Ont.

**Gaskets**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

**Gear Blanks**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario
Philadelphia Gear Works, Philadelphia, Pa.

**Gear-Cutting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

**Gear Testing Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Gears, Cast**
Can. Link-Belt Co., Toronto, Ont.
Can Steel Foundries, Montreal, Que.
Dom Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

**Gears, Cut**
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que
Hamilton Gear & Machine Co., Toronto, Ontario
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Gears, Dressed**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Gears, Forged**
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Gears, Herringbone**
Dom Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

**Gears, Machine Moulded**
Can. Steel Foundries, Montreal, Que.

**Gears, Rawhide (See Gears, Cut)**
Hamilton Gear & Machine Co., Toronto, Ontario
Philadelphia Gear Works, Philadelphia, Pa

**Gear, Silent Chain**
Gardner & Son, Robt., Montreal, Que
Morse Chain Co., Ithaca, N.Y.
Can. Link-Belt Co., Ltd., Toronto, Can
Hans Renold of Canada, Ltd., Montreal, Quebec

**Gears, Worm**
Dom Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.

**Generators, Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Generators, Electric**
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Goggles, Safety**
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

**Grab Buckets**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Grease Cups, Pressed Steel and Brass**
Can. Winkley Co., Ltd, Windsor, Ont.

**Greases, Lubricating**
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

**Grinding Discs**
Ritchey Supply Co., Toronto, Ont.

**Grinding Machines**
Brown & Sharpe Mfg. Co., Providence, R I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**Grinding Machines, Abrasive Belt**
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Automatic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Bench**
Aikenhead Hardware Ltd., Toronto, Ont.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Grinding Machines, Center**
U.S. Electrical Tool Co., Cincinnati, O
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines Chaser**
Jones & Lamson Machine Co., Springfield, Vt.

**Grinding Machines, Cutter and Reamer**
Cincinnati Milling Machine Co., Cincinnati, Ohio
Garlock-Walker Mchy Co., Toronto, Ont
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Cylindrical**
Garlock-Walker Mchy Co., Toronto, Ont
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Die**
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio
National Machinery Co., Tiffin, Ont.

**Grinding Machines, Disc**
Beacon Engineering Co., Tipton, England
Ford-Smith Machine Co., Hamilton, Ont

**Grinding Machines, Drill**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que

**Grinding Machines, Face**
Ford-Smith Machine Co., Hamilton, Ont

**Grinding Machines, Floor and Tool**
Beacon Engineering Co., Tipton, England.
Blount Co., J. G., Everett, Mass
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa
National Acme Co., Cleveland, Ohio
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Grinding Machines, Internal**
Garlock-Walker Mchy Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Portable**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wisconsin Electric Co., Racine, Wis

**Grinding Machines, Power Oscillating Tool**
Herbert Ltd., Alfred, Toronto, Ont.

**Grinding Machines, Ring Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Snagging**
Blount Co., J. G., Everett, Mass.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Surface**
Garlock-Walker Mchy Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machinery, Tool Post**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Universal**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.

**Grinding Wheels**
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I
Can. Fairbanks-Morse Co., Ltd., Montreal
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Guards, Machinery and Window**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Guards, Electric Lamp**
Flexible Steel Lacing Co., Chicago, Ill.

**Gun-Barrel Machinery**
Steinle Turret Machine Co., Madison, Wis

**Hack Saws, Power**
Ackworthie, Ltd., John, Birmingham, Eng
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I
Clemson Bros., Hamilton, Canada
Garlock-Walker Mchy. Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que
Petrie, Ltd., H. W., Toronto, Ont
Simonds Canada Saw Co., Montreal, Que
Starrett Co., L. S., Athol, Mass
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hammers, Chipping**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hammers, Drop**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Canada Foundries & Forgings Co., Welland, Ont
Canada Machinery Corp., Galt, Ont.

**Hammers, Electric**
Aikenhead Hardware Ltd., Toronto, Ont
Brown, Boggs & Co., Ltd., Hamilton, Ont
Holden Co., Ltd., Montreal, Que

**Hammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que
Independent Pneumatic Tool, Chicago, Ill
Keller Pneumatic Tool Co., Grand Haven, Mich

**Hammers, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hammers, Rivetting**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hangers, Shafting**
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Terry & Co., John C., Birmingham, Eng.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hardening, Case-Hardening and Tempering**
Hamilton Gear & Machine Co., Toronto, Ont.

**Hardness Testing Apparatus**
Shore Instrument Co., Jamaica, N.Y.

**Heating**
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.

**Hobbing Machines**
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hobs**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Hoists, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

**Hoists, Hand**
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Hoists, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Holders-On, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Hose, Flexible Steel**
Can. Fairbanks-Morse Co., Ltd., Montreal
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Hose, Industrial**
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co of Can., Ltd., Toronto, Ont.

**Hose, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Foamite Firefoam Co., Hamilton, Ont.

**Hydraulic Leather**
Graton & Knight Mfg. Co., Worcester, Mass

**Hydraulic Machinery**
Bertram & Son Co., Ltd., The John, Dundas, Ont
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.

**Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Index Centers**
Diekow, Fred. C., Machinery Co., Chicago, Ill.

**Igniters, Gas Engine**
Canada Foundries & Forgings Co., Welland, Ont.

**Indicators, Speed and Test**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg Co., Providence, R I.

**Insulation**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Jacks, Hydraulic**
Norton, A. O., Boston, Mass.

**Jacks, Planer**
Armstrong Bros Tool Co., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que
Crescent Machine Co., Ltd., Montreal, Q.

# BUYERS' DIRECTORY

**Jigs and Fixtures (See Tool Work)**
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Keyseating Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Keys, Machine**
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

**Knives, Machine**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Simonds Canada Saw Co., Montreal, Que.

**Knurl Holders**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lacing Leather**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

**Lamps, Electric**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**Lathe Attachments**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ort.

**Lathe Pans, Portable**
Canada Machinery Corp., Galt, Ont.

**Lathe Tools**
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

**Lathes, Automatic and Semi-Automatic**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Bench**
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lathes, Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
McDougall Co., Ltd., R., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Engine**
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Sidney Machine Tool Co., Sidney, Ohio
Sterlinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Extension and Gap**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Lathes, Heavy Duty Projectile Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Dingbill Wire Machy. Co., Ltd., Montreal
Sidney Machine Tool Co., Sidney, Ohio
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio.
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Polishing (See Polishing and Buffing Machines)**
Ford-Smith Machine Co., Hamilton, Ont.

**Lathes, Relieving**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Lathe, Universal Hand**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Lathes, Screw-Cutting**
Jones & Lamson Machine Co., Springfield, Vt.

**Lathe, Speed and Hand**
Blount Co., J. G., Everett, Mass.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Lathes, Spinning**
Terry & Co., John C., Birmingham, Eng.

**Lathes, Threading**
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

**Lathes, Vertical Turret**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

**Lathes, Wood Turning**
Blount Co., J. G., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Lead Pipe**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Lighting Fixtures**
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

**Linoleum Mill Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Liquid Air Plants**
L'Air Liquide Society, Toronto, Ont.

**Lockers, Clothes**
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

**Lubricants**
Cateract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Lubricating Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Machinists' Small Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Sterlinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Mandrels, Expanding**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Mandrels, Solid**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Measuring Machines**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Metals, Alloy**
British Smelting & Refining Co., Ltd. Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Tallman Brass & Metal, Ltd., Hamilton, Ontario.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Metalite Cloth**
Ritchey Supply Co., Toronto, Ont.

**Micrometer Calipers**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Milling Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Milling Machines**
Brown & Sharpe Mfg. Co., Providenee, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**Milling Machines, Automatic**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Bench**
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Hand**
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

**Milling Machines, Horizontal and Planer Type**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Milling Machines, Plain**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Milling Machines, Universal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Milling Machines, Vertical**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

**Monel Metal**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Motors, Electric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Moulded Rubber Goods**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Nail Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Nails and Staples**
Steel Co. of Canada, Ltd., Hamilton, Ont

**Nickel, Bars, Sheets, Wire, Etc.**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Nickel Plating Outfits**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Nickel Silver**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Nitrogen**
L'Air Liquide Society, Toronto, Ont.

**Nut Tappers (See Bolt and Nut Machinery)**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

**Nuts, Finished and Semi-finished**
Galt Machine Screw Co., Galt, Ont.

**Nuts, Machine Screw**
Torrington Company, Ltd., Upper Bedford, Que.

**Nuts, S.A.E., Plain and Castellated**
Galt Machine Screw Co., Galt, Ont.

**Oil Filtering and Storage Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oil Storage Engineers**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oils**
Canadian Oil Companies, Ltd., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Hole Covers**
Can. Winkley Co., Ltd., Windsor, Ont.

**Oils, Soluble**
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oxygen**
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

**Oxy-Acetylene Apparatus**
L'Air Liquide Society, Toronto, Ont.

**Packing, Hydraulic**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

**Packing, Steam**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

**Paper Mill Conveyors**
Bertrams Ltd., Edinburgh, Scotland.

**Patents**
Fetherstonhaugh & Co., Ottawa, Ont.
Marion & Marion, Montreal, Que.

**Pans, Wet and Dry**
Frost Mfg. Co., Chicago, Ill.

**Pattern-Shop Machinery (See Woodworking Machinery)**
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Patterns, Wood and Metal**
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Wraggis Pattern Works, Galt, Ont.

**Penstocks, Steel**
MacKinnon Steel Co., Sherbrooke, Que.

# BUYERS' DIRECTORY

**Phosphor Tin**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Photographic Duplicating Machines**
Commercial Camera Co., Providence, R.I.

**Pig Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Bending Machines**
American Pipe Bending Machine Co., Boston, Mass
Can. Fairbanks-Morse Co., Ltd., Montreal.
Underwood Corp., H. B., Philadelphia, Pa
Williams Machinery Co., A. R., Toronto, Ont.

**Pipe Couplings**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Cutting and Threading Machines**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**
Landis Machine Co., Inc., Waynesboro, Pa.

**Pipe Fitters' Tools**
Alkenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa.

**Piston-Ring Machines**
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Planers, Parallels**
L. & P. Mfg. Co., Niagara Falls, Ont.

**Planing Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Planing Machines, Rotary**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Pneumatic Tools**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Blount Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Pots, Steel**
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Pressed Steel Parts**
Ackworthie, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich.
Can. Fairbanks-Morse Co., Ltd., Montreal.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Presses, Drop and Forging**
Brown Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Foot and Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

**Presses, Forcing**
Atlas Press Co., Kalamazoo, Mich.
Stewart & Co., Duncan, Glasgow, Scot.

**Presses, Hydraulic**
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

**Presses, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**
Alkenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Protractors**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Propellers**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Pulleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal and Fibre**
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Pulp and Paper Mill Equipment**
MacKinnon Steel Co., Sherbrooke, Que.

**Pumps, Automobile Tire**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Pumps, Barrel and Boiler-feed**
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coalant**
Trahern Pump Co., Rockford, Ill.

**Pumps, Geared and Hand**
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**
Can. Fairbanks-Morse Co., Ltd., Montreal
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

**Pumps, Lubricant and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener
Jardine & Co., A. B., Hespeler, Ont.

**Punches, Power**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo, Ohio

**Punching Machines, Horizontal**
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Racks, Cut**
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**
Holden Co., Ltd., Montreal, Que.

**Reamer Holders**
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

**Reamers, Expanding**
Alkenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont
Cleveland Twist Drill Co., Cleveland, O
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Reamers, Solid**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Reamers, Taper**
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Recorders, Temperature**
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Recorders, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Rheostats**
Northern Electric Co., Montreal, Que.

**Resistance Materials**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Respirators**
Willson Goggles, Inc., Reading, Pa.

**Rivets**
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

**Rivet Heaters**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**
Acme Machinery Co., Cleveland, Ohio
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.

**Riveting Machines**
Bilton Machine Co., Bridgeport, Conn.
Can. Fairbanks-Morse Co., Ltd., Montreal
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**
Stewart & Co., Duncan, Glasgow, Scot.

**Rolls (Rubber Covered)**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rudder Frames, Steel**
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Rubber Goods, Mechanical**
Quaker City Rubber Co., Philadelphia, Pa.

**Rules, Steel**
Chesterman & Co., Ltd., J., Sheffield, Eng.

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Rust Preventatives**
Oakley Chemical Co., New York, N.Y.

**Sand Equipment**
Can. Link-Belt Co., Toronto, Ont.

**Sand Mills**
Frost Mfg. Co., Chicago, Ill.

**Sanding Machinery**
Oliver Machy. Co., Grand Rapids, Mich.

**Sand Rammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich

**Saw Frames and Blades, Hack**
Alkenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Sawing Machines, Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Sawing Machines, Power Hack**
Ackworthie, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Saw Sharpening Machines**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saw Tables, Universal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**
Alkenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Hot and Cold**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Saws, High Speed Steel**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Metal Band**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saws, Metal, Power**
Clemson Bros., Inc., Hamilton, Ont.

**Saws, Metal Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

**Saws, Milling**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Saws, Screw Slotting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Swing Cut-off**
Oliver Machinery Co., Grand Rapids, Mich.

**Scales**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal, Q.

**Screens**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Screw Driving Machine**
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Screw Extractors**
Cleveland Twist Drill Co., Cleveland, O.

**Screw Machine Work**
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
Tallman Brass & Metal Co., Hamilton, Ont.

# BUYERS' DIRECTORY

**Screw Machinery, Wood and Lag**
Cook Co., Asa S., Hartford, Conn.

**Screw Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Screw Machines, Automatic**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

**Screw Machines, Plain or Hand**
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio

**Screw Machine Products**
Torrington Company, Ltd., Upper Bedford, Que.

**Screw Plates**
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

**Screws, Cap and Set**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Lock Cap**
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Machine**
Barnes Co., Wallace, Bristol, Conn.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Safety Set**
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Screws, Side Knob**
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Thumb**
Torrington Company, Ltd., Upper Bedford, Que.

**Second-Hand Machinery**
**(See Searchlight Section)**
Petrie, Ltd., H. W., Toronto, Ont.

**Separators, Moisture and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Separators, Oil and Waste**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Shafting**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Shapes, Cold-Drawn Special Steel**
Union Drawn Steel Co., Hamilton, Ont.

**Shaping Machines**
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Hoby, R. S., Toronto, Ont.
Morris Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Rockford Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Walker Lathe Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Shapers, Wood**
Oliver Machinery Co., Grand Rapids, Mich.

**Shears, Hand**
Can. Blower & Forge Co., Ltd., Kitchener.

**Shears, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y.
Tennant & Co., Duncan, Glasgow, Scot.
Toledo Machine & Tool Co., Toledo, Ohio
Williams Machinery Co., A. R., Toronto, Ont.

**Shearing Machines, Angle, Iron Bar and Gate**
Bertrams Ltd., Edinburgh, Scotland

**Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio

**Sheets, Nickel, Resist, Alloy**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Sheets, Nickel, Monel and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Side Frames, Locomotive**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Slotting Attachments**
Ford-Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

**Slotting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

**Solders**
British Smelting & Refining Co., Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Canada.

**Snap Flasks**
Oliver Machy. Co., Grand Rapids, Mich.

**Special Machinery and Tools**
Brown Engineering Corp., Ltd., Toronto.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Specialties, Headed Work**
Torrington Company, Ltd., Upper Bedford, Que.

**Spectacles, Industrial**
Willson Goggles, Inc., Reading, Pa.

**Springs**
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

**Spring-making Machinery**
Sleeper & Hartley, Inc., Worcester, Mass

**Sprockets and Chains**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glasseo, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Squares**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Stamping, Metal**
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont
Keller Pneumatic Tool Co., Grand Haven, Mich
Parmenter & Bullock Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Stamps, Steel**
Diamond Saw & Stamping Works, Buffalo, N.Y.

**Stairways, Wrought Iron**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Steam Specialties**
Crane Ltd., Montreal, Que.

**Steel Plate**
Dom. Foundries & Steel, Hamilton, Ont.

**Steels, Tool**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa

**Steel Blooms and Billets**
Steel Co. of Canada, Ltd., Hamilton, Ont

**Steel, Cold-Rolled Strip**
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Drycr-Harris Co., Walkerville, Ont
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Steel Castings**
Dom. Foundries & Steel, Hamilton, Ont.

**Steel Forgings**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Steel, Shafting and Free Cutting Screw**
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

**Steel, Sheet**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

**Steel, Tanks**
Can. John Wood Mfg. Co., Toronto, Ont.

**Steel, Stainless**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel Wire Rods**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steels, Alloy, Open Hearth and Electric**
United Alloy Steel Corp., Canton, Ohio.

**Steels, Alloy and Carbon**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steels, High-Speed**
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel, Magnet**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel, Structural**
MacKinnon Steel Co., Sherbrooke, Que.

**Steel Tubing, Close Joint and Welded**
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

**Stern Frames, Cast Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont

**Straightening Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Studs**
Galt Machine Screw Co., Galt, Ont.

**Surface Plates**
Bilton Machine Co., Bridgeport, Conn.

**Swaging Machines**
Atkins & Co., Inc., E. C., Indianapolis, I.

**Switches, Railway**
Can. Steel Foundries, Montreal, Que.

**Switches and Switchboards**
Northern Electric Co., Montreal, Que.

**Tablets, Bronze, Memorial**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Tachometers**
Aikenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

**Tanks, Steel**
MacKinnon Steel Co., Sherbrooke, Que.

**Tanks and Pumps, Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

**Taper Cutting Dies**
Jones & Lamson Machine Co., Springfield, Vt.

**Tap Holders**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taper Pins**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Tapes, Measuring**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass.

**Tapping Machines and Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Taps and Dies**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
International Machinery & Supply Co., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taps, Collapsing**
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Teeth, Dredge Bucket**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Testing Metals and Materials**
Toronto Testing Laboratory, Toronto, Ont.

**Thermometers**
Bristol Co., Waterbury, Conn.

**Thread-Cutting Tools**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Thread Cutting Machines**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa.

**Threaded Wires**
Torrington Company, Ltd., Upper Bedford, Que.

**Threading Machines**
Acme Machinery Co., Cleveland, Ohio.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Thread Lead Testing Machines**
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Thread-Rolling Machines**
Bliss Co., E. W., Brooklyn, N.Y.

**Tongs**
Hepburn Ltd., John T., Toronto, Ont.

**Tool Cases**
Rice Lewis & Son, Ltd., Toronto, Ont.

**Tool Holders**
Armstrong Bros. Tool Co., Chicago, Ill.
Bilton Machine Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Markers, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Tool Posts, Lathe**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Steels for all Purposes**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Tools, Small (See Machinists' Small Tools)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Bertrams Ltd., Edinburgh, Scotland.
Burgess & Marchand, Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Chesterman & Co., Ltd., J., Sheffield, Eng.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Hamilton [illegible]neering Service, Ltd., Hamilton, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.
National Machine Tool Co., Racine, Wis.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
**Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.**
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Tool Work**
Brown Engineering Corp., Ltd., Toronto.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.

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**Torches, Blow**
National Electro Products, Ltd., Toronto Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Trackwork, Railway**
Can. Steel Foundries, Montreal, Que.

**Trackwork, Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Transformers**
Northern Electric Co., Montreal, Que.

**Transmission Machinery**
Bernard Industrial Co., A., Fortierville Que.
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Jones & Glassco, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Toronto, Ont.
Renold (Hans) of Canada, Ltd., Montreal Que.

**Transportation Systems (See Trucks)**
Mathews Gravity Carrier Co., Port Hope, Ont.

**Treated Bits**
Can. Atlas Crucible Steel Co., Toronto Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Trolleys and Tramways**
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Trucks**
Can. Fairbanks-Morse Ltd., Montreal, Q.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Maple Leaf Mfg. Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Trucks, Industrial Motor**
Maple Leaf Mfg. Co., Montreal, Que.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Tube, Products**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Electric Welded or Oxy-Acetylene Welded**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Flexible**
Dunlop Tire & Rubber Goods Co., Ltd. Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Tubing, Seamless Steel**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Seamless Steel, Brass and Copper and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Steel Products Co., Brantford, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Tubing, Welded**
International Nickel Co. of Can., Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Tubing, Welded Steel**
Tube Co. of Canada, Toronto, Ont.

**Turbines, Water**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Turret Heads**
Ackworthie, Ltd., John, Birmingham, Eng.
Bertram & Son Co., Ltd., The John, Dundas, Ont.

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Acme Machine Tool Co., Cincinnati, Ohio.
Cook Co., Asa S., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Turrets, Tool Post**
Gisholt Machine Co., Madison, Wis.

**Unions, Pipe**
Crane Ltd., Montreal, Que.

**Universal Joints**
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Valves**
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Cleveland Pneumatic Tool Co., Toronto, Ont.
Crane Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Vises, Drilling Machine**
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.

**Vises, Metal Workers'**
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Columbia Hdwe. Division, Cleveland, O.

**Vises, Milling Machine**
Brown & Sharpe Mfg. Co., Providence, R I.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.

**Vises, Pipe**
Columbia Hdwe. Division, Cleveland, O.
Greenfield Tap & Die Corp., Galt, Ont.

**Vises, Planer and Shaper**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Superior Machine Co., London, Ont.

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Oliver Machy. Co., Grand Rapids, Mich
Victor Tool Co., Waynesboro, Pa.
Parmenter & Bulloch Co., Gananoque, Ont.

**Voltmeters**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

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Barnes Co., Wallace, Bristol, Conn.
Diamond State Fibre Co., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

**Washers, Rubber**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Welding Apparatus, Oxy-Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Welding, Electric**
All-Weld Company, Toronto, Ont.
Carter Welding Co., Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.

**Welding Filler Rods**
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

**Welding Machines, Oxy-Acetylene**
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

**Welding, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Prest-O-Lite Co. of Can., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

**Welding Rod, Tobin, Manganese Bronze and Aluminum**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Welding Supplies**
British Smelting & Refining Co., Ltd., Montreal, Que.
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Perdue, W. B., San Francisco, Calif
Prest-O-Lite Co. of Canada, Ltd., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

**Wheels, Cast, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Wheels, Industrial**
American Pulley Co., Philadelphia, Pa.
Hull Iron & Steel Foundries, Hull, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.

**Winches, Electric**
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

**Winches, Headgate**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Winches, Stoplog**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Wire**
Barnes Co., Wallace, Bristol, Conn.
Canada Metal Co., Ltd., Toronto, Ont.
Dennis Wire & Iron Works, London, Ont
Greening Wire Co., B., Hamilton, Ont.
Northern Electric Co., Montreal, Que.

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**Wire Coiling Machinery**
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**Wire Rope**
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**Wire Straightening and Cutting Machinery**
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Perdue, W. B., San Francisco, Calif.
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Tallman Brass & Metal Co., Hamilton, Ont.

**Wires, Special**
Dennis Wire & Iron Works, London, Ont.
Greening Wire Co., B., Hamilton, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Woodworking Machinery**
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
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Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

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**Wrenches, Machinists'**
Armstrong Bros. Tool Co., Chicago, Ill.
Canada Foundries & Forgings Co., Welland, Ont.

**Wrenches, Pipe**
Canada Foundries & Forgings Co., Welland, Ont.
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Greenfield Tap & Die Corp., Galt, Ont.

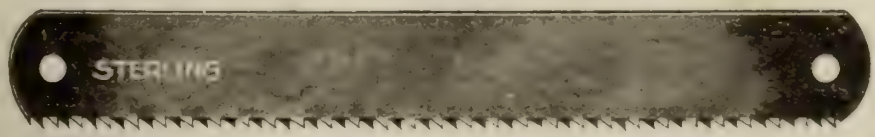
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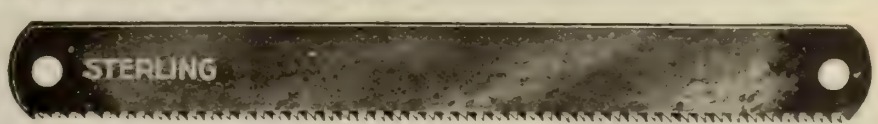
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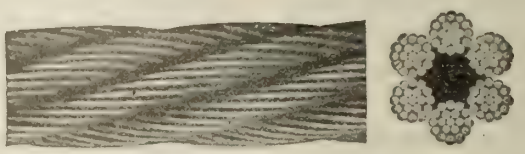
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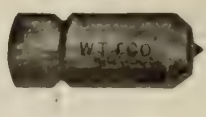
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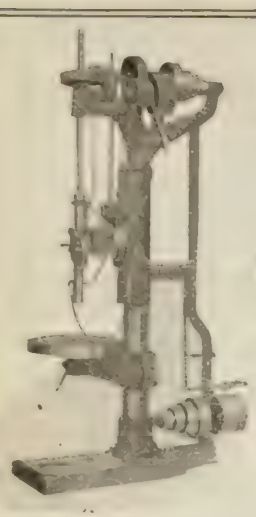
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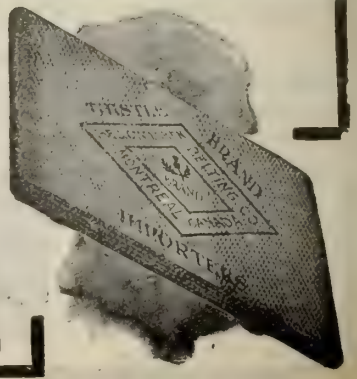
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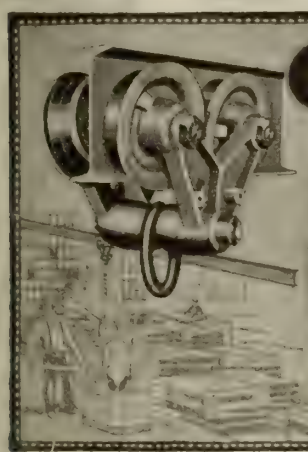
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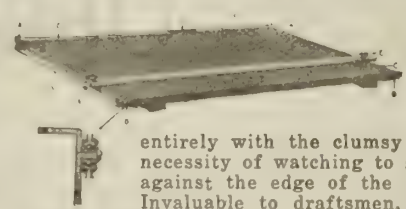
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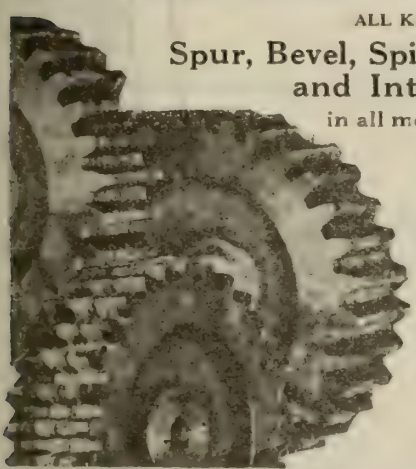
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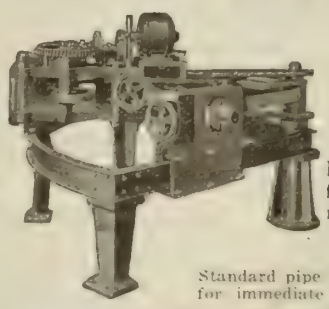
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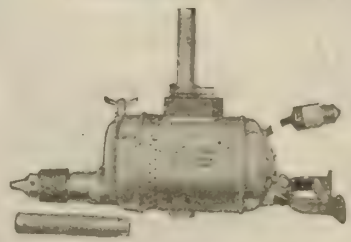
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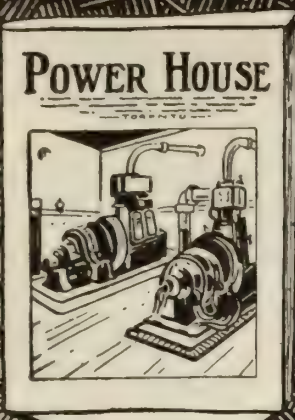
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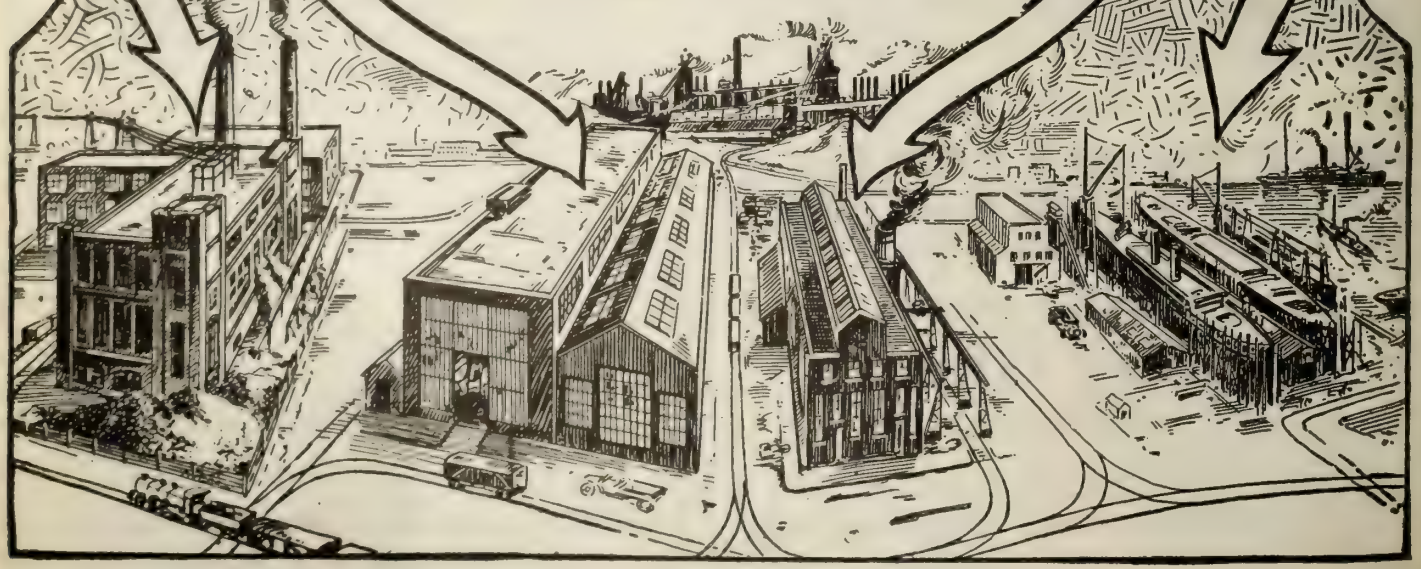
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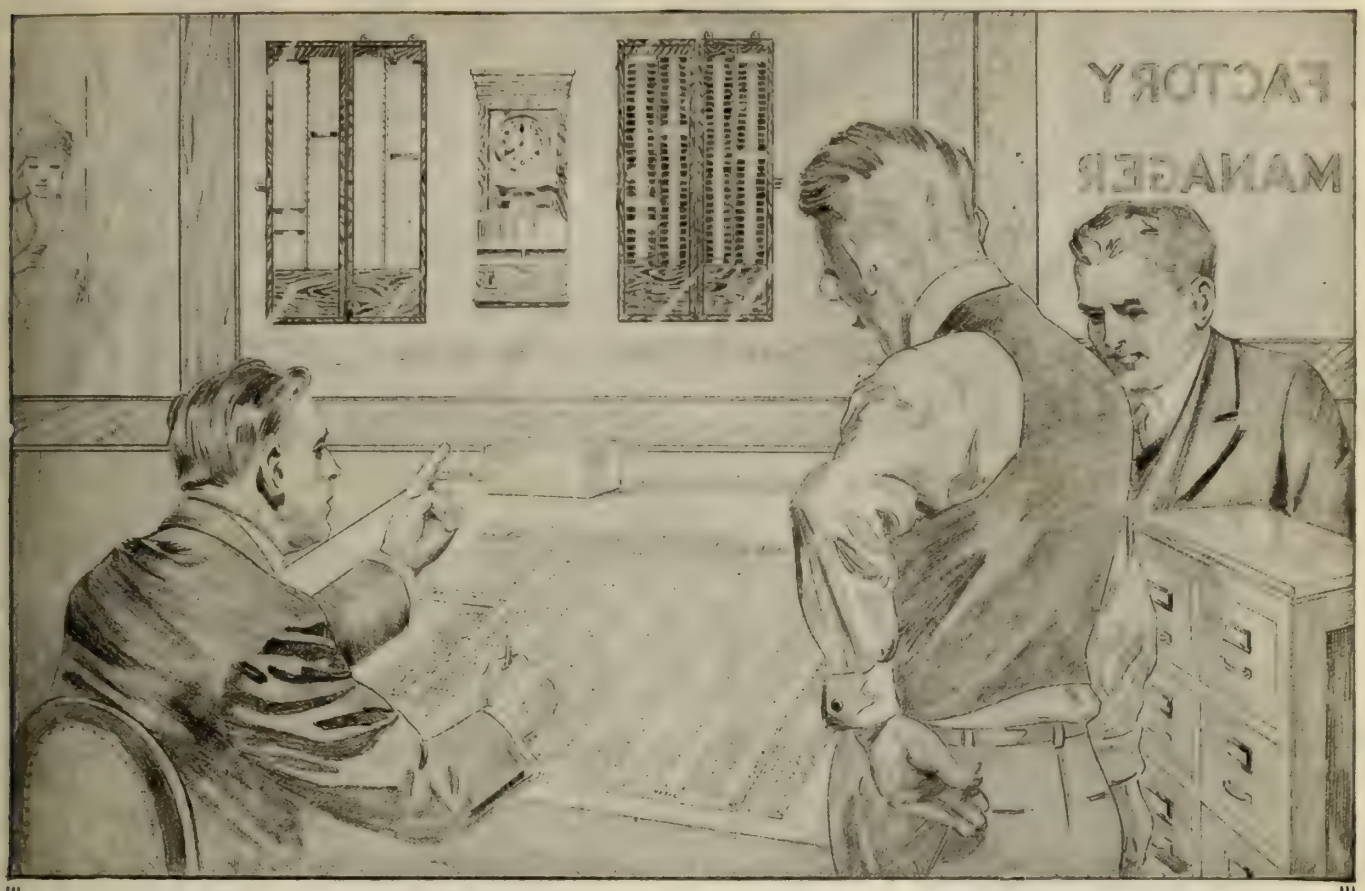
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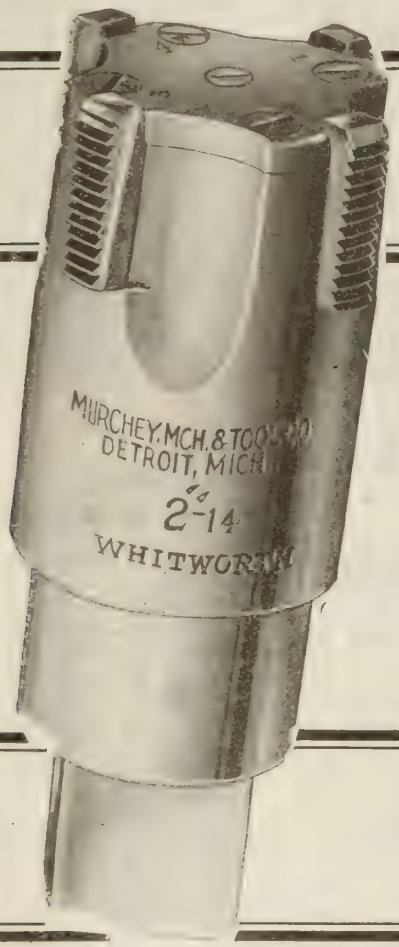
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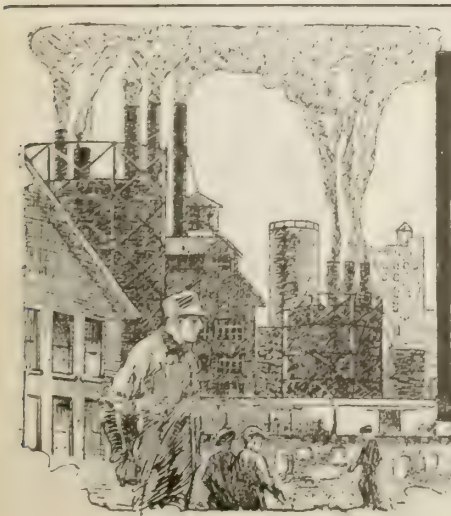
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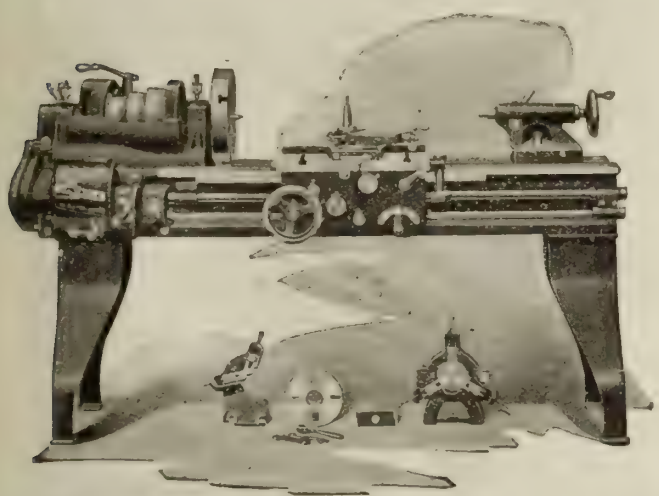
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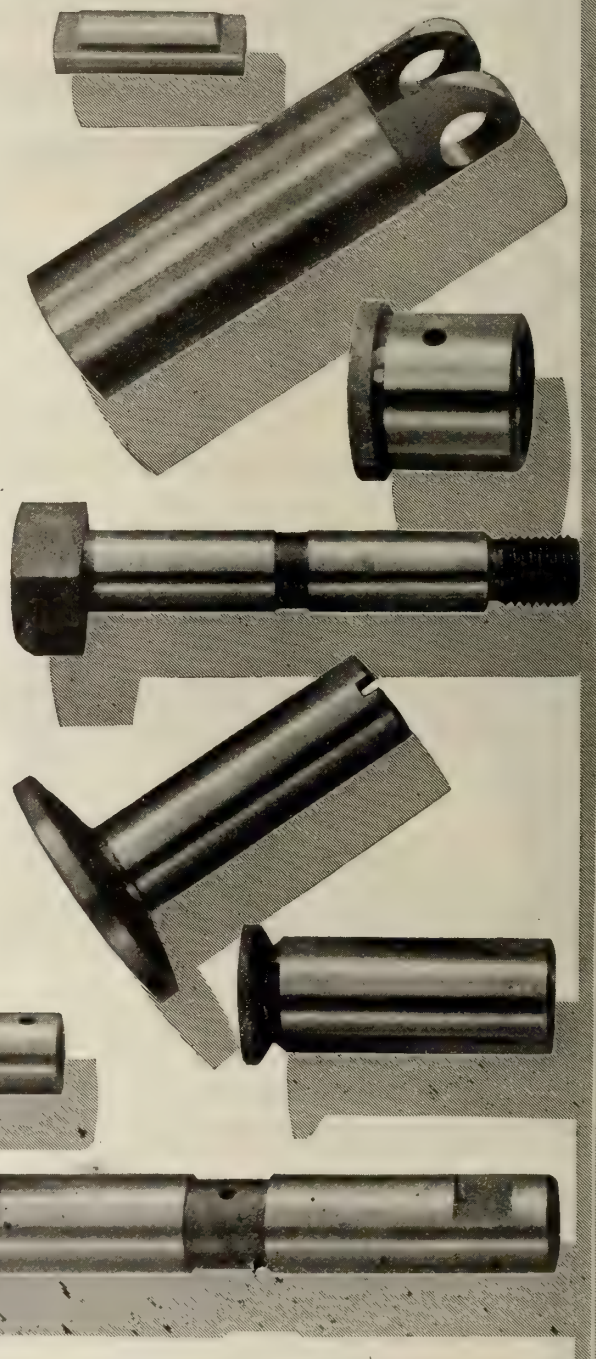
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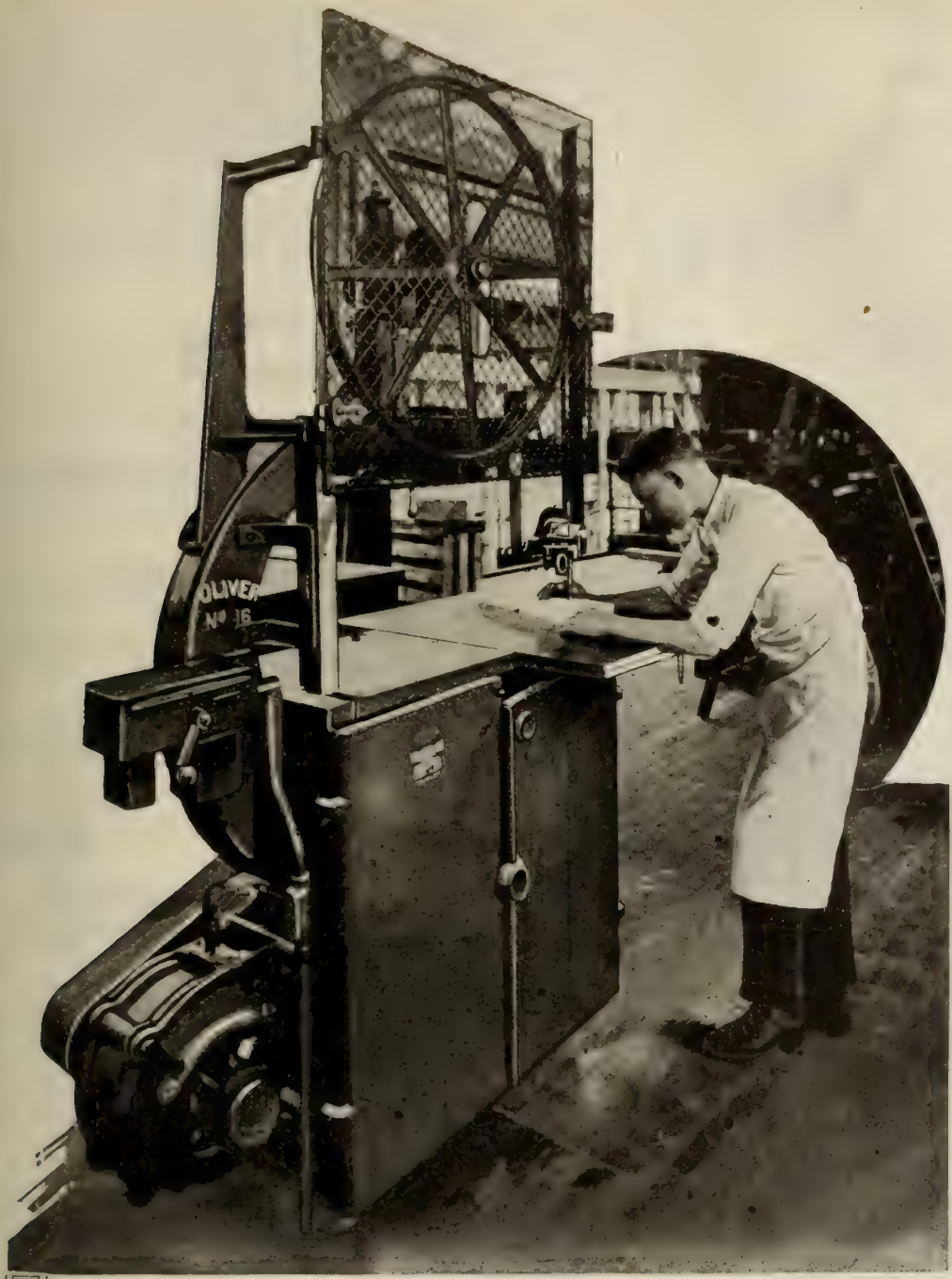
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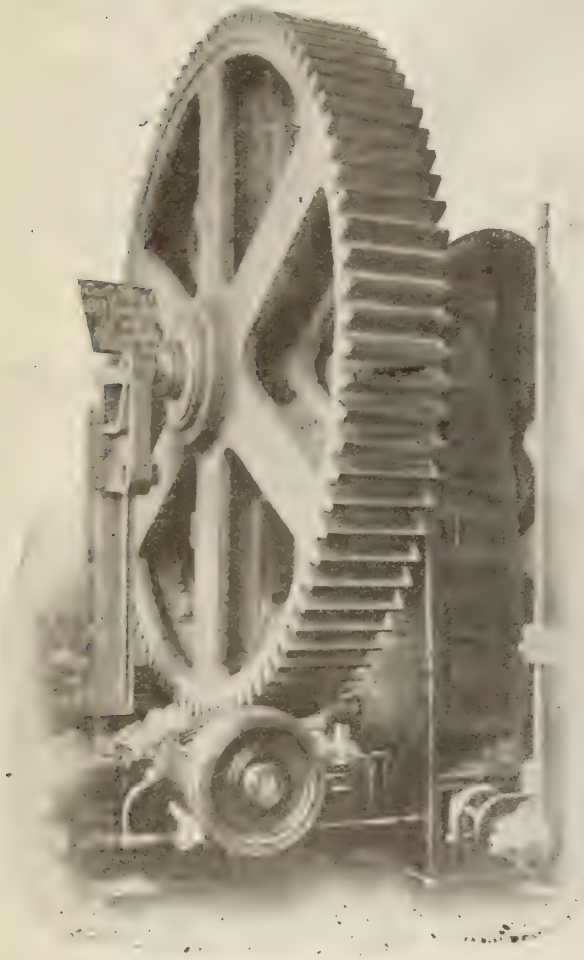
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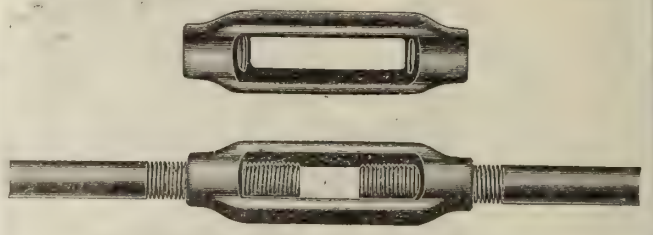
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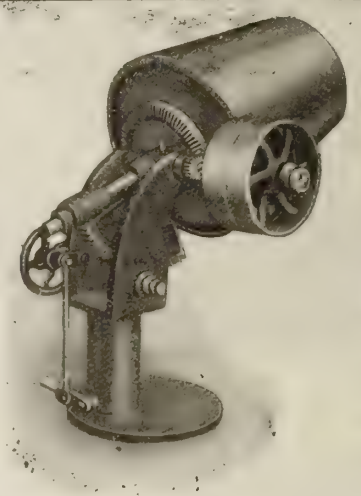


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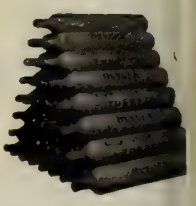
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# Perfectype COMPLETE WELDING and CUTTING Equipment

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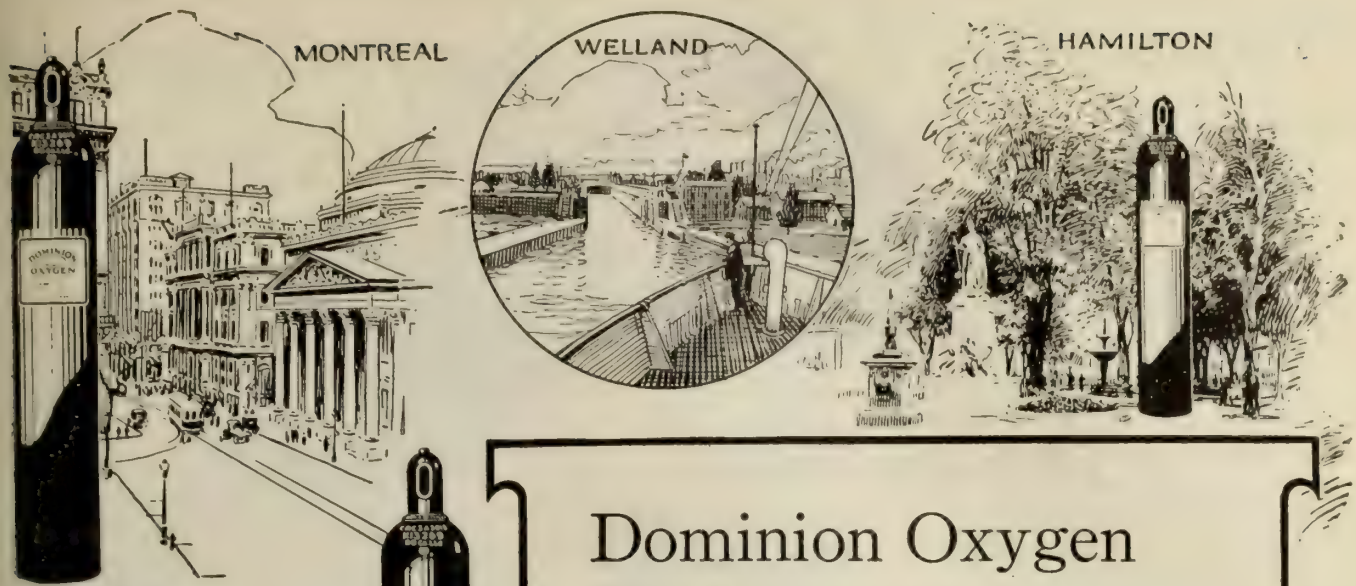
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By maintaining the high standard of purity of its product and by developing still further the efficiency of its distributing organization, the Dominion Oxygen Company, Limited, will strive to continue to merit the generous patronage accorded it by Canadian oxygen users.

**DOMINION OXYGEN COMPANY, LIMITED**

Hillcrest Park, Toronto

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P.W.C. 537

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LIMITED

Toronto and Winnipeg

4420

# Robertson Process Ventilators

## *Made of Robertson Process Metal*




The air is drawn out of the building—Automatically! A partial vacuum is created. Back draft is impossible. Maximum ventilation is the result.

These are some of the advantages you will find in Robertson Process Ventilators. And these advantages are insured, for this Robertson Product is made entirely of Robertson Process Metal—a building material that cannot rust or corrode—a protected metal in which the specially annealed steel core is completely encased (both surfaces and edges) and hermetically sealed. Rust and corrosion are avoided. All elements of deterioration, whether caused by weather conditions or manufacturing processes, are successfully overcome by Robertson Process Metal. Painting is made unnecessary. Upkeep costs are reduced to a minimum.

Further advantages of Robertson Process Ventilators are explained in an illustrated bulletin which will be gladly sent upon request, together with an actual sample of Robertson Process Metal.

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Sarnia, Ontario
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# ROBERTSON PROCESS

TRADE MARK REG. U.S. PAT. OFF.

## METAL FOR ROOFING AND SIDING




*Name of Hardware Merchant and further details, supplied upon request*

# The Answer is—He Didn't!

THE crowd was drawn by a hardware firm in an Ontario town of 700 population. This crowd of over 1,000 people represents customers of the store, drawn from miles around, to attend the picnic given by this firm to its customers. Surely this is evidence of the close relationship between this hardware firm and its customers.

The close relationship between retailer and customer in this instance is typical of conditions existing in hundreds of Canadian towns, villages and cities.

The average hardware merchant (particularly in the smaller cities and towns) has been established for many years. He has a big business connection built up through years of efficient service to his customers. He is well rated, and a desirable man with whom to do business. He influences the buying habits of the people in his community, and in over 90% of the sales made, he is the deciding factor.

*"Which one do you recommend?"* is a question asked thousands of times each day in the hardware stores of Canada.

If you can get the effort and enthusiasm of the retail hardware merchants and their clerks, plus their window and interior displays and local advertising behind your goods, you will have secured the co-operation of one of the greatest available selling forces.

HARDWARE AND METAL is paid for, and read, by all the wholesale hardware buyers of Canada, and over 90% of the retailers from coast to coast. They are the men who control the sale of your products to the hardware consumers. HARDWARE AND METAL can put your story before, practically, the entire Canadian hardware trade. One of our representatives would be glad to give further details.

(Only hardware paper in Canada with membership in the Audit Bureau of Circulations).

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*Published every Saturday since 1888. The only weekly hardware paper in Canada, and the only hardware paper in Canada that gives you a circulation statement audited by the Audit Bureau of Circulations*

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## No. 3

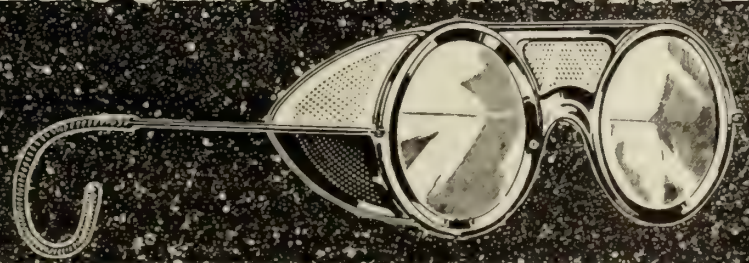
**They've made false teeth you can eat with, false arms you can work with, false legs you can walk with—but nobody ever made a false eye you could see with!**

# Wear Your Goggles!

This is No. 3 of a series of short paragraphs which is appearing regularly in our advertising. Permission is freely given Safety Engineers, Editors of Employees' Magazines and others to use this material as they wish. In addition we shall be glad to furnish these paragraphs in leaflet form, in any quantity, for insertion in pay envelopes or as posters for bulletin use.

# Men Handling Molten Metal Need— STOCO SAFETY GOGGLES with "CELOGLAS" Shatter-Proof Lenses

PAT. DEC 12 1916



The extra between-the-eyes protection afforded by STOCO Safety Goggles will be especially appreciated by men facing the molten metal eye hazard. The man behind the ladle will also find the STOCO Safety Goggle unusually comfortable—a safety glass that may be worn all day—every day—without discomfort to the eyes or face.

The Safety Goggle

Price Each (F.O.B. Geneva, N.Y.)

With "Celoglas" Shatter-Proof Lenses. $1.15
With Optical Glass Lenses..... .90

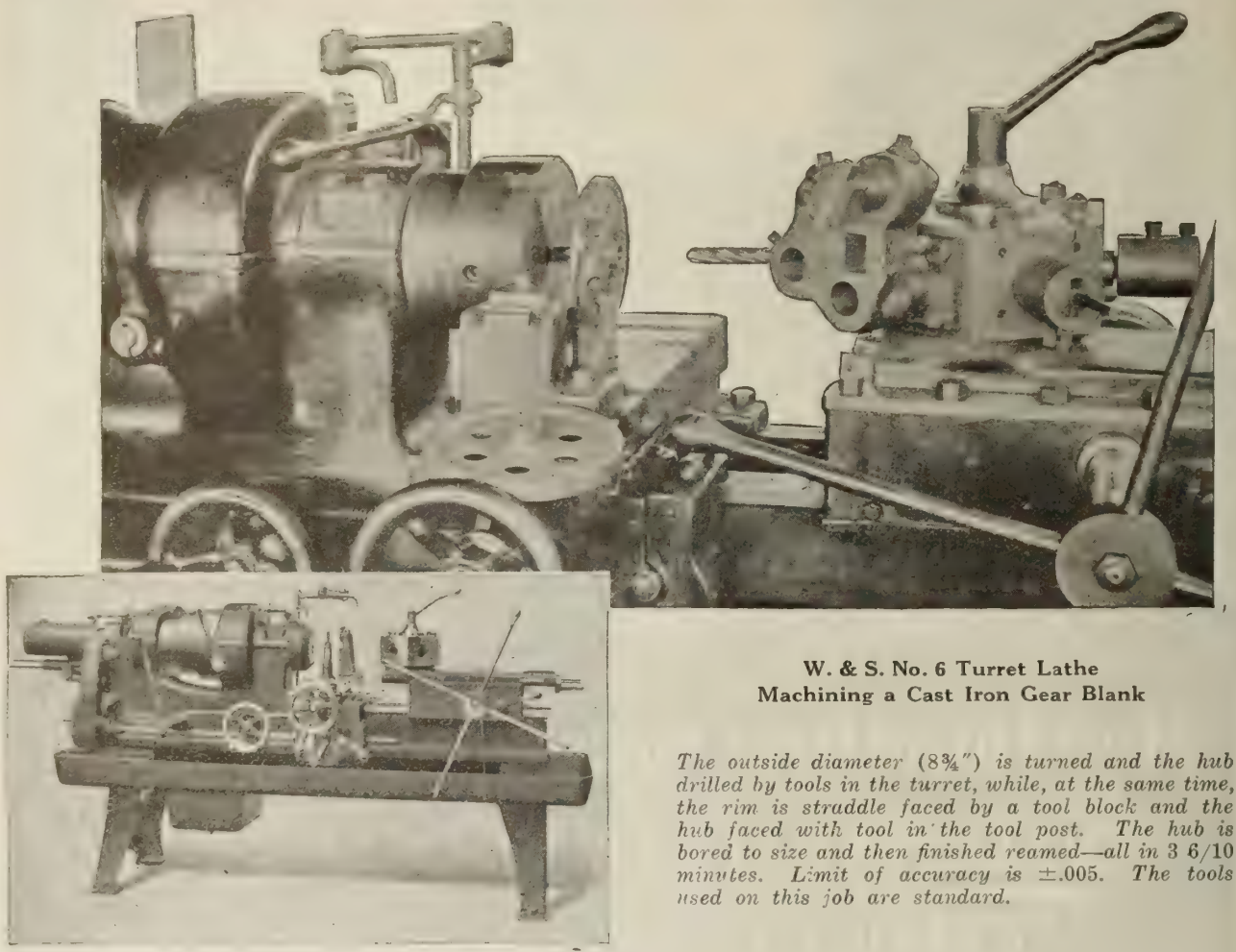
Attractive Discounts for Quantity Orders.

Comfortable earbows or black elastic headbands at the same price.

Note—A sample STOCO Safety Goggle will be sent interested, responsible people on receipt of request on letterhead.

# The Standard Optical Co. Geneva N.Y.

# The Revival of Business is Sure



**W. & S. No. 6 Turret Lathe**
**Machining a Cast Iron Gear Blank**

*The outside diameter (8¾") is turned and the hub drilled by tools in the turret, while, at the same time, the rim is straddle faced by a tool block and the hub faced with tool in the tool post. The hub is bored to size and then finished reamed—all in 3 6/10 minutes. Limit of accuracy is ±.005. The tools used on this job are standard.*

Anticipate your needs for the Revival of Business. Be ready to compete in price and quality. Warner & Swasey Engineers are eager to help you. They will study the working cost of your turret lathe equipment and show you where and how this cost can be reduced if possible, thereby increasing the earning capacity of the equipment.

There is no obligation attached to asking for our Engineer to call.

## The Warner & Swasey Company

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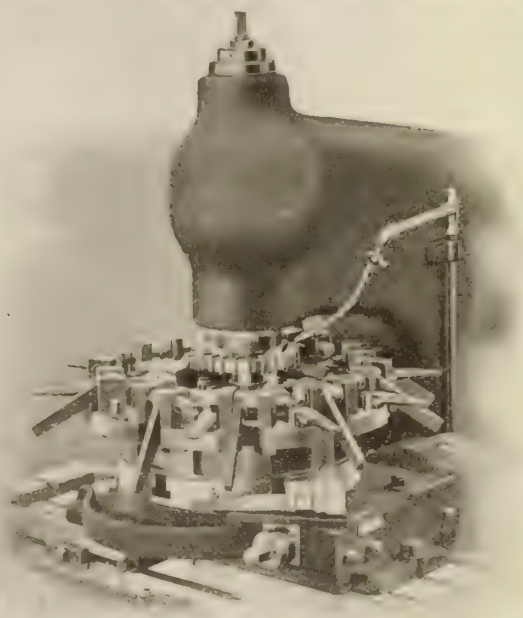
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# MILWAUKEE MILLING MACHINES



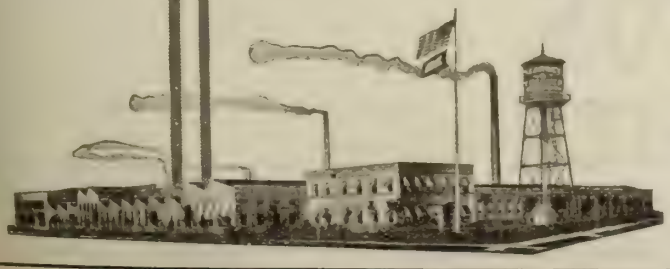
Continuous milling of 10-inch adjustable wrenches on a Milwaukee Vertical Milling Machine. These parts are turned out at the rate of 3,000 a day and the finished surface bears a constant and accurate relation to other selected points on the part.

## *Rapid, Economical Milling*

Manufacturing milling by the continuous process is an advanced step in milling machine practice that is worthy of the serious consideration of the management of any plant. The motion in this milling process is continuous. It is reasonable, therefore, that in this way maximum production is secured. This sort of milling is most desirable in the machining of parts in large quantities. The rotary table with chucking fixture holding the work revolves, and the cutter is in operation and in the work at all times. The operator removes the finished piece and puts another unmilled one in its place.

Milwaukee Vertical Milling Machines are particularly well adapted to continuous milling. The spindle is adjustable for wear only as sufficient adjustment can be obtained by the adjustment of the knee alone, the same as it is in the horizontal type milling machines.

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Showing installation of Skinner Bros. (Baetz Patent) Heaters in foundry of Best Foundry Co., Bedford, Ohio. Note extensive area served.



# Heat Your Plant the Logical Way

Install the Skinner Bros. (Baetz Patent) Heating System and every corner of your plant will be kept at the same uniform, comfortable temperature, regardless of weather conditions. This is the logical method of heating — there are no places always too warm while others are too cold — no long, cumbersome pipe lines or air ducts.

The Skinner Bros. (Baetz Patent) Heater applies only natural laws and is simple and positive in action. It is portable; requires no special foundations; installation cost is 15% to 50% less than any other system, with equally low operating costs. Creates no drafts or air blasts, does not disturb floor dust and maintains comfortable, healthful working conditions always.

Performance guaranteed — if a Skinner Heater should ever fail, it would become immediately returnable to the factory and every cent of your money refunded.

### Mechanical Details

Built as an individual enclosed unit with a series of pipe coils compactly mounted above a powerful fan-wheel. Coils are heated by exhaust or live steam. Cold air is drawn into the heater by the fan, impelled upward and around the coils, and, after being heated, is diffused through outlet hoods to every part of the open area. No pipes or ducts used. The fan is operated by any power available.



### Direct-Fired Type

Where steam is not available, we supply our direct-fired type DF, which burns coal, coke or wood. Built on the same scientific principle as type SC. The fan is operated by any power available.

### Send for Full Particulars

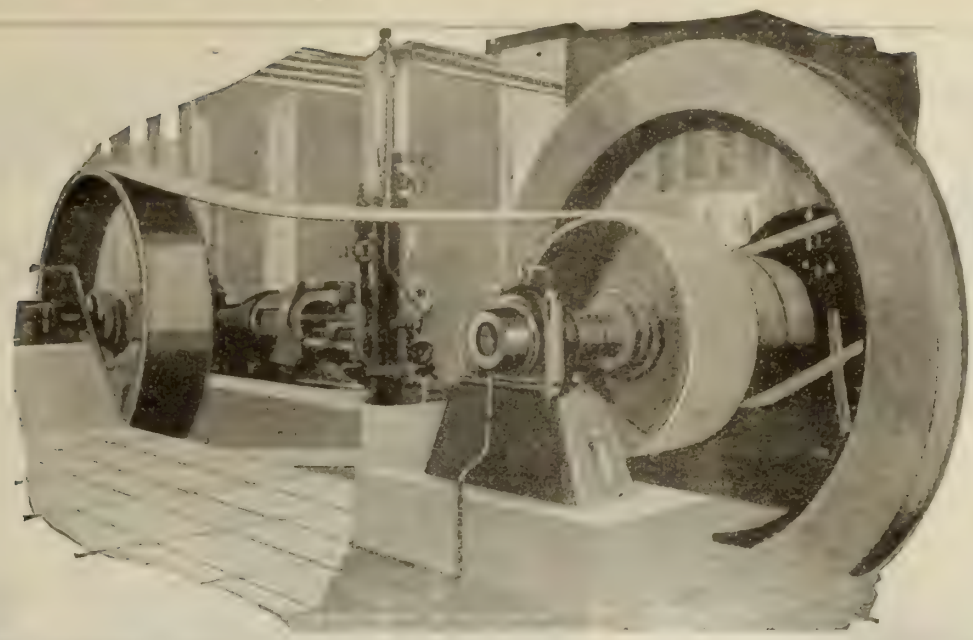
Find out more about this wonderful heating system—we will send complete details and list of users on request.

**Skinner Bros. Mfg. Co., Inc.**
1438 South Vandeventer Ave. St. Louis, Mo.

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# Skinner Bros.
## Baetz Patent HEATING SYSTEM

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We can / cannot use steam.



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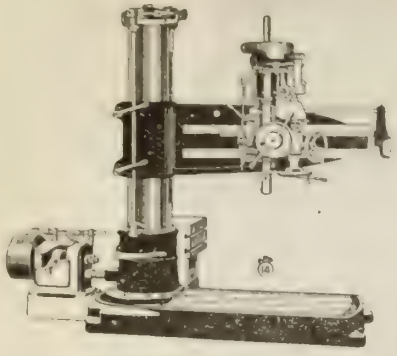
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DOMINION RUBBER SYSTEM AND ASSOCIATED COMPANIES

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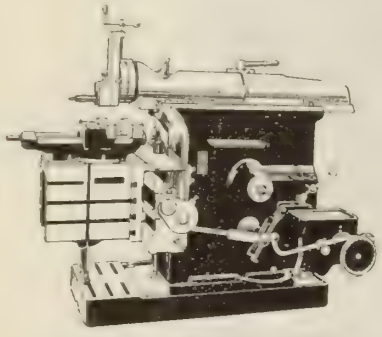


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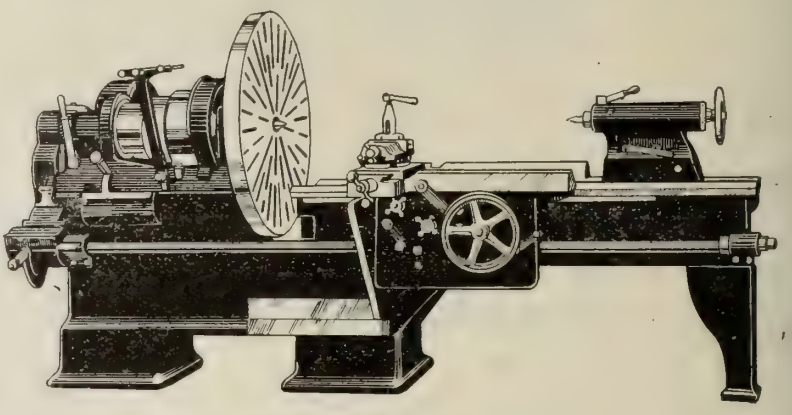
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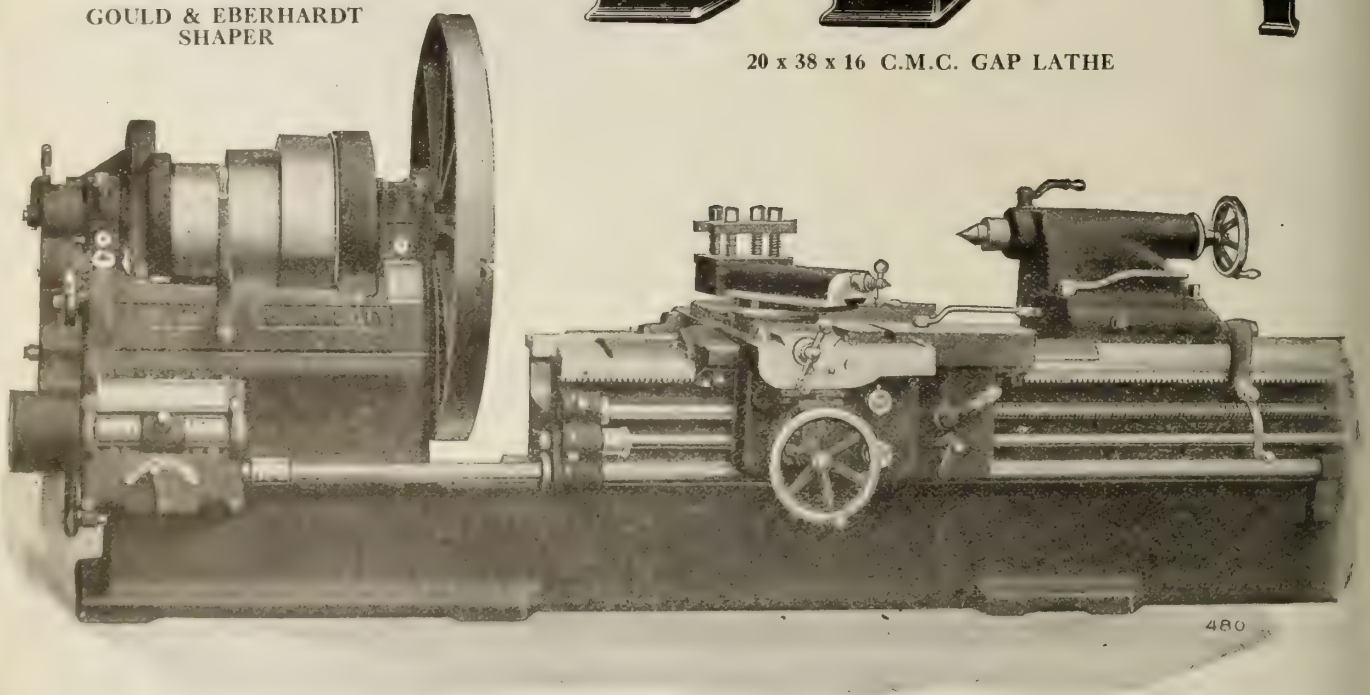
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"A BETTER SAW FOR EVERY USE"

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TRADE K-T MARK

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We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us. Ask us.

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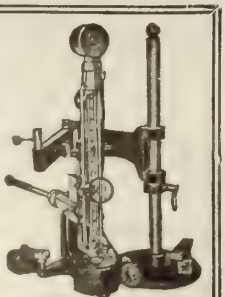
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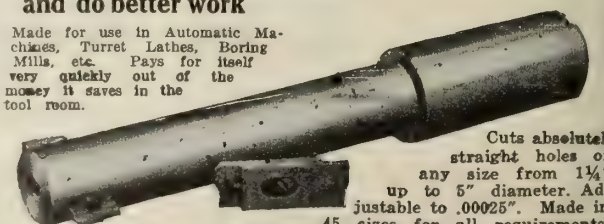
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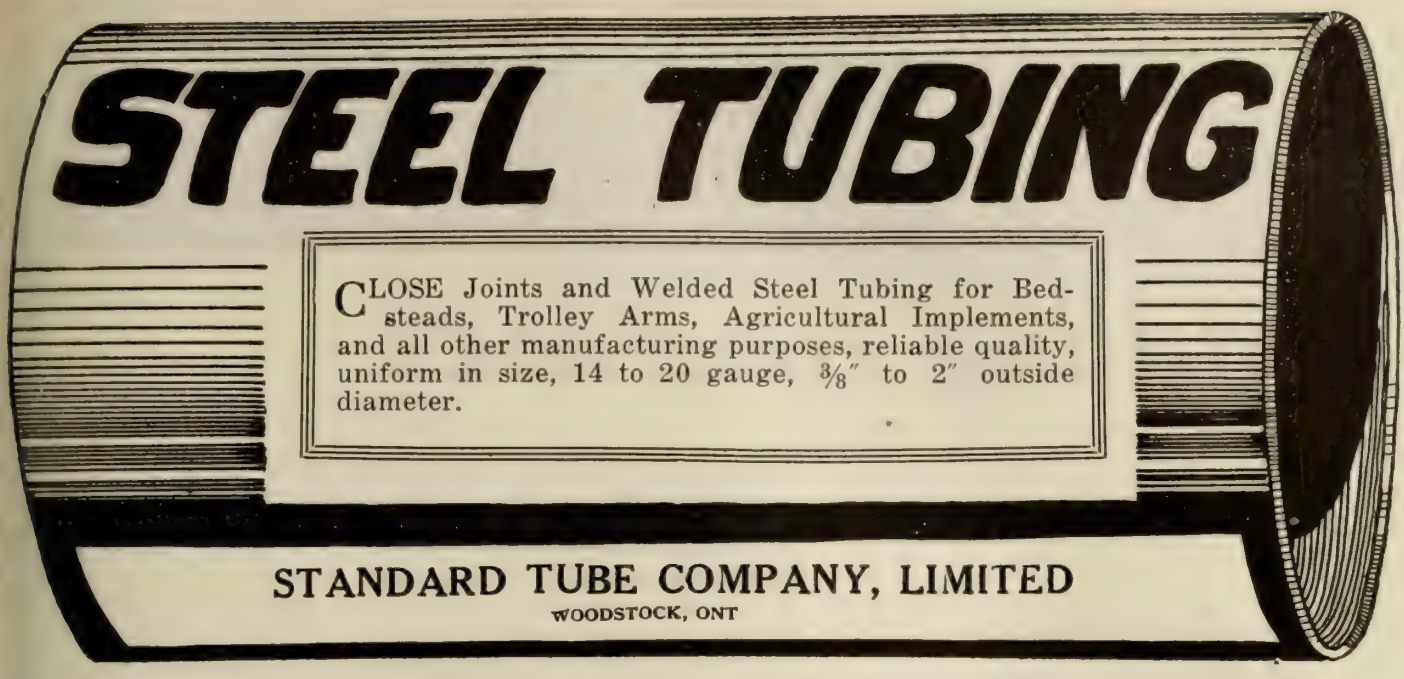


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# *Milling Insurance*

When you take out an accident insurance policy you feel that it is well worth the money you pay in premiums—"just in case." The only trouble is you have to get hurt to secure any money from your investment.

When you purchase a Hendey Miller you reap dividends from the moment you put it in use—and its initial cost is the only premium you pay!

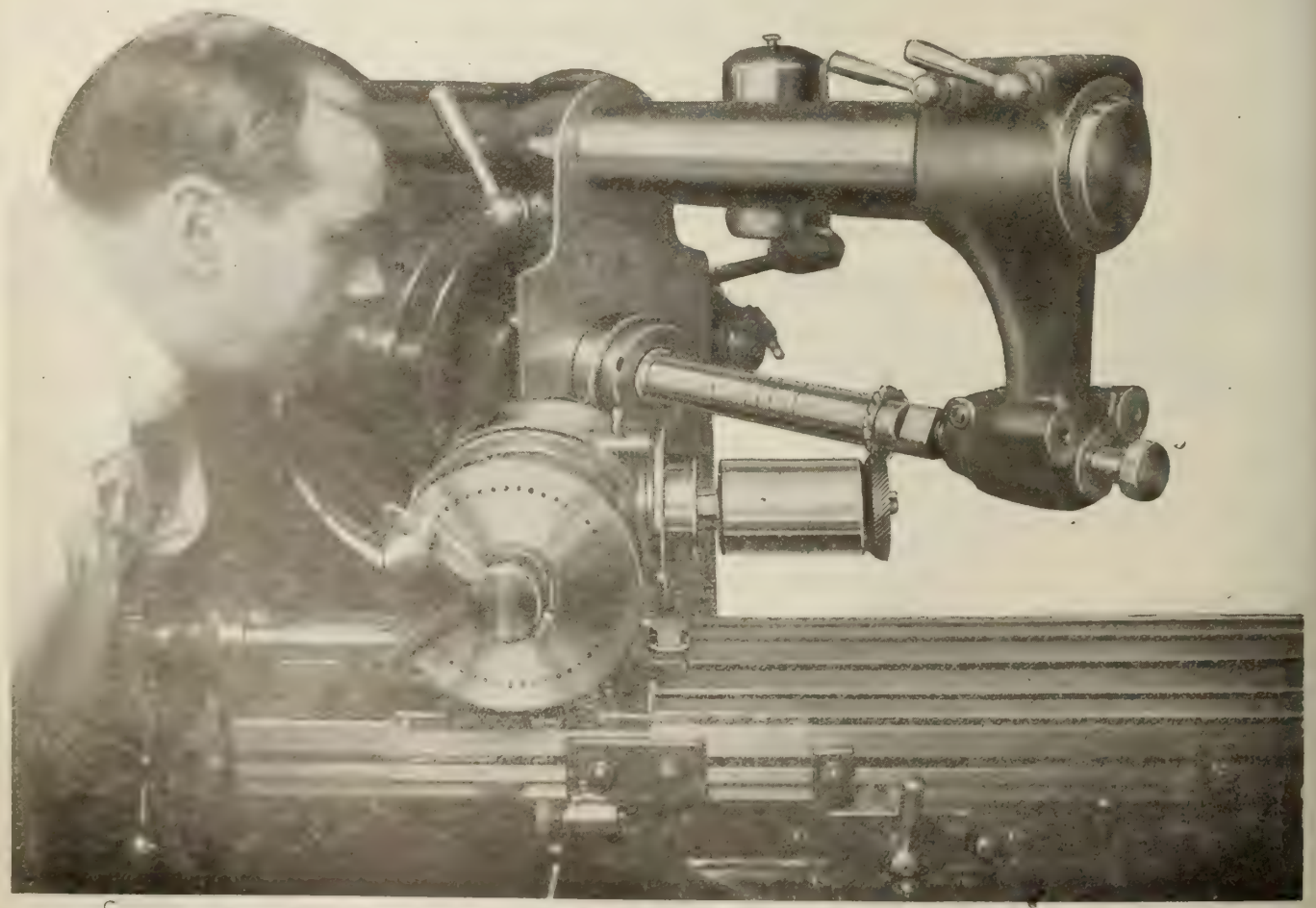
The use of Hendey Millers guarantees the speed and precision with which your milling can be accomplished. The unfailing satisfaction which each machine renders its user is the reason why "the purchase of one Hendey means the purchase of more."

## THE HENDEY MACHINE COMPANY

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# IMCO TOOLS

## *Hard Workers*

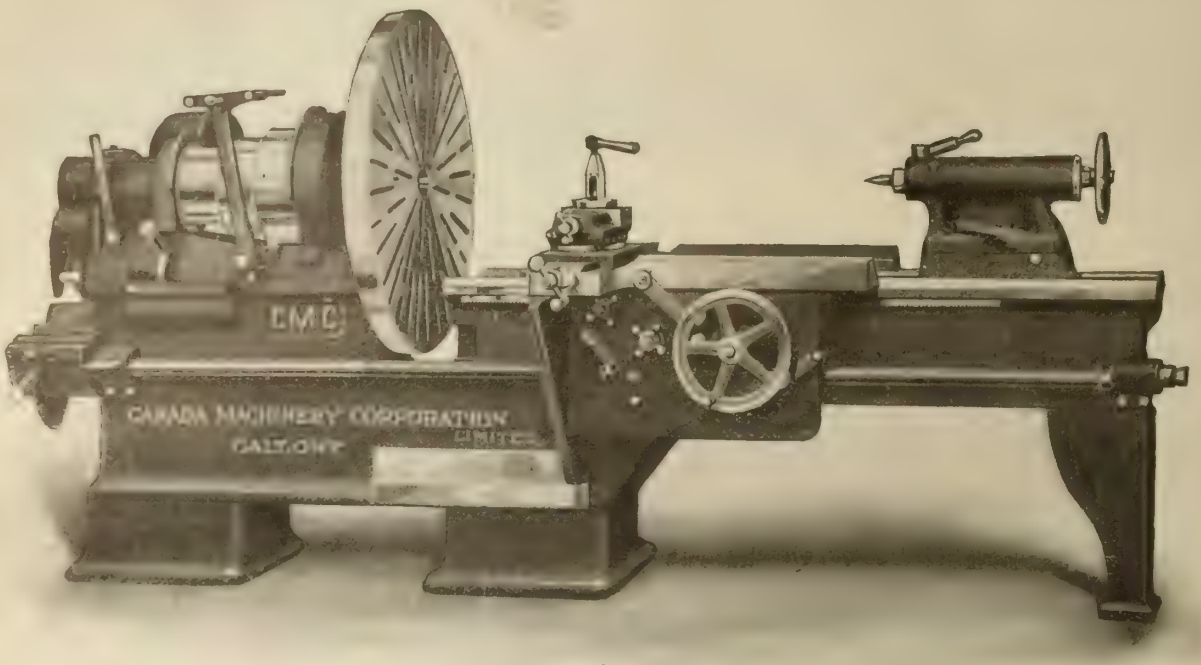
Tools which "lay down" on the job are an extravagance which no firm can afford to tolerate.

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# 18" x 10' Q.C.G. Gap Lathe

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# CANADIAN MACHINERY
## AND MANUFACTURING NEWS

Vol. XXV., No. 15 | Published by the MacLean Publishing Company, Limited, Toronto | April 14, 1921 | $4.00 a Year Subscription Price


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*High Speed—High Quality*

**TWIST DRILLS**

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**MILLING CUTTERS**




REST assured that when you adopt Butterfield Tools you are going to get service that results in the **utmost in economy, and the utmost in efficiency.**

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P & W

# Pratt & Whitney Taps

**"With the 'Con-eccentric' Land"**

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If you're doing work that calls for big production and for unusual precision, give them a trial. You'll be back for more when you see them prove themselves.

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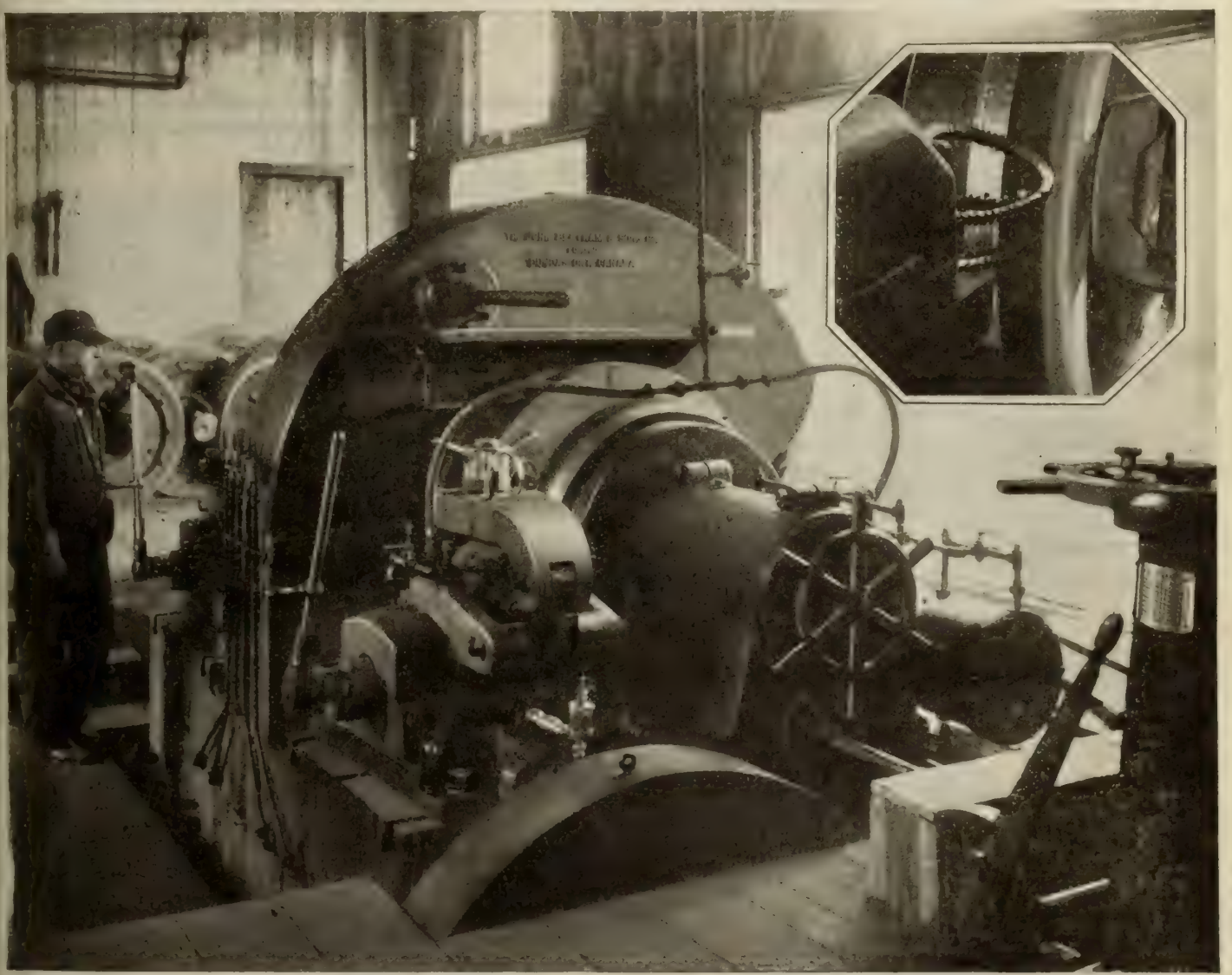
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VANCOUVER
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WINDSOR: Davis Building

# BERTRAM
## MACHINE TOOLS



**Shop View of NO. 5 CAR WHEEL LATHE, a number of which we have recently furnished to Canadian Railways. (Inset—enlarged view of cut on wheel).**

## Note These Features—

Pneumatic Tool Clamps,
Movement and Clamping of Tailstocks, by Air Cylinders,
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# HANNA

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# Plan Your Oil Storage

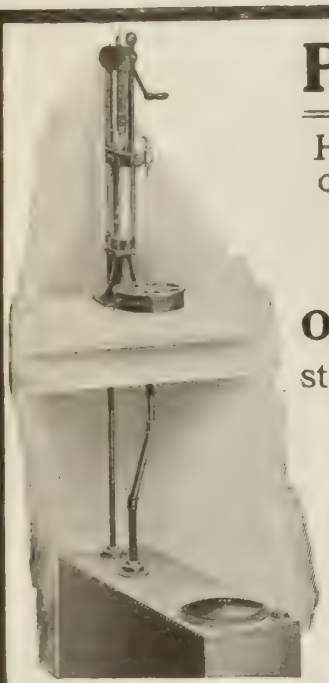
Haphazard methods of storing and handling oils are costly, dangerous and unnecessary.

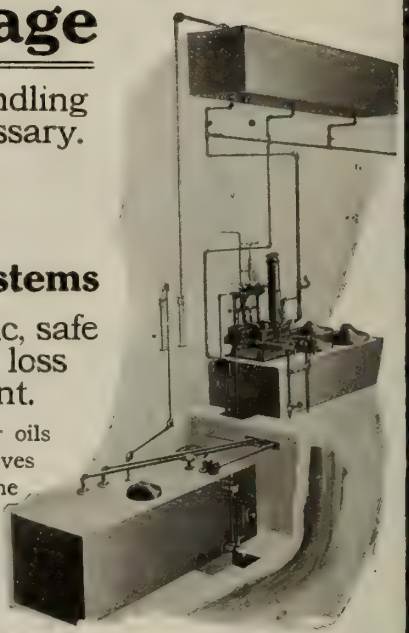
BOWSER ESTABLISHED 1885

**Oil Storage and Distributing Systems**

store and handle all oils in a systematic, safe and saving manner—they prevent all loss of oils—make every drop of oil count.

In factory, machine shop, power plant or wherever oils are used, BOWSER Storage Systems pay for themselves many times, through the saving in oils, besides the saving in labor and floor space.

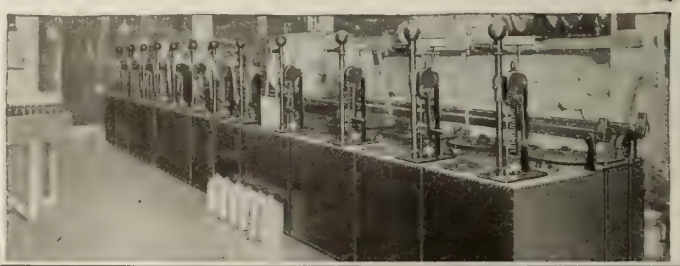




## S. F. Bowser Co., Ltd.

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BOWSER Oil Storage GIVES Convenience AND Safety



BOWSER Oil Storage IS Systematic AND Saving

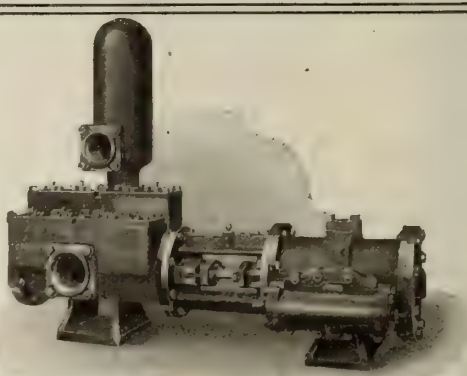
# Hepburn Steam Pumps

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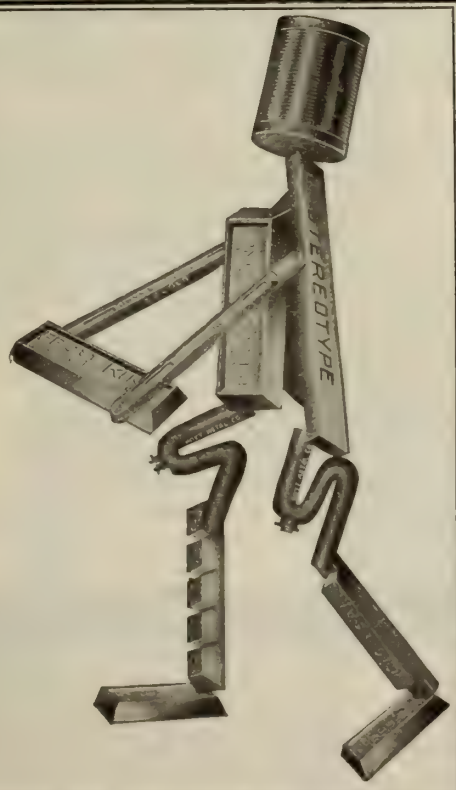


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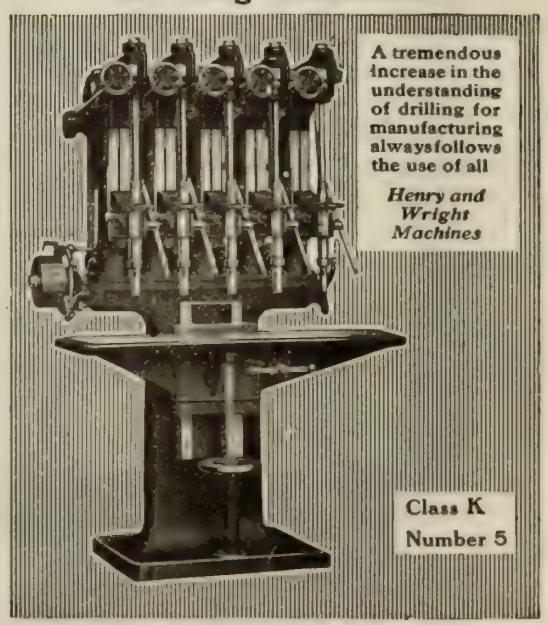
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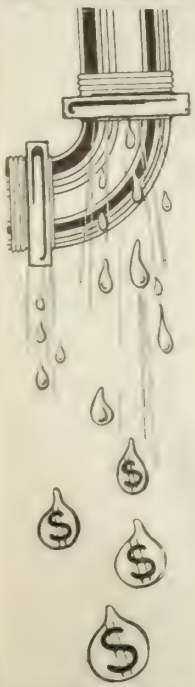
"Elkco," "Elkco Special," "Elk Steel"
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Each brand of Elk Fire Brick has some particular qualification which fits it to give better results in certain places than other brands we produce. And then there's the matter of **quality** and **price.** When you buy Elk Brands you get Brick of established quality; you also benefit by our service, which advises the most economical brand for your needs.

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Keep your workmen supplied with sharp files and they will do their filing jobs well and remain contented.

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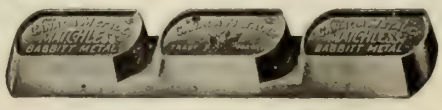



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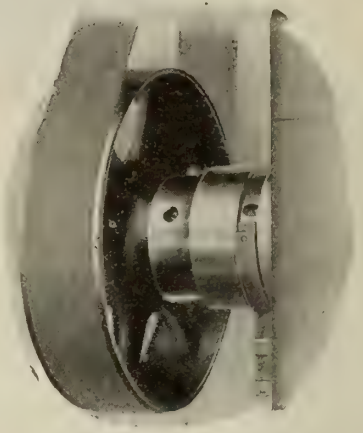
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The tight and loose pulley is passing from favor. With all its disadvantages, it long survived because a reliable friction clutch was not in evidence.

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Replace your tight and loose pulleys with Johnson Clutches.



*Single Clutch with Pulley Mounted*

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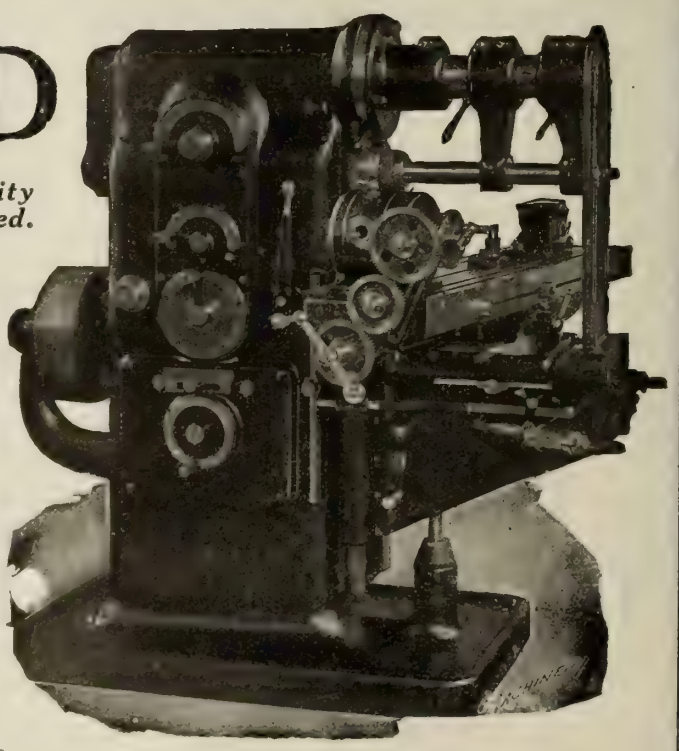
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Saves Time, Labor, Expedites Production

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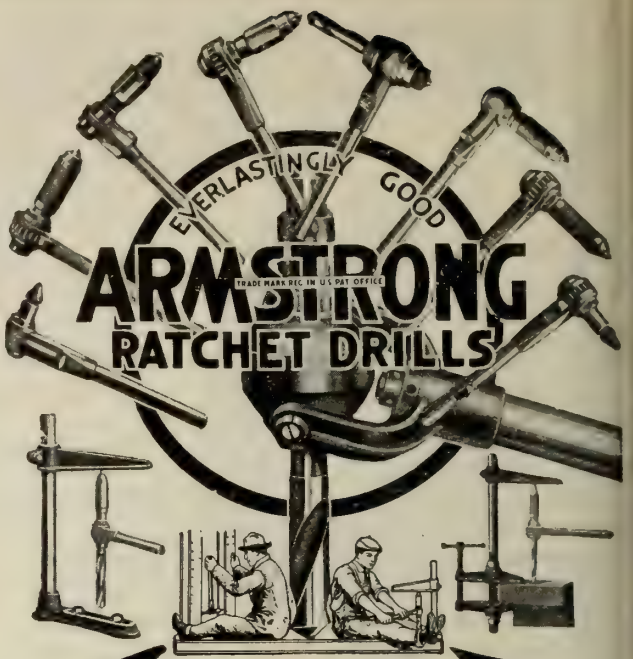
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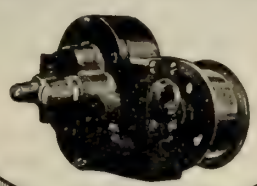
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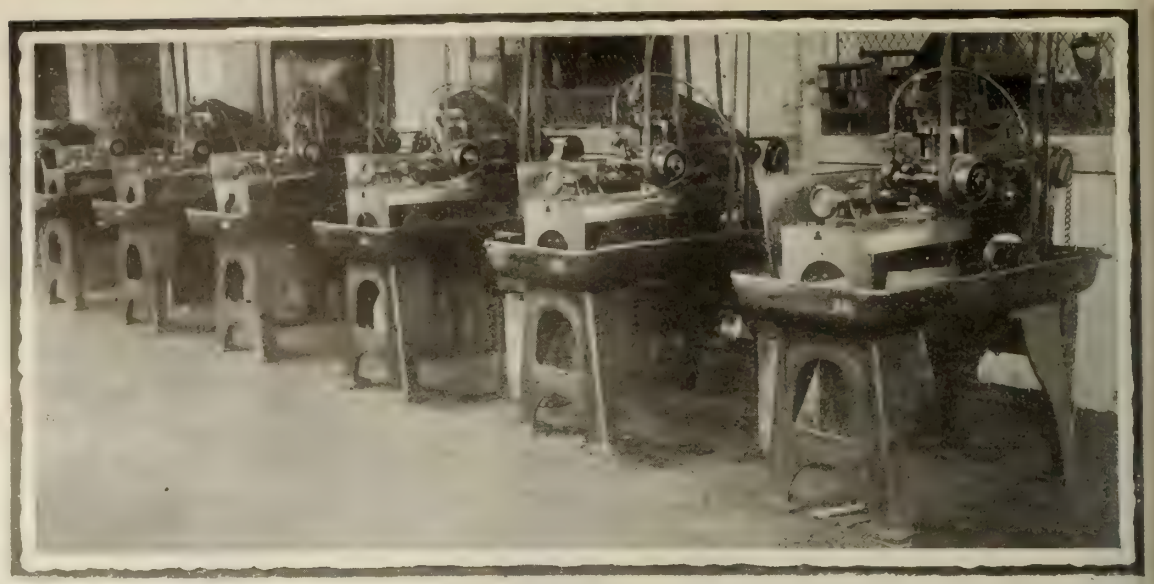
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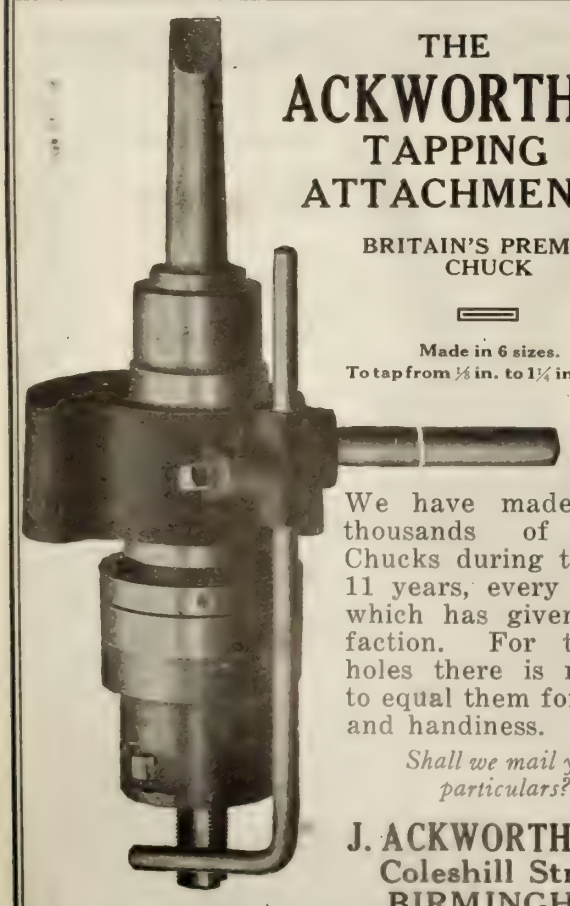
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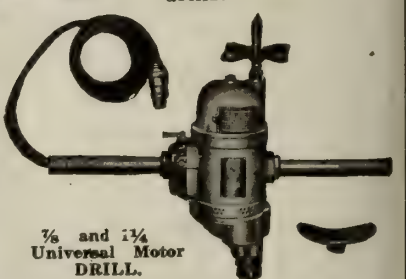
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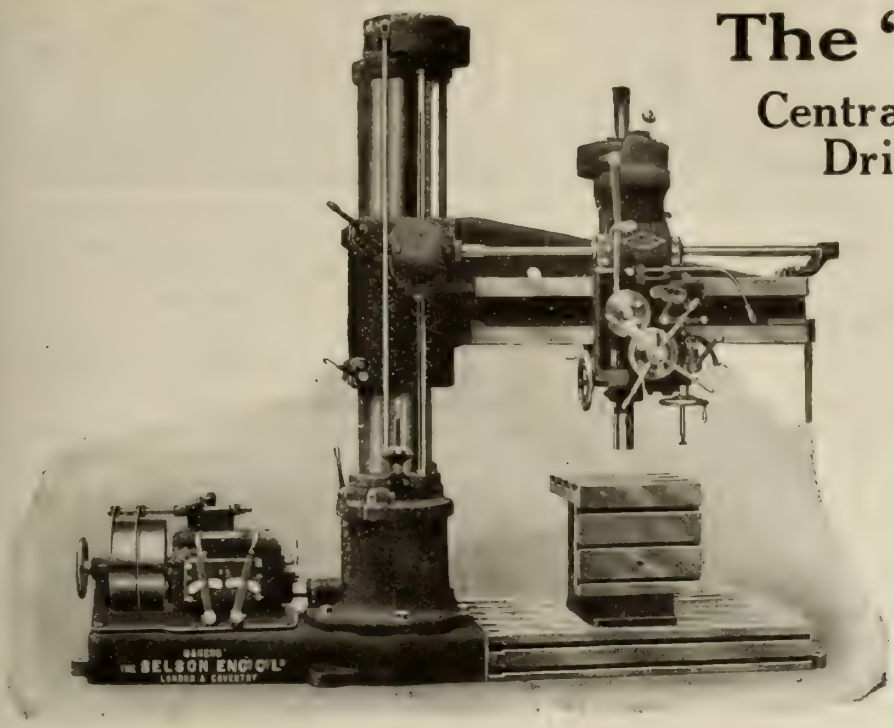
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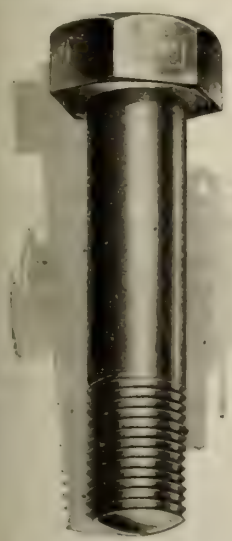
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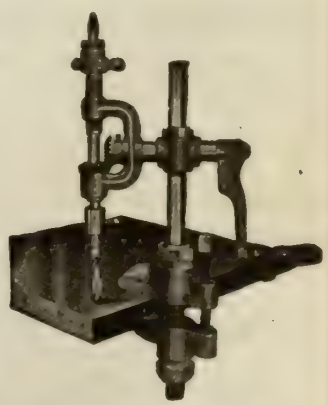
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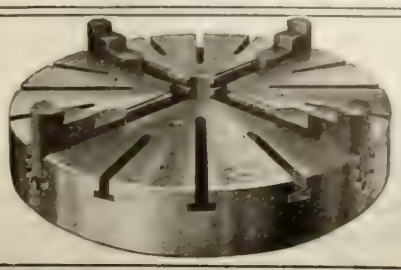
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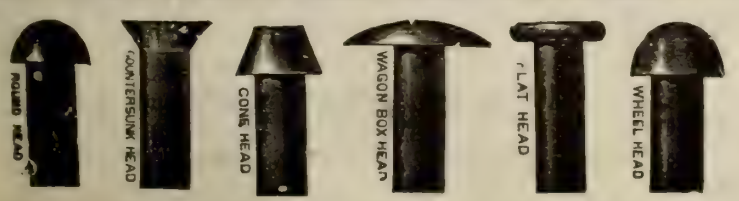


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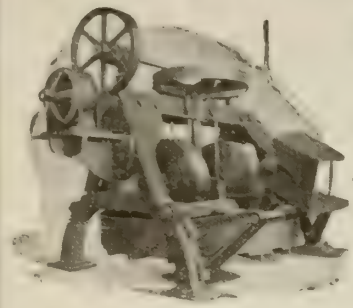
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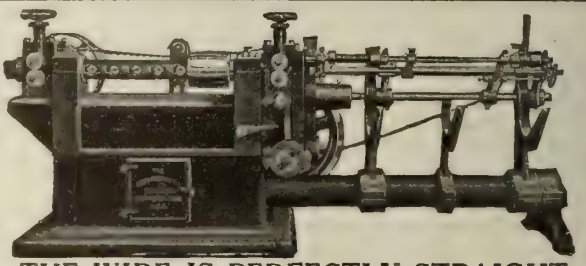
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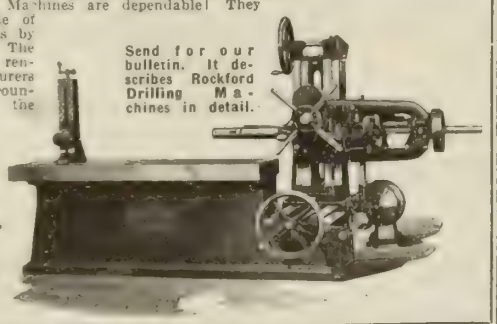
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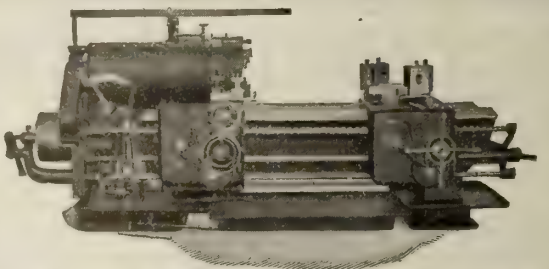
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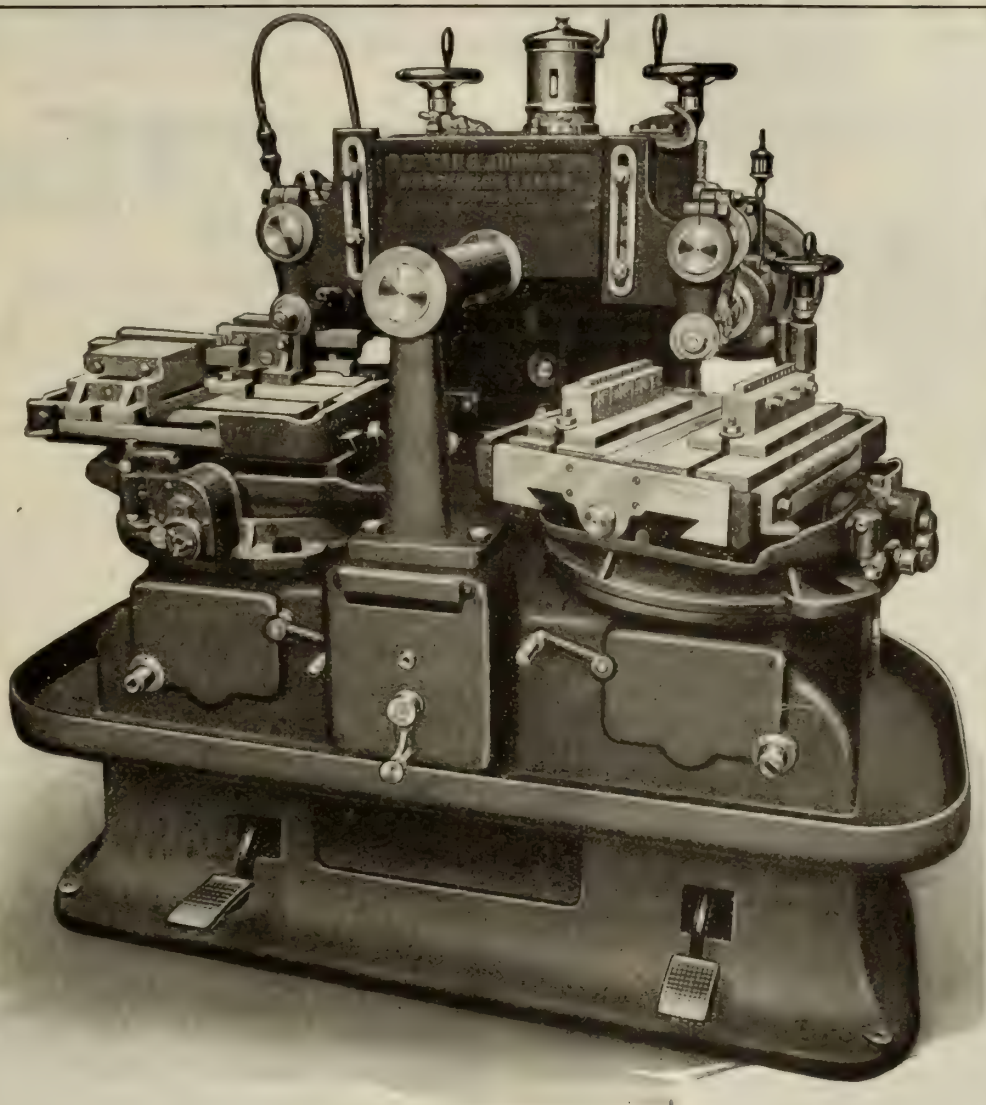
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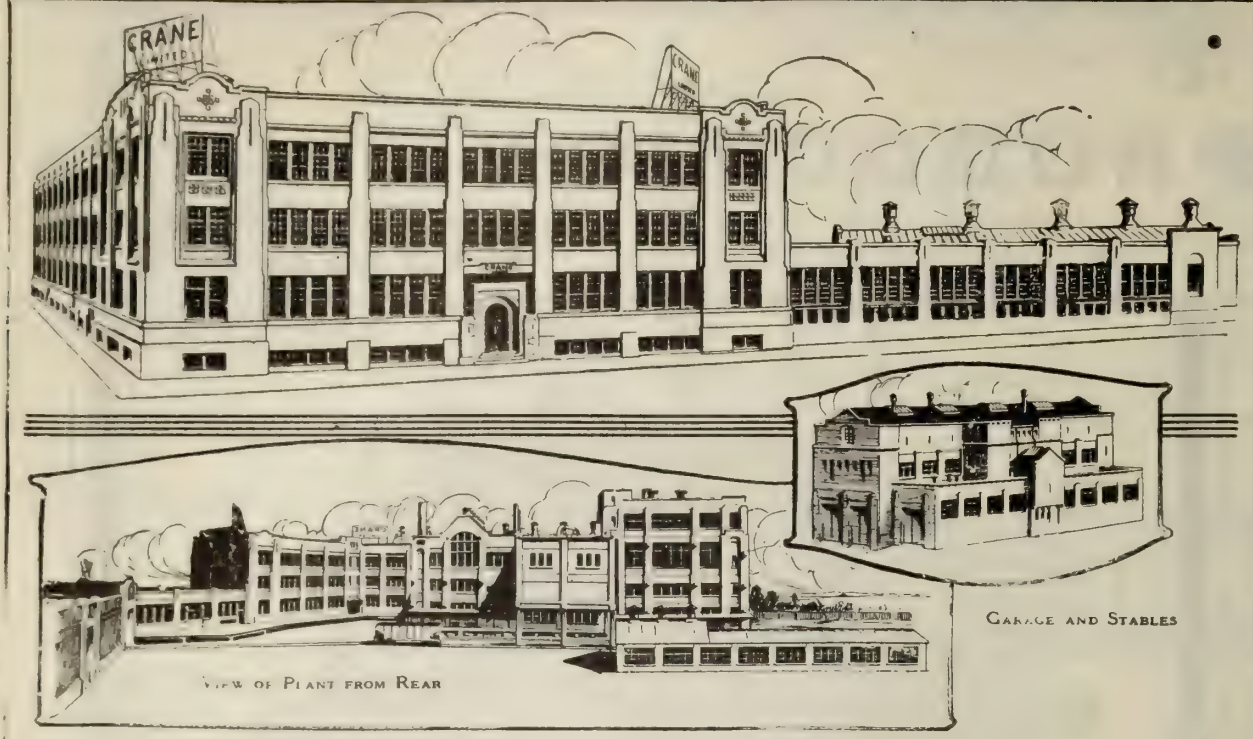
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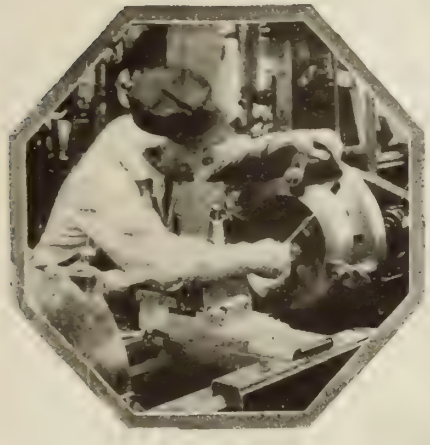
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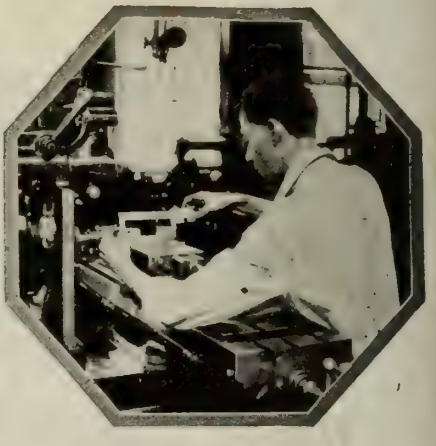
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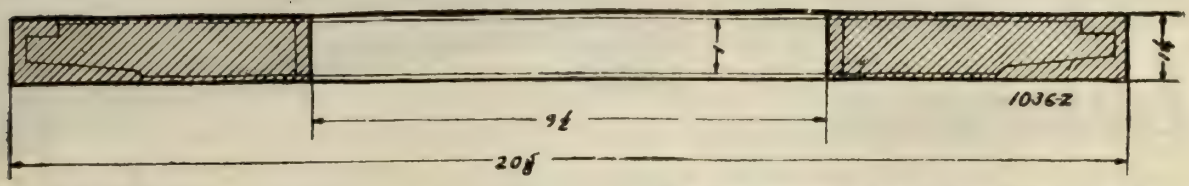
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## 40 Minutes Typical Boring Mill Production

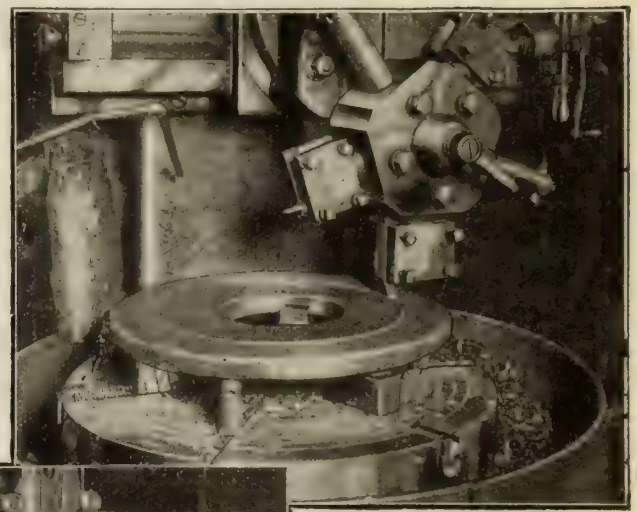
The workman shown at the right is interested in the job.

You are interested in the time it takes to do it.

The workman appreciates the ease with which the job is handled and the confidence he has in the machine.

You appreciate what these qualities mean to the cost of handling this, and similar work.

The part shown is a Scroll Plate for Chuck. Material, steel forging. Finished all over in two operations on the Gisholt Vertical Boring Mill.





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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

VOL. XXV. No. 15. April 14, 1921

# Producing 900 Float Valve Seats Every Hour

## Automatic Procedure in the Making of Spark Plug Shells, Carburetor Float Valve Seats, Piston Wrist Pins, Transmission Bolts, Sewing Machine Screws, Cylinder Priming Bodies and Nuts in Quantity

By J. H. MOORE

PRODUCTION met in with a real companion when automatic machinery came into being. True, the term automatic machines covers a very wide field, but what we are particularly interested in is automatics as used in the machine tool industry, that is, for production purposes.

There is a story told of an old-time machinist who could not see why these new-fangled machines should be catered to. "The old lathe is good enough for me" was his favorite expression, until one day the boss asked him, merely for a joke, to make 5,000 screws, all of the same size and length. That finished him, and from that day on he saw the force of the argument for production, also the need of some kind of production tool. It's a case of getting out the work as speedily as possible, and in the material to follow we shall illustrate how one concern is helping manufacturers solve their production problems. It is not our intention to compare or comment upon its method but rather to present the data on these jobs to our readers, leaving them to study the same at their leisure. There will doubtless be points brought up that will help solve some other problems, and if so we will be well repaid for our efforts in preparing this data.

### Automatic Screw Machine

First of all, the purpose of this type of machine is too well-known to require detailed comment, and yet there are a few still existent who believe that such a machine is for the making of screws only. Of course, this is an erroneous impression, for briefly such a machine is designed to produce that large class of work which can be made from bar stock, the parts being drilled, formed, threaded, etc., on the bar, and then cut off.

There are various types of these machines but to treat them in detail would take a volume in itself, so for the purpose of this article we have confined our data to one type of machine, that made by the New Britain Machine Co., New Britain, Conn., and to this firm we owe thanks for the data afforded us.

Fig. 1 shows the general appearance of one of these machines, and, briefly, here is a description of its principal parts. As will be noted it consists of six spindles, these being contained in suitable bearings. There is also a spindle cylinder, this being contained in a cylinder housing. An end working tool slide forms part of the machine, its function being self-apparent. Generally speaking, the operations which the machine is adapted to perform in the several positions are as follows:

First position—feeding to a stop, centering and drilling. Second position—box tooling, drilling and rough forming. Third position—box tooling, drilling and finish forming. Fourth position—box tooling, drilling, counterboring, reaming, undercutting, or any end operation. Fifth position—threading, or any other end operation. Sixth position—cutting off.

In the fifth, or threading position,

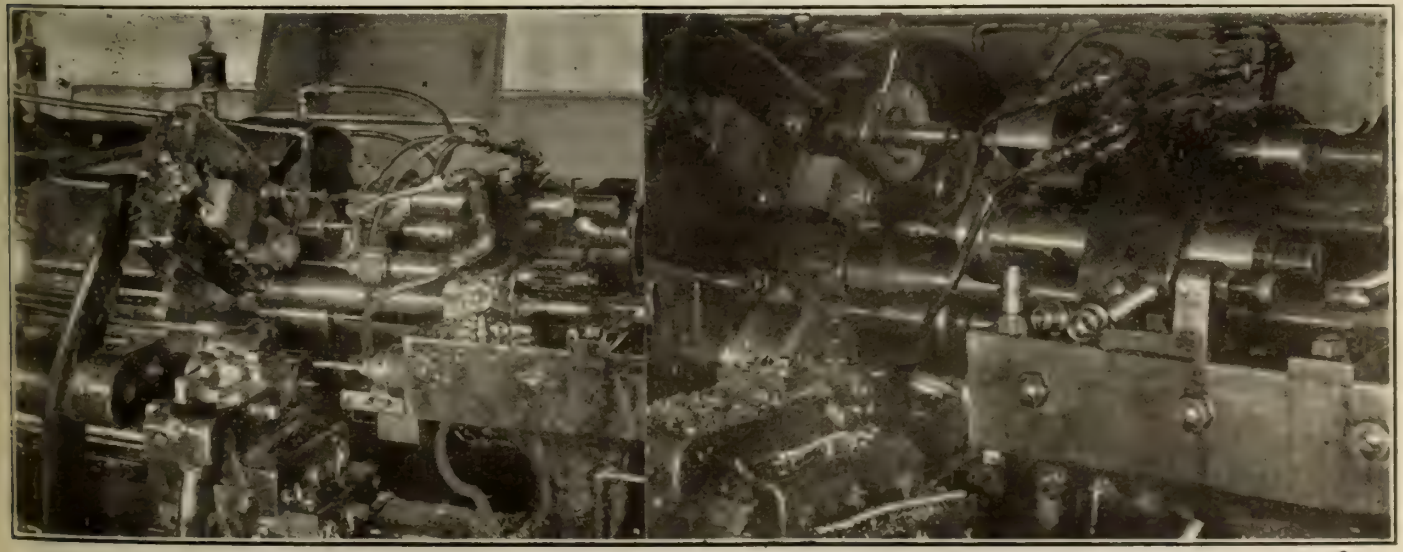


FIG. 2- MACHINING CARBURETOR FLOAT VALVE SEAT.

FIG. 1- PRODUCING A SPARK PLUG SHELL.

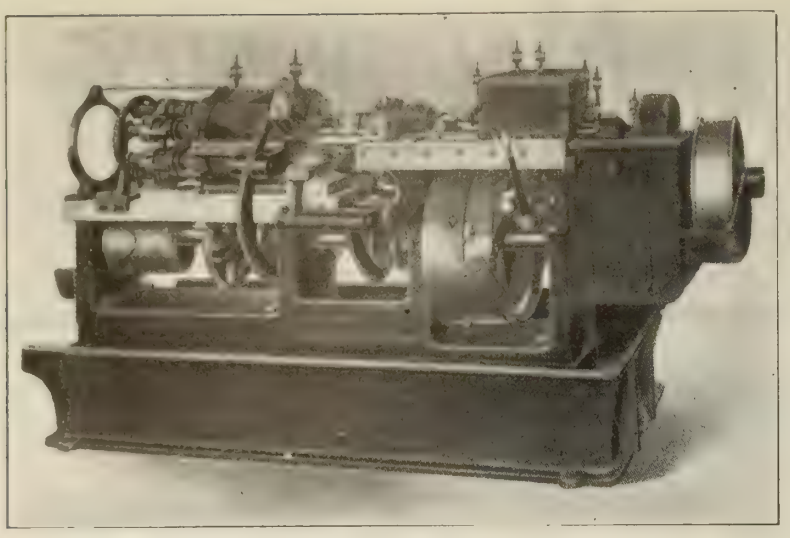


FIG. 1—FRONT VIEW OF A SIX-SPINDLE AUTOMATIC.

there is an extra large tool shank hole which is bushed to the standard size and fitted with a bearing cap. The removal of this cap and bushing makes it possible to take out any spindle, by indexing it into that position, without disturbing the cylinder or tool slide.

The tool slide is operated by a feed cam and drum, these being capable of adjustment for the entire range of tool slide travel. Should an operator wish to stop his power feed, convenient hand levers control these feeds, and they can be stopped instantly.

Two forming slides, in addition to a cut off slide, form a part of the machine, and by the addition of an elevating block to the cut off slide forming can also be done in the fifth position. These slides are independent of each other, the lower one, for rough forming, being mounted on the frame, while the other slide, used for finish forming, is attached to the spindle cylinder housing, and is so placed that its plane is at right angle with the spindle axis.

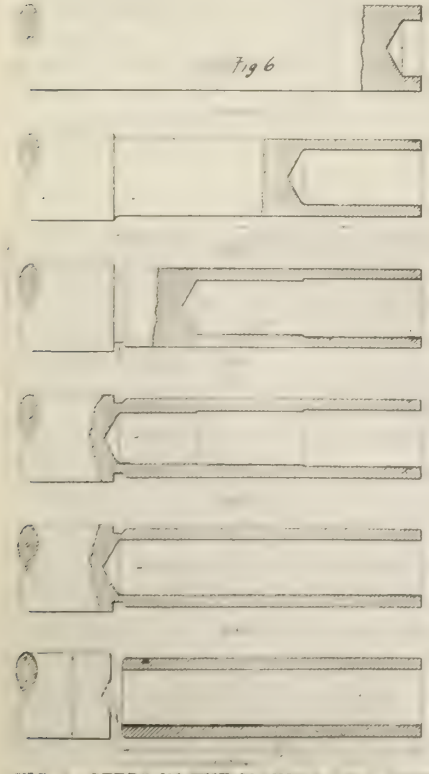



FIG. 6—STEPS IN THE MAKING OF A PISTON WRIST PIN.

### Tools and Attachments

We shall not go further into the design of the machine itself, but will dwell for a moment on the style of tools and attachments used in conjunction with the machine. Six end-working tools are accommodated by the tool slide. The direction of spindle rotation permits of the employment of standard right hand drills, reamers, counterbores, etc., and, of course, this feature means that the majority of tools used are regular stock cutting tools.

Generally speaking, a standard equipped machine consists of two universal adjustable box tools, three adjustable tool holders for tool slide and two forming tool holders. As already stated, forming can be accomplished in the fifth position by using a forming slide extension.

Revolving drilling spindles can be applied in the third and fourth positions to speed up small drills, these being gripped in chucks and running against the direction of work rotation. On short work special drill speeders can be used to run in second, third, fourth or fifth positions. Of course, where necessary, the use of such speeders accelerates production, reduces drill breakage and insures concentricity of hole with outside.

A multiple turning attachment can be fitted to the lower forming slide of such machines, this being designed for work on gas engine wrist pins, or pieces of similar form where the length to be turned is considerable, but the amount of stock removed comparatively small. Four or more cutters are fed in the required depth, after which the tool slide moves parallel with the work approximately one inch. This, of course, reduces turning time, as the work can be finished in one-fourth of the time ordinarily required.

In some cases an accelerating reamer attachment is used for work on whic the drilling is done in steps, the arrang ment being such that the feed and trav of reamer are from two to four tim that of the drills.

The threading mechanism is designe to cut right and left hand threads, a without going into the details of co struction, enough to say it has a tri ping arrangement that permits threa ing practically up to a shoulder. Th only changes necessary for cutting le hand threads are the reversing of pawl in the die holder, and the inte changing of two dogs on the cam dru

It will be noted that we have give no detailed description of these ca drums, but this has been done inte tionally, as what we are after partic larly is examples of work performe

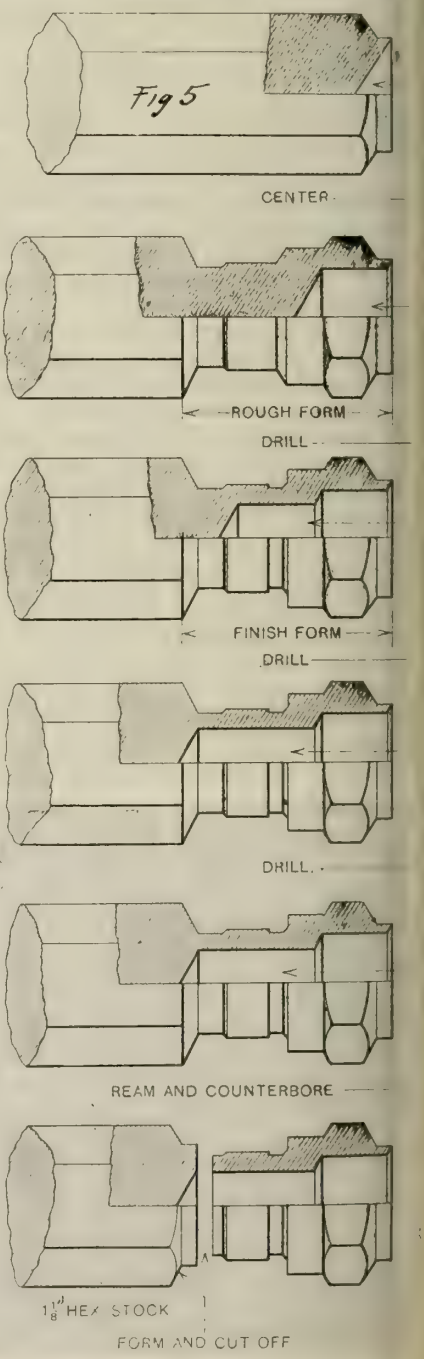



FIG. 5—MAKING A SPARK PLUG SHELL

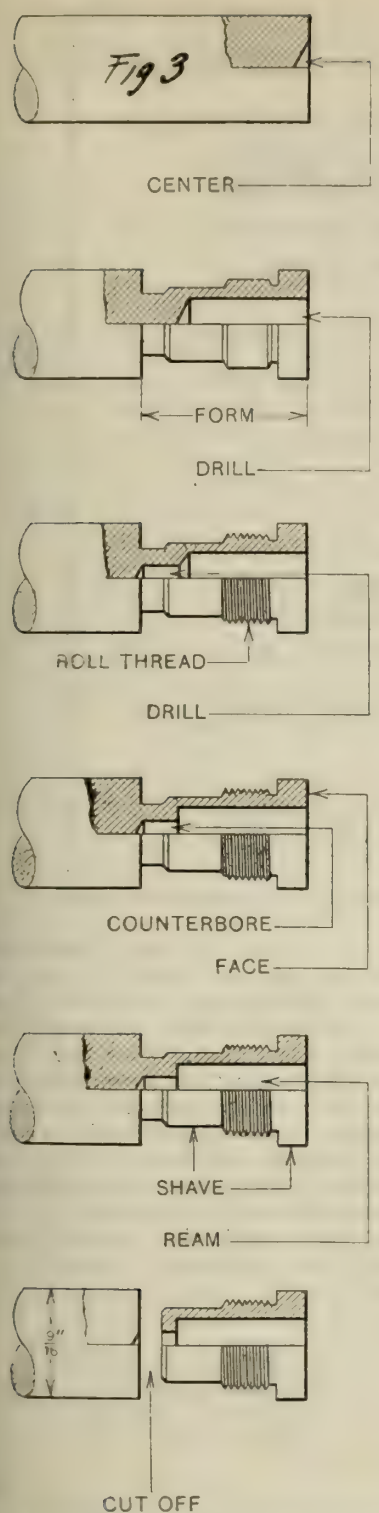



FIG. 3 MACHINING A CARBURETOR FLOAT VALVE SEAT.

not so much the design of the machine, In fact the preceding description is longer than we first of all intended, but the main points could not be told in less space.

### Examples of Work

The first example, Fig. 2, depicts the machining of a carburetor float valve seat, this piece being made of brass. At Fig. 3 is shown the step by step procedure in the making of the part. First the work is centered, then drilled and formed as shown. The thread is next rolled, and at the same position the smaller hole is drilled.

The fourth step is counterboring and facing, while at the fifth position the outside unthreaded portions are shaved to size, and the large hole reamed as shown. The last position is, of course, devoted to cutting off. Nine hundred pieces per hour are produced with this arrangement of tooling.

Fig. 4 depicts the machine set up for producing a spark plug shell, this piece being made from regular screw stock. Again let us follow the different steps at Fig. 5. First comes the centering, then next the drilling and rough forming. At the third position the piece is finish formed, and drilled further in, but to a smaller size. The fourth step is simply a case of drilling still deeper, while the holes are reamed and counterbored at the fifth position. The sixth and last position is devoted to cutting off, and it will be noted from this view that the stock which these pieces are made from is 1⅛-inch hexagon. The production with this arrangement of tooling is 256 pieces per hour.

A good example of deep drilling is shown at Fig. 6. It is interesting to note the steps taken in the completion of this piece, which is a piston wrist pin made of chrome nickel steel. The first step is, of course, centering. The second position is that of drilling for a certain distance in, at the same time turning the outside diameter.

The third step is that of drilling still further with a drill of slightly smaller diameter, at the same time forming the portion shown in sketch. At position four the drilling is continued still further, and at position five this series of holes are reamed. The last step is that of cutting off. The production by this method is 38 pieces per hour.

Fig. 7 shows a transmission bolt in process of manufacture. The material in this case is screw stock, and the first step is that of feeding to a suitable stop. The next position is devoted to forming and turning a certain portion of the bolt, while the third step is that of turning the portion shown in sketch, also the forming of bolt head. Next another portion of bolt is turned, and at the same time the point is chamfered.

The fifth position is taken up with threading, while the last step is that of cutting off. It will be noted that the bolt is made from 9/16-inch stock, and is 3 1/16 inches long when finished. This example demonstrates clearly the advantage of studying the work.

Fig. 8 illustrates some clever tooling on a sewing machine screw. As can be noticed, the first step is that of centering. Drilling and forming are accomplished at position two, while drilling is continued at position three, the knurling of the screw head being done at the same time. Next comes the reaming at position four, while at position five threading is performed. The last step as usual is that of cutting off. This screw is made of regular screw stock, and 180 are produced per hour.

### Some Further Examples

In many cases pieces are of such simple form that they do not require six spindles for their completion. In such instances the tooling can be so arranged to make possible the production of more

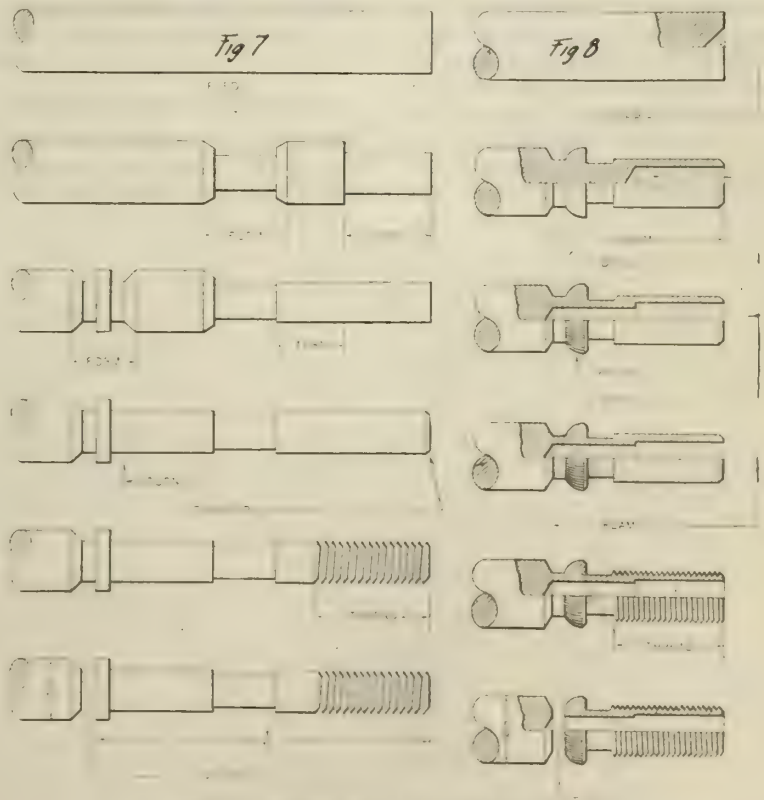



FIG. 7—PRODUCING A TRANSMISSION BOLT.
FIG. 8—MACHINING WORK ON A SEWING MACHINE SCREW.

than one piece at each indexing, cutting off at other positions, usually the third and sixth. Carrying the idea still further, the machines can be arranged to cut off in the second, fourth and sixth positions, thus permitting the handling of work commonly accomplished on single spindle machines—but with trebled production. This is largely a matter of experience, and as one gets more familiar with such machines, improvements on tooling can be made. In fact, when in doubt, it is a good plan to consult the maker of the machine, putting your problem direct. In practically every case they are only too pleased to give the benefit of their experience.

To illustrate the idea of producing more than one piece at each indexing, let us refer to Fig. 9. In this case the piece to be produced is a nut, and note carefully the steps taken. First comes centering. Next, the drilling part way and the forming of three nut blanks. At the third position the first nut is cut off, while the hole is drilled completely through the three blanks at position four. Positions five and six are devoted to cutting off, the second and third nut being cut respectively. It will be noted that the stock is 1⅜-inch hexagon, so that it can be plainly seen, with a little careful planning, production can be increased by efficient method of tooling.

We could go on indefinitely showing examples of work performed, but for the purpose of the article we will show only one more, that being the cylinder primer body shown at Fig. 10. The first step is drilling to the form shown, while rough forming is completed at position two. At step three a smaller size of finish form tool gets in its work. Step four is the drilling of a still smaller hole, while at position five the medium sized hole is tapped. At position six the part is cut off, but before this happens the counterbore is finished as shown. The material from which this piece is made is screw stock and 150 pieces are produced per hour.

These examples will in some measure help readers to size up the method of laying out tooling steps on automatics, and in a later issue we shall describe another type of machine, together with the work performed on the same.

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### SCOOP-BODY INDUSTRIAL CAR.

An industrial car of the scoop body type, which can be used singly or as a trailer, has been placed on the market by the Easton Car and Construction Company of New York. A turn-table device, located below the body of the car, permits of revolving the body to any position and dumping from any of the four sides. The truck is provided with wide rim wheels equipped with roller bearings; the front axle is of the swivel type, with a machined cast-iron ball-bearing in the centre. It is adaptable to the handling of castings, machine cuttings, coal, sand, etc., and when used singly can be operated easily by one man.

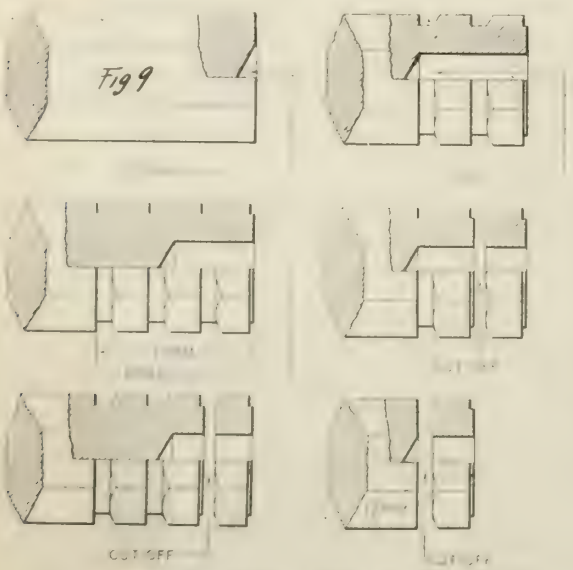



FIG. 9—PRODUCING NUTS IN QUANTITY.

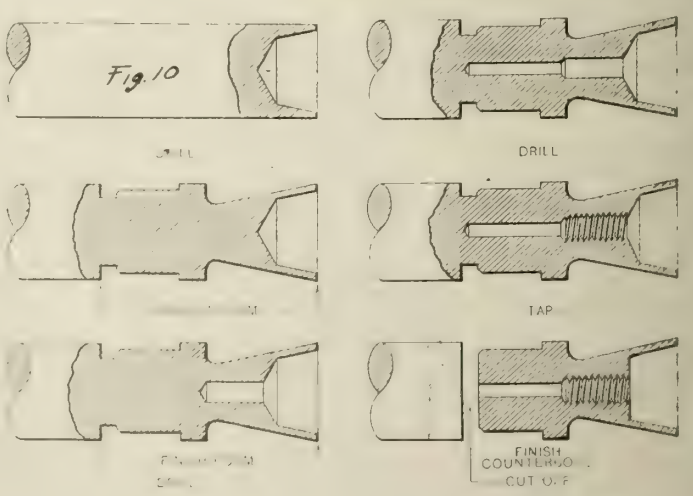



FIG. 10—MACHINING A CYLINDER PRIMING BODY.

# Standard Practice for the Small Jobbing Shop

## Practice Suitable for Shop Employing One Hundred Men or Less, the Business Consisting of General Jobbing Work and a Small Amount of Manufacturing—Departments Included: Pattern, Foundry, Machine, Plate and Electrical.

By M. B. SAUNDERS

THE small jobbing shop is neglected by writers on the subject of works management, they usually taking as illustrations the system or method as used by a concern employing a large number of men and it is not always very clear how it can be adapted to a small shop of, say, 100 men, especially if their principal work is of a jobbing nature.

Yet, for every large shop, there are a number of small ones, the managers of which have at some time or another struggled with this difficulty of getting enough system to obtain satisfactory results, without making it too unwieldy and expensive to operate.

The following is a description of a standard practice installed in a shop employing about 100 men, the business consisting of general jobbing work and a small amount of manufacturing. The works consisted of pattern shop, foundry, machine shop, plate shop and electrician shop.

When an order is received, here is the procedure: It is first O.K.'d for credit by the accountant and provided with its shop order number. It is next sent to engineering department, who see that all details are clear; they make out bill of material, arrange for necessary drawings or sketches, all manufacturing data and make out shop order on regular order blanks. They now check and return customer's original order, acknowledgement (green) and office copy (yellow) to general office. They pass on works copies, bill of material and all necessary data to production department.

The production department enters the order in production register, estimates its value, arranges delivery dates, and keep in touch during the progress through the works.

### Sales and Quotations

On receipt of an inquiry, the sales department arranges specifications and prices. The engineering department supplies any data, drawings and sketches that may be required, but delivery dates are not made without first consulting the production department.

### Engineering Department

This department passes on all shop orders, prepares necessary bill of material and supplies all necessary manufacturing data before they are passed on to production department. They also take charge of drawings, blue prints and all data. They prepare all drawings and sketches that may be necessary and also prepare preliminary estimates for special jobs and assist sales department when required. They obtain from accounting department each month all cost sheets, so that data may be compiled on all products to facilitate estimating. They also see that all drawings, blue prints, etc., are returned when order is completed.

### Production Department

The production department has general supervision of orders and production. They keep progress register up to date, see that there are no delays, either between departments or waiting for material or instructions. They arrange delivery dates, and inspect all workmanship and material, also reporting to the main office each day all delivery dates that have been exceeded, stating reasons.

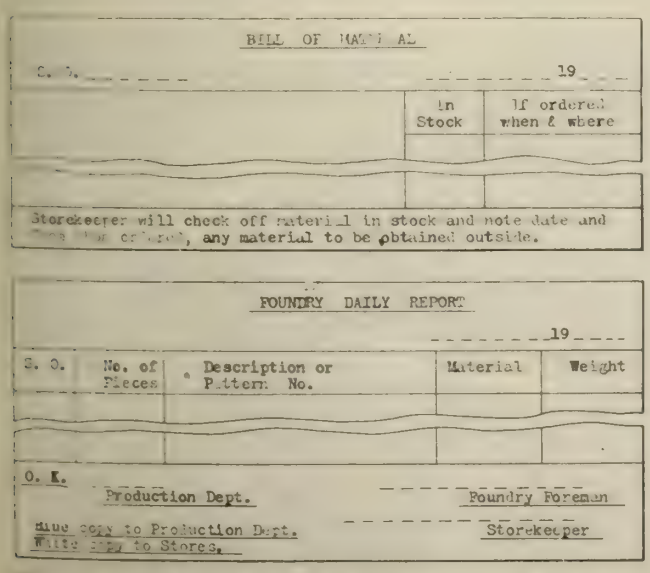
### Foremen Generally

The foremen have control of, and are responsible for their own department. Each one will not accept verbal orders and all orders must come through the recognized channels as shown on management and operation charts. All interdepartment instructions and requests must be in writing and be O.K.'d by production department.

Each foreman is held responsible for the work in his department, and he must personally inspect all his work. The fact of a job passing inspection does not relieve him of responsibility in case of error. Each foreman operates his own department to its best advantage, but he must remember that one department cannot be run at the expense of another and that the works must be operated to the best advantage as a whole.

### Pattern Shop Foreman

The foreman patternmaker has charge of patternmakers and carpenters, pattern store, and he is responsible for its condition and contents. When a pattern is ready for the foundry, after being carefully checked, a foundry ticket is made out in duplicate, showing exactly how many castings are required, the


BILL OF MATERIAL

S. O. _____ 19____

| | In Stock | If ordered when & where |
|---|---|---|
| | | |

Storekeeper will check off material in stock and note date and ... any material to be obtained outside.

FOUNDRY DAILY REPORT

19____

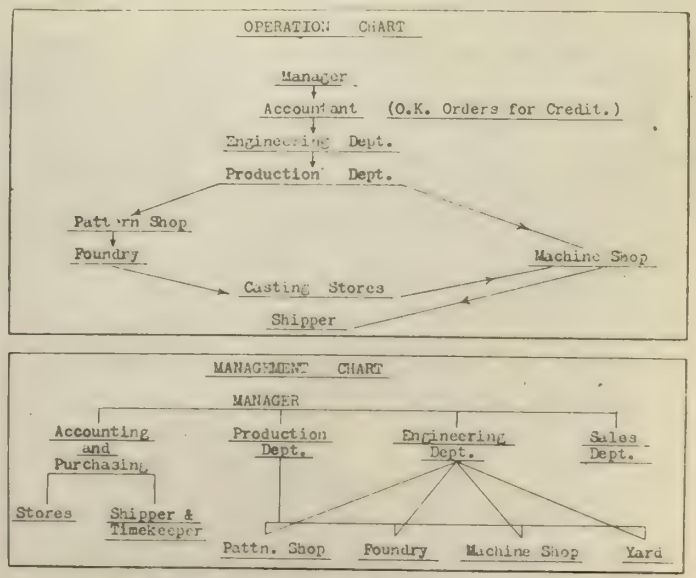
| S. O. | No. of Pieces | Description or Pattern No. | Material | Weight |
|---|---|---|---|---|
| | | | | |
| | | | | |

O. K. _____ Foundry Foreman

Production Dept.

Blue copy to Production Dept. White copy to Stores. Storekeeper

TYPE OF FORMS USED FOR MATERIAL LIST AND FOUNDRY.




SHOWING BOTH THE OPERATION AND MANAGEMENT CHART.

SHIPPER'S DAILY REPORT

_____ 19___

| S. O. | Name | Address | Description | Order Complete or Part Only? | Weight of Castings | Shipp'g Weight | Freight or Express |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |

Blue copy to Production Dept. White Copy to Main Office.

PRODUCTION DEPT. REGISTER

| S.O. | Name | Description | Approx. Value | Eng. Date | Patterns | Fdy. | Mach. Shop | Delivery Date | Date Shipped |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

THE SHIPPER'S REPORT, ALSO PRODUCTION DEPARTMENT REGISTER.

date, S.O. number, customer's name and description. Both these tickets are handed to the foundry foreman. Patterns are sent to foundry and placed in the room provided for them.

After use, patterns must be returned to pattern store.

Upon completion of each order, a requisition must be sent to store covering all material used on that S.O. or in the case of a large order, upon completion of each part or section. The foreman keeps a record of his delivery dates upon his copy of the S.O. and checks them up when he sends patterns to foundry. Patterns arriving from outside sources are delivered to the foreman, who then handles them in the same manner as patterns from their own store.

### Foundry Foreman

On receipt of a pattern (with foundry tickets) he at once checks it and sees that all core boxes, sweeps, etc., are with it. He hands on a duplicate ticket to his leading chipper. After castings have been taken out of the sand and cleaned, the leading chipper enters the S.O. description and weight of all castings on the foundry daily report forms and marks on each castings its weight and S.O. number. After inspecting these castings the foreman O.K.'s the report and passes it on to casting storekeeper not later than 48 hours after the heat. It is important that all castings from any particular heat go on the report for that date. He also issues stores requisition for all material used, this including pig, scrap, steel, coke, etc. He keeps a record of his delivery dates on his copy of the S.O. or foundry tickets.

### Machine Shop Foreman

This foreman has charge of machine shop, blacksmiths and electricians. He keeps a record of his delivery dates on his copy of the S.O. and on completion of orders he notifies shipper and has material moved to shipping point, or in the case of large machinery he requests the shipper to arrange with yard foreman to move to crane or car as the case may be.

### Delivery Dates

Delivery dates are arranged by the production department with the foremen of the departments concerned. The foreman notes on his copy of the S.O. the date promised, and he cannot vary this without first consulting the production department. If it becomes necessary to make a later date, the foreman consults the production department before making any changes in his schedule. Rush orders and breakdown jobs are not accepted for immediate delivery, until such time as production department has arranged any necessary alterations to regular schedule.

### Casting Stores

The foundry daily report must be filled in not later than 48 hours after each heat and O.K.'d by the foreman before being turned over to the casting storekeeper. The storekeeper, when ready to check this report, notifies the production department when inspection is made. Accepted castings are initialed in yellow and rejected castings in red.

After castings have been inspected and O.K.'d the storekeeper signs the report, showing particulars of all castings accepted that day. In case there are more castings than the S.O. calls for, the particulars of the surplus must be entered on a rejected material report, orders for its disposal being issued later.

### Rejected Material

Shop order number and particulars of any material returned as faulty are entered on a rejected material report. Full particulars, the reason, and if the department returning the material makes any claim for labor expended on the particular piece returned, this is all stated and must be O.K.'d by production department. Before this report is sent to main office, the foreman of the department whose material has been rejected must initial the pink copy. The casting storekeeper is responsible for the clearness of these reports. Any castings rejected must be replaced at once, using the original S.O., which must supersede all other shop orders.

### Shipper

The shipper keeps a daily report on the form provided, turning in copies to the accounting and production departments every morning. He obtains from casting storekeeper, machine shop foreman or pattern shop foreman, as the case may be, a notification that the material is ready for shipment. He also turns into main office with this report the pink copies of the shop orders completed, and casting cards, covering these shipments.

When an order is completed, or in the case of a large order, when a part of section is ready for shipment, the foreman of the department concerned will notify the shipper on the form provided.

### Patterns

All patterns must have a number and be entered in pattern register, except in the case of very small temporary patterns. In case customer has a pattern or B.P. No., that number must be stamped on the pattern in a convenient place. In case of standard stock patterns, these carry a number arranged by engineering department. If at any time it is necessary to alter a pattern, after consulting with engineering department and getting alteration O.K.'d, a note is made in the pattern register describing the alteration. This register is kept by foreman patternmaker, engineering department holding a duplicate and keeping it up to date by comparison each month.

### Time Sheets

Time sheets are collected every night

(Continued on page 33)

REJECTED MATERIAL REPORT

_____ 19___

I have received the following faulty material from_____Dept.

Description.

Give number of pieces and weight.

The Reason Given is:

This Dept. claims_____hrs. @____Labour

Pink copy to Main Office. Blue to Production Dept. O.K. _____ Prod'n. Dept.

_____ Storekeeper

Foreman of Dept. whose material has been rejected must initial PINK copy here _____

THE TYPE OF REJECTED MATERIAL REPORT USED.

# The Importance of Inter-Shop Transportation

## Study Your Present Trucking System—Secure Definite Figures On Your Handling Costs, Then Ask Yourself "Is This the Best I Can Do?"—Others Followed This Procedure With Great Success.

By J. H. M.

THE importance of efficient transportation can never be over-emphasized. This applies both to long and short hauls, but the short haul, or shall we say the inter-plant haul, is perhaps of the greatest interest to the plant manager, superintendent, yes, and even the foreman of each department.

There still exist unfortunately a few who claim: "No, we don't watch our trucking so awful hard, for after all the men pushing the trucks are non-producers." Others will mumble something about their plant being hardly large enough, but in both cases the excuses are not founded on facts. Instead of looking upon the improvement of their trucking system as an expense, they should view the change from the standpoint of investment. Perhaps the very manager who mumbles that the present system of pushing the trucks by hand is good enough for him never stops to think why he himself uses an automobile. Would he consider someone calling for him each morning with a wheelbarrow and pushing him down to the office? Not much, for apart from the curiosity he would arouse, what he wants is speed. He wants to get there, and to get there without DELAY. It is in this word DELAY that the stumbling block lies. A manager refuses to be delayed himself, but how many allow their goods in the plant to be delayed through lack of proper trucking equipment.

### I Get Enough

It is very seldom you hear an executive say he is getting enough production yet I heard this statement made in a careless offhand manner not so long ago. "Would you refuse an increase?" I asked.

"Certainly not," came the reply, "an increase in production would make lower production costs."

This latter remark is, in a nutshell, the best argument in favor of efficient interplant transportation.

A good method is to start out in this way. First of all ascertain what time is



FIG. 2 THE LIFTING PLATFORM TYPE OF TRUCK IN OPERATION.

consumed on actual manufacture, then find out how much time is taken up in handling. For example, a workman might take 4 seconds to obtain a piece of work, 6 seconds for the actual operation and 4 seconds to dispose of it. This means that 8 out of every 14 is consumed in handling. This is a very average condition. I remember one case in point. A certain product was being drilled, and strange to state for over four years 85 per cent. of the time on this operation was taken up in handling. One day a suggestion was made, and later approved of. By placing a convenient tray at the drill, together with a tin chute to a nearby truck body, resting on a lifting truck platform, production was increased over 100 per cent. This is no uncommon incident, but one of hundreds happening all over the country.

The example related had to do with actual handling at the machine, but how about the increased production, how was that taken care of? Simply by the use of a truck in the shop which was not half busy enough, so in this case additional equipment was unnecessary. Suppose no truck had existed, what would have happened? Part of the operator's time would have been consumed in moving a hand truck, or some other help would have had to push the finished material away, otherwise congestion would have occurred. In either case the added production value would have been overshadowed by the extra help required.

Another case that came to my notice was on the handling of a certain product through a particular department. The handling cost was .59 per thousand pounds, but after a change in the haulage system had been made, this figure was lowered to .12.

### Proper Procedure

On having made up your mind as to the value of efficient transportation, write the firms which handle the equipment you believe will suit your purpose. State your problem frankly, do not make light of it—ask their opinion, also invite them down to look you over, then watch results. Naturally any concern wants a sale, and they will do their ut-



FIG. 1 THIS VIEW SHOWS TO GOOD ADVANTAGE THE USE OF TRUCKS IN THE FORGE DEPARTMENT.

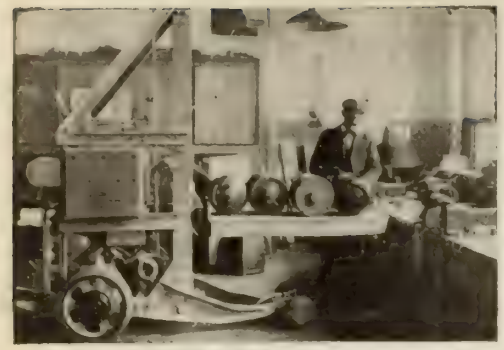


FIG. 3—A CASE WHERE THE TIERING TYPE OF TRUCK COMES IN VERY HANDY.

most to prove to you, where they claim they can save you money.

In speaking to H. S. Powley, of Powley & Townsley, Ltd., who are the sole Canadian distributors for trucks made by the Automatic Transportation Co., Buffalo, N.Y., I asked him if my statement was correct, viz., that manufacturers will give figures and prove them. His answer is worth recording.

"Speaking for my own particular firm, Yes. We not only give figures and prove them, but keep on plugging till we better them. You know, after you sell a battery of trucks, or even a single truck, your work is only started. If you are content to let it rest there, you've merely made a sale, increased efficiency to a stated figure, made a satisfied customer, and then what?

"To my mind you should follow up such problems—help a firm to really get somewhere—and above all prove to them the maximum efficiency of your particular style of truck. Many a truck is not working to 50 per cent. of its efficiency at the present time. Why?—because the improvement at 50 per cent. efficiency is so great over the old method, that the executive never imagines still further haulage can be handled. Let me cite a case.

"At the Canada Steel Co., Ltd., we installed some trucks, guaranteeing a certain figure. We more than covered that figure, and the superintendent was very well pleased, but not so with us. I told him we could do still better, and in a kindly way I was asked if I was crazy. Had I not made my sale, received my money, then why on earth bother further?

"'Because,' I replied, 'I'm going to show you the real value of careful trucking.' I stuck with the job, studied the conditions existing at the plant in question, then started on a little scheme which worked out as follows:

"Getting the truck operator to one side I said, 'How would you like to make more money?' Need I tell you his answer? I next explained that if he were to get another man to help him load and unload he could make more money. I pointed out that he was to be the other man's foreman, always having it understood, of course, that both he and the new man must be under the superintendent. I asked him to pick out his own man, and he did so, with the result that haulage increased another 50 per cent.

"At this point let me say that it does not pay to put any old dub on a truck as operator. A manager of a firm likes to handle his own car, or if he is fortunate enough, he has a trained chauffeur. In like proportion he should not expect a dub to do as good as a capable workman. For example, the operator on the truck I told you about was a machinist before I made him a truck operator. He didn't want the job at first, but when I showed him he could make more money at trucking than at his trade—well—the rest was easy. I always break in a new operator with the truck empty. I show him the movements carefully, then as soon as he understands them, he becomes the chauffeur, so to speak. I never hurry a man, but let him learn the game thoroughly—but wait, you are writing this article, not me." Laughingly he passed over the reins, so again I speak from my own standpoint.

### The Electric Truck

The electric storage battery type of truck is too well-known to require any introduction. There are two general styles in use, first, the carrier truck, which takes its load from place to place, and second, the tractor type, which pulls loaded trucks to any desired department. The principle of design is practically the same in both cases, an electric motor supplied with current from storage batteries doing the driving. Generally the speed of such trucks is so controlled that they cannot travel at more than a predetermined rate. Steering is done by one hand, while the other is on the driving lever. If the driver moves his hand from the lever it immediately returns to neutral and the brakes are applied. However, we are not so interested in the truck design itself, as what it accomplishes, so let us get to some examples of work performed. The following figures were kindly given us by Mr. Powley, and apply to trucks as made by his concern.

First of all, let us study Fig. 1. Here



FIG. 6—THIS VIEW SHOWS ELECTRICAL CONTROL OF A TYPE "T" TRACTOR.



FIG. 5—A TRUCK OF THIS STYLE SAVES MANY A MAN'S BACK.

is shown one of four trucks used by the Massey-Harris Co., Toronto, for hauling material throughout their plant. The truck shown is of the tractor type, and is at present pulling two long hand trucks filled with angles and channels. This concern tells us that not only have the trucks proved of value for speeding the work through the plant, but they have helped to keep all aisles clear in the different departments. Briefly, they wouldn't be without them. They also use the lifting platform type of truck for other purposes, and have another tractor type at their plant in Brantford, Ont. Fig. 2 shows the lifting platform type truck in operation.

Then there is the tiering type of truck. Its uses are varied, but the view shown at Fig. 3 is ideal from a machine shop standpoint. Here we see the work raised to the proper bench level, and all that remains to do is push the work on to the bench. Another good illustration of the same type of truck is shown at Fig. 4. Here is a condition often met with. A high platform level, yet the difficulty is removed without trouble with a truck of such a nature. Lifting castings from the floor or yard is easily accomplished with a truck of the style shown at Fig. 5. Up goes the work on the crane, on to the truck, a pull on the handle and away goes the truck to the desired department.

At Fig. 6 is shown the electrical control of a type T tractor and while we will not go into detail of the mechanical features, enough is seen to appreciate the compactness of the arrangement. We could go on indefinitely illustrating uses for inter-plant trucks, but enough has already been shown to prove their value. For this reason we will content ourselves with one more view, that shown at Fig. 7. This depicts a type AA industrial engine hauling a load of coal. Note that the engine is equipped with a tilting hopper, this making for speed in unloading. The value of such an arrangement is self-apparent, and without going further it is safe to say that such trucks can be made with all types of bodies designed to suit every conceivable kind of material flat or otherwise.

Should readers imagine the examples already quoted to be mere flights of fancy I might say that the names of the



FIG. 7 HAULING COAL IN THIS MANNER REDUCES EXPENSE.

firms using these trucks are available if required, and this is also true of the figures to follow, which are statements made by concerns as to conditions as they have found them, these, of course, dealing with electric trucks of the make already mentioned.

A plant superintendent states, "We are saving $15,000 a year in wages alone as a result of the installation."

A factory manager says, "We find that we can move as much material with one truck as twenty-three laborers."

Another general manager states that he saves $12,000 yearly, and a superintendent who devotes his time to inter-plant transfer claims that he has reduced confusion and lost motion, and in addition is approximately saving $30,000.

An assistant superintendent mentions that in place of 44 men he uses two, and that he handles his product 100 per cent. faster than formerly.

Another concern reduced their trucking staff 80 per cent., yet get better results. We have used an electric truck 40,000 miles, and its still going strong, writes another.

Here briefly are some other savings: $12,000 yearly, $9,000 yearly, $10,000 yearly, one truck alone saves $4,000 yearly, and one concern goes as far as to say eight horses and eight men were replaced by four trucks.

Surely there must be something to all this? Managers and superintendents do not waste wind telling of things that do not happen. Have you a truck problem? If so, investigate, for by so doing you will save time, worry and considerable cash. The question of inter-plant haulage is a vital one. Give it the attention it deserves.

## STANDARD PRACTICE FOR THE SMALL JOBBING SHOP

(Continued from page 30)

between 4.30 and 5 p.m., a new time sheet being left with each man for the following day. The foreman sees that these sheets are filled in at intervals during the day and not left till the last minute, when proper distribution of time is not always possible. The sheets are collected and delivered to timekeeper's office every morning not later than 10 o'clock.

Each of these standard practices is typewritten on a separate sheet, clipped together in a folder and a copy supplied to all department heads and foremen, which, together with the operation and management charts, which are prominently displayed in the main office and works office, make all routine work and operation in connection with the management of the works quite clear.

The idea is to elaborate this by adding additional ones, covering any important subject that may necessitate a standard practice.

Of course, it is important that before a standard practice is put into force, it should be very carefully discussed with all concerned and an opportunity made for suggestions.

When once it is finally agreed upon and becomes law, it should not be deviated from, except under instructions from the manager or some other appointed official, when, if necessary, the practice concerned should be rewritten to cover the new conditions.

The production department register will enable the production superintendent to keep in touch with his orders with the minimum amount of trouble. The procedure is this: When an order is received from the engineering department, it is entered up and delivery date fixed. By checking up each day with the shipper's report and the foundry report, together with personal observation and inquiry, the superintendent is able to see which orders are lagging or where dates require rearranging.

If alterations are made with heavy blue pencil, and orders completed are scored off with red pencil, it becomes quite easy to pick out the unfinished orders. The writer has found that in the small works it is better to have this register in book form rather than on cards. Of course, it is absolutely necessary that no delivery dates be made by any other official, and any changes in schedule must be arranged with the production department.

Two new industries have decided to erect plants in Hamilton, Canada—the Fuller Brush Company, of Hartford, Conn., which will employ about one hundred hands, and the Coffield Washer Company, which will employ about fifty hands at the beginning.

# *TEMPERATURES*

## *CENTIGRADE AND FAHRENHEIT SCALES*

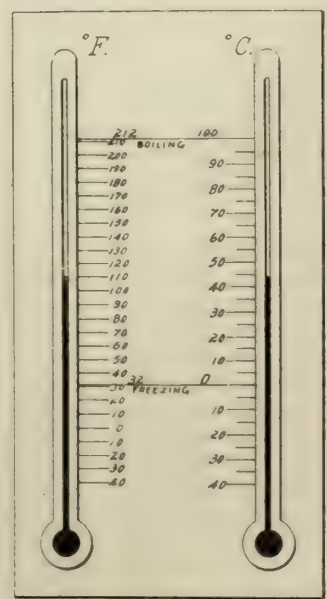
In mechanics and engineering it is often desired to convert temperatures from one scale to another or to find the relative equivalents. On the F. scale the freezing point is at 32 degrees, while on the C. scale it is at zero. The boiling temperature on the F. scale is at 212 degrees, and on the C. scale it is at 100 degrees. It is then evident that on the C. scale the temperature range between freezing and boiling temperatures is 100 degrees, while by the F. reading the range is 180 degrees; that is, a rise in temperature of 9 degrees on the F. scale would correspond to a rise of 5 degrees on the C. scale.

To convert a C. reading to Fahrenheit—multiply the C. temperature by $\frac{9}{5}$ and add 32.

Thus:—$60° \text{ C} = \left(\frac{9}{5} \text{ C}\right) + 32 = \left(\frac{9}{5} \times \frac{60}{1}\right) + 32 = 140 \text{ F.}$

To convert an F. reading to Centigrade—subtract 32 from the F. reading and multiply by $\frac{5}{9}$

Thus:— $100° \text{ F} = \frac{5}{9} \times (\text{F} - 32) = 37\frac{2}{3}° \text{ C.}$




$$F = \left(\frac{9}{5} \times C\right) + 32°$$

$$C = \frac{5}{9} \times (F - 32°)$$

*Canadian Machinery*

# Tool Steel Used in Making Miscellaneous Tools

## Using High Carbon Open Hearth Steel for Various Kinds of Tools—Composition of Such Steels—How to Obtain Best Results —Heat Treatment Important—Such a Steel Only Has Its Place

By GEORGE PORTEOUS*

THIS subject should be of general interest because of the fact that the purchase of tool steel for general tools, such as hand and pneumatic chisels, shear blades, etc., is a large item in the yearly expense bill of many manufacturing concerns. The substitution of high carbon open-hearth steel in place of the more expensive crucible tool steels in the manufacture of these classes of tools is not a recent departure from established practice, but this subject in the past has not received the serious consideration which it merits.

It is axiomatical that the quality of open-hearth high carbon steel can not be compared fairly to that of the more carefully made electric and crucible tool steels, therefore, it is obvious that the forging and thermal treatment of the lower grade steel must be studied carefully in order to compete against the higher grade steels in the manufacture of miscellaneous tools.

I have often noticed advertisements of special tool steel made into punch and chisel form, driven through steel blocks of from 1 to 2½ inches thick. These illustrations purport to show that the steel from which the punches and chisels were made is of special quality and far ahead of any ordinary tool steel. As a matter of fact, this is not to my mind a quality test at all. A sample of high carbon open-hearth steel can be made into a similar punch, and be treated and drawn through a 3-inch block of medium carbon steel.

From the foregoing we learn that high carbon open-hearth steel can be so treated that it will equal the durability of a so-called superior grade of steel by means of careful and intelligent treatment, and we can also realize that this characteristic also opens up a very large field of usefulness by the substitution of this steel in place of the high grade steels in the manufacture of many kinds of tools.

We have been using high carbon open-hearth steel as a substitute for tool steel for several years and we have been successful in its treatment for such tools as cold chisels, rivet snaps, punches and dies, taps, shear blades, and similar tools. The grade of steel that has proven most successful in the manufacture of these classes of tools has had an analysis of approximately 80 to 100 per cent. carbon, less than .03 phosphorus, less than .03 per cent. sulphur and .35 to .45 per cent. manganese.

### Getting Results

To get the best results for a steel of the above composition, great care is necessary in the heating and forging operations as well as in the subsequent thermal treatment. The billet from which the steel is drawn down should be at least twice the diameter of the finished forging. For example, ¾ to 1-inch octagon should be forged from not less than a 1½-inch bar or billet. The forging temperature should be from 1,800 to 1,950 degrees Fahr., reheated as required depending upon the rapidity of the forging operation and the dimensions of the finished bar. As the forging approaches the final stages, the hammering should become more rapid with lighter blows to finish the forging of the steel at a temperature of about 1,350 degrees Fahr., which refines the grain and leaves the steel in better condition for the subsequent heat treatment.

#### POINTS BROUGHT OUT

That the purchase of tool steel for general purposes, such as hand and pneumatic chisels, shear blades, etc., is a large item yearly, therefore any possible chance of economizing should be taken advantage of.

That high carbon steel can be so treated that it will equal the durability of a so-called superior grade by means of careful and intelligent treatment.

That high carbon steel is used with success as a substitute for tool steel in the making of tools, such as cold chisels, rivet snaps, punches and dies, taps, shear blades and similar tools.

The refining and equalizing process of steel treatment as applied to the forge and heat treatment of percussion tools such as cold chisels, hand and pneumatic, made from open-hearth high carbon steel is applied to the steel in several progressive stages, the success of each stage of the treatment depending upon the proper carrying out of the preceding one.

The first stage in the evolution of a cold chisel is the forging operation which in order to ensure success in the finished product must be done intelligently and with due attention to the proper forging temperature. The steel should be heated high enough to be in a thoroughly plastic condition, approximately 1,850 to 1,950 degrees Fahr. The closer the heat is to the higher temperature the better, so long as a reducing and not an oxidizing heat is obtained. At this stage it is well to remember that when forging the point of a chisel, the edges should not be hammered after the point has been forged thin, because if the steel has been thoroughly worked down to a thin edge on the flat and then turned up and hammered on the edge, the force of the hammering will affect the grain of the steel on the edges but will not penetrate to the center, thereby causing the grain structure of the steel to be uneven. This will cause the steel to develop water cracks when hardened.

The proper method of forging the point of a chisel is to work the steel down to a square taper, as in the forging of a diamond point chisel and then flatten out to the desired width. A little practice will enable a person to gauge the amount of stock required to forge the point of a chisel so that there will be little, if any, grinding to do on the edge. The rough point of the chisel should be trimmed off with a hot chisel immediately following the forging operation when the steel is at a cherry red heat. If necessary the chisel should be reheated.

The second or refining stage of the treatment is done by light blows with a hand hammer, the face of the hammer being dipped in water once or twice during the operation, on the flat of the chisel point when at a dark blood red heat.

The third stage of the treatment is the equalizing of the steel at the point of the chisel. The steel should be allowed to cool down to about 750 degrees Fahr., when the red disappears in the dark, dipped in black oil, withdrawn, and allowed to cool down slowly to atmospheric temperature. The oil should be at a temperature of about 125 degrees Fahr. for this purpose.

If the forging, refining and equalizing operations as just explained have been followed carefully, the grain structure of the steel will be in a state of equilibrium and in perfect condition to be hardened and tempered.

The hardening temperature should be the lowest possible consistent with the holding of the martensitic condition of the structure when heated over the decalescent point of the steel. This would be about 1,425 degrees Fahr. The point of the chisel should not touch water after the first chill. Check the rising temperature in oil when drawing temper by the color method. If an oil tempering bath is used, the temperature for this class of tool would be 490 to 500 degrees Fahr. for a period to be determined by the character of the work to be performed.

In cases where the structure of the

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steel at the points of cold chisels and kindred tools has been impaired by reason of overheating or cold working, it is possible to restore the steel to its original state by upsetting and rewelding the part affected, using a flux of common dry yellow clay. This flux prevents the atmospheric oxygen from finding its way through the pores of the metal and combining with the carbon, forcing the crystalline grains apart, and destroying their cohesion when heating the steel to the high temperature necessary. This, with the subsequent thorough hammering and working, will restore the steel to its original state. The shanks of pneumatic chisels are treated by being heated to 1,450 degrees Fahr., dipped all over in cyanide of potassium, and cooled in oil with no further treatment.

Many of our scientific steel experts will be shocked at the crudity of the above treatment, nevertheless it is the only treatment that gave maximum service on the shanks of chisels used by us for the chipping of hard steel billets.

### Adaptability

The adaptability of using high carbon open-hearth steel in the manufacture of pneumatic chisels for chipping hard steel has been tested very thoroughly in the chipping and dressing of shell steel bars and billets. We have tested it against some of the more expensive steels on the market and it has given us just as good service as these high grade steels and as a consequence we have adopted high carbon open-hearth steel exclusively for this class of tools.

The approximate analysis of open-hearth high carbon steel for taps and reamers should be approximately the following: .90 to 1.10 per cent. carbon, not over .02 per cent. phosphorus, not over .02 per cent. sulphur, and .25 to .35 per cent. manganese. The steel should be forged at a temperature of 1,750 to 1,900 degrees Fahr. annealed at 1,425 to 1,475 degrees Fahr. in a muffle furnace or in covered receptacle to prevent access of air, or withdrawn when the proper temperature has been reached and covered with dry lime or ashes.

When the tools have been rough machined they should be equalized as described in a former paragraph. This equalizing process acts as a preventive to the warping of the tools in the subsequent heat treatment. The hardening temperature of this grade of steel is 1,400 to 1,425 degrees Fahr. To obtain maximum cutting qualities combined with toughness and resistance to shock, the best method of hardening treatment is to hold the tap or reamer in the water just long enough to harden the teeth or cutting faces and then immerse quickly in oil and allow the center of the tool to cool down slowly. The oil immersion allows the hard surface of the tool to heat up enough without losing hardness to take care of the cooling strains which would be liable to crack the tool if allowed to cool off entirely in the water.

### HINTS OF VALUE

When forging the point of a chisel work the steel down to a square taper, as in the forging of a diamond point chisel. After this is accomplished, flatten out to the desired width. The rough point should be trimmed off with a hot chisel immediately following the forging operation. When the steel is at a cherry red heat the third stage in the chisel's treatment is the equalizing of the steel at the point. The steel should be about 750 degrees and the oil about 125 degrees.

The approximate analysis of open-hearth high carbon steel for taps and reamers should be approximately .90 to 1.10 per cent. carbon, not over .02 per cent. phosphorus, not over .02 per cent. sulphur, and from .25 to .35 per cent. manganese. The steel should be forged at from 1750 to 1900 deg. Fahr., and annealed at 1425 to 1475 deg. Fahr. in a muffle furnace, or some covered receptacle to prevent access of air. Should this be impossible the work can be withdrawn when the proper temperature has been reached, covering the parts with dry lime or ashes.

The drawing temperature is from 400 to 425 degrees Fahr.

The analysis of high carbon open-hearth steel found to give the best results in the manufacture of shear blades for cutting cold metal such as steel plate and bar stock is within the following limits: .85 to .95 per cent. carbon, not over .03 per cent. phosphorus, not over .03 per cent. sulphur, and .30 to .45 per cent. manganese. Steel that has been forged for shear blades should be annealed at 1,450 to 1,500 degrees Fahr., heated evenly in a muffle furnace and allowed to cool down with the furnace.

The hardening temperature is 1,425 to 1,450 degrees Fahr., chill in water and allow to remain in the bath long enough to harden the exposed surfaces, then transfer to an oil bath and allow to cool down in the oil, draw in oil tempering furnace to 490 to 500 degrees Fahr. Allow the blade to remain in oil tempering furnace long enough to ensure thorough toughening. A shear blade of the following dimensions, 1½ x 7½ x 24 inches, should be allowed to remain at the proper drawing temperature for a period of at least two hours.

To secure the best results in service from a high carbon open-hearth shear blade, the center of the blade longitudinally through the hole centers should be left as soft and tough as possible by being protected from the action of the quenching medium. This can be done by putting a bolt through each bolt hole with a washer on each side of the blade and the bolt and washer luted with clay. In the case of large size shear blades, the best method is to use two flat strips ⅜-inch thick and of suitable width, drilling holes in the strips to match the holes in the shear blades, luting with clay and holding them in place with suitable bolts. Care should be taken that the strips do not cover the cutting edge of the blade. In the case of a shear blade 9 inches wide, the strip should be 4½ inches wide. We have never had a shear blade to break either in hardening or in service when protected in this manner.

I have already mentioned that the punch test is not an indication of the superior quality of the steel from which the punch is made, but is rather a problem in heat treatment. This drive test can be made by using either open-hearth high carbon or regular crucible tool steel.

High carbon open-hearth steel can not be made to take the place of high grade crucible steels for certain classes of tools such as some forms of milling cutters and intricate blanking dies because the cost of the workmanship in making and finishing these classes of tools overbalance the first cost of the steel to such a large extent that it would not be justifiable to use anything but the very highest grade of special alloy steel in their manufacture, but high carbon open-hearth steel can be used in the manufacture of tools some of which I have enumerated, and will give just as much satisfaction in service as the higher grade steels. There is another point in favor of the use of open-hearth high carbon steel as against the crucible steels and that is the difference in price. The cost of open-hearth steel is around 3 cents and crucible steel from 12 to 17 cents per pound. This considerable difference in price should be an incentive to the more general use of open-hearth high carbon steel. I have investigated this matter thoroughly and can guarantee that just as good results can be secured by the judicious use of open-hearth high carbon steel with the proper heat treatment as can be secured from the use of a higher grade and more expensive tool steel.

## NOVEL USE FOR TRACTORS.

A sudden strike among the employees at the electricity station in a British town interrupted the supply of current to the local factories and thus brought them to a standstill. Help came, however, from an unexpected quarter. One of the factories was engaged on the mass production of tractors for agricultural and other purposes; and within a few hours a number of tractors were employed to supply the necessary power in this factory. Twelve tractors were belted up to a shaft from which several motors were driven as dynamos, this novel installation giving an average output of two hundred horse-power. Other tractors were used to drive machines directly. When the news of this got about, demands for the tractors came from other factories, and the emergency service so provided greatly discounted the effect of the strike.

# Uses of Creosoted Wood Block Factory Floors

## Material Used—Problems Encountered—Conditions Met With in a Successful Installation—The Requisites for Success—How to Lay Floors Subjected to Moisture

By LAMBERT T. ERICSON*

THE use of creosoted wood blocks for factory floors has been so extensive during the past few years that it is hardly necessary to go into details in regard to the advantages of this type of flooring. Most engineers and architects have come in contact with this material at first hand, so that we will confine ourselves to a discussion of (1) the material used; (2) the problems encountered; and (3) the field covered.

Southern yellow pine has been employed almost entirely for this work, except on the west coast, where Douglas fir and tamarack are used. Long-leaf pine is usually specified, but short-leaf pine is also adaptable for the work. The lumber should be thoroughly air-seasoned before being cut into blocks, and then should be given a preservative treatment with coal-tar creosote oil to preserve the wood from decay. Hard woods, such as gum, beech and maple, can be used, but they are not favored on account of the difficulty in properly seasoning the lumber and the tendency of the blocks to warp and check after they are cut. The coniferous woods are more homogeneous in grain and texture and are consequently more adaptable. Soft wood compacts under service and consequently it is just as serviceable as hard wood, and has the advantage of not becoming slippery under traffic.

It should be understood in the beginning that factory flooring with creosoted wood blocks cannot be grouped under one general heading and specification. The conditions under which the floor is to be used must first be studied and the specifications made to suit. Creosoted wood blocks can be laid to meet practically all factory conditions if the conditions are first properly analyzed. The real reason for most of the trouble encountered with this type of flooring is the fact that wood expands and contracts with various conditions of the atmosphere and the moisture content of the blocks. It is therefore necessary to lay the individual blocks in such a way as to allow for this change in volume, which in extreme cases may be as much as 5 per cent. The individual units in the floor must be bound tightly in place with a binder which will allow this expansion and contraction and which will exclude water from the underside of the floor. As long as the blocks are held tightly and firmly in place and a smooth surface is maintained the floor will wear almost indefinitely, but as soon as they become loose and the surface rough they will break up into sticks very quickly.

*From "Mechanical Engineering."

### Conditions to be Met in a Successful Installation

The three most essential requisites for success are: (1) thoroughly air-seasoned lumber; (2) a smooth, solid foundation base; and (3) a waterproof and elastic binder to hold the units in place. In the majority of cases factory floors are dry most of the time; consequently, the lumber should be thoroughly seasoned, in order to keep the shrinkage to the minimum. Blocks cut from green or semi-dry lumber will shrink in volume to such an extent that they will often have to be taken up and relaid. If it is possible to do so, it is advisable to use a concrete base for the installation of these floors. The base should be strong enough to carry the entire load and should be finished smooth and level so that it will not be necessary to use a cushion between the concrete and the blocks in order to secure a level floor and uniform bearing for the individual units.

**THINGS TO REMEMBER**

Creosoted wood blocks can be laid to meet practically all factory conditions, if the conditions are first of all properly analyzed.

The chief point is to hold the blocks firmly in place, presenting a smooth surface. As long as this condition exists the floor will wear almost indefinitely.

The three important requisites for success are: 1. Thoroughly air-seasoned lumber; 2. A smooth, solid foundation base; 3. A waterproof and elastic binder to hold the units in place.

Floors which are to be subjected to considerable moisture, or to weather conditions, should be laid with ample provision for expansion.

Wherever a cushion is necessary between the concrete and the blocks, it is advisable either to use a mixture of portland cement and sand or a bituminous mastic. The latter is preferable in a great many cases on account of being both waterproof and elastic. It is standard practice to-day to lay the blocks directly upon a smoothly finished concrete without any cushion whatever. It is also customary to give the base a thin, even coating of coal-tar pitch before installing the blocks, so that the underside of the blocks may be thoroughly sealed and made waterproof.

The elimination of cushions and the use of a successful waterproof binder in the joints of the blocks, thereby eliminating the possibility of shifting of the base and a loosening of the units, has permitted a reduction in the depth of the blocks used. Factory floors are now being very successfully installed throughout entire manufacturing plants with blocks as shallow as two inches in depth.

Successful installations may be made on timber and plank foundations in mill-type buildings, but care must be taken to see that the timber in the foundation is sound and that the blocks are afforded a firm and even footing. A bituminous-mastic cushion between the planks and the blocks is now being extensively used and is proving very successful.

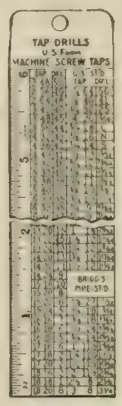
Creosoted wood-block floors are being installed in machine shops, forge shops, foundry molding and core rooms, casting cleaning and chipping rooms, warehouses, leather and paper mills, automobile assembly plants, garages, loading platforms, etc. The conditions in the above work vary from extremely dry to a saturated moisture state. They also vary from low to high temperatures, and in some cases the blocks are submitted to the action of molten metal. The extreme variation in the demands covered by the above list of industries gives a fair idea why it is necessary to study the individual job at hand and draw a specification to meet the particular work.

For ordinary factory purposes the proper treatment for the blocks is six pounds of creosote oil per cubic foot of timber. This is injected by the Reuping process and is sufficient to preserve them from decay. When they are to be subjected to considerable moisture or to the weather, they should be treated with twelve pounds of oil per cubic foot of timber by a combination of the empty- and full-cell processes. This extra amount of oil insures better waterproofing of the blocks.

Floors which are to be subjected to considerable moisture, or to weather conditions, should be laid with ample provision for expansion. It is good practice to provide ample space between the individual units to take care of this expansion. These joints should be flushed full of a waterproof, elastic binder, which should preferably be coal-tar pitch of a consistency which will not soften up under atmospheric or room temperatures. Coal-tar pitch has proven the most successful binder and filler for creosoted wood blocks, as it is a derivative of the same base as creosote oil, and thus readily unites with the oil in the blocks.

# Have You Tried This Contest Yet? If not--- Do so Now

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.




The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

## What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

This week V. L. Arnott is the winner. Three other readers forwarded correct lists, but lost out in the elimination test, these being John McGachie, Jr., Woodstock; George Land, Peterborough, and Chas. E. Mars, Brantford.

**CONTEST FOR APRIL 14TH ISSUE**

**Contestants are required to write us, stating to which advertisements we refer in this number.**

1 How to save floor space.

2 Something that has a push button control.

3 How to solve the problem of handling small lots of various shapes and sizes.

4 Something that is designed with a thorough understanding of present day requirements.

5 Where to get something for any purpose or pressure.

6 How to economize in steam.

7 Something that will appeal to those interested in furnace design.

8 How to obtain close regulation of what?

9 A case where a hollow milling tool proved well worth while.

10 Something that is easier and less expensive.

11—How to secure three important features, these starting with L, G, and I, respectively.

12 Something that acts as an incentive.

**These are Correct Answers for List from March 24th Issue:**

1—Nicholson File Co.

2—Hamilton Gear & Machine Co.

3—Imperial Oil Co.

4—La Salle Tool Co., A. R. Williams

5—Roelofson Machine & Tool Co.

6—Skinner Chuck Co.

7—International Business Machines Co.

8—Cleveland Pneumatic Tool Co.

9—Kearney & Trecker Co.

10—Aurora Tool Works

11—Shore Instrument Co.

12—Trahern Pump Div., George D. Roper Corp.

## Closing Date for This Contest is May 5th



# WHAT OUR READERS THINK AND DO



## EYE BENDING FIXTURE

By L. GEORGE

THE drawings herewith illustrate a fixture used in the forming of the double eye on hinges of about 9-32 inch diameter on the forked end of the piece shown. The material is blue annealed sheet steel of No. 14 gauge, and the operation is performed on a light power press of 3-inch stroke. Attached to the ram of the press is an upper bolster having a rear boss that carries the upper end of the round steel plunger A. A nut on the threaded part below the boss allows of vertical adjustment and takes the upward thrust. The lower end of the plunger slides in a steel bushing set into the lower bolster. The middle portion of the plunger is milled away for the cutting of a rack, this having 15 teeth of 10 pitch, with a face of about one inch wide. This rack drives the short end C of a double quadrant which rocks about a fulcrum in detachable bearings. The large end D of the quadrant is forked to straddle the work, the sector of each fork having teeth to mesh with the pinion E, each of these pinions has its own trunnion, bearing and collar. The right hand trunnion is bored to take the 9-32 inch sliding pin with a rounded end, which is normally supported in the left hand trunnion by means of a spring attached to the hand lever G. Between the two pinions lies a hardened steel pin or roller H, also 9-32 inch diameter, which has its bearings in aligned holes in the pinions, in which it is free to roll. This cross pin is located at a distance from the centre to suit the thickness of the stock used, and is retained endwise by the diameter of the trunnions. The pinions are made separate from the trunnions to make alignment of the cross pins easy. A short steel block projects in front of the pinions and carries two pins K, which act as guides or gauges for the blank hinge.

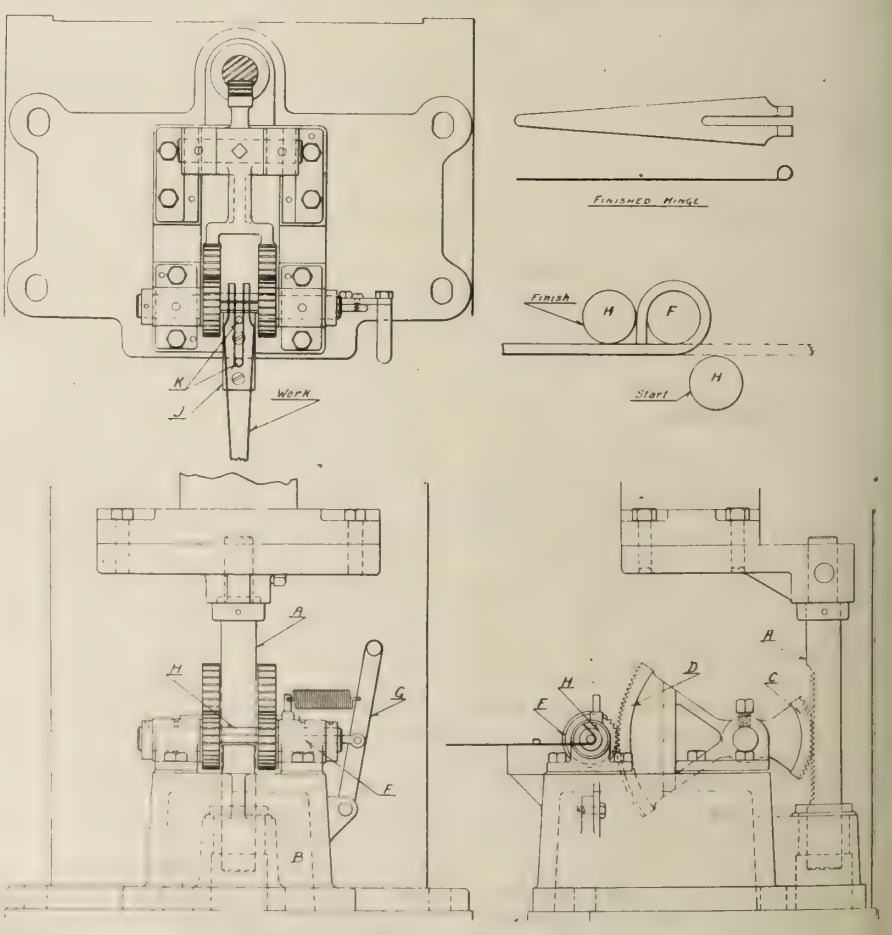
The principle of operation in the forming of the pin can be followed by study of the drawings, the enlarged sketch showing the start and finish positions of the forming roller. With the ram up, the position of the quadrant brings the forming pin H below the line of entrance of the stock, which passes under the central pin and over the pin H, the slot in the hinge blank being located over the pins K. The downward movement of the ram causes the quadrant to move the pinions and the forming pin H forms the stock about the centre pin F, the radius of the quadrant arms being such that the desired angle is traversed in the forming operation. This gives an eye that is only three-quarter circular, but for the purpose for which the hinge is used it is quite sufficient. The upward movement of the ram reverses the mechanism and there is enough spring in the stock to allow the pin F to be withdrawn freely.

## FORCED FITS AND SHRINK FITS

By W. S. STANDIFORD

IN machine construction and factory repairs, the method of holding wheels on shafts by means of a forced fit instead of the usual method of securing the parts to be held together by means of a key does not seem to be used to the extent that it should, considering the excellent results obtained with gear wheels, etc., that are subjected to heavy vibration. Pinions held on the ends of shafts by a key will not stand jarring for any length of time, as sooner or later they cause trouble by getting loose and coming off their shafts. In cases where the shaking and pressure exerted upon a pinion is continuous, the latter will remain fast upon its support for a much longer length of time than where the motion is intermittent and jerky as the heavy thrust and leverage soon forces out a key.

Two keys, put upon a quarter circle from each other, will enable a pinion to remain longer on a shaft; but the writer has found out by experience that where continuous running machinery is desired that gives the least amount of trouble to a factory's repair forces, it is much better to force a gear wheel on a shaft




DETAILS OF THE EYE-BENDING FIXTURE.

by hydraulic pressure, no key being needed in this case, as a pinion or gear wheel pressed on in this manner will remain until it requires to be removed by reason of worn teeth, removal being easily and quickly effected by cutting a slot in the bottom of a tooth and forcing a wedge in slot and knocking the wheel off with a hammer. In making press or forced fits, the part that is to be driven must, of course, be larger in diameter than the hole which receives it, but the difference in regard to such press fits is not so great as some machinists think should be the case, as all that is needed is to have the grip between the two metals sufficiently tight so as to prevent the parts from coming off. Any heavier pressure used for work of this character puts a strain upon the metal around the hole which will cause a cast iron pinion to break suddenly while it is in action. The usual practice among machinists in doing work of this kind is, to judge the proper amount of oversize allowance by the feel of calipers; but this is a very uncertain method as errors are likely to be made in judging sizes.

The correct method of taking such measurements is by means of inside micrometer calipers, used in the hole, and outside micrometer calipers to find the shaft size. This puts all measurements upon an exact basis, the worker knowing at all times just what allowance has been given in thousandths of an inch, instead of the slipshod caliper feel and its guesswork as to the proper amount of oversize required. A mechanic always gains by doing all work, whatever its character may be, as carefully as possible, as bad habits once formed are hard to break, and often lead to spoilt work. There is a limit to the sizes of articles made with forced or pressed fits, which is due to the fact that as the diameter of a shaft and hole in a pinion increases, more powerful hydraulic apparatus is required to press them together, so that a point is soon reached where it would not pay to keep an expensive and powerful machine around a shop for only occasional use.

### Simple Formulae

As a general rule, force fits are mostly made on such small objects as crank pins, car wheel axles, repair work and lathe and other machine construction parts that require to be held very securely. In judging the proper allowance for a press fit, several factors have to be taken into consideration, viz.: The thickness of metal surounding the hole, kind and quality of material of which the parts are made, the size of the work and also smoothness and accuracy of bore and shaft that are to be fitted together. However, as a general rule, to make a press fit of the greatest possible strength, there should be a difference in the sizes of the parts to be fitted of from two to three thousandths of an inch for each inch of diameter of the article. The following formula will serve to give an idea of the pressure in tons required for making forced fits for different sizes of shaft diameters. The required pressure in tons will be the fit allowances in thousandths of an inch multiplied by the diameter of shaft in inches and also by the factor of 1½.

As an example: Suppose that a gear wheel is to be forced on a 5-inch shaft, the press fit allowance being .002 for each inch of diameter. 5 x .002 = .010, the latter being the total allowance, and the pressure in tons will be 10 x 5 x 1½ = 75 tons. On smaller diameters of shafts where an extra heavy grip between the parts is desired, the larger figure of .003 can be used. Take the case of a 2-inch shaft, 2 x .003 = .006 the allowance, and the pressure in tons will be 6 x 2 x 1½ = 18 tons. It will be apparent from this that if the allowance figures given in both of the above examples were adhered to for large sizes of shafts that the necessary pressures would be very great and beyond the appliances found in most shops. To show this clearly, we will suppose that a 15-inch crank pin is to be fitted into its disk. Using an allowance of .002 inch x 15 inches = .030 the allowance, multiplying 30 x 15 x 1½ = 675 tons pressure needed to do the work. Very few large factories possess the facilities for obtaining such heavy pressures, which make extra tight fits that are unnecessary, as all that is required is sufficient pressures so as to make the parts hold together. In practice, for a shaft of 15 inches diameter, it will be found that .010 inch press allowance will be sufficient, the tonnage necessary to force them together being much less. Some mechanics taper the parts to be fitted together, thinking that tighter fits will result. This is bad practice, because the tendency of a taper fitted part to become loose under vibration is always present, and once it loosens, the entire fit frees itself, taking very little axial movement to do so. On the other hand, a taper fit does not abrade the surfaces of the parts pressed together to the extent that a level fit does. In order to prevent abrasion in work of this kind, it is advisable to lubricate the surfaces with white lead mixed with a little lard oil. It is best to keep the surfaces as smooth as possible so as to allow for renewing gears, etc., on the same shaft when they are needed.

Old wheels which have been pressed on and off shafts require a far greater pressure when being forced on another one. This is due to the fact that the metal has become surface-hardened by the pressure which it has already sustained, and on this account it takes double the pressure to force it on a shaft as contrasted with that of a new wheel of the same shaft diameter. Shrink fits are used in cases where the greatest possible binding effects are desired, they being used extensively by machinery manufacturers and also in railway locomotive shops for putting tyres on the driving wheels of engines, etc.

The allowance for a shrink fit depends to a great extent upon the thickness and amount of metal around the hole, as this has a great influence upon the stresses in the hub at the bore of a wheel and shaft that has been put on by shrinkage. The higher the heat of the outer member, the greater the shrinkage allowance, as the expansion is greater when a piece of steel is heated to 1,200 degrees Fah. than the same metal would have if it were only heated to 800 degrees. It is thus possible by this means to control the amount of adhesion between a wheel and a shaft put together by the shrinkage method; but in practice, there are limits beyond which it is not safe to go, on account of the mechanical stresses set up when the metal is cold. Should the shrinkage allowance exceed the elastic limit of the steel, either a permanent set will occur, with the metal around the hub of the wheel in a state of strain that is likely to develop into a crack by jarring at its weakest point, or the pressure on the hub may be so great that its ultimate strength is exceeded and it will burst after the shrunk parts are cold.

For the general run of machine work, an allowance of about .004 of an inch for each inch of internal diameter of a hole in a wheel will give satisfactory results. On account of their large diameters, railway locomotive tyres are shrunk on with an allowance of from 1/64 to 1/32 inch per foot of diameter.

## TANK STEEL.

Tank steel has been defined by the Association of American Steel Manufacturers "as a grade to be used for ordinary fabrications or for structural purposes where no particular stresses are required. It should be free from "surface defects." The reason for making this definition lies in the fact that, since the outbreak of the war, a great deal of "tank steel" has been specified for purposes for which such steel was unsuited and then has had attached to it requirements that would throw the material into a higher classification without, of course, expecting to pay the extras required by such higher classification.

The ruling of the committee is, further, that if the buyers' specifications stipulate a tensile test from each plate as rolled, the material shall be classified as flange steel. Further, that if a flange steel purchase specifies a homogeneity test in addition to naming chemical and physical properties, the material becomes firebox steel. Again, that if the steel plate order carries specifications with regard to phosphorus and sulphur limits equivalent to the firebox grade, the steel shall be regarded as firebox steel unless the chemical tests are modified.



# DEVELOPMENTS IN SHOP EQUIPMENT



## CAR WHEEL LATHE

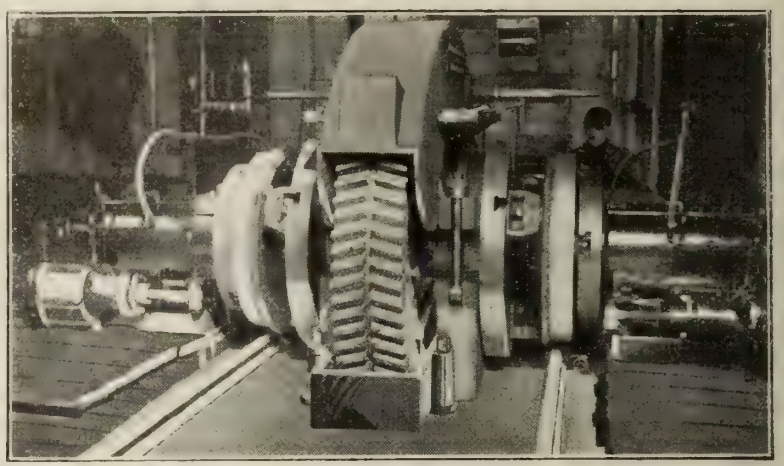
The John Bertram & Sons, Co., Ltd., Dundas, Ont., have recently installed in the C.P.R. shops, Toronto, Canada, a machine that is a new departure for this section of the country. This new machine tool is known as a No. 5 car wheel lathe of center driving type. As will be noted from the three photographs, it is of very rugged construction, and following are some of the features incorporated.

The tool will turn wheels from 26 inches to 42 inches in diameter on the tread. It accommodates the largest M.C.B. axles with outside journals up to 6½ inches diameter, and will take axles up to 9½ inches diameter with inside journals. The maximum distance between centers is 91½ inches; between tailstock faces 96 inches.

The large powerful drive in the center is of particular interest. The steel central driving gear and pinion are of the double herringbone type. Of course, for transmitting heavy torque, as required by this class of work, the herringbone style of gear is ideal, as its construction eliminates all end thrusts and is very smooth in operation, due to the spiral action of the teeth.

The central driving gear is mounted on a spool which revolves in large bearings in the bed. This spool has two faceplates that carry the drivers, and it has an opening of 10 inches to receive the axles. The driving gear is equipped with a patented hinged segment which operates automatically. It closes and locks as the wheels are rolled into the lathe, and unlocks and opens as they are rolled out. The operation of the segment requires no manipulation on the part of the workman.

The wheels are rolled into the lathe on short tracks as shown. A power operated elevating device quickly brings the work up to proper height for the split bushings to enter the tailstock sliding spindles. This elevating device is driven by a separate 5 H.P. constant speed motor.



THIS GIVES AN IDEA OF HOW MACHINE LOOKS WHEN IN ACTUAL USE.

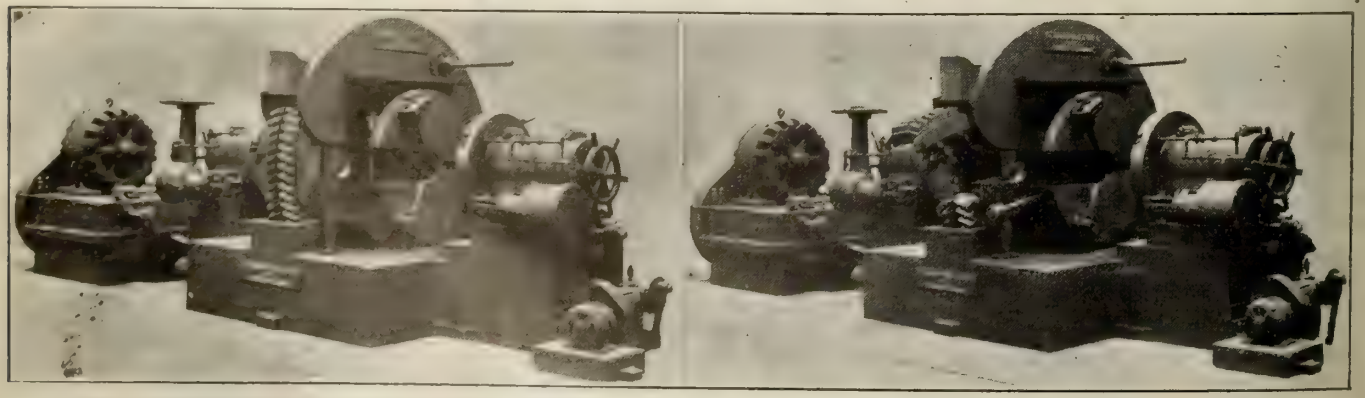
### Tailstocks

The wheels are centered by tailstocks which are moved on, and clamped to the bed by powerful air cylinders. These tailstocks are under perfect control, air valves being within easy reach of the operator. For wheels with outside journals collapsible bushings are used that fit over the journals, and are tapered to fit the tailstock spindle. This method insures the tread of wheels being concentric with the journals. For wheels with inside journals, centers are used.

Each faceplate of the driving spool is equipped with three patented semi-automatic drivers, which engage the inside of the wheels near the circumference. These drivers are tightened by hand and exert a uniform pressure on the wheels. The tailstock faceplates are provided with independent chuck jaws which engage the outside of the wheels and support them against the thrust of the semi-automatic drivers already mentioned. This guarantees that the wheels are held with absolute rigidity, and chatter is eliminated; at the same time all torsional strains are relieved.

### Tool Rests

The tool rests are equipped with patented pneumatic clamps, these enabling the operator to change and clamp his tools in a few seconds without the aid of a wrench. The tools are clamped by means of a wedge action which forms a positive lock, independent of the air pressure. The tool slides have in and out adjustment for setting depths of cuts,



TWO VIEWS OF THE CAR WHEEL LATHE, ONE WITH DRIVING GEAR CLOSED, THE OTHER IN AN OPEN POSITION.

also hand longitudinal traverse. Slide wearing surfaces have hardened and ground steel plates to resist wear due to the excessive tool pressure. The tool slide screws are fitted up with ball thrust bearings, and the rests can be swivelled to provide for the taper of the wheel treads.

The power feed is obtained by direct gearing and is positive in action. The range is from ⅛ inch to ⅜ inch per revolution of the faceplates. There are 6.4 feeding strokes per revolution of the face plate, this giving practically a continuous feed.

The machine is equipped with a simple calipering device by means of which the operator can readily size both wheels to equal diameter. There are no exposed gears on the machines, these being suitably guarded, and all driving gears are made of steel. The driving spool is fitted with guards and wipers to prevent chips and dirt from getting into the bearings. Wipers are also attached to the tailstock to keep the tracks free from chips and dirt. The tool slides are also suitably guarded.

### The Drive

A 50 H.P. motor of 3 to 1 speed variation is used for direct current drives, while a 50 H.P. motor through gearing by which six faceplate speeds are obtained is used in the case of alternating current. Push button control is adopted, the panel being located at the most convenient position for the operator.

The regular equipment with this machine consists of calipering attachment, wheel elevating device, pneumatic tool clamps, set of three semi-automatic drivers for each faceplate, five sets of bushing for different size axles, tailstock traversed and clamped by air, push button control, and a set of eight tire turning tools.

Speaking to the operator of this machine, Canadian Machinery asked his views on the subject of vibration. "There is no such thing with this tool," was his answer, and watching it in actual operation we could not help but agree with him. Speaking on production, he claimed that ½ hour per set of wheels was a pretty fair average. In Fig. 1 is shown the machine with main drive gear closed, while Fig. 2 shows the gear open ready for entering the work. Fig. 3 depicts the machine in actual operation at the C.P.R. shops.

## AN INTERESTING PIPE-BENDING MACHINE.

The problem of bending wrought iron pipes to various degrees and getting the bend without distortion of the pipe has always been an interesting one. Many devices have been introduced to achieve the desired result, and we recently had the opportunity to see one of these at work. The machine in question is owned and operated by the Tube and Pipe Bending Co. of Ontario, St. Nicholas St., Toronto.

The device is made in two sizes, the smaller size being used for pipe up to 2-inch diameter, while the large machine can handle up to 6-inch extra heavy. The bending is, of course, carried out without any heating of the pipe.

The accompanying photograph will give a good idea of the machine and the principle on which it works. The drive from the belt pulley is transmitted by a worm to a worm wheel revolving in a horizontal plane underneath the table. On the table is mounted the form for bending, and these forms are, of course, made to accommodate the various sizes to be bent. The pipe to be bent is placed in the jaws of the vise and is run through between the form and vise the necessary distance to form the bend. The mandrel carried on the table is then run into the pipe just as far as is necessary. A series of stops on a quadrant under the table can be set to any number of degrees that may be required. When the pipe is set, the operator presses a pedal, which thows the head carrying the mandril into gear with the revolving worm, thus turning the head and mandril, and, of course, the pipe, through the arc previously settled. When the stop is reached, the machine disengages automatically. The mandril, owing to the path described by the table, automatically draws out of the pipe as the bend is formed.

The machine can be used to put several bends in a pipe, and we saw a number of exhaust pipes for automobiles which contained no less than five bends. One great feature with a machine of this kind is that, once it is set, it can produce any number of absolutely identical bends. This makes it especially useful where large numbers of pipes must be bent to a uniform standard. We had an opportunity to examine some four-inch pipe which had been bent to about 60 degrees, and there was no sign of any wrinkles or distortion on the inner side of the bend. A large number of bends on extra heavy pipe for marine work were performed on the large machine during the shipbuilding activities recently, and were all passed by Lloyd's surveyors.

We understand this machine is fully protected by patents in Canada and the U. S.

## SHEET STEEL PULLEY

A new design of sheet steel pulley has been placed on the market by the Worcester Pressed Steel Co., of Worcester, Mass. The pulley is so constructed that it presents a smooth surface on each side, being free from spokes and hubs, thus almost eliminating the possibility of danger to the workmen, and the creation of air draft. It is light and strong and is said to be easily removed or placed in position. These pulleys are made in sizes ranging from 6 to 18 inches in diameter and with any width of face.

## SIZE BLOCK FOR SETTING TOOLS

An adjustable tool for the setting of machine tools is now being offered to the trade by M. B. Hill, of Worcester, Mass. The top gauging block has three steps and moves upon an inclined surface on the base. Through a T-slot in the base a bolt extends up into the body of the top block, the upper end of this bolt having a tapered hole into which the end of a screw, passing through the block, enters. This screw is provided with a knurled head, a slight turn of which is sufficient to clamp the block in any desired position.

## ADJUSTABLE COPING SAW

The Consolidated Tool Works are now making a coping saw in which the blade can easily be adjusted to any desired position and quickly locked. The means of setting are so located that adjustments can be made without altering the position of the hands when using the tool. The frame is nickel plated and polished, and the handle is made of wood and black enamelled.



BENDING AUTOMOBILE EXHAUST PIPES.

# CANADIAN MACHINERY
## AND MANUFACTURING NEWS

Published in the Interests of the Machinery, Manufacturing, Iron, Steel, and Metal Working Industries.

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## Let the Steel Corporation Act

THE steel market in this country and the steel market in the United States is about as ragged as anything could be imagined.

For the ultimate consumer, a ton of steel is a ton of steel, and yet there seems to be no end of variations to the price at which he may purchase.

The United States Steel Corporation is supposed to be selling at a fixed schedule, based on the list in operation under government control on March 21, 1919. Yet the market hears plenty of stories of the Corporation meeting prices that are named by some of the independents in order to hold its business.

This paper is not charging that this practice is being followed in many cases, but the incident is used here to show that there is no confidence even in the present schedule of the United States Steel Corporation, and as far as the independents are concerned, there have been so many prices peddled in Canada that it is quite within the range of absolute truth to state that there is no recognized steel market price at the moment.

Under such a condition, the steel mills and the steel warehouses, and any branch of industry into which steel enters largely as a basic material, knows full well that buying is going to be carried on on an ounce for ounce basis. Absolute needs are attended to, but beyond that the buyers are not going, nor will they go.

The independents have made a move to strengthen the situation now by withdrawing, or threatening to withdraw, certain prices they have named in this district. They cannot strengthen the market in this way. They have done much to muss the market up, but it is hard to see where their hand comes in in the "clearing-the-air" process.

The United States Steel Corporation can do it, and they should do it. Canadian Machinery does not urge that the announcement of a new schedule by the United States Steel Corporation would result in an increase in the tonnage sent to the mills under present conditions, but it would set a standard, and fix something around which the market could build for the future. Right now there is nothing to which the steel world can look with any degree of stability. Even the much-talked-of schedule of the Steel Corporation is not regarded in Canada as the absolute selling price of that organization.

It seems likely that the Steel Corporation will move shortly, and the steel market, and the machine tool industry to a very large extent, awaits the announcement. The Corporation can give that much needed stability to the market by announcing its new schedule. It can be done by no other agency, and it does appear as though the time were fully ripe for the Corporation to act.

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ONCE more the Montreal scrap metal dealers have risen and whacked down the prices which they might possibly pay in case they might possibly buy something that they might possibly sell to some concern that might possibly have some use for it.

But the coming of spring, or the opening of navigation, or the injection of new courage of some sort or other, has caused the Montreal dealers to apply the honorable arts of subtraction and division on the scrap list. And when said list was handed its hat and coat and told to go out and walk around, its friends of former days knew it not.

For are they not offering $6 per hundred pounds for copper which in war days was scarce at $20? Likewise boiler plate is wearing a $10 suit instead of a $27 outfit in war days. And heavy melting steel is clad in a $9 design against the haughty $24 of 1918.

## Some Good Issues Coming

Following out its policy of keeping readers well informed of coming events in its editorial pages, Canadian Machinery presents the following for the coming weeks:

In the April 21st issue there will be an article on "Broaching." This will embody various examples of work performed, together with production data. This practice, one of the more recent developments to be followed in this country, has come into the realm of milling, drilling, slotting and keyseating operations.

April 28th will find the leading article dealing with methods of efficient threading. Here again the interest will be very general in this article. Various examples, well illustrated, will be shown under actual production work.

On May 5th, "Surface Grinding" will be the leading article, and it may be there will be something on your problem.

"Roller Bearings In Industry" will be featured in May 12th, and a number of actual applications are to be shown.

In addition to the above we have other good articles on various phases of machine shop practice which will appear throughout these four issues. These are all practical machine shop articles. You can hardly afford to miss them.

# The Problem of the Railroads

HAS over-organization on the part of railroad workers forced a system on the railroads that is too hard and too complex for them to finance successfully?

The Boston News Bureau brings out the following, which has received wide circulation on both sides of the border:

"When a railway engine goes to the shop for repairs these days, men of three, four, even of five crafts, have to be used to do what the men of two crafts, and even of one craft, did four years ago. When a locomotive headlight generator has to be removed nowadays, six men have to be employed to do what, after all, is a simple job—an electrician with his helper, a sheet-metal worker with his helper, and a machinist with his helper. Four years ago, two men, a machinist and his assistant, did the whole job.

"When a railway engine boiler springs a leak three craftsmen, each with a helper—under the rules that now regulate railway labor—have to be employed to make the necessary repairs.

"A sheet-metal worker, with a helper standing by to hand him his tools, will loosen the jacket; a locomotive carpenter, with another assistant standing at his elbow to handle his tools and pass them to the skilled workman, will remove the lagging; then a boilermaker, with a third helper at hand to wait upon him, will caulk the leak; the carpenter and his helper will replace the lagging, and the sheet-metal worker and his assistant will then tighten the jacket. Six men, three skilled and three semi-skilled, have waited their turns and stood round in each other's way, whereas a good boilermaker and his helper could have done the job as well and quicker. If a boiler check has to be changed, two men have to do now what one man used to do.

THE GREAT EYE REMEDY.




### The Conditions Four Years Ago

"Four years ago, an ordinary handy shopman could change a nozzle tip in the front end of a locomotive; he could do it to-day if the rules would permit it. But the rules require that six men shall be employed to do that small task—a boilermaker and his assistant, a pipeman and his assistant, and a machinist and his assistant.

"These are all railroad shopcraft jobs. All the workmen are highly paid. All belong to the skilled labor classifications. For each illustration here given, a hundred more might be cited, all calculated to show just what the railroads of the United States are up against."

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Advices from Germany state that firms are again putting on the "Made in Germany" mark. German industry is gaining strength every day, and that strength is being aided and helped by just such industrial crises as are being forced in England now.

* * *

Some men succeed because they don't know when they're licked.

* * *

According to reports reaching this office, the scrap metal market in Scotland is shot to pieces. But the scrap situation in Ireland remains active.

* * *

One dealer handled twice as many orders in March as February, but total sales showed an increase of only 15 per cent. Yes, but think of the impetus that sort of buying is giving to manufacturers of wrapping paper, twine and shoe leather.

* * *

A Toronto machine tool dealer submits this one: "At one point on the way down town I saw a number of pickets trying to keep men from going to work. Down at the Government employment office there was another group out looking for work. Now, how far are we going to get on that basis?"

* * *

# This Canada of Ours

New York *Sun*: Canada to-day is unique among the great nations in that she has no serious labor troubles, and in that she appears to be effecting the difficult process of readjustment to after-the-war conditions as painlessly as may be. Montreal reports that in most cases where wage reductions have been necessary they have been made without friction, and that this holds true of the Pacific coast and the Middle West, as well as of the more industrial Ontario.

The attitude of the Dominion and Provincial Government toward business has been helpful, but, fundamentally, such successful readjustment must be due to the exercise of plain common sense on the part of both labor and capital. It is not the first time that Canada has set an example worth studying.

One thinks of Canada as primarily an agricultural nation, and it is still true that her wheat and other grains outrun any other commodity. But the Dominion has turned more and more to manufacture, and its industries grow at a tremendous pace. Doubtless the growth may continue as further water power is put to use, and more resources in coal and minerals are opened up and her network of railroads extended.



# MARKET DEVELOPMENTS



# Stability Needed In The Steel Market

## Several Promising Inquiries in the Markets—Some Word is Expected Soon From the U.S. Steel Corporation—More Orders Being Taken in Order to Get the Same Turnover as Formerly

THERE is a growing feeling in the steel market that it is high time for the United States Steel Corporation to make some announcement regarding its schedule. This has been in effect since March 21, 1919, and conditions have changed very materially since then. Then the market has in it many stories tending to show that this schedule of the Steel Corporation is being shaded to meet competition. The Steel Corporation is the one agency that can lend any degree of stability to the market. Its announcement, were it to contain reductions, might not start any buying at all, but it would serve the very good purpose of setting some standards around which the markets of the future weeks and months might be built. At present, any such standard is entirely lacking, and the market is ragged as a result.

During the week several independent steel mills have withdrawn low prices they have been quoting to Canadians, and this has lent a little strength to the situation. Buying in the steel and iron world is still carried on on a very confined basis. Actual wants are attended to, but not a pound over in most cases. Conditions are not favorable to heavy buying.

The machine tool market continues to receive a number of inquiries, and many of them will undoubtedly be turned into business. In this field the machine tool houses have a new problem to deal with, in that they find it necessary to watch closely the credit of some of their former customers. Collections are reported as being more or less spotty.

Small tools are being sold sparingly. One dealer reported that during the last month he had made twice the number of sales, compared with February, yet the actual increase in his turnover had been only fifteen per cent.

The scrap metal market continues as it has been for months now, at about as low an ebb as possible. The volume of business moving is very small, and there is nothing in sight to indicate that an improvement is imminent.

## MONTREAL DEALERS ONCE MORE PUT THE AXE INTO LOWLY SCRAP PRICES

Special to CANADIAN MACHINERY.

MONTREAL, April 14.—Those in the trade who, in the closing days of the old year, anticipated a spring revival of normal activity, now look for business revival still farther ahead. Nothing has developed that gives pronounced encouragement to an early revival of active industry, although some reports seem to foreshadow a gradual betterment. In speaking of trade one dealer here remarked that "the year to date has shown steady improvement. January was quiet, February was more so, March showed a gradual increase from week to week, and if April continues to show returns like the first week, we will have the best month in nearly a year; not the turnover we had a year ago, but a substantial increase over any of the previous six months." In commenting on the recent reaction of the U. S. steel market and the advance in prices on certain classes of steel, one merchant stated: "It is difficult to see how any other action could have been taken. There is little doubt that many mills, particularly the smaller of the independents, had to operate on a very close margin of profits, if not at a slight loss. It is quite evident that, with all the cutting of the past six months, the volume of business placed has not shown any marked increase. A comparison might be given in the quotation on sheet bar billets, which at the moment is $47 per ton ($2.35 per hundred). Added to this would be the cost of re-rolling operations, and yet we have known instances where bars have been sold at $2 and $2.25. How is it done?"

Few dealers will commit themselves on the early possibilities as experience has amply demonstrated the fallacy of industrial prediction. "It may mean a long period of dullness," said a dealer, "similar to that of the past six months, while on the other hand, the revival may take place overnight. We know for a certainty that few consumers are heavily stocked and the majority are buying only what they need for immediate use, and succeed in securing the lowest possibl price for the least possible quantity. Little buying is being done by the rail roads and this is a puzzle to many of th dealers. Owing to the competition amon American steel mills, the Pittsburg quo tations on some lines have been given range of from $2.25 to $2.65 on tan plates, and from $2.25 to $2.45 on struc tural shapes. Local quotations on plate have declined $5 per ton, the price bein $5 per hundred on the 3-16 inch size, an $4.50 on the heavier plates. The move ment on sheets is light but steady; quo tations are easier. Black, 28, are now cents, and blue annealed 5¼ cents pe pound. Canada plates, dull, are consid erably lower at $7.50 per hundred. Quo tations on all bright have been with drawn. Premier No. 28 are quoted a 8¼ cents, a decline of ½ cent per poun

### Dealers Depleting Stocks

A feature of the present machine too and supply business is the wide distribu tion of small orders, a factor that aggre gates a fair volume of business but whic likewise adds considerably to the expens necessary in securing it. The conserva tive buying policy of many manufactu ing plants has necessitated increase

calls on the part of dealers and salesmen, and very often the small margin of profit is wiped out by the resultant overhead and selling costs. If any one line might be termed active the statement would probably apply to construction machinery, as dealers in contractors' supplies are reporting a fair business. The conservatism of the average consumer is ably seconded by many dealers in their method of clearing out surplus stocks and acquiring only those lines that have a quick sale. The market today does not require that orders for tools or supplies must be on the books far in advance, so that the dealers can relay the customer's requirements on to the manufacturer and obtain prompt delivery.

### Sharp Declines in Scrap

While there is no pronounced change in the old material situation, the market is featured by another general decline in price quotations. The consumers are not falling over themselves in placing orders, even when a sharp reduction is announced. Prices are only taken into consideration when an actual covering is required, and the sale is transacted on its individual merits, the purchaser usually getting the best of the argument. The volume of business is exceedingly light, with few large sales recorded. Dealers would be willing to adopt any reasonable method of infusing their customers with a spirit of buying, but price cutting does not appear to serve the purpose. Price reductions this week range from $1 to $8 per ton, the heaviest decline being registered against malleable scrap, which has fallen to $12 per ton. Heavy melting steel is now quoted at $9, a decline of $3 on the previous price. Stove plate at $20 is $3 off, and cast borings have declined from $5 to $3 per ton. Other lines show a proportionate reduction. Non-ferrous lines are likewise weaker but business shows no improvement. Coppers and brasses are down, light copper being quoted at the low figure of 6 cents per pound. Heavy lead has again weakened, the present price being 3½ cents per pound.

## POINTS IN WEEK'S MARKETING NOTES

**A report received from Glasgow states that very low prices are being offered for scrap iron and steel, the values all being below those prevalent before the war.**

**The Republic Iron and Steel Co. announce an advance of $2 per ton in bars, shapes, and plates.**

**Pittsburgh refers this week to "the market dragging along much as in the last few weeks." The feeling seems to be that when the Corporation announces the new schedule it will show substantial reductions.**

**Canadian buyers of black sheets have been advised of the withdrawal of prices quoted to them by several of the independent mills.**

**A report from London states that under existing rates of exchange German goods can be sold at a price less than the cost of materials in the United Kingdom.**

**Machine tool dealers in this district have a large number of inquiries in their offices just now, but actual orders are still slow. One Canadian manufacturer of machine tools says that at the present time they have tenders out on $750,000 worth of equipment.**

## GOOD BUSINESS IN CERTAIN LINES

### Toronto Dealers and Warehouse Interests Have Varied Experience in Week's Trading

TORONTO.—There are lines of business where improvements have been noticed, and there are others where the claim is made that one week is very much the same as another in the present market.

The machine tool trade is still quiet as regards actual placing of business, and it is still a fact that the majority of the trade is going to firms that handle both new and used equipment. Some dealers are carrying very little new stock now — some of them almost none at all—while the used equipment is in stock and can be inspected at any time. One or two dealers have prospects away to points in the United States for the purpose of inspecting machine tools there that cannot be seen in Canada because there are none operating here. When prospects get interested enough to go out inspecting machines at that distance, sales are not far off.

Several dealers reported that inquiries are improving, and judging from the list of proposals they have out, they should have some business on their books before long if they land only a small portion of their prospects. There is a certain element of uncertainty in the market on the matter of prices, and several dealers stated this week that they were not satisfied that they had reached the bottom of the market, and also that many of their customers seemed to entertain the same views.

### Reports Good Month

The manager of one of the Toronto houses reported that they had done a good business in the last month. "Of course," he added, "when we say that we do not mean that it is good compared with some of the months during the last few years, but when present conditions are considered the month's business was good."

This same firm also brought out the point that there was something else to do besides chasing orders, and that was the watching of credits. Some firms that were considered very good a year or so ago are pretty well tied up for working capital now, and banks are not at all anxious to deal in their paper, so it is a fact that a certain amount of business has not come into the machine tool field for that reason.

The sale of small tools is going on in a small way. Actual wants are being supplied, but that is about all that is being done, and several firms that have restarted operations after a shutdown of several months are not buying because they were well stocked at the time of the stopping of operations.

The policy seems to be followed out in many lines, and although it does not bring much grist to the mill for the present, it is certainly clearing the shelves bare for business that must come in when operations become more marked.

### Steel Prices Stiffen?

The weight of evidence in the steel market this week seems to show that prices have not sagged any more, but in certain directions they have become stronger. It is known that one large importer—a manufacturer in this case—who takes quite a tonnage of sheets, was informed by several of the mills that a low figure on black sheets was being withdrawn at once. He had been buying around 4c base Pittsburgh district, and even at that figure had not bought very heavily. Another representative of several independent sheet mills has also informed his trade here that prices on which he is now working are likely to be withdrawn without notice. The trade here is wondering what it all means. Some of the warehouse interests seem inclined to think it is a move to hurry up any business that may be undecided as to disposition, while others incline to the belief that cost sheets may show that sheets cannot be turned out at the figure at which they are being offered to-day. Still another Toronto buyer had word during the week from a mill in the Ohio valley that sheets were selling below actual cost of production, and the price was being withdrawn. There is still a fair sale for sheets in this district. In fact it is one of the lines that has remained fairly good right along.

Bars are quiet yet. We are still quoting 4.25 as the average price but better figures are being made on certain deals. The tonnage may be desirable enough to warrant a closer price, or the warehouse may be overstocked and anxious to move material. In such cases a price better than 4.25 can be secured.

Tubes are quieter than they have been for some time. The trade, judging from

former years, should look for a pretty fair trade in this line at present, but so far it has not developed, and just now the average is not as good as during the first two months of the year.

### Buying in Small Lots

"We are selling in smaller lots to-day than we have for years." That remark is heard in several lines. It is known that there are orders going through and being filled for very small quantities of sheets and bars and tubes, while the same thing is true of small tools. One steel merchant claimed, "We are sending out any number of bills for three and four dollars, a thing unheard of before. It is also more expensive to ship in this way, especially where we have to make deliveries in the city." Another dealer, this time in small tools, gives his experiences as follows: "During the last month we shipped out twice as many orders as during February, but when it was all totalled up we found out that our increase in actual business had been only 15 per cent."

# THE STEEL MARKET IS RAGGED AND STABILITY IS NEEDED MORE THAN EVER

Special to CANADIAN MACHINERY.

PITTSBURGH, April 14.—An interesting incident is the announcement of the Republic Iron & Steel Co. of an advance of $2 a ton in its prices for bars, shapes and plates, the advanced prices being 2.10c for bars and 2.20c for shapes and plates. The company made no change in its prices on tubular goods or sheets. It is inferred in the trade that the Republic Company took this action as an experiment, in hope that other independents would do likewise, and that the Steel Corporation would reduce its prices to this basis. The balance of probability is that the other independents will not follow. The theory is a good one, for it is certain the Steel Corporation will reduce its prices at some time, and when it does it will, of course, go at least as far as the lowest prices made by independents. While Republic's regular prices were 2c on bars and 2.10c on shapes and plates there have been some sales at several dollars a ton less, when a fair sized tonnage was involved, with attractive specifications. Republic's advance does not cost anything, since very little business was being booked at the old prices, and a reduction can be made at any time, or competitive prices can be met without any formal reduction being made.

On the same day that the Republic Company announced the advance in its prices on bars, shapes and plates, the Steel & Tube Co. of America, formerly the Mark Manufacturing Co., announced an entirely new schedule of prices on tubular goods, at $10 a ton below the Industrial Board or Steel Corporation prices. The action was entirely unexpected and has caused considerable comment. In line pipe a reduction of $10 from the nominal prices means nothing since line pipe sold weeks ago at a greater concession, and the reduction does not mean a great deal as to oil country goods generally, but in standard steel pipe it is very important, for the shading in this line has been only $2 to $4 a ton. The company's basing discount on standard steel pipe is now 62½ per cent., against the regular published discount of 57½ per cent. shown in the discount lists of other mills. What action the other makers will take remains to be seen, nothing having been done thus far. The market as a whole cannot be quoted at the reduced price of this one interest, not because one good-sized producer could not supply all the current inquiry, but because it is a Western concern and while quoting on the basis of Pittsburgh plus freight to destination it would not sell in the East since then it would have to absorb freight.

Steel prices in general show no change, the market dragging along in this respect much as in the past few weeks. On most products the independents have made a sort of market, though by no means a clearly defined one, at prices ranging from $7 a ton on bars to $18 on galvanized sheets below the Industrial Board or Steel Corporation prices. The Steel Corporation has taken no action. The trade is still speculating as to when the Corporation will make a move as to prices and wages. There is no buying pressure, however, and no evidence that if the Corporation should reduce its prices a buying movement would start. There is no question, however, but that eventually the Corporation must reduce, for otherwise buyers will have no confidence in the market and would not buy if they were otherwise disposed to do so. When the Corporation does reduce prices the reduction will probably be quite extensive.

In some quarters it is being remarked that the Corporation ought to reduce prices, so as to start a buying movement, and it is remarked that in the past a buying movement generally followed sharp reductions in steel prices. Buying could not thus be forced, however. These observers confuse cause and effect. In the past, when the steel producers reduced prices they did not do so arbitrarily, but waited until they could see that there was latent demand, so that the demand, though latent, was really the cause of the reduction. Just now there is no such demand. The mills would be keen enough to see the demand if it existed. The average consumer is more interested in seeing prices maintained so that he can dispose of his stocks than in seeing prices reduced against purchases still to be made.

### Steel Corporation Tonnage

The United States Steel Corporation's unfilled obligations amounted to 6,284,765 tons at the end of March, showing a decrease during March of 649,102 tons, an amount equal to 46 per cent. of capacity for the month. Shipments were at about 51 per cent. and the difference between these, only 5 per cent., represents the net bookings, or the total bookings minus any cancellations that may have occurred. It is improbable there were any cancellations of importance, so that evidently the Corporation booked scarcely any new business in March. References are frequently made to the rate at which the Steel Corporation is receiving business, but that is another matter, the reference being to shipping orders, in many cases merely "releases" against orders previously suspended, and thus not new business in the sense of being reportable as additional unfilled obligations. The Corporation's operations now are on old business and on specifications now being received against old contracts, chiefly the former.

### Steel Production

Production of steel ingots by the Steel Corporation in March is understood to have been at about 51 per cent. of capacity. From this, and the report compiled by the American Iron and Steel Institute showing the monthly production of 30 of the steel producing companies, it can be computed that the independents during March produced at 31 per cent. of their capacity, and this, with the Corporation operation, makes an average for the industry as a whole of about 40 per cent. Evidences have been coming out of late that the trade reports have tended to underestimate the rate at which the independent steel companies are operating. It is very difficult to make accurate estimates because plants and departments are starting and stopping all the time. Perhaps the personal element enters, by each independent objecting to its full production being known, for fear its competitors would think it is cutting prices more than is the case. It should be noted that the monthly ingot report is not a precise guide to the total production because some steel interests do not report, and they may be operating at much higher or lower rates than are those that do report.

The West Leechburg Steel Co. has formally announced a price of 2.75c on hot rolled strip steel. The market has been difficult to quote of late, there being so few sales to define prices. Cold rolled strip can be done at about 5.70c, the nominal price being 6c.

## NEW YORK TOOL TRADE VERY QUIET

**No Improvement Noticed and Prospects Not Being Turned Into Business**

Special to CANADIAN MACHINERY.

NEW YORK, April 14.—Despite a promising number of "live" prospects—or at least inquiries that were thought to be "live"—the machine tool markets of the East are quieter than at any time this year, and that is saying a great deal. Very few orders are being placed, and such as there are come mostly from small manufacturers and are for single tools. The larger users of machine tool equipment are doing virtually nothing.

In some departments of industry there are signs of an improvement, particularly in the automobile, textile and shoe trades, but this betterment has not yet created any better demand for machine tools. In fact, most of the automobile companies apparently have about all of the equipment they will need for this year's production, and in some instances have more than they will need. Either they will become sellers of some of their surplus equipment or they will manufacture in their own plants automobile parts which heretofore have been supplied to them by other companies.

No doubt the present unsettlement in all metal working lines is due in considerable measure to the fact that the Steel Corporation has not yet announced its price policy. The fact that buyers are expecting a sharp reduction by the Steel Corporation has unsettled the steel market and it naturally follows that products made from iron and steel feel the same unsettlement.

Moreover, there can be no very active machine tool buying movement until general business has revived sufficiently to require the work that machine tools do. Yet if the inquiries which have come to the attention of machine tool builders and their representatives since the first of the year were all to be closed within, say, the next thirty days, there would be a fairly good volume of business.

## MUST WATCH THE CREDITS CLOSELY

**Some Firms Having Trouble with Collections That Used to Come as a Matter of Course**

"It is not simply a matter of selling now, but also watching the changing credits of various firms." According to the head of one Toronto firm of machine tool dealers this is the dual occupation of many of the fraternity just now. "I know of several cases where a very nice order can be secured at any time, but the trouble is with the financing of the deal. The buyer wants more in the way of terms than we are prepared to offer, nor does there seem to be much hope of getting assistance from the bank."

"There is also a wide variance in the collections. Some firms are paying just as promptly as they ever did, while in other cases they are looking for all sorts of excuses, and finding them, too. One of the oddest things we have come across happened when a firm refused to pay a bill long overdue; they claimed a machine previously put in would not do a certain operation. We looked through all the correspondence and found that this operation had never been mentioned. That machine had been paid for long ago and had nothing to do with the order under consideration. However, I made an offer of allowing a certain amount on the machine already in, and they promised to have a cheque down here by a certain day and hour. Well, we never got it What can you do in a case like that? We want to make conditions just as easy as possible, and yet we want our money. The firm a year ago was in splendid shape, and all right yet. We don't want to force matters, so there it rests. And in the meantime we have not got our money."

## URGES DEALERS NOT TO ALLOW STOCKS TO GET DOWN TOO LOW

One of the twist drill firms, in a little book recently issued, urges dealers not to allow stocks to run too low. It says in part:

Under the present trying business conditions, it is perhaps human nature to reduce stock inventories. But this retrenchment may be carried too far. We see examples of it every day.

In every line of business there are certain staple lines which are called for at all times. And these articles must be kept in stock or the business of the dealer must suffer.

This is especially true in the tool business.

There are certain lists and sizes that are in constant demand even when business is dull. If a dealer does not maintain adequate stocks, his trade is bound to fall off.

Look at it from the other fellow's point of view.

Perhaps he sends a messenger to you for a few common sizes of drills or reamers. The order is not large but the consumer must have these few tools immediately. You say, "I'm sorry but we are just out of this or that and I cannot fill your order right away. Just wait a little while though, and I'll send out and get it."

As a result the consumer's messenger must wait until you have sent out and gathered up the order. This waste of time in dollars and cents may be more than the actual value of the few drills.

Or to make the case even worse, the consumer may send his truck and driver to pick up this small order. Figure out for yourself the cost of keeping a big truck and its driver waiting for an hour or two while you go and obtain the few simple tools desired.

And what is the usual result?

As a rule the messenger or truck driver cannot wait. His time is valuable and although you may be able to supply some of the tools, he will not split the order. He goes to a dealer that can fill the order complete. This may be one of your greatest competitors who has shown foresight enough to keep a fair supply of the commonly called for tools on hand. As a result you lose the sale of the tools you had on hand and, what is more, the consumer having found out where he can get his orders filled goes there the next time he wants prompt service and he figures that your profit is legitimate only when you give him what he wants when he wants it.

## TOOK BACK THE LOW SHEET PRICE

**Hamilton Manufacturer Believes That Low Price in Black Sheets Has About Been Touched**

Hamilton.—That the bottom of the black sheet market is here, or not far distant, is the opinion of A. T. Enlow, president and general manager of the Dominion Sheet Metal Corporation.

Mr. Enlow had offers from several independent mills, quoting an attractive price on black sheets, of which he buys large quantities for putting through his galvanizing plant. A few days ago he received advice that the price was to be withdrawn, or that it had been withdrawn by some of the mills.

Fortunately, Mr. Enlow was able to cover his requirements when buying was at its best from his point of view.

Some of the prices that were being quoted on black sheets in the last few weeks undoubtedly represented figures that were below the actual cost of production.

**Make Screw Cutting Tools.**—Galt has a new industry in Hi-Speed Tools, Ltd., organized to manufacture screw cutting tools, taps, dies, gauges, standard and special punching, stamping and forming dies. They plan to be in full operation by May 1. The directors are: W. W. Champ, Regina, Sask., president; L. W. O'Connor, Galt, secretary and manager, and J. A. Johnston, Galt., vice-president. Harry Champ is factory manager. The company starts with a staff that has had much experience in this department of tool production. Machinery is now being installed in their temporary factory in a wing of the Perfect Machine building.

# SELECTED MARKET QUOTATIONS

**Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.**

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $26 00 |
| Lake Superior, charcoal, Chicago | 40 50 |
| Standard low phos., Philadelphia | 41 50 |
| Bessemer, Pittsburgh | 28 96 |
| Basic, Valley furnace | 26 00 |
| Toronto price:— | |
| Silicon, 2.25% to 2.75% | 39 25 |

## IRON AND STEEL

| Per lb. to Large Buyers | Cents |
|---|---|
| Iron bars, base, Toronto | $ 4 25 |
| Steel bars, base, Toronto | 4 25 |
| Iron bars, base, Montreal | 4 25 |
| Steel bars, base, Montreal | 4 25 |
| Reinforcing bars, base | 4 25 |
| Steel hoops | 5 50 |
| Tire steel | 5 00 |
| Spring steel | 8 00 |
| Band steel, No. 10 gauge and 3-16 in. base | 4 75 |
| Chequered floor plate 3-16 and heavier | 6 50 |
| Bessemer rails, heavy, at mill | 2 35 |
| Steel bars, Pittsburgh | 2 10-2 25 |
| Tank plates, Pittsburgh | 2 25-2 65 |
| Structural shapes, Pittsburgh | 2 25-2 45 |
| Steel hoops, Pittsburgh | 3 05 |
| F.O.B., Toronto Warehouse | |
| Small shapes | 4 50 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 3 48 |
| Structural shapes | 3 58 |
| Plates | 3 78 |
| Small shapes under 3-in. | 3 48 |

## FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

| | C.L | L.C.L. |
|---|---|---|
| Montreal | 58½ | 73 |
| St. John, N.B. | 84½ | 106½ |
| Halifax | 86 | 108 |
| Toronto | 38 | 54 |
| Guelph | 38 | 54 |
| London | 38 | 54 |
| Windsor | 35 | 50½ |

Current surcharge, 8 per cent.

## METALS

| | Gross. Montreal | Toronto |
|---|---|---|
| Lake copper | $18 00 | $17 50 |
| Electric copper | 17 50 | 17 50 |
| Castings, copper | 17 25 | 18 00 |
| Tin | 36 00 | 39 00 |
| Spelter | 7 75 | 7 50 |
| Lead | 6 50 | 7 50 |
| Antimony | 8 00 | 8 25 |
| Aluminum | 34 50 | 30 00 |

Prices per 100 lbs.

## PLATES

| | | |
|---|---|---|
| Plates, 3-16 in. | $5 00 | $4 75 |
| Plates, ¼ up | 4 50 | 4 25 |

### PIPE—WROUGHT

Standard Buttweld Pipe S/C

Per 100 feet.

| Size | Steel Blk. | Steel Galv. | Gen. Wrot Iron Blk. | Gen. Wrot Iron Galv. |
|---|---|---|---|---|
| ⅛ in. | $ 6 50 | $ 8 50 | $ .... | $ .... |
| ¼ in. | 4 89 | 6 99 | 5 91 | 8 01 |
| ⅜ in. | 4 89 | 6 99 | 5 91 | 8 01 |
| ½ in. | 6 50 | 8 03 | 7 96 | 9 48 |
| ¾ in. | 7 99 | 10 06 | 9 95 | 12 02 |
| 1 in. | 11 82 | 14 88 | 14 71 | 17 77 |
| 1¼ in. | 15 99 | 20 13 | 19 90 | 24 04 |
| 1½ in. | 19 11 | 24 06 | 23 79 | 28 74 |
| 2 in. | 25 72 | 32 38 | 32 01 | 38 67 |
| 2½ in. | 40 66 | 51 19 | ..... | ..... |
| 3 in. | 53 17 | 66 94 | ..... | ..... |
| 3½ in. | 67 62 | 84 18 | ..... | ..... |
| 4 in. | 80 12 | 99 74 | ..... | ..... |

Standard Lapweld Pipe S/C

Per 100 feet.

| Size | Steel Blk. | Steel Galv. | Gen. Wrot Iron Blk. | Gen. Wrot Iron Galv. |
|---|---|---|---|---|
| 2 in. | $29 42 | $36 08 | $35 71 | $42 37 |
| 2½ in. | 44 17 | 54 70 | 54 11 | 64 64 |
| 3 in. | 57 76 | 71 53 | 70 76 | 84 53 |
| 3½ in. | 69 46 | 86 02 | 85 10 | 101 66 |
| 4 in. | 82 30 | 101 92 | 100 83 | 120 45 |
| 4½ in. | 95 89 | 1 20 | 1 30 | 1 54 |
| 5 in. | 1 12 | 1 40 | 1 52 | 1 80 |
| 6 in. | 1 45 | 1 81 | 1 97 | 2 33 |
| 7 in. | 1 89 | 2 37 | 2 53 | 3 01 |
| 8L in. | 1 99 | 2 49 | 2 66 | 3 16 |
| 8 in. | 2 29 | 2 87 | 3 07 | 3 64 |
| 9 in. | 2 74 | 3 43 | 3 67 | 4 36 |
| 10L in. | 2 54 | 3 18 | 3 41 | 4 05 |
| 10 in. | 3 28 | 4 10 | 4 39 | 5 21 |

Prices—Ontario, Quebec and Maritime Provinces

## WROUGHT NIPPLES

4-in. and under, 50 per cent.
4½-in. and larger, 40 per cent.
4-in. and under, running thread, 20%.
Standard couplings, 4-in. and under, 20%
Dd., 4½-in. and larger, net.

## OLD MATERIAL

Dealers' Average Buying Prices

Per 100 Pounds.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $ 6 00 | $ 9 00 |
| Copper, crucible | 11 00 | 11 00 |
| Copper, heavy | 10 00 | 11 00 |
| Copper wire | 10 00 | 11 00 |
| No. 1 machine composition | 8 50 | 9 75 |
| New brass cuttings | 6 00 | 8 00 |
| Red brass turnings | 7 50 | 8 00 |
| Yellow brass turnings | 5 00 | 6 00 |
| Light brass | 3 50 | 5 00 |
| Medium brass | 4 00 | 6 00 |
| Scrap zinc | 4 00 | 4 00 |
| Heavy lead | 3 50 | 4 00 |
| Tea lead | 2 00 | 2 00 |
| Aluminum | 12 00 | 10 00 |

| | Per Ton | Gross |
|---|---|---|
| Boiler plate | $10 00 | $12 00 |
| Heavy melting steel | 9 00 | 14 00 |
| Axles (wrought iron) | 22 00 | 20 00 |
| Rails (scrap) | 12 00 | 14 00 |
| Malleable scrap | 12 00 | 20 00 |
| No. 1 machine cast iron | 28 00 | 25 00 |
| Pipe, wrought | 8 50 | 8 00 |
| Car wheel | 28 00 | 25 00 |
| Steel axles | 18 00 | 18 00 |
| Mach. shop turnings | 5 00 | 6 00 |
| Stove plate | 20 00 | 20 00 |
| Cast boring | 3 00 | 7 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent |
|---|---|
| Carriage bolts, 7-16 and up | Net list |
| Carriage bolts, ⅜" and less | 15 |
| Coach and lag screws | —20 |
| Stove bolts | 55 |
| Wrought washers | —25 |
| Elevator bolts | Net |
| Machine bolts, 7-16 and over | —5 |
| Machine bolts, ⅜-in. and less | —30 |
| Blank bolts | Net |
| Bolt ends | —5 |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | +25 |
| Machine screws, fl. and rd. hd., brass | Net |
| Machine screws, o. and fil. hd., brass | Net |
| Nuts, square, blank | +25 add $2 00 |
| Nuts, square, tapped | add 2 25 |
| Nuts, hex., blank | add 2 25 |
| Nuts, hex., tapped | add 2 75 |
| Copper rivets and burrs, list less | 27½ |
| Burrs only, list plus | 10 |
| Iron rivets and burrs | 37½ and 5 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, bright | 67½ |
| Wood screws, flat, brass | 55 |
| Wood screws, O. & R., brass | 55½ |
| Wood screws, flat, bronze | 50 |
| Wood screws, O. & R., bronze | 47½ |

## MILLED PRODUCTS

(Prices on unbroken packages)

| | Per Cent |
|---|---|
| Set screws | Less 40% |
| Square and hexagon head cap screws | Less 30% |
| Round head cap screws | Plus 10% |
| Fillister head cap screws | Less 10% |
| Flat head cap screws | Net list |
| Button head cap screws | Plus 10% |
| Studs | Less 20% |
| Semi-finished nuts up to and including 1-in. | Less 35% |
| Semi-finished nuts 1⅛ to 1½" | Less 30% |
| Semi-finished nuts 1⅝ to 2 in. | Net list |
| Coupling bolts | Plus 10% |
| Taper pins | Less 40% |
| Planer bolts without fillet | Plus 40% |
| Planer bolts with fillet | Pus 50% |
| Patch bolts | Plus 80% |
| Hollow set screws | Plus 20% |
| Thumb screws | Less 35% |
| Thumb nuts | Less 65% |

## BILLETS

F.O.B. Pittsburgh.

| | Per gross ton |
|---|---|
| Bessemer billets | $43 50 |
| Open-hearth billets | 43 50 |
| O.H. sheet bars | 47 00 |
| Forging billets | 48 50 |
| Wire rods | 57 00 |

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails, base | $5 10 |
| Cut nails, base | 5 75 |
| Miscellaneous wire nails | 50% |

## ROPE AND PACKING

| | |
|---|---|
| Plumbers' oakum, per lb. | 0 10¼ |
| Packing, square braided | 0 38 |
| Packing, No. 1 Italian | 0 44 |
| Packing, No. 2 Italian | 0 36 |
| Pure Manila rope | 0 26 |
| British Manila rope | 0 20 |
| New Zealand hemp | 0 20 |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | Net |

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | $ 0 25 |
| Solder, guaranteed | 0 27 |
| Soldering coppers, lb. | 0 62½ |
| White lead, pure, cwt. | 17 00 |
| Red dry lead, 100-lb. kegs, per cwt. | 13 00 |
| Linseed oil, boiled, single bbls. | 1 03 |
| Wood alcohol, per gal. | 2 75 |
| Whiting, plain, per 100 lbs. | 3 00 |

### CARBON DRILLS AND REAMERS

| | |
|---|---|
| S.S. drills, wire size | 40 and 5 |
| Can. carbon cutters, plus | 10 |
| Standard drills, all sizes | 40 and 5 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 and 5 |
| Bit stock | 50 |
| Ratchet drills | 10 |
| Pure turp., single bbls., gal. | 1 20 |
| Linseed oil, raw, single bbls. | 1 00 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 50 |
| Sleeves | 50 |
| Taper pin reamers | 25 off |
| Drills and countersinks | Net |
| Bridge reamers, carbon | 50 |
| Centre reamers | 5 |
| Gasoline, per gal., bulk | 0 42 |
| Chucking reamers | Net |
| Hand reamers | 10 |
| High speed drills, list net to plus | 20 |
| Can. high speed cutters, net to plus | 10 |
| American | plus 40 |

### COLD ROLLED STEEL

[At Warehouse]

| | |
|---|---|
| Rounds and squares | $7.00 base |
| Hexagons and flats | 7.00 base |

### IRON PIPE FITTINGS

| | Black | Galv. |
|---|---|---|
| Class A | 60 | 75 |
| Class B | 26 | 36 |
| Class C | 17 | 26 |

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 6 00 | $ 6 50 |
| Sheets, blue ann., No. 10 | 5 25 | 5 50 |
| Canada plates, dull, 52 sheets | 7 50 | 13 00 |
| Can. plates, all bright | 14 00 | ..... |
| Apollo brand, 10¾ oz., galvanized | ..... | ..... |
| Queen's Head, 28 B.W.G. | 10 75 | ..... |
| Fleur-de-Lis, 28 B.W.G. | 10 00 | ..... |
| Gorbal's Best, No. 28 | ..... | ..... |
| Colborne Crown, No. 28 | ..... | ..... |
| Premier, No. 28, U.S. | 8 25 | 8 50 |
| Premier, 10¾-oz. | 8 25 | 8 90 |
| Zinc sheets | 13 00 | 15 00 |

### PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13; 5-16, $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

### ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13; 5-16 in., $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

### FILES AND RASPS

| | Per Cent. |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 32½ |
| Black Diamond | 27½ |
| J. Barton Smith, Eagle | 50 |
| McClennand, Globe | 50 |
| Delta Files | 20 |
| Disston | 40 |
| Whitman & Barnes | 50 |
| Great Western-American | 50 |
| Kearney & Foot, Arcade | 50 |

### BOILER TUBES

| Size | Seamless | Lapweld |
|---|---|---|
| 1 in. | $26 00 | $..... |
| 1¼ in. | 27 25 | ..... |
| 1½ in. | 26 25 | 29 50 |
| 1¾ in. | 29 75 | 27 00 |
| 2 in. | 29 25 | 24 50 |
| 2¼ in. | 33 00 | 28 50 |
| 2½ in. | 44 75 | 32 50 |
| 3 in. | 49 25 | 40 00 |
| 3¼ in. | ..... | 48 50 |
| 3½ in. | 63 50 | 43 50 |
| 4 in. | 85 00 | 55 50 |

Prices per 100 ft., Montreal and Toronto

### OILS AND COMPOUNDS

| | |
|---|---|
| Castor oil, per lb. | — |
| Royalite, per gal., bulk | 28 |
| Palacine | 31 |
| Machine oil, per gal. | 58 |
| Black oil, per gal. | 27 |
| Cylinder oil, Capital | 1.01 |
| Petroleum fuel oil, bbls., net | 11.2 |

### BELTING—No. 1 OAK TANNED

| | |
|---|---|
| Extra heavy, single and double | 15% |
| Standard | 15 and 10% |
| Cut leather lacing, No. 1 | 2 00 |
| Leather in side | 2 40 3 00 |

### TAPES

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES

| | |
|---|---|
| Polishing wheels, felt | $4 50 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, Turkish | 8¾ |
| Pumice, ground | 06 |
| Emery glue | 30 |
| Tripoli composition | 9½ |
| Crocus composition | 12 |
| Emery composition | 11 |
| Rouge, silver | 64 |
| Rouge, powder, nickel | 38 |

Prices per lb.

### ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | 8½ |
| Grits, 80 and finer | 6 |

### BRASS—Warehouse Price

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 30 |
| Brass sheets, 24 gauge and heavier, base | 38 |
| Brass tubing, seamless | 42 |
| Copper tubing, seamless | 44 |

| | | | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 19 |
| Peerless | 22 | X Empire | 15 |
| Grand | 21½ | Ideal | 18 |
| Superior | 21½ | X Press | 13½ |
| X L C R | 16½ | | |

### WASTE

**Colored**

| | | | |
|---|---|---|---|
| Lion | 13½ | Popular | 10½ |
| Standard | 12 | Keen | 9 |
| No. 1 | 14 | | |

**Wool Packing**

| | | | |
|---|---|---|---|
| Arrow | 35 | Anvil | 22 |
| Axle | 28 | Anchor | 17 |

**Washed Wipers**

| | | | |
|---|---|---|---|
| Select White | 20 | Dark colored | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

### RUBBER BELTING

| | | | |
|---|---|---|---|
| Standard | 10% | Best grades | 15% |

### ANODES

| | |
|---|---|
| Nickel | .55 to .60 |
| Copper | .38 to .40 |
| Tin | .70 to .70 |
| Zinc | .16 to .17 |

Prices per lb.

### COPPER PRODUCTS

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | $30 00 | $34 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 32 00 | 38 00 |
| Copper sheet, tinned, 14 x 60, 14 oz. | 38 00 | 42 00 |
| Copper sheet, planished, 16 oz. base | 44 00 | 48 00 |
| Braziers', in sheets, 6 x 4 base | 36 00 | 41 00 |

### LEAD SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $ 9 50 | $14 50 |
| Sheets, 3½ lbs. sq. ft. | 9 25 | 14 00 |
| Sheets, 4 to 6 lbs. sq. ft. | 9 00 | 13 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS

| | |
|---|---|
| Acid, boracic | $ .25 |
| Acid, hydrochloric | .03¾ |
| Acid, nitric | .10¼ |
| Acid, sulphuric | .03¾ |
| Ammonia, aqua | .20 |
| Ammonium, carbonate | .23 |
| Ammonium, chloride | .22 |
| Ammonium, hydrosulphuret | .75 |
| Ammonium sulphate | .30 |
| Arsenic, white | .18 |
| Copper, carbonate, annhy. | .35 |
| Copper, sulphate | .10 |
| Cobalt, sulphate | .20 |
| Iron perchloride | .62 |
| Lead acetate | .30 |
| Nickel ammonium sulphate | 16½ |
| Nickel carbonate | .30 |
| Nickel sulphate | .17½ |
| Potassium sulphide (substitute) | .40 |
| Silver Chloride (per oz.) | 1.15 |
| Silver nitrate (per oz.) | 1.10 |
| Sodium bisulphate | .13 |
| Sodium carbonate crystals | .04 |
| Sodium cyanide, 127-130% | .39 |
| Sodium hyposulphite per 100 lb. | 6.50 |
| Sodium phosphate | .15 |
| Tin chloride | .80 |
| Zinc chloride, C.P. | .30 |
| Zinc sulphate | .08 |

Prices per lb. unless otherwise stated



# INDUSTRIAL NEWS

## NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES



## MUCH DEPENDS ON FARM CROPS

**Brantford Manufacturer Has Contract for Turning Out a Small Farm Engine**

A. A. Goodwin, president of the Ker & Goodwin Machinery Co., Ltd., of Brantford, when asked for his opinion on the business outlook, informed Canadian Machinery that as far as his business is concerned the prospects for a big increase depend entirely on the crop outcome in the West.

He is a keen student of market conditions and says that all indications point to this year's harvest being the greatest that Canada has ever produced.

Mr. Goodwin says that 33 1-3 per cent. more land will be under cultivation this year over last, and this, together with the snowfalls that are now being experienced in the wheat belt, point to a banner year for Canada's great West. Mr. Goodwin further informed Canadian Machinery that while general machine work is inclined to be slack they have just signed contracts with the Renfrew Machinery Co. and A. R. Williams, of Toronto, for the sale of a large number of the Hvid type, Brantford oil engines that they are manufacturing. These are unique little engines, especially adaptable for farm use, and are constructed along Diesel lines, having no spark plugs, coils, magnetos, batteries, wires, switches or carburetors, and using crude oil or kerosene for fuel.

## MANY TENDERS BUT FEW ORDERS

**How Some of the Galt Firms Are Doing in These Days of Reconstruction**

GALT.—Mr. Goldie, of the Goldie, McCulloch Co. of this city, when interviewed on the subject of market conditions said present business is decidedly slack. His company has $750,000 worth of tenders out at the present time but has small hopes of this resulting in orders until such time as a reduction of wages, coupled with a showing of more energy on the part of the workers, and a steady market would offer more inducement for building operations.

Just when these conditions would come about Mr. Goldie could not say, but felt that the coming summer would bring forth a change for the better. The need of immediate construction work is great and it only remains for a restoration of public confidence through the adjustment of the wage question and the settling of the market to see work commenced on a large scale.

### A Busy Shop Here

W. D. Sheldon, of Sheldons, Ltd., said his plant has not lost an hour as yet. Orders are continuing to come in and if present conditions hold Mr. Sheldon says that this will be one of the best years of business his firm has ever enjoyed.

### Hinges on Steel Corporation

Mr. Cowan, president of Cowan & Co., manufacturers of woodworking machinery, told this paper he felt that the results of the annual meeting of the United States Steel Corporation at the end of the present month would affect conditions to a great extent. If, as expected, steel prices take a drop, Mr. Cowan thinks that construction work will begin to move, especially so if the worker can be made to realize that he must speed up his productive powers.

### His Unlucky Day

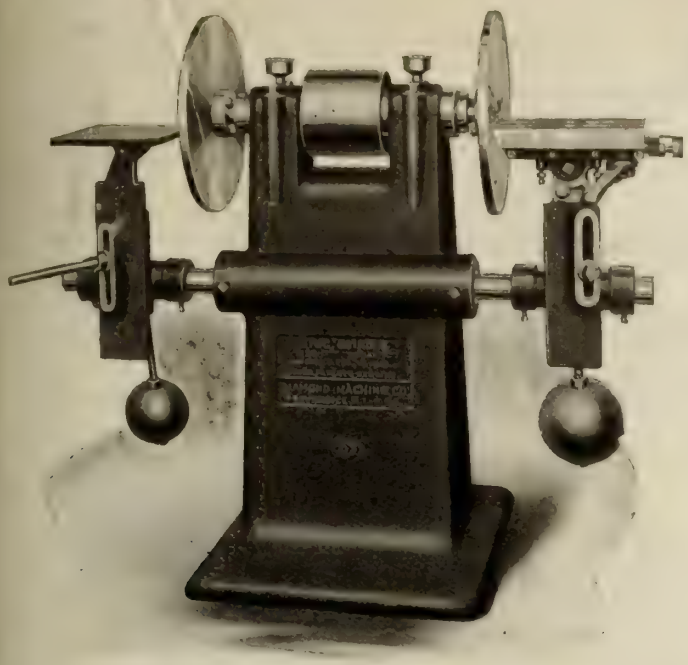
April 5 proved to be an unlucky day for John Turnbull, a shareholder and superintendent of the Shirley, Deitrich Co., Ltd., of Galt.

Mr. Turnbull was doing some experimental work on a thin bevel edge emery wheel when the little finger on his left hand got caught in some manner between the wheel and the rest, causing him to lose his finger close to the hand. For a man well on to sixty years of age Mr. Turnbull showed remarkable fortitude. He took the rest of the day off but when the writer called the day after the accident Mr. Turnbull was back on the job, superintending operations with his hand and arm in a sling.




—Orr in the Chicago "Tribune."

DESTROYING THE SEED OF PROGRESS.



# DIAMOND
## DISC GRINDERS

Good grinding in fast time has made the Diamond popular in a host of shops. The right design and build eliminate vibration and give the operator a perfect surface every time. There is a suitable size and equipment for every surface grinding job you have. Workmanship and material of "Diamond" quality throughout.

May we send you catalogue?

**The A. R. Williams Machinery Company, Limited**

ST. JOHN, N.B.
WINNIPEG, VANCOUVER

*If It's Machinery, Write "Williams"*

64 Front Street West
TORONTO

## Pig Iron Market

The March pig iron statistics show the greatest shrinkage in output in all the months of the decline, and the production during the last week has been the smallest on record in proportion to the country's capacity.

An inquiry has been put out on the Pittsburgh market by the Oil Well Supply Co., for 1,000 to 2,000 tons of foundry iron for delivery between now and July 1st, and the American Radiator Company is asking prices on a total of 7,600 tons of foundry iron for early delivery at its several plants. Neither inquiry has been closed and there is some doubt whether all of the iron asked for will be placed in the near future.

The average prices for basic and Bessemer iron from Valley furnaces in March, as compiled by W. P. Snyder & Co., were $24.50 for basic and $26.50 for Bessemer, as compared with $25 and $27 respectively in February.

While buying is still much below normal at Chicago, there are indications of improvement. Some of the foundries serving the automobile industry are again getting busy.

Cincinnati reports the dullest week for the past year, even carload orders being very few.

One iron maker on the Birmingham market reports a large number of small orders, but no large ones, during the past week. He also shipped as much iron as one furnace made. The $25 base seems to have stood pretty well, being shaded only in case of close competition.

The Buffalo market has improved slightly during the last week. One interest has started another blast furnace and another intends to start an open hearth within a few days.

One company reports inquiry for 4,000 tons of pig iron.

## Scrap Metal Market

The decline in prices on scrap material is still unchecked. Melters almost without exception in the Pittsburgh district are out of the market, and dealers who have yards appear to have all the funds they care to have tied up employed in the tonnages now lying in their yards.

The market at Chicago received a slight stimulus during the past week as a result of the cleaning up of old contracts for heavy melting and malleable which expired with the end of the month.

The small amount of business transacted at New York in scrap material indicates that prices are still descending.

Cleveland reports practically no change in the scrap market. A local mill has purchased a few small lots of heavy melting steel at $12 to lay down in its yard, and turnings are being purchased by dealers in small lots for yard stocks at $6 and $7.

The scrap market continues to be dull at St. Louis, but dealers are beginning to pick up some scrap to lay down in their yards.

Owing to the prices of all grades of scrap dropping so low at Philadelphia only forced sales are being made.

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**Want Equipment.**—The Crown Furniture Co., Ltd., of Preston, Ont., are building an addition to their plant to accommodate a new machine shop, which will be built to handle the manufacture of filing systems. Roy McMullen, who is mechanical superintendent of the Crown Furniture Co., informed this paper that they would be in the market within the next two months for the following equipment: six turret lathes, an engine lathe, universal grinder, surface grinder, milling machine and some other small accessories.

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One million pounds of copper has been imported by the Canada Wire and Cable Works, Leaside, Ont., from the Anaconda Mines, Montana, for the manufacture of wire.

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The Vulcan Iron Works, Ltd., Winnipeg, have received the contract for the miscellaneous and ornamental iron work for the Technical School, Calgary. The general contractors are the J. McDiarmid Company.

# LET GERMANY WORRY OVER THE PAYING OF THE DEBT TO THE ALLIES

WRITING to Canadian Machinery, John S. Watts, M.E., of New Glasgow, N.S., says:

While I have not been requested to express an opinion upon the advisability or otherwise of trading with the enemy (the German is still in actual fact, although not legally so, our enemy), I am impelled to butt into the discussion because of my studied conviction that such trading will tend to our own undoing in the not far distant future.

The main argument brought forward by those who advocate resuming commercial relations with Germany is that unless we do so Germany will be unable to pay the reparation which is demanded from her. For the sake of argument, let us assume that this is correct. To get our indemnity then, we must purchase sufficient goods from Germany to permit them to repay to us the damages assessed against them, out of the profits on such sales. Taking the average net profit on the transactions at the comparatively high figure of 10 per cent., the Allies will be compelled to purchase goods in Germany to the value of at least ten times the amount of their claim against Germany, which would simply make Germany the workshop of the world and leave the rest of us without employment.

If we trade with Germany, there must perforce be profit in the trade for Germany, and if unrestricted trade is allowed we will soon have Germany again the menace to the peace of the world that she was in the years before 1914. It is impossible in the space of a short letter to prove this statement, but it will not, to any who have really studied the matter, need proof.

To those who are laboring under the delusion that the German will refrain from using any force at his command to steal the wealth of other countries, or that he is now, or ever has been, other than a predatory barbarian, with a penchant for stealing, I would recommend a study of the history of the Prussian people and of the writings of their statesmen.

Such a study will show that the Prussians, as far back as we can trace them in history, have always existed mainly by the plunder forcibly stolen from their weaker neighbors.

That they are a brutal people, cruel to those in their power and servile to those who are stronger.

That they intend to gather their strength again for another effort to conquer, we have their own statements to prove.

That they have shown no symptoms of repentance for the vile outrages and unspeakable abominations committed by them during the war, and will repeat them any time they are powerful enough to do so.

In conclusion I would suggest that we cease to worry over how they are to pay the indemnity, let the Hun do the worrying, and if we keep him under the control of superior force I am sure he will find a way to pay. Anyway, when a criminal is fined, the judge does not have to consider how the criminal is to finance the fine, it is up to the guilty party to find the money, as best he can, or suffer the penalty, and there is no reason why the greatest criminals of all time should be treated more leniently. Let us have at least the intelligence, after having been "once bit, to be twice shy."

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# SCOTTISH SCRAP MARKET IS POOR

**Nearly All the Prices Are Lower Than Those Which Were Quoted Before the War**

Writing to Canadian Machinery on conditions of the scrap market in Scotland, James Johnstone & Son, 212A St. Vincent Street, Glasgow, state:

Since last writing you the market for scrap has completely collapsed, owing largely to competition from the Continent. The iron and steel works here have very few orders on hand, and several of the leading works have not melted anything this year, and the others are only working a small proportion of their furnaces. Consequently the only buyers of scrap are some merchants who are inclined to buy in the hope that prices will advance later on. Present prices are as follows:

| | Per ton |
|---|---|
| Heavy mild steel melting scrap | £3 0 0 |
| Heavy wrought iron scrap | £4 0 0 |
| Heavy steel turnings | £1 15 0 |
| Cast iron borings | £1 0 0 |
| Heavy machinery metal | £7 0 0 |
| Light metal | £4 10 0 |

Nearly all of these prices are lower than they were before the war. Very few transactions are now taking place and only for small quantities.

---

# $2,000 IS AVERAGE OF THE SYSTEM

**Some Figures Showing Where Wage Bill of the National Railways Has Gone**

Speaking before the Canadian Club, D. B. Hanna, chairman of the Canadian National Railways, quoted figures to show the tremendous increase in wages and the cost of materials with which the management had been confronted. At the present rate the average wage of every man, woman and office boy employed by the company would be $2,0 for 1920 contrasted with $709 ten ye ago. Yet if the Canadian Railways w allowed to charge the same freight ra as the Government owned lines of So Australia he would undertake to pay 5 per cent. on all capital invested, 5½ cent. on the Canadian national debt a have a round hundred millions to good. He did not suggest such rat but was there any reason why railwa shouldn't be allowed to live? Mr. H na's address made a deep impression his audience and he was frequen applauded.

---

# Trade Gossip

A belt dressing factory is being bu by J. W. Bowden, 164 Cottingham Str Toronto.

* * *

Jarry Bros., 2828 St. Lawrence Bl Montreal, are planning to build a gar on Beaubien St.

* * *

Lanagan Bros., Strathroy, Ont., having plans prepared for the erection a garage costing $7,000.

* * *

The erection of a warehouse at C tierville, Que., is contemplated by J. Leger, 291 Monkland Blvd., Montreal.

* * *

The erection of freight shed and provements to station is planned by Amherstburg Hydro Electrical Railw

* * *

Plans are being prepared by H. V lance, architect, 128 Bleury St., for sh rooms and general offices for Crane, L St. Patrick St., Montreal.

* * *

The general contract for the constr tion of a garage costing $7,000 for International Harvester Co., 217 Y St., London, has been awarded to R. Wilson & Sons, 193 College St.

* * *

The Ruggles Motor Truck Co., Don ion Savings Building, East London, O are contemplating the erection of an dition to their factory.

* * *

Mr. McFadden, one of the Onta representatives of the Diamond St Fibre Co. of Canada, is in the hosp at Port Hope suffering from pleurisy.

* * *

The Hamilton Bridge Works Co., L have received the general contract for construction of superstructure of s bascule bridge for Dominion Governm at Burlington, Ont.

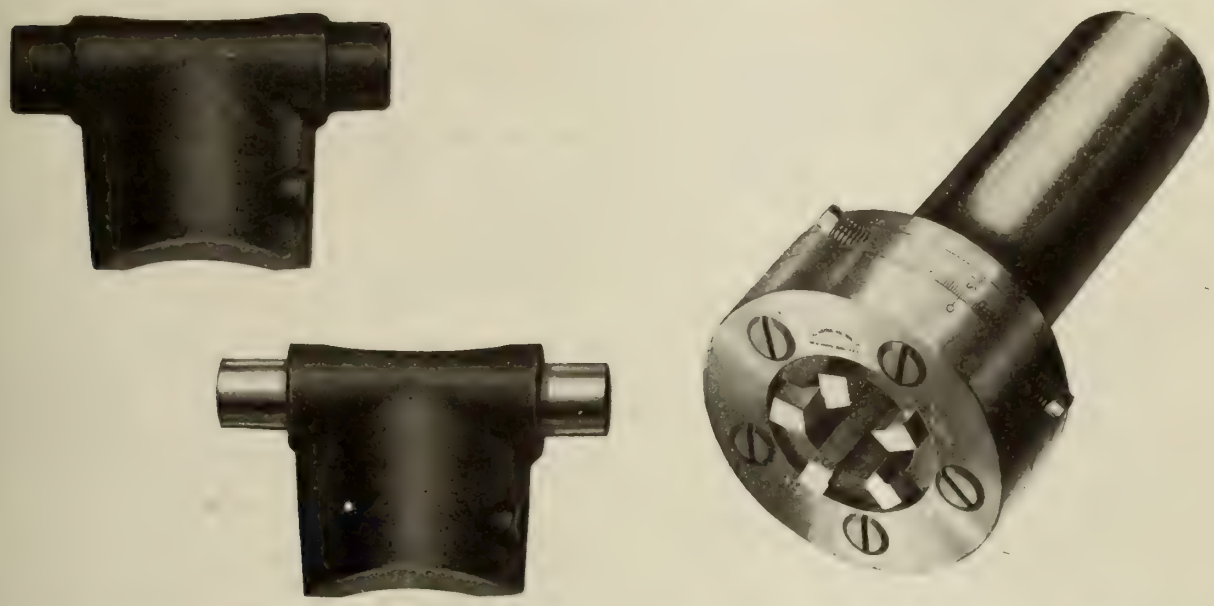
* * *

C. W. Northcott, manager of the gina branch of the Goold, Shapley Muir Co., Ltd., Brantford, has been p moted to the position of general sa manager at Brantford. He will have pervision over all sales, both east west, and jurisdiction over West Canada.

Right on the Lead

# 2,000 A DAY

## 1/16" TURNED DOWN ON 2,000 DROP FORGINGS WITH A GEOMETRIC ADJUSTABLE HOLLOW MILLING TOOL



There is an extensive quantity of milling that is done with great economy by the use of GEOMETRIC ADJUSTABLE HOLLOW MILLING TOOLS.

Like all other Geometric Tools, the Hollow Mill is regarded as superior at home and abroad. A Sydney (New South Wales) man volunteers the good information that he has used different styles of GEOMETRIC DIE HEADS and GEOMETRIC HOLLOW MILLS quite a lot, and after cutting threads under all sorts of conditions with all sorts of methods on his side of the world and in England, he has arrived at the conclusion that the GEOMETRIC WAY CANNOT BE EQUALLED.

The Geometric Hollow Mills provide an efficient and economical method of reducing duplicate parts to an exact diameter prior to threading and for brass finishing.

Send for the Geometric Adjustable Hollow Milling Tool Booklet if you are interested, for it tells what these tools are doing.

**THE GEOMETRIC TOOL COMPANY**
**NEW HAVEN CONNECTICUT**

***Canadian Agents :***

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto; St. John, N.B.; Halifax, N.S.

*If interested tear out this page and place with letters to be answered.*

# The National Acme Plant's Bonus System

## Several Objects In View, Among Them Being the Securing of Regular Attendance—All Must Co-operate in Order to Secure Conditions That Make the Payment of the Bonus Possible

THE payment of premiums to industrial workers for maintaining or exceeding a predetermined quantity production on a certain article is now recognized as one of the best methods of obtaining the full co-operation of the employees in solving the problem of manufacture. The varied character of the pieces produced, together with the different classes of machines and equipment necessary for production, makes it almost impossible to duplicate premium payment plans in other shops, but the principle involved is generally such that slight modifications of the details may be made so that a satisfactory working plan can be devised to conform to any or all conditions.

Early in January of this year the National Acme Co. inaugurated a premium payment plan, at their Montreal plant, that has been favorably received by the workmen, and its operation, so far, has been very successful and entirely satisfactory both to the employees and to the company. The scheme is being tried out first in connection with automatic and nut machine operators and helpers. Provision is also made to include those employees indirectly associated with the successful operation of the premium system. This is a very important factor in securing maximum efficiency from any proposed plan of this character, as the co-operation of everyone in the plant is required to maintain the spirit of harmony essential to the success of an undertaking of this kind.

### Based on Month's Work

Linemen, machine repair men and assistant foremen, who are more or less responsible for the production obtained, are rewarded on the standard of efficiency shown for the month by the department in which they are employed. These awards are made once a month and the amount of the premium is reckoned on a basis of from 10 to 15 per cent. of their month's salary, provided there has been no wilful absence from their regular duties during that period.

Regarding the actual machine operations, the operator and his helper are expected to supervise the running of four machines, and the premium system in force is of a graded character, being increased as the estimated output is obtained on two or more machines. If scheduled production is maintained on the four machines, it is possible for the operator to obtain $1.65 and the helper $1.10 over their regular day rate. Helpers are required to qualify to the satisfaction of the department foreman before they are entitled to participate in the premium payments.

Premiums are not allowed to either operator or helper for any part of the full day less than 9½ hours, for a working day of 10 hours, or for less than 4½ hours on a Saturday half-day, even though the estimated production has been obtained, as one of the primary objects was to insure regular attendance at their work for the entire day. However, provision is made for the absence of one or the other; that is, should the operator be away for a greater period than one-half hour and the helper succeeds in getting the required output, the helper will receive his allotted premium, and vice versa.

If, for any reason, it is deemed necessary to reduce the working hours for the day, the premium schedule will be revised to conform to the changed conditions. On work that requires less than a two-day run premiums are not allowed, but work of this kind is distributed as evenly as possible amongst the different operators.

Where any premium plan is in operation there is the possibility, particularly where the class of work is of a varied character, of making errors in the original estimated production. If the production is underestimated the output is revised and the premium allowed on the new estimate. Should the initial estimate exceed the possibility of paying a premium, the company consider they have assumed a loss and no payment is allowed. Where alterations are made in the method of production, such as improved machines or re-tooling, revision of production rate is made and the premium based on the new estimate.

Operators are encouraged to suggest changes that will increase production but are not permitted to adopt their own ideas without the consent and approval of the department heads. Premiums are allowed only on work accepted by inspectors. If quantity or quality is in question, the matter is investigated by the production clerk, and his decision is final.

The success or failure of this plan is decidedly up to those interested, and the scheme may be discontinued at any time, when, in the opinion of the management, production does not warrant its continuance.

### TURNING TAPERS BY SETTING OVER THE TAIL STOCK

Tapers are usually given in "inches per foot" and include the total taper or difference in diameters unless otherwise noted. In turning tapers in the lathe it is necessary to consider the total length of the bar, whether the taper extends the whole distance or not, and to set the tail stock over just as though the taper extended the whole length.

If the taper is ¾ inch per foot as in pipe threads and the whole bar is 16 inches long, then the total taper is 1 inch and the tail stock must be set over ½ inch. There is nothing to remember except to set the tail stock over half the total amount if the whole bar was tapered at the same rate.

## MR. FIELD ON THE WAY TO TORONTO

F. W. Field, the British trade commissioner for Ontario, will be returning to Toronto from the United Kingdom, on SS. Olympic, leaving on the 6th of April. Mr. Field left Toronto in the middle of October last year, and during his stay in the United Kingdom he has interviewed over 540 British manufacturers interested in trade with Canada. He has addressed numerous chambers of commerce, rotary clubs, etc., and visited over forty factories and plants. The principal commercial and industrial centres in England, Scotland and Wales were visited and Mr. Field found a widespread interest existing amongst British manufacturers regarding trade conditions and prospects of doing business in the Dominion. It is anticipated that many United Kingdom manufacturers will be visiting Canada this year, with a view to establishing business connections.

During the period of the British Industries Fair Mr. Field was in attendance at the White City and met many buyers from Canada. The attendance at the fair was highly satisfactory, nearly 65,000 visiting the White City. Overseas buyers came from fifty different countries, from Chile and China, from Sweden and Singapore. While the bulk of the foreign buyers came from Europe, Holland, Switzerland, Belgium and Scandinavia being specially well represented, the attendance from the Dominions was also considerable and many American visitors were seen.

Considering the severe and universal nature of the present trade depression, the bookings in most sections of the fair were considered satisfactory. Many firms did exceptionally heavy business, but throughout the fair as a whole business was considerably below that of last year.

# ATKINS

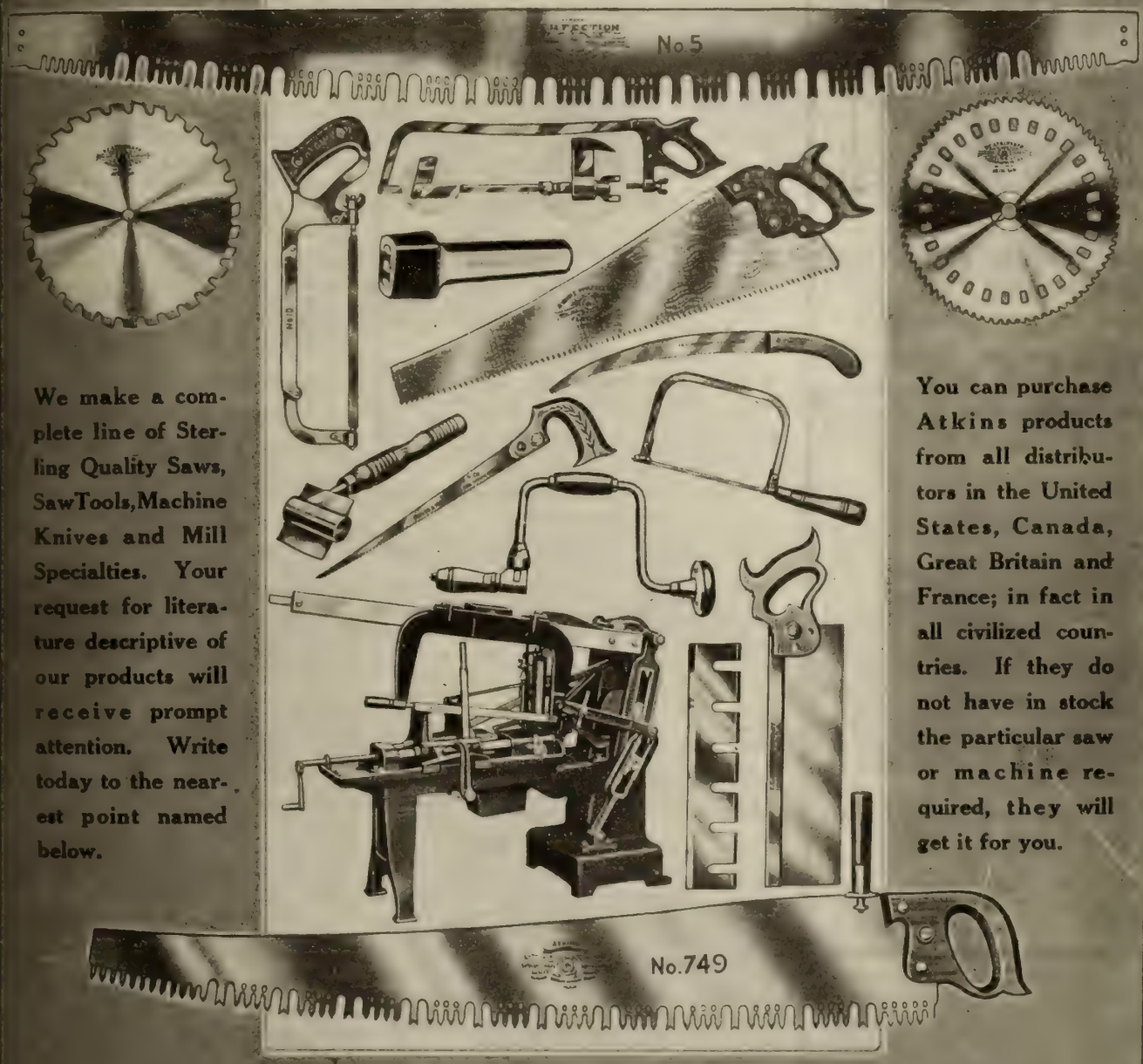
STERLING QUALITY

SAWS and TOOLS

A Perfect Saw for every Purpose

"Finest on Earth"

"Finest on Earth"




We make a complete line of Sterling Quality Saws, SawTools, Machine Knives and Mill Specialties. Your request for literature descriptive of our products will receive prompt attention. Write today to the nearest point named below.

You can purchase Atkins products from all distributors in the United States, Canada, Great Britain and France; in fact in all civilized countries. If they do not have in stock the particular saw or machine required, they will get it for you.

*If you have difficulty in obtaining Atkins Saws and other products through your regular service, write*

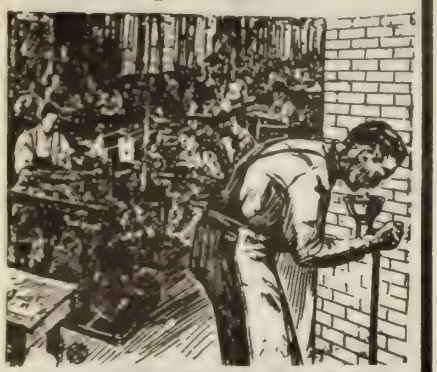
## E. C. Atkins & Company

Established 1857

*Canadian Factory:* HAMILTON, ONTARIO

*Branch:* VANCOUVER, B. C.

**Upon the Health of your employees depend your profit and production**



Don't be contented with half-way goodness or makeshift drinking arrangements.

**Throw out the germ-laden Drinking Cup!**

**Give your men a clean drink**

**PURO** SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)



Allows just the proper amount of cool, clean fresh water to come through the bubbler. No spurting, overflowing, no loss. "Puro" regulates itself. "Puro" saves 35% on water bills, too. You can attach it in a few minutes. Tell us how many men, how many departments and we'll tell you how much the cost will be.

**Puro Sanitary Drinking Fountain Co.**

*Canadian Agents:*

**McKENZIE BROS.**

888 F. St. Andre St., Montreal, P.Q.



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Send us your blueprints and specifications. Entrust your requirements to experienced workmen and up-to-date equipment. Have your dies made in Canada. First-class workmanship guaranteed.

THE KIMBER & HILLIER MFG. CO., Thorold Road, - St. Catharines, Ont.



**HAMILTON ENGINEERING SERVICE LIMITED**

*Consulting and Designing* — Tools, Jigs, Fixtures and Special Machinery. Let us shoulder your problems.

17 MAIN ST. EAST, HAMILTON


## NEW CATALOGUES

Those interested in any of the catalogues described below can procure a copy of the same by writing direct to these firms. Mention that you noticed this in Canadian Machinery.

### CRANE PAMPHLET

The Shepard Electric Crane & Hoist Co., Montour Falls, N.Y., have issued a pamphlet dealing with their transfer cranes. Illustrations are shown to prove their effectiveness.

### DRILL PAMPHLET

The Aurora Tool Works, Aurora, Ind., have issued a pamphlet dealing with their 28-in. ball bearing upright drill. Full particulars of the construction of this machine is shown, also three photographs of the same. Complete specifications are included.

### KELLER PRODUCTS

The Keller Pneumatic Tool Co., Grand Haven, Mich., have issued a pamphlet dealing with their line of riveting hammers, sand rammers and drills. These are well illustrated and data pertaining to the same are given. A list of Keller products is also included.

### REAMER DATA

The Gisholt Machine Co., Madison, Wis., have issued a booklet on the subject of reamers at work. This booklet contains examples of work performed and describes in detail this company's manufacturing reamers. It concludes with a list of the various sizes procurable.

### FORCING PRESSES

The Lucas Machine Tool Co., Cleveland, Ohio, have issued various pamphlets dealing with their line of power forcing presses. These range from 15 to 50-ton capacity and a full description is given of their construction. Interesting photographs are shown of these various presses.

### STOCK LIST

The Lyman Tube & Supply Co., Ltd., Montreal, have a good method of issuing their stock lists. Enclosed in the form of a piece of tube is to be found the various stocks on hand and the very appearance of the booklet attracts one to it, ensuring its receiving the proper attention.

### BOOK ON BLOWERS

The B. F. Sturtevant Co., Hyde Park, Boston, Mass., have issued a catalogue No. 276 which describes their Design 5 Turbo-Undergrate Blower. This book discusses first the subject of such a blower, then goes into details regarding its construction, installation, etc. The second part is devoted to the care and operation of such a blower. The third portion of the book takes up the method of ordering replacements or spare parts.

### STEEL BOOK

The Vanadium-Alloys Steel Co., Latrobe, Pa., have issued a new booklet dealing with their red cut superior high speed steel. The contents deal with heat treatment, forging, annealing, hardening, double preheating, drawing or tempering, pack hardening, and uses of this particular type of steel. There is also a drill and reamer section, a roll turners' department and other interesting portions to this book, including some tables that will be useful to anyone interested in steel of any kind.

### PRESS CATALOGUE

The V. and O. Press Co., Brooklyn, N.Y., have issued a catalogue dealing with their line of presses, dies and special machinery. This includes bench, inclinable, open back double action crank, double action cam punching, arch, horning and wiring presses also presses of the reducing and hand toggle type.

Roll feed and other attachments are illustrated, including dial feed and straightening devices, and dies and special machinery conclude the book.

### PNEUMATIC TOOLS

The Globe Pneumatic Engineering Co Ltd., London, England, have issued a catalogue dealing with their line of pneumatic tools and appliances. This book covers chipping hammers, caulking hammers, riveting hammers, sealing hammers, jam riveters, chisels, snaps, drilling machines reaming machines, tapping machines, wood boring machines, air compressors, surface grinders, hose couplings and other similar lines. This is a very complete catalogue and covers quite a representative line.

### PORTABLE TOOLS

The United States Electrical Tool Co Cincinnati, Ohio, have issued a catalogue dealing with their line of portable electric tools. Breast or hand drills of various styles are shown, also applications of the same. Portable stands for such drills are described, also a style of portable radial for heavier work. Electric screw drivers electric grinders, centre grinders, internal grinders, surface grinders, bench grinders buffers and heavier styles of floor grinders are included in this catalogue.

### PORCELAIN ENAMELING FURNACES

The Chicago Flexible Shaft Co., Chicago Ill., have issued a new catalogue No. 80 which deals in detail with various of their lines. Porcelain enameling methods and furnace construction are discussed, both from the metallurgical and practical shop standpoint. This information in itself is well worth while, and to anyone interested in furnaces the data is well worth preserving.

The remaining portion of the catalogue is devoted to muffle, oven, triple purpose and crucible furnaces, also forges, pressure blowers, pyrometers and various styles of burners. Some valuable tables are also included.

### HOW I FIXED IT

This is the title of a very interesting book issued by the Greenfield Tap & Die Corp. The method of gathering the information contained in the book is rather good For some time past this concern has been anxious to know definitely what jobs farmers were using their tools for, so through the medium of three farm journals, the offered prizes for the best stories of actual jobs performed. The result, of course, is the book, and it speaks well for the company's aggressiveness that the idea has reached such a successful compiling of real information, especially to the class the want to reach. In fact this book should be of interest to everybody in general as it shows unthought of uses for such articles as this company produces.

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### BOOK ON CAM DESIGN

The D. Van Nostrand Co., 8 Warren St., New York, have published a very interesting book entitled "Cam Design and Manufacture, by F. B. Jacobs." Canadian Machinery has had the pleasure of perusing this book, and a short portion from the preface is well worth repeating. "When cams are laid out by cut-and-dry methods they are noisy in operation create a vast amount of friction and are short-lived. On the other hand, if the curves are properly laid out, giving a possible time for the rises, the finishe

ams can be run at high speeds with very little noise or friction."

This briefly is the secret of successful cam design, and designers in general will no doubt welcome such a book, for complicated formulas have been eliminated in its preparation. The book is divided into seven chapters and is well illustrated throughout, both with photographs of modern machine tool equipment, and with line drawings showing mode of constructing various shaped cams. Following are the titles of the various chapters.

Machine cam design—gas engine cam design—cam followers—master cams—machine work on cams and cam cutters—cam cutting—while the last chapter is devoted to cam grinding.

Taken in all this book should be of real interest to anyone up against a cam problem of any nature, as the principle of any cam design is very clearly given.

## New Incorporations

General Forgings and Stampings, Ltd., has been incorporated to manufacture, sell and deal, etc., in automobiles, motor trucks, and vehicles of all kinds, with capital stock of $900,000 and head office at Merritton, Ont.

* * *

The Hercules Truck Company, Ltd., to take over the business formerly carried on by William Kerr and Enan Stanley Kerr, to manufacture, repair, etc., all kinds of trucks, automobiles, etc. Head office to be situated at Hamilton, Canada, and capital stock of $100,000.

* * *

The Happy Thought Foundry Co., Ltd., to carry on the business of manufacturers and dealers in furnaces, general machinery, iron founding, etc., with capital stock of $500,000 and head office at Brantford, Ont.

* * *

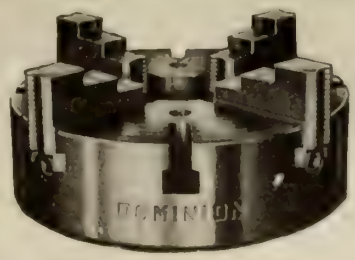
The Canadian Transit Co. with capitalization of $5,000,000 has been incorporated for the purpose of constructing and operating a railway and general traffic bridge across the Detroit River between Windsor and Detroit. The directors are given power to borrow money and issue bonds, etc., subject to and approved by the railway commission of Canada. They may not commence construction of the bridge until an act of the United States Congress has been passed approving the work.

### AUTOMATIC WARNINGS.

On one of the chief British railways nearly all the locomotives are fitted with an automatic device to warn the driver when the "home" or "distant" signals are against him. A crank is placed between the two sets of rails, and when the signals are not down it comes into contact with a lever on the engine, sounding the whistle and opening a small cock on the train pipe, thus putting on the brake. This mechanism is expected to raise still higher the standard of safety achieved in British railway operation.

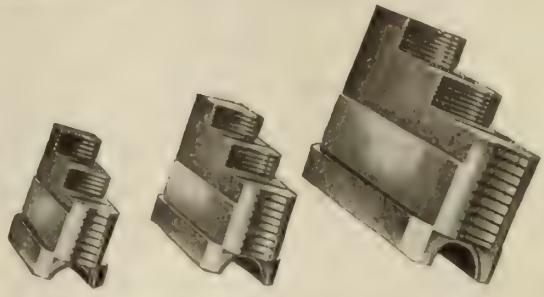
### HANDY FIXTURE.

The ordinary "breast drill" is one of the most familiar of hand-operated tools and is commonly employed in workshops where small holes have to be drilled only occasionally. It may often happen, however, that it becomes necessary to drill a number of detached pieces, which could be more easily handled by a light bench drill. At the same time, the volume of such work may not be sufficient to justify the purchase of a bench drill. To meet these conditions, a British firm of engineers has introduced a small fixture which enables the ordinary breast drill to be adapted as a bench drill. It consists of a pillar, which can be bolted to the fitter's bench, carrying two arms, one of which takes the thrust at the end of the spindle, the other virtually taking the place of the operator's left hand. The feeding of the drill is operated by a treadle so that the operator's hands are free to manipulate the work and turn the drill. The whole equipment is very simple and cheap.

DOMINION CHUCKS

STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY



The Jaws Are Extra Strong

THEY are drop forgings, made of best quality steel, heat-treated and hardened. The threaded portion of jaws form a half nut for the setting-up screws. Have stood the test of heavy duty work in our own shops where accuracy was the only accepted standard.

DOMINION STEEL PRODUCTS CO.
LIMITED
*Engineers • Manufacturers*
BRANTFORD, CANADA

3

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The old established firm. Patents everywhere. Head office, Royal Bank Bldg., Toronto. Ottawa office, 7 Elgin St. Offices throughout Canada. Booklet Free.

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OVENS
Japanning and Varnishing Ovens heated by Gas, Electricity, Steam or Coal. Kernchen Siphonage Ventilators, Bakers' Ovens, trucks, casters, etc. Write for Booklet.
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*Brantford, Canada*

PAPER MILL MACHINERY
BERTRAMS LIMITED
SCIENNES EDINBURGH

# Classified Opportunities

## MACHINERY WANTED

WANTED — ONE USED WATER CINDER mill. State length of time machine has been used, condition and where it can be examined. State lowest net price. G. W. McFarlane Engineering Limited, Paris, Ont.

WANTED—NEW AND RE-MANUFACTURED gas and gasoline engines, boilers, saw-mill machinery, planing mill and sash and door factory machinery. New and manufactured iron and wood-working machinery. Electric motors, dynamos, direct connected steam operated generators, portable electric tools. Builders' hoists, elevators. Box 739F, Canadian Machinery.

IF YOU HAVE IRON-WORKING OR WOOD-working machines for sale, or idle machine shop equipment, call or write Canada's largest dealers in new and used machinery. H. W. Petrie Limited, Toronto, Ont. (cfm)

GEARED POWER PRESS, 4" STROKE OR more.
No. 21 Power Press.
16" or 18" Bulldozer.
Bradley Hammer.
20" Shaper.
16" or 18" Lathe.
20" Drill.
500 to 800 lb. Drop Hammer.
State condition and prices. Box 748, Canadian Machinery.

WANTED — WOODWORKING MACHINERY and mining machinery, machine tools, boilers and steam pumps, alternating or direct current motors. Contractors' equipment. Apply Box 737F, Canadian Machinery.

### Machinery Wanted

Advertisements under this heading will be inserted once free of charge. Readers are invited to use this department when in need of equipment. Replies may be sent to box number, care of Canadian Machinery, if desired.

## MACHINERY FOR SALE

1—24" x 12' Canadian Machinery Lathe
2—22' x 10' Davies Lathes.
1—21" x 10' London Lathe.
6—20" x 8' C.M.C. Lathes.
1—18" x 8' Mueller Lathe.
3—19" x 8' C.M.C. Lathes.
1—18" x 8' London Lathe.
1—16" x 8' C.M.C. Lathe.
1—16" x 6' McDougall Lathe.
1—D-1 H. D. Colburn Drill.
2—No. 24 H. D. Foote-Burt Drills.
1—28" B. G. Barnes Drill.
1—22" B. G. Barnes Drill.
1—D.C. Compound Wound Generator, 110 Volts, 125 Amp.
2—No. 54 Perkins Sprue Cutters.
2—2" x 26" Pratt & Whitney Turrets.
1—10" x 52" Plain Landis Grinder.

**Write us for particulars and prices.**

**Box 751 F.**

**Canadian Machinery**

**Phone Park. 3550 House: Coll. 9660W**
**197 Clinton Street, Toronto**
**A. AUSTIN**
**GENERAL MACHINE WORK**
**Turret Lathe and Automatic Screw Machine a Specialty. Let us quote on your work.**
***With:*** **Garlock, Walker Machinery Co. 163 Dufferin Street.**

### Grey Iron Castings

Light and Medium-Bench and Floor Repetition Castings; Capacity 15 tons per day.
Expert Metal and Wood Pattern Work. Our advice and estimates will save you money.
Semi-finishing operations on Lathe or Grill on Castings supplied if required.
ASK US.
**THE KATIE FOUNDRY, GALT, ONT.**

### Modern Marine Machinery

Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering-Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

### Used Belting, Pulleys, Etc.

We carry right in stock a large quantity of used Belting, Pulleys, Hangers, Shafting, etc., in good condition, which we sell at half the price of new. Inquiries solicited. In writing mention sizes wanted. L. S. Tarshis & Sons, 92 Wellington St., Montreal.

## CLOSING TIME

Advertisements for this section must be in our composing room Tuesday morning prior to day of issue.

In order that the announcements of your wants, machinery for sale, etc., etc., shall not be delayed, please try to have them in our office with the Tuesday morning mail.

**Canadian Machinery**

## REGO WELDING *and* CUTTING APPARATUS

Oxygen, Acetylene, and a complete line of Welding and Cutting Supplies.

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Engine Lathes,
Gap Lathes,
Turret Lathes,
Wheel Lathes,
Axle Lathe,
Automatic Turret Lathes,
Milling Machines,
Metal Planers,
Punches and Shears,
Rotary Shears,
Angle Shears,
Beam Shears,
Gate Shears,
Plate Planer,
Rotary Planer,
Pneumatic Riveters,
Geared Presses,
Pipe Machines,
Plate Straightening Rolls,
Plate Bending Rolls,
Shapers,
Slotters,
Saws,
Band Saws,
Wood Planers,
Moulders,
Band Re-Saw Tenon Machine,
Wood Shaper,
Wood Lathes,
Buzz Planers,
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Etc., Etc.

*Used Machinery Dept.*

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21 x 8 LEBLOND, 3 step cone D.B.G., Q.C.G.
20 x 10 WALCOTT, 3 step cone D.B.G., Q.C.G.
20 x 10 REED PRENTICE, 3 step cone D.B.G., Q.C.G.
20 x 8 WALCOTT, 3 step cone D.B.G., Q.C.G.
18 x 8 MUELLER, 3 step cone D.B.G., Q.C.G.

### Miscellaneous

10 x 24 LANDIS Grinder, rebuilt, complete.
5-ton Pneumatic Hoist, 70-lb. pressure.
20" BARNES Drill, wheel and lever feed.
No. 9 HENDEY WHITMORE double end Punch and Shear, ½" in ½".
No. 4 Greenard Arbor Press, complete.
24" Shaper.
Bolt Cutter, solid head, ¼" to 1" capacity.
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LeBlond Cutter and Reamer Grinder.
16" Walcott D.B. Shaper.

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**Our present stock for immediate delivery is one of the largest in Canada.**

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1—30" x 12' "Blaisdell" (used).
1—30" x 14' "Niles-Bement-Pond" (used).
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1—24" x 10' "Milwaukee" (new).
1—18" x 8' Rae, Q.C.G. (new).
1—16" x 6' Reed, Q.C.G. (used).
1—12" x 8' "LeBlond" Tool Room (used).
1—12" x 6' Worcester, Q.C.G. (used).
1—8" "Rivett" with Cabinet, several attachments, (used).
1—7" Cataract Precision, several attachments (used).

**GAP LATHES**

1—38" x 54" x 12' Bertram (used).
1—22" x 40" x 16' McDougall (used).
1—21" x 30" x 7' South Bend.
1—20" x 38" x 12' C.M.C. (used).

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No. 4 Millhollands, capacity 1⅝" (used). Several Davis and other makes. Various capacities.

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1—16" "MacKenzie" B.G. Crank Shaper, (new).
1—16" "Rae" B.G. Crank Shaper (slightly used).
1—24" "McGregor-Gurley" B.G. Crank Shaper (used).

**PLANERS**

1—42" x 42" x 20' Putnam, 1 head (used).
1—30" x 30" x 10' Pond, 1 head (used).
1—24" x 24" x 6' Powell, 1 head (new).

**MILLING MACHINES**

1—Briggs High Duty, Type "A," 22" Traverse (new).
1—Briggs High Duty, Type "B," 42" Traverse (new).
1—Whitney Hand Miller, 18" x 6" table (used).
1—No. 3 Ford-Smith Plain (used).
1—No. 3 Ford-Smith Universal (used).
1—No. 4 Cincinnati Plain (used).

**DRILLS**

1—10" Burke Sensitive (Bench type) (new)
1—16" No. 2B Edlund H.S. Sensitive (new)
20" "Sibley," "Champions," "Rockwell" and "Silver" (new) and (used).
1—36" C.M.C. Heavy Duty (used).
1—3-spindle 20" Silver Gang Drill (used).
3—4-spindle W. & R. Sensitive (cap. ½") (used).

**BORING MACHINES**

1—66" Bement-Niles Vertical, 2 heads, 24" under rail (used).
1—Universal No. 2½ Horizontal Table, 42" x 22" (used).
1—Bullard "New Era" Vertical Turret, 36", complete equipment (new).

**POWER HACK SAWS**

1—No. 10 Racine 8" x 8" Cap. (new).
1—No. 7 Watkins 9" Cap., 18" Blade (used).
1—No. 1, 6" x 6" Racine (used).
1—No. 3 Robertson 6" x 6" (used).

**AIR COMPRESSORS**

1—8" x 8" Sullivan, Class W.G.-3, Belt driven (used).
1—8 x 10 x 8 Bury, Steam driven (used).
1—12" x 18" Ingersoll-Sargent, belt drive (used).
1—12" x 12" Can. Ingersoll Rand NE-1 (used).

**GRINDING MACHINES**

1—Landis No. 4 Universal (used).
1—Landis Plain, self-contained, 36" x 12" (used).
1—Fitchburg Cylindrical, 8" x 36" (new).
Several Tool and Cutter Grinders (new) and (used). "Globe," "Stevens," "LeBlond" and "Cincinnati."

**MISCELLANEOUS**

2—No. 4 Jno. Hall Pipe Machines (1 used) (1 new).
1—Lennox Rotary Bevel Shear, 1" Cap. (new).
1—"High Speed" Riveting Hammer, No. 3A (used).
1—Beaudry Champion Power Hammer, No. 9 (used).
1—"Grant" Rivet Spinning Machine, No. 80A, (new).
1—"Grant" Rivet Spinning Machine, No. 80B, (used).
1—Arbor Press, No. 4 "Greenerd" (new).

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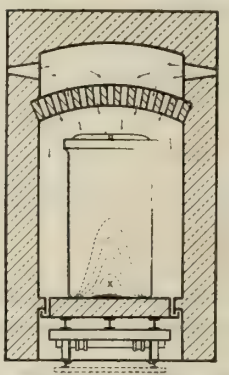
## USES and LIMITATIONS

of

Car Type and Car-and-Ball Type Furnaces

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are clearly defined in Bulletin 222-T



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Typical installations are shown to illustrate—

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Factors governing selection of the type (car or car-and-ball) best suited to individual manufacturing requirements.

Difference in design of each type.

Influence of unequal cooling on the quality of finished product.

*In brief, this bulletin is a discussion of principles which will appeal to those interested in furnace design, loading and handling methods, heat generation and utilization, etc.*

*Write for Bulletin 222-T*

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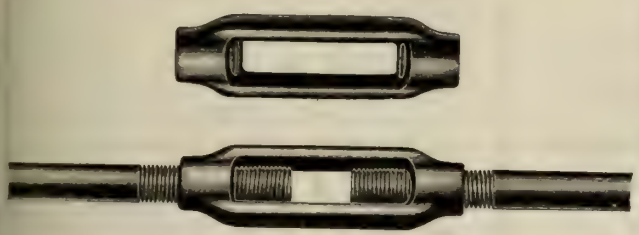


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# Canadian Machinery BUYERS DIRECTORY

**If what you want is not here, write us, and we will tell you where to get it. Let us suggest that you consult also the advertisers' index—last page of book, after having secured advertisers' names from this directory. The information you desire may be found in the advertising pages. This department is maintained for the benefit and convenience of our readers. The insertion of our advertisers' names under proper headings is gladly undertaken, but does not become part of an advertising contract.**

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Skinner Chuck Co., New Britain, Conn.

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British Smelting & Refining Co., Ltd., Montreal, Que.
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Hoyt Metal Co., Toronto, Ont.
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Canadian SKF Co., Toronto, Ont.
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Railway Roller Bearing Co., Syracuse, N.Y.

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McDougall Co., Ltd., R., Galt, Ont.

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Gisholt Machine Co., Madison, Wis.
Madison Mfg. Co., Muskegon, Mich.

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Vanadium Alloys Steel, Latrobe, Pa.

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Lyman Tube & Supply Co., Montreal, Que.
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Railway Roller Bearing Co., Syracuse, N.Y.

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Railway Roller Bearing Co., Syracuse, N.Y.

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Tallman Brass & Metal Co., Hamilton, Ont.

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Railway Roller Bearing Co., Syracuse, N.Y.

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Dom. Belting Co., Ltd., Hamilton, Ont.
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Graton & Knight Mfg. Co., Worcester, Mass.
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Ford Chain Block Co., Philadelphia, Pa.
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Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

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General Combustion Co. of Can., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Bolt and Nut Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Bolt and Nut Machinery, Automatic**
National Acme Co., Cleveland, Ohio.

**Bolts and Nuts**
London Bolt & Hinge Works, London, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Petrie, Ltd., H. W., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Bolt Threading Die Heads**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa

**Boosters**
Sturtevant Co., B. F., Boston, Mass.

**Boring and Turning Mills, Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.

**Boring, Drilling and Milling Machines, Horizontal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa.

**Boring, Drilling and Milling Mach., Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Boring Heads**
Aikenhead Hardware Ltd., Toronto, Ont.

**Boring Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill
Gisholt Machine Co., Madison, Wis.

**Brakes, Magnetic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Brass**
Brown's Copper & Brass Rolling Mills Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bricks, Fire**
Elk Firebrick Co. of Can., Ltd., Hamilton, Ont.

**Bridges**
Hamilton Bridge Works Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que

**Broaching Machines**
Bilton Machine Co., Bridgeport, Conn
Garlock-Walker Mchy. Co., Toronto, Ont

**Bronze**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bronze, Phosphor**
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bucket Carriers, Pivoted**
Can. Link-Belt Co., Toronto, Ont.

**Buffing or Polishing Machines (See Polishing and Buffing Machines)**
Blount Co., J. G., Everett, Mass.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Petrie, Ltd., H. W., Toronto, Ont.
U S Electrical Tool Co., Cincinnati, O.

**Bulldozers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Burners, Oil and Gas**
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

**Bushings**
Fisher Motor Co., Ltd., Orillia, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Cabinets, Oil**
S. F. Bowser & Co., Ltd., Toronto, Ont.

**Calipers**
Brown & Sharpe Mfg. Co., Providence, R.I
Starrett Co., L. S., Athol, Mass.

**Cams**
Canada Foundries & Forgings Co., Welland, Ont.

**Can-Making Machinery (See Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont
MacKinnon Steel Co., Sherbrooke, Que.

# BUYERS' DIRECTORY

Union Carbide Co of Can., Ltd., Welland, Ont.

**Cars, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Castings, Aluminum**
Canada Electric Castings Co., Ltd., Orillia
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Brass and Bronze**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Copper**
Can. Hanson & Van Winkle Co., Toronto, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Marine**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Castings, Die Molded**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Ferro-Alloy**
Can. Steel Foundries, Montreal, Que.

**Castings, Iron**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Hyd. Press**
Can. Steel Foundries, Montreal, Que.

**Castings, Monel Metal**
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

**Castings, Naval Bronze**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Nichrome**
Can. Driver-Harris Co., Walkerville, Ont.

**Castings, Nickel**
Can. Hanson & Van Winkle Co., Toronto, Ont.

**Castings, Semi-Steel**
Davidson Mfg. Co., Thos., Montreal, Que.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

**Castings, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

**Cements, Iron**
Smooth Mfg. Co., Jersey City, N.J.

**Centering Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Chains (See Sprockets and Chains)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chains, Driving**
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chasers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chemists**
Toronto Testing Laboratory, Toronto, Ont.

**Chucking Machines**
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Chucks, Drill**
Jacobs Mfg. Co., Hartford, Conn.

**Chucks, Drill and Tap**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Lathe**
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Magnetic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**
Columbia Hdwe. Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

**Cleaners, Metal, Waste, General**
Oakley Chemical Co., New York, N.Y.

**Clocks, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Clutches, Friction**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**
Can. Link-Belt Co., Toronto, Ont.

**Collars, Shaft or Set**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

**Collets**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compressors, Air**
Curtis Pneumatic Machinery Co., St Louis, Mo

**Compressors, Air and Gas**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**
Ford-Smith Machine Co., Hamilton, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Conveyor Belt Joiners**
Flexible Steel Lacing Co., Chicago, Ill.

**Copper**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Cored Bronze Bars**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Cotter Pins**
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Counterbores**
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Countershafts**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Couplers, Car and Locomotive**
Can. Steel Foundries, Montreal, Que.

**Couplings, Flexible**
Holden Co., Ltd., Montreal, Que.

**Couplings, Rigid**
Bernard Industrial Co., A., Fortierville, Que.

**Couplings, Shaft**
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

**Cranes, Electric**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.

**Cranes, Hand (See Hoists, Hand)**
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

**Cranes, Locomotive**
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Cranes, Traveling**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Crank Pin Turning Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia, Pa.

**Cutters, Flue**
Holden Co., Ltd., Montreal, Que.

**Cutters, Gear**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wi
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.

**Cutters, Milling**
Armstrong-Whitworth of Canada, Ltd Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence R.I.
Butterfield & Co., Inc., Rock Island, Qu
Can. Fairbanks-Morse Co., Ltd., Montrea
Cleveland Milling Machine Co., Clevelan
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wi
Morse Twist Drill & Machine Co., Ne Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.

**Cutters, Stay Bolt**
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, P.
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.

**Cutters, Thread**
Butterfield & Co., Inc., Rock Island, Qu
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Sprin field, Vt.
Landis Machine Co., Inc., Waynesboro, P

**Cutting-Off Machines**
Bertram & Son Co., Ltd., The Joh Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.
Garlock-Walker Mchy. Co., Toronto, On
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Cutting-Off Machines, Pipe (See Pi Cutting and Threading Machine**
Landis Machine Co., Inc., Waynesboro, P
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Bran ford, Ont.

**Cutting-Off Tools**
Armstrong-Whitworth of Canada, Ltd Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, I
Pilot Steel & Tool Co., Montreal, Que.

**Cutting Oil Filters (See Oil Filteris Systems)**
Bowser, S. F., & Co., Ltd., Toronto, Ca
Cataract Refining Co., Toronto, Ont.

**Cutting, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, On

**Cutting, Oxy-Hydrogen**
National Electro Products, Ltd., Toront Ont.

**Dealers, Machinery (See Searchlig Section)**
Ford-Smith Machine Co., Hamilton, On
Petrie, Ltd., H. W., Toronto, Ont.

**Deckle Straps**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Diamonds, Black and Rough**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond, Carbon and Bortz**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond Tools**
Aikenhead Hardware Ltd., Toronto, Ont
Can. Desmond-Stephan Co., Hamilto Ont.
Ford-Smith Machine Co., Hamilton, On
Wheel Trueing Tool Co., Detroit, Mich.

**Diamond Crossings**
Can. Steel Foundries, Montreal, Que.

**Die-Castings**
Tallman Brass & Metal, Ltd., Hamilto Ont.

**Dies, Pipe-Threading**
Jones & Lamson Machine Co., Sprin field, Vt.

**Die Sinking Machines, Automatic**
Jones & Lamson Machine Co., Sprin field, Vt.
Walcott Lathe Co., Jackson, Mich

**Die Sinkers**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Screw and Thread Cutting**
Ackworthie, Ltd., John, Birmingham, En
Butterfield & Co., Inc., Rock Island, Qu
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Sprin field, Vt.
Landis Machine Co., Inc., Waynesboro, P
Murchey Machine & Tool Co., Detroi Mich.
National Acme Co., Cleveland, Ohio.

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**
Armstrong-Whitworth of Canada, Ltd Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, On
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, On
Toledo Machine & Tool Co., Toledo, Ohi

# BUYERS' DIRECTORY

**Dies, Forging**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

**Dies, Hammer**
Kimber & Hillier, St Catharines, Ont.

**Dies, Self-Opening, Adjustable**
Can Fairbanks-Morse Co., Ltd., Montreal.
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt
Landis Machine Co., Inc., Waynesboro, Pa
Murchey Machine & Tool Co, Detroit, Mich
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Dies, Threading-Opening**
Jardine & Co, A. B, Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co, Inc., Waynesboro, Pa
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co, Detroit, Mich
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Disc Cement**
Ritchey Supply Co., Toronto, Ont
Wausau Abrasives Co., Chicago, Ill

**Dividing Heads**
Ackworthle, Ltd., John, Birmingham, Eng
Dickow, Fred. C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont
Hendey Machine Co., Torrington, Conn
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Dogs, Lathe and Milling Machine**
Armstrong Bros. Tool Co., Chicago, Ill

**Drafting Boards and Tables**
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co, Adrian, Mich.
Hughes Owens Co., Ltd, Montreal, Que

**Drafting Materials**
American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd, Montreal, Que.
Economy Drawing Table & Mfg. Co, Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que

**Dressers, Grinding Wheel**
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont
Ford-Smith Machine Co., Hamilton, Ont
Joyce-Koebel Co., Inc., New York, N.Y
Norton Co of Can., Ltd., Hamilton, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Drill Holders**
Armstrong Bros. Tool Co., Chicago, Ill

**Drill Rods**
Armstrong-Whitworth of Canada, Ltd., Montreal Canada
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Drill Speeders**
Canada Machinery Corp., Galt, Ont.

**Drilling Machine Heads**
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg Co, Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

**Drilling Machines, Automatic**
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind

**Drilling Machines, Bench**
Beacon Engineering Co., Tipton, England.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Henry & Wright Mfg. Co, Hartford, Conn.
Petrie Ltd, H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Electric and Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Can Fairbanks-Morse Co., Ltd., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Foss Machinery & Supply Co., Geo. F., Montreal Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Gang**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co, Bridgeport, Conn.
Garlock-Walker Mchy Co., Toronto, Ont.
Hoefer Mfg Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas Ont.

**Drilling Machines, Heavy Duty**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd, The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy Co, Toronto, Ont
Hoosier Drilling Mach. Co, Goshen, Ind
Rockford Lathe & Drill Co, Rockford, Ill.

**Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**
Canada Machinery Corp, Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co, Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Multiple Spindle**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

**Drilling Machines, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill

**Drilling Machines, Portable**
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago Ill
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co, Racine, Wis.

**Drilling Machines, Radial**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co, Geo. F, Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Drilling Machines, Sensitive**
Beacon Engineering Co, Tipton, England.
Bilton Machine Co, Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn
Herbert Ltd., Alfred, Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co, Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co, A. R, Toronto, Ont.
Wisconsin Electric Co, Racine, Wis

**Drilling Machines, Turret**
Gisholt Machine Co, Madison, Wis
Steinle Turret Machine Co, Madison Wis
Williams Machinery Co, A. R, Toronto, Ont.

**Drilling Machines, Vertical**
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont
Canada Machinery Corp., Galt, Ont.
Can Blower & Forge Co, Ltd, Kitchener
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy Co, Toronto, Ont
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg Co., Freeport, Ill.
Hoosier Drilling Mach. Co, Goshen, Ind
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co, Rockford, Ill.
Rockford Lathe & Drill Co, Rockford Ill.
Perfect Machine Co., Ltd., Galt, Ont
Terry & Co., John C., Birmingham, Eng
Steptinger Co of Can, Ltd, Chas A, Windsor, Ont.

**Drills, Center**
Butterfield & Co., Inc, Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co, Ltd, John, Ingersoll Ont.
Pratt & Whitney Co, of Canada, Ltd, Dundas, Ont.

**Drills, High Speed Twist**
Armstrong Whitworth Co of Can, Ltd, Montreal, Que
Butterfield & Co., Inc Rock Island, Que.
Can. Fairbanks-Morse Co, Ltd Montreal
Cleveland Twist Drill Co., Cleveland, O
Can Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F, Montreal, Que.
Garlock-Walker Mchy Co, Toronto, Ont
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co, Ltd, John Ingersoll, Ont.
Morse Twist Drill & Machine Co, New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que
Pratt & Whitney Co., of Canada, Ltd, Dundas, Ont.
Sheffield Engineering Supplies, Ltd, Montreal, Que.
Sheffield Twist Drill & Steel Co, Sheffield, Eng.

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill
Butterfield & Co, Inc, Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O
Morrow Screw & Nut Co., Ltd, John, Ingersoll, Ont.
Morse Twist Drill & Machine Co, New Bedford, Mass.

**Drills, Twist and Flat**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.

**Dust Handling Equipment**
Can. Blower & Forge Co., Ltd., Kitchener.
Skinner Bros Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Electrical Instruments**
Bristol Co., Waterbury, Conn.
Northern Electric Co, Montreal, Que

**Electrical Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co, Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O

**Elevating Trucks (See Trucks)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Elevators and Conveyors**
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que
Mathews Gravity Carrier Co., Port Hope, Ont.

**Emery Wheels (See Grinding Wheels)**
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Hart Products, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Ltd, Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Engines, Capstan**
Kennedy & Sons, Wm., Owen Sound, Ont

**Engineers, Mechanical**
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B, San Francisco, Calif

**Expanders, Tube**
Garlock-Walker Mchy Co, Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont
Petrie, Ltd., H. W., Toronto, Ont.

**Eyeglasses, Safety (See Goggles, Safety)**
Prest-O-Lite Co. of Can., Toronto, Ont
Willson Goggles, Inc., Reading, Pa.

**Fans, Electric**
Can. Blower & Forge Co., Ltd., Kitchener
Can. Fairbanks-Morse Co., Ltd., Montreal.
Northern Electric Co, Montreal, Que
Skinner Bros. Mfg. Co., Inc, St. Louis Mo
Sturtevant Co, B. F, Boston, Mass

**Fans, Exhaust**
Can. Blower & Forge Co, Ltd., Kitchener
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros Mfg. Co., Inc, St Louis Mo
Sturtevant Co., B. F., Boston, Mass.

**Fans, Ventilating**
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H W, Toronto, Ont.
Skinner Bros Mfg Co., Inc, St Louis Mo
Sturtevant Co., B. F., Boston, Mass.

**Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Northern Electric Co, Montreal, Que.

**File Handles**
Ingersoll File Co, Ltd, Ingersoll, Ont

**Files and Rasps**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F, Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont
Morrow Screw & Nut Co., Ltd, John, Ingersoll, Ont.
Nicholson File Co, Port Hope, Ont
Simonds Canada Saw Co., Montreal, Que.

**Filing Machines**
Garlock-Walker Mchy Co, Toronto, Ont
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. B., Montreal, Que.

**Filler, Iron (See Cements, Iron)**
Smooth Mfg Co, Jersey City, N J

**Fire Extinguishers**
Can Consolidated Rubber Co., Ltd., Montreal, Que.

**Fittings, Pipe**
International Malleable Iron Co., Guelph, Ont

**Flexible Shafts**
Aikenhead Hardware Ltd., Toronto, Ont

**Flux, Galvanizing**
British Smelting & Refining Co., Ltd. Montreal, Que.

**Fluxes, Welding**
L'Air Liquide Society, Toronto, Ont.

**Forging Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Canada Machinery Corp., Galt, Ont.
Can Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy. Co., Toronto, Ont
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot

**Forgings, Drop**
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Lt Toronto, Ont.

**Forgings, Hammer**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Lt Toronto, Ont.
Dominion Bridge Co, Ltd., Lachine, Que
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Foundry Equipment**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke. Que.
Ford-Smith Machine Co., Hamilton, Ont
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Foundry Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Frogs, Spring or Rigid**
Can. Steel Foundries, Montreal, Que.

**Fuel Oil Burning System**
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Heat Treating Coal**
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co, W S., New York City.

**Furnaces, Heat Treating Oil and Gas**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bellevue Industrial Furnace Co., Detroit.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke. Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont

**Furnaces and Ovens, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd Hiram, Walkerville, Ont.

**Furnaces, Tempering and Annealing**
Brown & Sharpe Mfg. Co., Providence, R.I
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co, W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furniture, Machine Shop**
Garlock-Walker Mchy Co, Toronto, Ont

**Gages, Comparator**
Jones & Lamson Machine Co., Springfield, Vt.
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont.
Perdue, W. B, San Francisco, Calif.
Starrett Co., L. S., Athol, Mass

**Gages, Measuring (See Tool Work)**
Chesterman & Co, Ltd, J, Sheffield, Eng
Crescent Machine Co, Ltd., Montreal, Q
Greenfield Tap & Die Corp, Galt, Ont.
Johansson Inc., C. E., Windsor, Ont
Starrett Co., L. S., Athol, Mass.

**Gages, Recording**
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.

# BUYERS' DIRECTORY

**Gages, Snap, Thread and Cylindrical**
Ackworthie, Ltd., John, Birmingham, Eng
Brown & Sharpe Mfg. Co., Providence, R.I
Can. Fairbanks-Morse Co., Ltd., Montreal
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Standard**
Armstrong Whitworth Co. of Can., Lt Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis,
Johansson Inc., C. E., Windsor, Ont.

**Gages, Thread**
Ackworthie, Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Garnet, Emery and Flint Paper and Cloth**
Ritchey Supply Co., Toronto, Ont.

**Gas, Coal Compressed**
L'Air Liquide Society, Toronto, Ont.

**Gas, Compressed**
Prest-O-Lite Co. of Can., Toronto, Ont.

**Gaskets**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

**Gear Blanks**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear-Cutting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

**Gear Testing Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Gears, Cast**
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que

**Gears, Cut**
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hamilton Gear & Machine Co., Toronto, Ontario.
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Gears, Dressed**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Gears, Forged**
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Gears, Herringbone**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

**Gears, Machine Moulded**
Can. Steel Foundries, Montreal, Que.

**Gears, Rawhide (See Gears, Cut)**
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear, Silent Chain**
Gardner & Son, Robt., Montreal, Que
Morse Chain Co., Ithaca, N.Y.
Can. Link-Belt Co., Ltd., Toronto, Can.
Hans Renold of Canada, Ltd., Montreal, Quebec.

**Gears, Worm**
Dom Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario

**Generators, Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Generators, Electric**
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Goggles, Safety**
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

**Grab Buckets**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Grease Cups, Pressed Steel and Brass**
Can. Winkley Co., Ltd, Windsor, Ont.

**Greases, Lubricating**
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

**Grinding Discs**
Ritchey Supply Co., Toronto, Ont.

**Grinding Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**Grinding Machines, Abrasive Belt**
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Automatic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Bench**
Aikenhead Hardware Ltd., Toronto, Ont
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Grinding Machines, Center**
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis

**Grinding Machines Chaser**
Jones & Lamson Machine Co., Springfield, Vt.

**Grinding Machines, Cutter and Reamer**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Cylindrical**
Garlock-Walker Mchy. Co., Toronto, Ont
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Die**
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio
National Machinery Co., Tiffin, Ont.

**Grinding Machines, Disc**
Beacon Engineering Co., Tipton, England
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Drill**
Beacon Engineering Co., Tipton, England
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Face**
Ford-Smith Machine Co., Hamilton, Ont

**Grinding Machines, Floor and Tool**
Beacon Engineering Co., Tipton, England
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng

**Grinding Machines, Internal**
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Portable**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Power Oscillating Tool**
Herbert Ltd., Alfred, Toronto, Ont.

**Grinding Machines, Ring Wheel**
Ford-Smith Machine Co., Hamilton, Ont

**Grinding Machines, Snagging**
Blount Co., J. G., Everett, Mass.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Surface**
Garlock-Walker Mchy. Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machinery, Tool Post**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Universal**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.

**Grinding Wheels**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Guards, Machinery and Window**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Guards, Electric Lamp**
Flexible Steel Lacing Co., Chicago, Ill.

**Gun-Barrel Machinery**
Steinle Turret Machine Co., Madison, Wis.

**Hack Saws, Power**
Ackworthie, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Hamilton, Canada.
Garlock-Walker Mchy. Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hammers, Chipping**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hammers, Drop**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

**Hammers, Electric**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Hammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich

**Hammers, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hammers, Rivetting**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hangers, Shafting**
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F. Montreal, Que.
Terry & Co., John C., Birmingham, Eng
Williams Machinery & Supply Co., A. R. Montreal, Que.

**Hardening, Case-Hardening and Tempering**
Hamilton Gear & Machine Co., Toronto, Ont.

**Hardness Testing Apparatus**
Shore Instrument Co., Jamaica, N.Y.

**Heating**
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.

**Hobbing Machines**
Herbert Ltd., Alfred, Toronto, Ont
Petrie, Ltd., H. W., Toronto, Ont.

**Hobs**
Armstrong-Whitworth of Canada, Ltd. Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd. Dundas, Ont.

**Hoists, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co. Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

**Hoists, Hand**
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Hoists, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Curtis Pneumatic Machinery Co., St Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Holders-On, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Hose, Flexible Steel**
Can. Fairbanks-Morse Co., Ltd., Montreal
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Hose, Industrial**
Dunlop Tire & Rubber Goods Co., Ltd. Toronto, Ont.
Goodyear Tire & Rubber Co. of Can Ltd., Toronto, Ont.

**Hose, Rubber**
Can. Consolidated Rubber Co., Ltd. Montreal, Que.
Can. Foamite Firefoam Co., Hamilton Ont.

**Hydraulic Leather**
Graton & Knight Mfg. Co., Worcester Mass.

**Hydraulic Machinery**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Stewart & Co., Duncan, Glasgow, Sco.

**Hydrogen**
National Electro Products, Ltd., Toronto Ont.

**Index Centers**
Dickow, Fred. C., Machinery Co., Chicago, Ill.

**Igniters, Gas Engine**
Canada Foundries & Forgings Co., Welland, Ont.

**Indicators, Speed and Test**
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I
Brown & Sharpe Mfg. Co., Providence, R.I

**Insulation**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Jacks, Hydraulic**
Norton, A. O., Boston, Mass.

**Jacks, Planer**
Armstrong Bros. Tool Co., Chicago, Ill
Starrett Co., L. S., Athol, Mass.

Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que
Crescent Machine Co., Ltd., Montreal, Q.

# BUYERS' DIRECTORY

**Jigs and Fixtures (See Tool Work)**
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Keyseating Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Keys, Machine**
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

**Knives, Machine**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Simonds Canada Saw Co., Montreal, Que.

**Knurl Holders**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lacing Leather**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

**Lamps, Electric**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**Lathe Attachments**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.

**Lathe Pans, Portable**
Canada Machinery Corp., Galt, Ont.

**Lathe Tools**
Armstrong Bros. Tool Co., Chicago, Ill.
Can Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

**Lathes, Automatic and Semi-Automatic**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Bench**
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lathes, Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
McDougall Co., Ltd., R., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Engine**
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill
Roelefson Machine & Tool Co., Toronto, Ont
Sidney Machine Tool Co., Sidney, Ohio.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Extension and Gap**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Lathes, Heavy Duty Projectile Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blaskill Wire Machy Co., Ltd., Montreal.
Sidney Machine Tool Co., Sidney, Ohio.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Polishing (See Polishing and Buffing Machines)**
Ford-Smith Machine Co., Hamilton, Ont.

**Lathes, Relieving**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Lathe, Universal Hand**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Lathes, Screw-Cutting**
Jones & Lamson Machine Co., Springfield, Vt.

**Lathe, Speed and Hand**
Blount Co., J. G., Everett, Mass.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Lathes, Spinning**
Terry & Co., John C., Birmingham, Eng.

**Lathes, Threading**
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

**Lathes, Vertical Turret**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

**Lathes, Wood Turning**
Blount Co., J. G., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Lead Pipe**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Lighting Fixtures**
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont

**Linoleum Mill Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Liquid Air Plants**
L'Air Liquide Society, Toronto, Ont.

**Lockers, Clothes**
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

**Lubricants**
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Lubricating Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Machinists' Small Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Manganese Steel**
Can. Steel Foundries, Montreal, Que

**Mandrels, Expanding**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Mandrels, Solid**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Measuring Machines**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Metals, Alloy**
British Smelting & Refining Co., Ltd. Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Tallman Brass & Metal, Ltd., Hamilton, Ontario.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Metalite Cloth**
Ritchey Supply Co., Toronto, Ont.

**Micrometer Calipers**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Milling Attachments**
Ackworthle, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Milling Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**Milling Machines, Automatic**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Bench**
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Hand**
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng
United States Machine Tool Co., Cincinnati, Ohio.

**Milling Machines, Horizontal and Planer Type**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal Q
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Milling Machines, Plain**
Bilton Machine Co., Bridgeport, Conn
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cleveland Milling Machine Co., Cleveland
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng

**Milling Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Milling Machines, Universal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Mchy. Co., Toronto, Ont
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Milling Machines, Vertical**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy Co., Toronto, Ont
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis
Rockford Milling Machine Co., Rockford Ill.
Williams Machinery Co., A. R., Toronto, Ont.

**Monel Metal**
International Nickel Co of Can., Ltd., Toronto, Ont.

**Motors, Electric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy. Co., Toronto, Ont
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis

**Moulded Rubber Goods**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Nail Machinery**
Sleeper & Hartley, Inc., Worcester, Mass

**Nails and Staples**
Steel Co. of Canada, Ltd., Hamilton, Ont

**Nickel, Bars, Sheets, Wire, Etc.**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Nickel Plating Outfits**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Nickel Silver**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Nitrogen**
L'Air Liquide Society, Toronto, Ont

**Nut Tappers (See Bolt and Nut Machinery)**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

**Nuts, Finished and Semi-finished**
Galt Machine Screw Co., Galt, Ont.

**Nuts, Machine Screw**
Torrington Company, Ltd., Upper Bedford, Que.

**Nuts, S.A.E., Plain and Castellated**
Galt Machine Screw Co., Galt, Ont.

**Oil Filtering and Storage Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oil Storage Engineers**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oils**
Canadian Oil Companies, Ltd., Toronto, Ont
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Hole Covers**
Can. Winkley Co., Ltd., Windsor, Ont

**Oils, Soluble**
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont

**Oxygen**
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

**Oxy-Acetylene Apparatus**
L'Air Liquide Society, Toronto, Ont

**Packing, Hydraulic**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester Mass.
Guildford & Sons, Ltd., Halifax, N.S.

**Packing, Steam**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
Graton & Knight Mfg. Co., Worcester Mass.
Guildford & Sons, Ltd., Halifax, N.S.

**Paper Mill Conveyors**
Bertrams Ltd., Edinburgh, Scotland

**Patents**
Fetherstonhaugh & Co., Ottawa, Ont
Marion & Marion, Montreal, Que.

**Pans, Wet and Dry**
Frost Mfg. Co., Chicago, Ill

**Pattern-Shop Machinery (See Woodworking Machinery)**
Canada Machinery Corp., Galt, Ont
Oliver Machinery Co., Grand Rapids, Mich

**Patterns, Wood and Metal**
Crescent Machine Co., Ltd., Montreal, Q
Victoria Foundry Co., Ltd., Ottawa, Ont
Wraggis Pattern Works, Galt, Ont.

**Penstocks, Steel**
MacKinnon Steel Co., Sherbrooke, Que

# BUYERS' DIRECTORY

**Phosphor Tin**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Photographic Duplicating Machines**
Commercial Camera Co., Providence, R.I.

**Pig Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Bending Machines**
American Pipe Bending Machine Co., Boston, Mass.
Can. Fairbanks-Morse Co., Ltd., Montreal
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

**Pipe Couplings**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Cutting and Threading Machines**
Can. Fairbanks-Morse Co., Ltd., Montreal
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**
Landis Machine Co., Inc., Waynesboro, Pa.

**Pipe Fitters' Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa.

**Piston-Ring Machines**
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Planers, Parallels**
L. & P. Mfg. Co., Niagara Falls, Ont.

**Planing Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Planing Machines, Rotary**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Pneumatic Tools**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas P., Montreal, Q.
Blount Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Pots, Steel**
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Pressed Steel Parts**
Ackworthie, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich.
Can. Fairbanks-Morse Co., Ltd., Montreal
L. & P. Manufacturing Company, Ltd., Niagara Falls, Ont.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Presses, Drop and Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Foot and Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

**Presses, Forcing**
Atlas Press Co., Kalamazoo, Mich.
Stewart & Co., Duncan, Glasgow, Scot.

**Presses, Hydraulic**
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Perrin Ltd., W. B., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot
Williams Machinery Co., A. R., Toronto, Ont.

**Presses, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Protractors**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Propellers**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Pulleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal and Fibre**
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Pulp and Paper Mill Equipment**
MacKinnon Steel Co., Sherbrooke, Que.

**Pumps, Automobile Tire**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Pumps, Barrel and Boiler-feed**
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coalant**
Trahern Pump Co., Rockford, Ill.

**Pumps, Geared and Hand**
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**
Can. Fairbanks-Morse Co., Ltd., Montreal
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

**Pumps, Lubricant and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener
Jardine & Co., A. B., Hespeler, Ont.

**Punches, Power**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo, Ohio

**Punching Machines, Horizontal**
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Racks, Cut**
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**
Holden Co., Ltd., Montreal, Que.

**Reamer Holders**
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

**Reamers, Expanding**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Reamers, Solid**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Reamers, Taper**
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Recorders, Temperature**
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Recorders, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Rheostats**
Northern Electric Co., Montreal, Que.

**Resistance Materials**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Respirators**
Willson Goggles, Inc., Reading, Pa.

**Rivets**
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

**Rivet Heaters**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.

**Riveting Machines**
Bilton Machine Co., Bridgeport, Conn.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**
Stewart & Co., Duncan, Glasgow, Scot.

**Rolls (Rubber Covered)**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rudder Frames, Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Rubber Goods, Mechanical**
Quaker City Rubber Co., Philadelphia, Pa.

**Rules, Steel**
Chesterman & Co., Ltd., J., Sheffield, Eng.

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Rust Preventatives**
Oakley Chemical Co., New York, N.Y.

**Sand Equipment**
Can. Link-Belt Co., Toronto, Ont.

**Sand Mills**
Frost Mfg. Co., Chicago, Ill.

**Sanding Machinery**
Oliver Machy. Co., Grand Rapids, Mich.

**Sand Rammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Cleveland Pneumatic Tool Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill
Keller Pneumatic Tool Co., Grand Haven Mich.

**Saw Frames and Blades, Hack**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que

**Sawing Machines, Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que

**Sawing Machines, Power Hack**
Ackworthie, Ltd., John, Birmingham, Eng
Atkins & Co., Inc., E. C., Indianapolis, I
Can. Fairbanks-Morse Co., Ltd., Montreal
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Saw Sharpening Machines**
Atkins & Co., Inc., E. C., Indianapolis, I
Oliver Machinery Co., Grand Rapids, Mich

**Saw Tables, Universal**
Atkins & Co., Inc., E. C., Indianapolis, I
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**
Atkins & Co., Inc., E. C., Indianapolis, I
Simonds Canada Saw Co., Montreal, Que
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I
Simonds Canada Saw Co., Montreal, Que

**Saws, Hot and Cold**
Atkins & Co., Inc., E. C., Indianapolis, I
Simonds Canada Saw Co., Montreal, Que
Stewart & Co., Duncan, Glasgow, Scot

**Saws, High Speed Steel**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I
Butterfield & Co., Inc., Rock Island, Que
Clemson Bros., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que

**Saws, Metal Band**
Atkins & Co., Inc., E. C., Indianapolis, I
Oliver Machinery Co., Grand Rapids, Mich.

**Saws, Metal, Power**
Clemson Bros., Inc., Hamilton, Ont.

**Saws, Metal Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I
Brown & Sharpe Mfg. Co., Providence, R.I
Butterfield & Co., Inc., Rock Island, Que
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

**Saws, Milling**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Saws, Screw Slotting**
Atkins & Co., Inc., E. C., Indianapolis, I
Butterfield & Co., Inc., Rock Island, Que
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que

**Saws, Swing Cut-off**
Oliver Machinery Co., Grand Rapids, Mich

**Scales**
Brown & Sharpe Mfg. Co., Providence, R.I
Can. Fairbanks-Morse Ltd., Montreal, Q.

**Screens**
Can. Wire & Iron Goods Co., Hamilton Ont.

**Screw Drivers, Optical, Jewelry and Novelty**
Torrington Co., Ltd., Upper Bedford, Que

**Screw Driving Machine**
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill

**Screw Extractors**
Cleveland Twist Drill Co., Cleveland, O

**Screw Machine Work**
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
Tallman Brass & Metal Co., Hamilton, Ont.

# BUYERS' DIRECTORY

**Screw Machinery, Wood and Lag**
Cook Co., Asa S., Hartford, Conn.

**Screw Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Screw Machines, Automatic**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

**Screw Machines, Plain or Hand**
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio.

**Screw Machine Products**
Torrington Company, Ltd., Upper Bedford, Que.

**Screw Plates**
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

**Screws, Cap and Set**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Lock Cap**
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Machine**
Barnes Co., Wallace, Bristol, Conn.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Safety Set**
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Screws, Side Knob**
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Thumb**
Torrington Company, Ltd., Upper Bedford, Que.

**Second-Hand Machinery**
**( See Searchlight Section)**
Petrie, Ltd., H. W., Toronto, Ont.

**Separators, Moisture and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Separators, Oil and Waste**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Shafting**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Shapes, Cold-Drawn Special Steel**
Union Drawn Steel Co., Hamilton, Ont.

**Shaping Machines**
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Rocleson Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Walcott Lathe Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Shapers, Wood**
Oliver Machinery Co., Grand Rapids, Mich.

**Shears, Hand**
Can. Blower & Forge Co., Ltd., Kitchener.

**Shears, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y.
[illegible] & Co., Duncan, Glasgow, Scot.
Toledo Machine & Tool Co., Toledo, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.

**Shearing Machines, Angle, Iron Bar and Gate**
Bertrams Ltd., Edinburgh, Scotland.

**Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio.

**Sheets, Nickel, Resist, Alloy**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Sheets, Nickel, Monel and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Side Frames, Locomotive**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Slotting Attachments**
Ford-Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

**Slotting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

**Solders**
British Smelting & Refining Co., Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Canada.

**Snap Flasks**
Oliver Machy. Co., Grand Rapids, Mich.

**Special Machinery and Tools**
Brown Engineering Corp., Ltd., Toronto.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Specialties, Swaged and Headed Work**
Torrington Company, Ltd., Upper Bedford, Que.

**Spectacles, Industrial**
Willson Goggles, Inc., Reading, Pa.

**Springs**
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

**Spring-making Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Sprockets and Chains**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Squares**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Stamping, Metal**
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Stamps, Steel**
Diamond Saw & Stamping Works, Buffalo, N.Y.

**Stairways, Wrought Iron**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Steam Specialties**
Crane Ltd., Montreal, Que.

**Steel Plate**
Dom. Foundries & Steel, Hamilton, Ont.

**Steels, Tool**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel Blooms and Billets**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steel, Cold-Rolled Strip**
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Steel Castings**
Dom. Foundries & Steel, Hamilton, Ont.

**Steel Forgings**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Steel, Shafting and Free Cutting Screw**
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

**Steel, Sheet**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

**Steel, Tanks**
Can. John Wood Mfg. Co., Toronto, Ont.

**Steel, Stainless**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel Wire Rods**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steels, Alloy, Open Hearth and Electric**
United Alloy Steel Corp., Canton, Ohio

**Steels, Alloy and Carbon**
Algoma Steel Corp., Ltd., Sault Ste Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steels, High-Speed**
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel, Magnet**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel, Structural**
MacKinnon Steel Co., Sherbrooke, Que.

**Steel Tubing, Close Joint and Welded**
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

**Stern Frames, Cast Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Straightening Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Studs**
Galt Machine Screw Co., Galt, Ont.

**Surface Plates**
Bilton Machine Co., Bridgeport, Conn.

**Swaging Machines**
Atkins & Co., Inc., E. C., Indianapolis, I

**Switches, Railway**
Can. Steel Foundries, Montreal, Que.

**Switches and Switchboards**
Northern Electric Co., Montreal, Que.

**Tablets, Bronze, Memorial**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Tachometers**
Aikenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

**Tanks, Steel**
MacKinnon Steel Co., Sherbrooke, Que.

**Tanks and Pumps, Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

**Taper Cutting Dies**
Jones & Lamson Machine Co., Springfield, Vt.

**Tap Holders**
Greenfield Tap & Die Corp., Galt, Ont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taper Pins**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Tapes, Measuring**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass.

**Tapping Machines and Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Taps and Dies**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que
Can. Fairbanks-Morse Co., Ltd., Montreal
Geometric Tool Co., New Haven, Conn
Greenfield Tap & Die Corp., Galt, Ont
International Machinery & Supply Co., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taps, Collapsing**
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Teeth, Dredge Bucket**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Testing Metals and Materials**
Toronto Testing Laboratory, Toronto, Ont.

**Thermometers**
Bristol Co., Waterbury, Conn.

**Thread-Cutting Tools**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Thread Cutting Machines**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa.

**Threaded Wires**
Torrington Company, Ltd., Upper Bedford, Que.

**Threading Machines**
Acme Machinery Co., Cleveland, Ohio.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Thread Lead Testing Machines**
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Thread-Rolling Machines**
Bliss Co., E. W., Brooklyn, N.Y.

**Tongs**
Hepburn Ltd., John T., Toronto, Ont.

**Tool Cases**
Rice Lewis & Son, Ltd., Toronto, Ont.

**Tool Holders**
Armstrong Bros. Tool Co., Chicago, Ill
Bilton Machine Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Markers, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Tool Posts, Lathe**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Steels for all Purposes**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Tools, Small (See Machinists' Small Tools)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Bertrams Ltd., Edinburgh, Scotland.
Burgess & Marchand, Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
Chesterman & Co., Ltd., J., Sheffield, Eng.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield T[illegible] & Die Corp., Galt, Ont.
Hamilton [illegible]neering Service, Ltd., Hamilton, [illegible]t.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.
National Machine Tool Co., Racine, Wis
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
**Strelinger Co. of Can., Ltd., Chas. A. Windsor, Ont.**
Wheel Truing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Tool Work**
Brown Engineering Corp., Ltd., Toronto
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont

# BUYERS' DIRECTORY

**Torches, Blow**
National Electro Products, Ltd., Toronto Ont.
Perdue, W. B., San Francisco, Calif
Prest-O-Lite Co. of Can., Toronto, Ont
Rice Lewis & Son, Ltd., Toronto, Ont

**Trackwork, Railway**
Can Steel Foundries, Montreal, Que.

**Trackwork, Manganese Steel**
Can Steel Foundries, Montreal, Que

**Transformers**
Northern Electric Co., Montreal, Que.

**Transmission Machinery**
Bernard Industrial Co., A., Fortierville Que
Can Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Jones & Glasseo, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Toronto, Ont.
Renold (Hans) of Canada, Ltd., Montreal Que.

**Transportation Systems (See Trucks)**
Mathews Gravity Carrier Co., Port Hope, Ont.

**Treated Bits**
Can Atlas Crucible Steel Co., Toronto Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Trolleys and Tramways**
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Wright Mfg. Co., Lisbon, Ohio.

**Trucks**
Can Fairbanks-Morse Ltd., Montreal, Q
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Maple Leaf Mfg. Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Trucks, Industrial Motor**
Maple Leaf Mfg. Co., Montreal, Que.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Tube, Products**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Electric Welded or Oxy-Acetylene Welded**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Flexible**
Dunlop Tire & Rubber Goods Co., Ltd Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Tubing, Seamless Steel**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Seamless Steel, Brass and Copper and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Steel Products Co., Brantford, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Tubing, Welded**
International Nickel Co. of Can., Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Tubing, Welded Steel**
Tube Co. of Canada, Toronto, Ont.

**Turbines, Water**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Turret Heads**
Ackworthie, Ltd., John, Birmingham, Eng.
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Turret Machines (See Lathes, Horizontal Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Cook Co., Asa S., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Turrets, Tool Post**
Gisholt Machine Co., Madison, Wis.

**Unions, Pipe**
Crane Ltd., Montreal, Que.

**Universal Joints**
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Valves**
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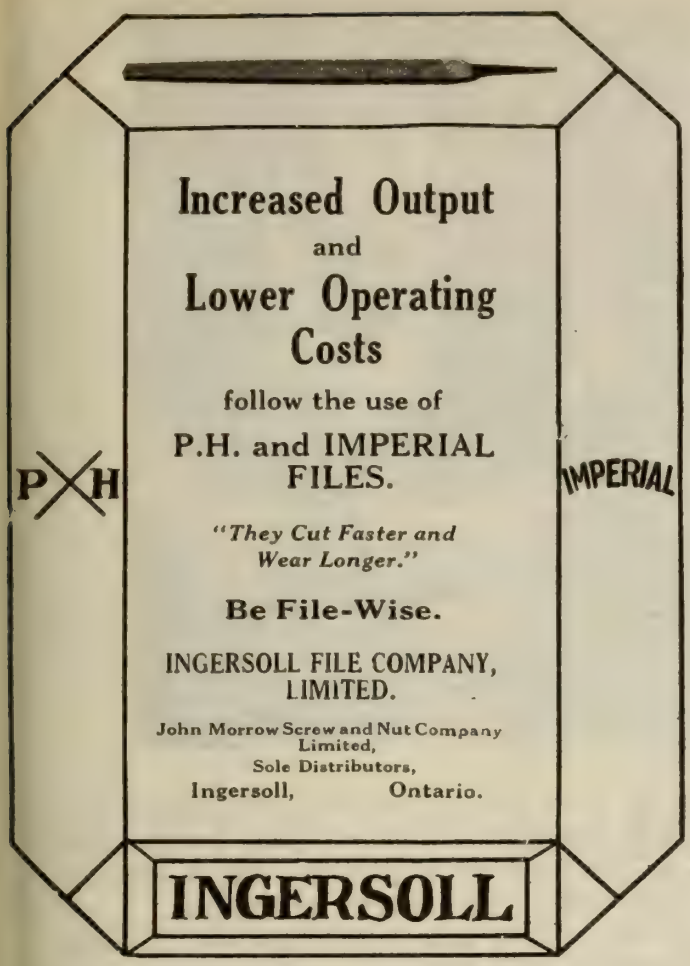
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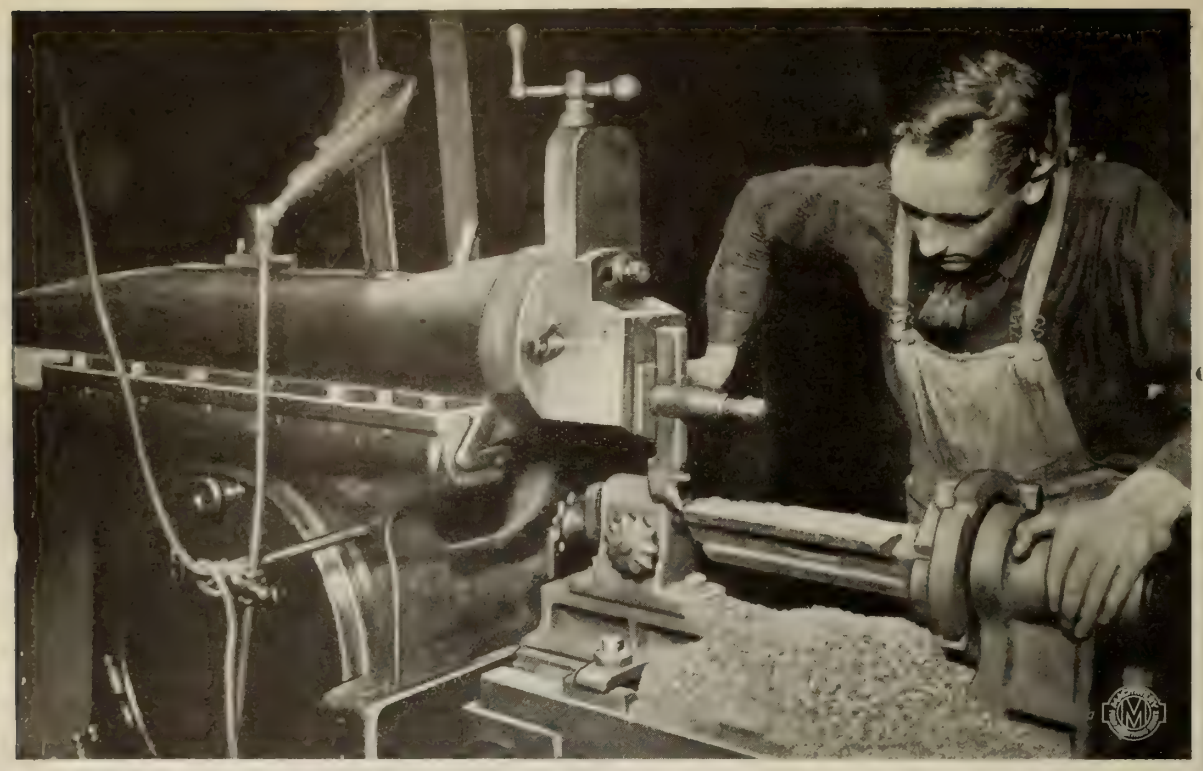
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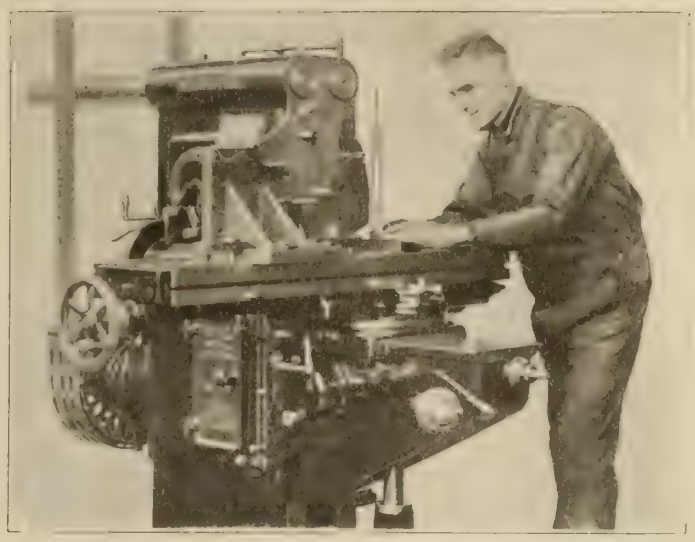
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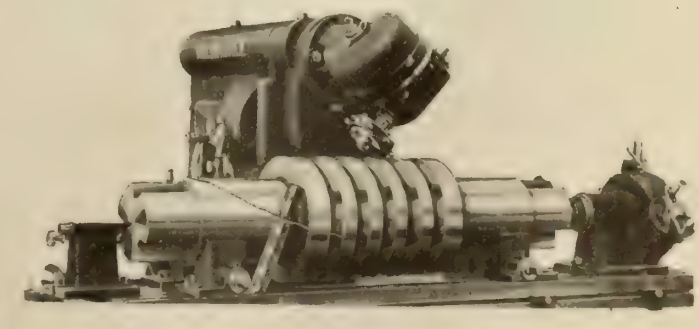
## Efficient on Light and Heavy Milling

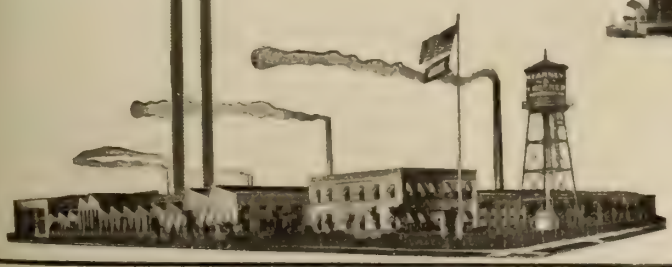
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# CANADIAN MACHINERY AND MANUFACTURING NEWS

Vol. XXV., No. 16 | Published by the MacLean Publishing Company, Limited, Toronto | April 21, 1921 | $4.00 a Year Subscription Price


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# Torrington MACHINE SCREWS

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ANOTHER large firm from across the border has established a branch in Canada to meet a growing demand for their products.

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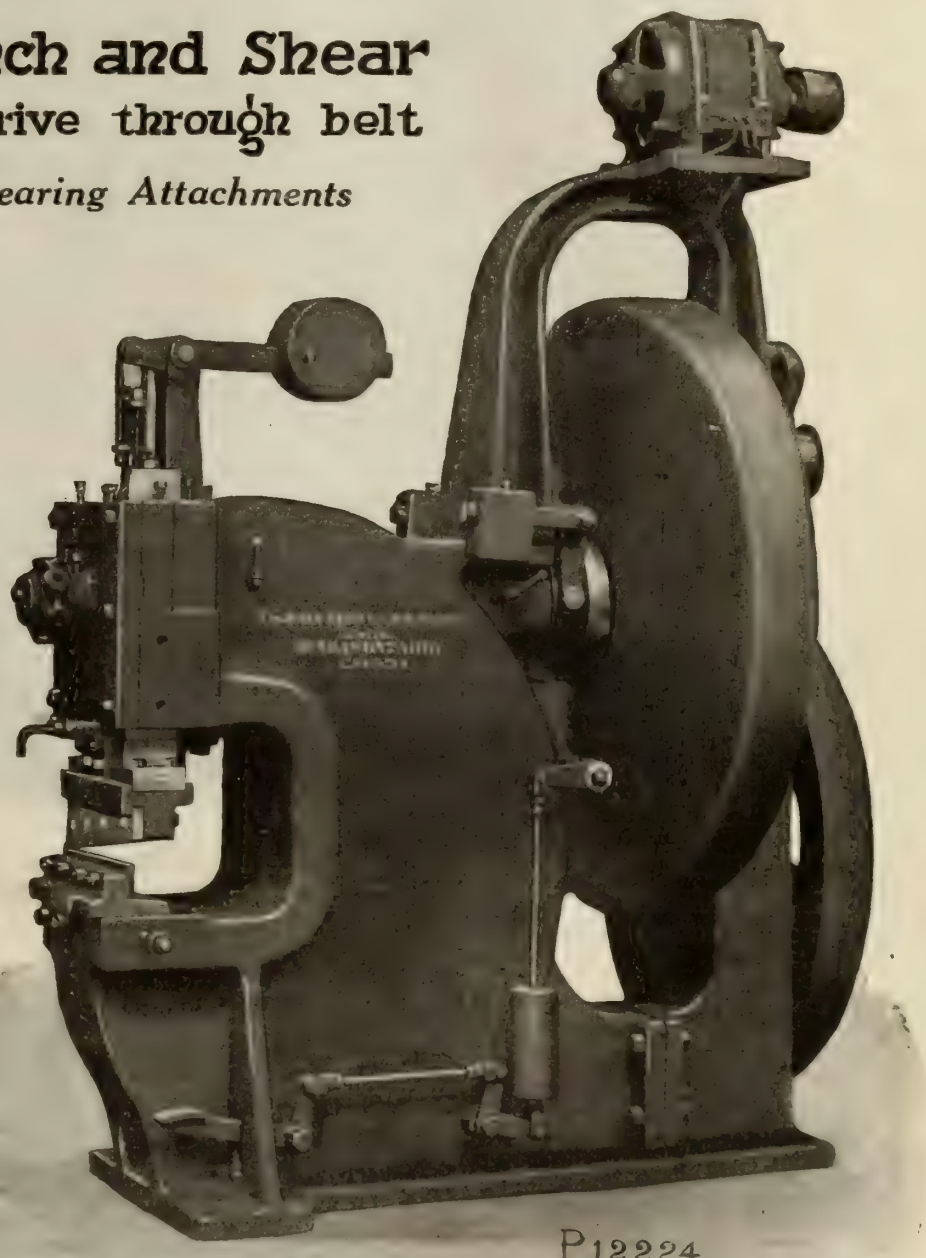
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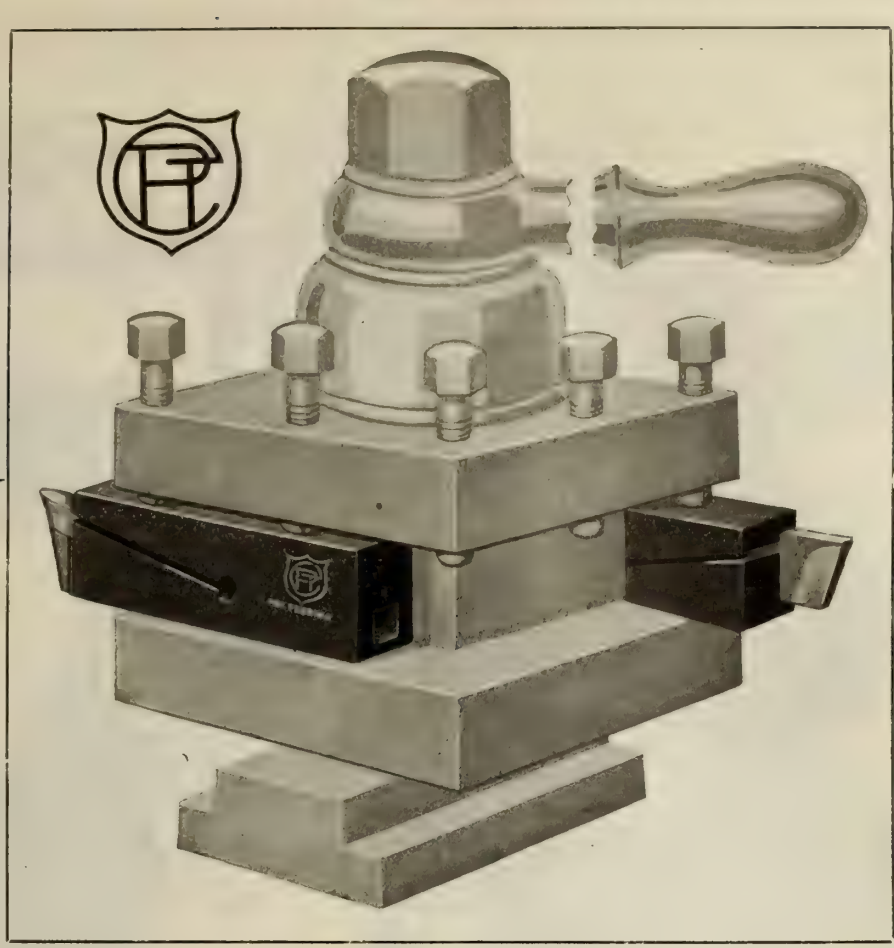
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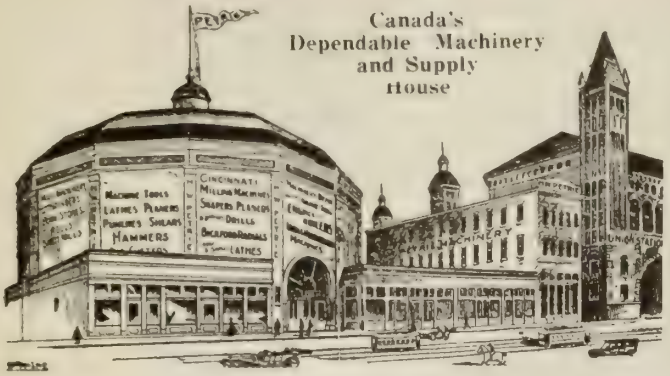
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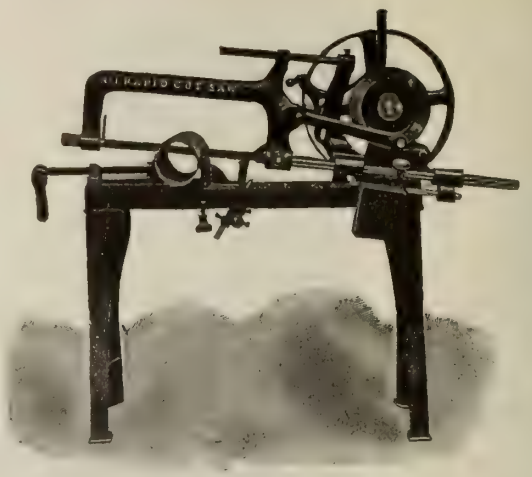
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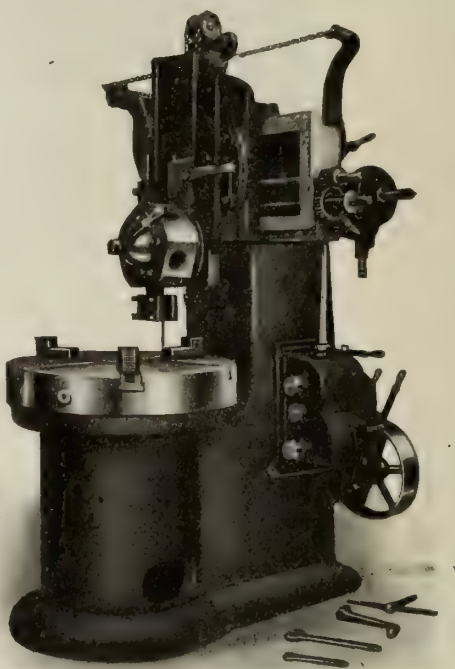
# EVERYTHING

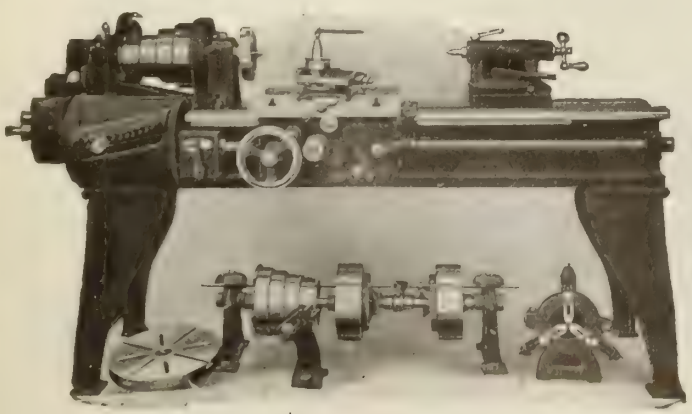
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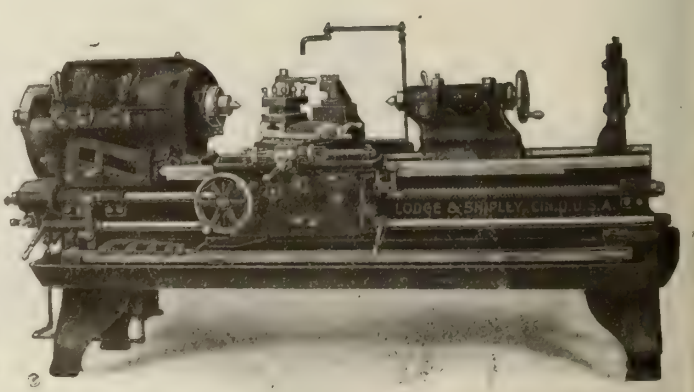
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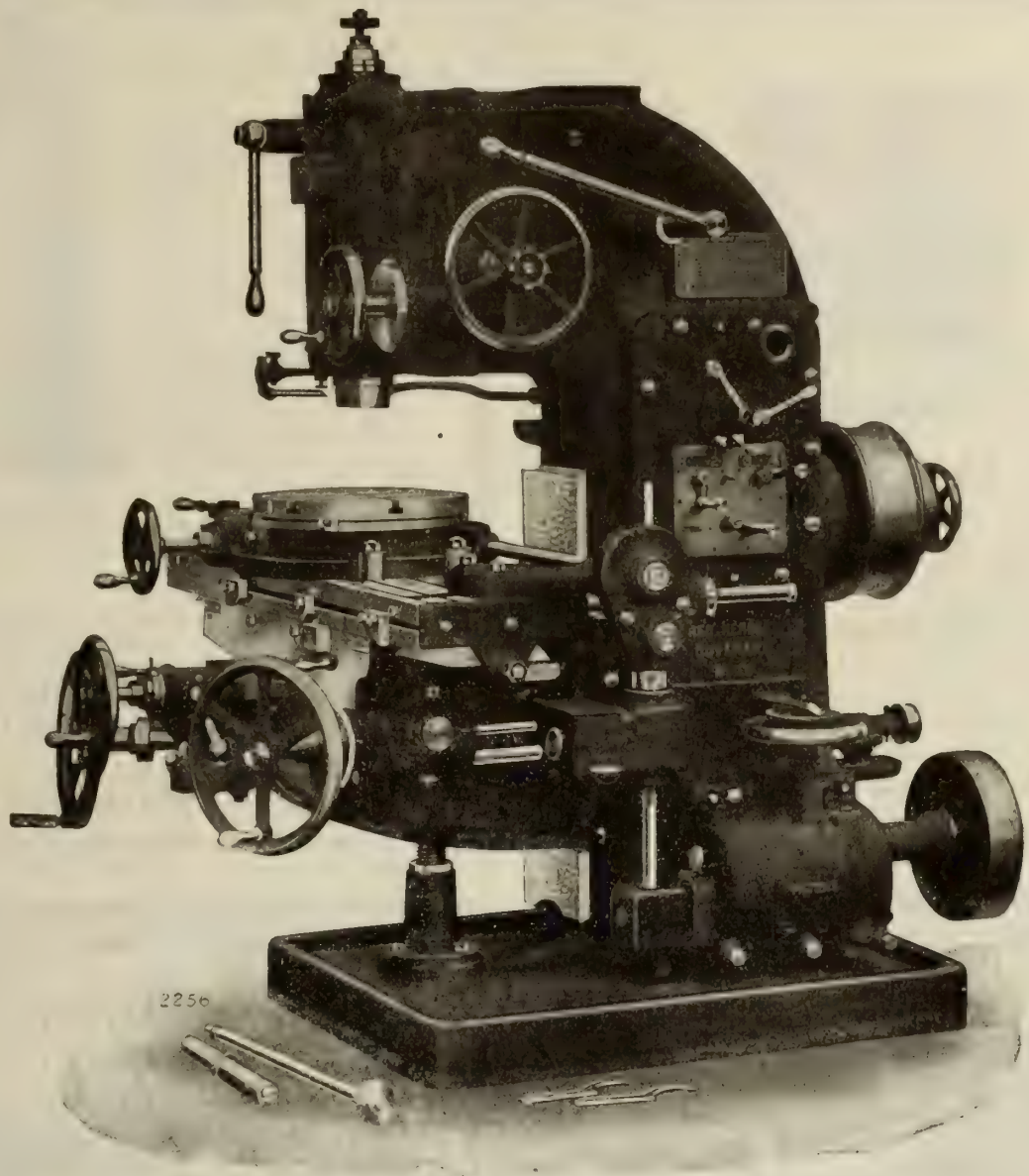
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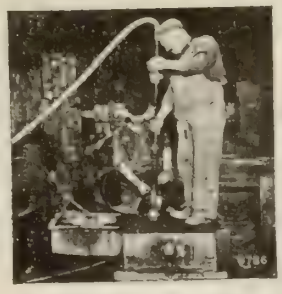
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LA SALLE

Has an Advantage Over Other Grinders

There is some outstanding feature of all La Salle Grinding Machines that lends it exceptional productive ability.
The American Drill Grinder is especially adaptable for grinding twist, flat and three-lipped drills, because it has automatic lip rest and caliper jaw device, which assures proper clearance on all sizes of drills automatically. Send for descriptive matter covering our entire line of grinding machinery.



American Drill Grinder
For Wet or Dry Drill Grinding 1/8" to 2¼". Also 1/8" to 3½" dia.

LA SALLE TOOL CO.
La Salle, Illinois, U.S.A.

Represented in Canada by
A. R. Williams Machinery Co., Ltd.
64-66 Front Street W., Toronto
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"Hisco" Machine—Molded Gears

The fact that "Hisco" Machine Molded Gears require no pattern is a factor of considerable importance when the price of lumber and labor is so high. "Hisco" quality insures accurate, dependable gears. Remember — **the price of "Hisco" gears does not include the cost of patterns.**

We are also manufacturers of Steel, Chrome, Manganese and Nickel Steel Castings, Annealed and Unannealed; Cement Mill and Mining Machinery; Castings; Stamp Mills; Crushing Plants; Excavating Outfits; Steel Car Wheels; Locomotive Driving Wheels and Frames, etc.

*Let us know your requirements—we do the rest.*

Hull Iron & Steel Foundries, Limited
HULL, Quebec

TRADE MARK

# "AW" DRILLS

Milled or Twisted



## High Speed Twist Drills

The Drills for MAXIMUM PRODUCTION

From the raw materials entering the steel to the finished drill a rigid inspection is given after each operation, which assures a superior product.

*Prompt Deliveries on Special Sizes*

*All Standard Sizes Carried In Stock.*

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# STEEL *for*

## Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

**We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.**



Steel Ingots *by the* HARMET Liquid Process

## Nova Scotia Steel and Coal Co., Limited

*Head Offices :*

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# THE JOHNSON FRICTION CLUTCH

## The Case Against the Countershaft

The old familiar countershaft drive, through cross belts and tight and loose pulleys, stands accused of the following offences against efficiency.

In that it—

1. Involves needless equipment.
2. Costs too much to set up.
3. Prevents economical and systematic use of space.
4. Operates sluggishly.
5. Multiplies belt troubles and the resultant cost of upkeep.

Modern practice has discarded the antiquated countershaft for the simplicity and efficiency of the clutch drive direct from lineshaft.

**Adopt the Johnston Lineshaft Drive**

The economical, efficient and durable method of power transmission through friction control.

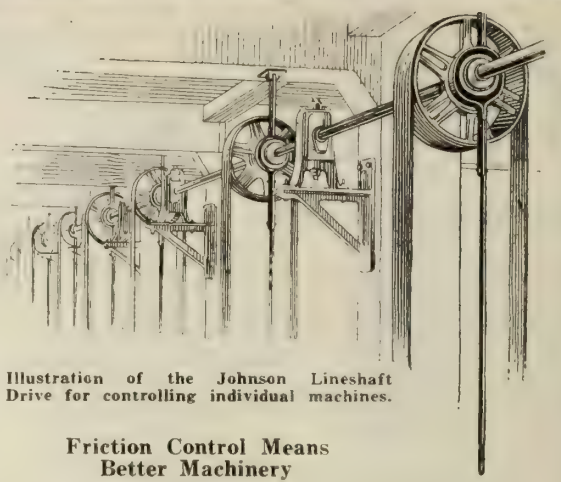


Illustration of the Johnson Lineshaft Drive for controlling individual machines.

**Friction Control Means Better Machinery**

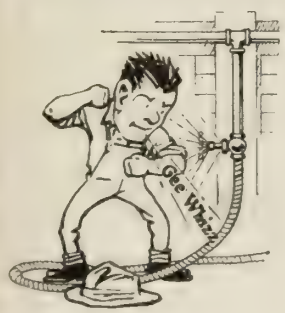
Whether it is applied overhead or in the machine itself.

Write for our Booklet "Clutches as Applied to Machine Building" and our Yellow Catalog.



CANADIAN AGENTS:
WILLIAMS & WILSON, LTD., 84 Inspector Street, Montreal
CANADIAN FAIRBANKS-MORSE CO., LTD., Montreal, Toronto, Winnipeg

**THE CARLYLE JOHNSON MACHINE CO.** MANCHESTER, CONN.




Jim

# *Do Your Air Valves Leak?*

**Well!** Go into your shop when the power is shut off and you will hear leaks at every valve.

**Jim Says:—Gee Whiz:** They are all leakin'—there ain't a Valve in the shop but what is spurtin' air, and ye can't stop 'em—the compressor's workin' overtime and the coal pile is meltin' like a snow ball in June. **Every leak is an extra load on your Compressor, an added pull on your "Coal pile" and a steady drain on your "Cash box."**

**Put your "Valve Troubles" up to us—Listen!**

**Bill says:**—"Leaks," there ain't none; we stopped 'em all with **Cleco Valves**—they are all over the shop now—we don't have to waste time patchin' leaky valves, you bet."

**Ask us for a sample valve** and test it until you are satisfied—then buy some; you can't lose.

**Cleco Air-Valves** are pressure-seated—the air pressure is always on the large end of "Plug," holding it firmly on seat. No packing or springs used, the air never comes in contact with the seat, therefore no seats to replace—or springs to renew.

**Cleco Valves** improve with use—they require no attention after installation.

Bulletin 48 illustrates and describes our complete line of Air Valves and Hose Fittings. Mailed on request.



Bill

## Cleveland Pneumatic Tool Co. of Canada, Limited

84 Chestnut St., Toronto 337 Craig St. West, Montreal

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- Bolsters
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- Draft Arms
- Locomotive Side Frames
- Machinery Castings
- Marine Castings
- Rolling Mill Rolls
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**MANGANESE-STEEL**
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- Crusher Jaws
- Dipper Teeth
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**OTHER ALLOYS**
- Crank Pins
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- Locomotive Frames
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**TRACKWORK**
- Diamond Crossings
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- Frogs
- Mates
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- Rail Braces
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- Complete Intersection

This list is merely an indication

General Offices:
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## WE CAN SUPPLY

# STEEL PLATE

—IN—

**Universal Edge** - up to 40 in. wide

**Sheared Edge** - up to 60 in. wide

**Any Thickness** **Any Lengths**

*Send Us Your Enquiries.*

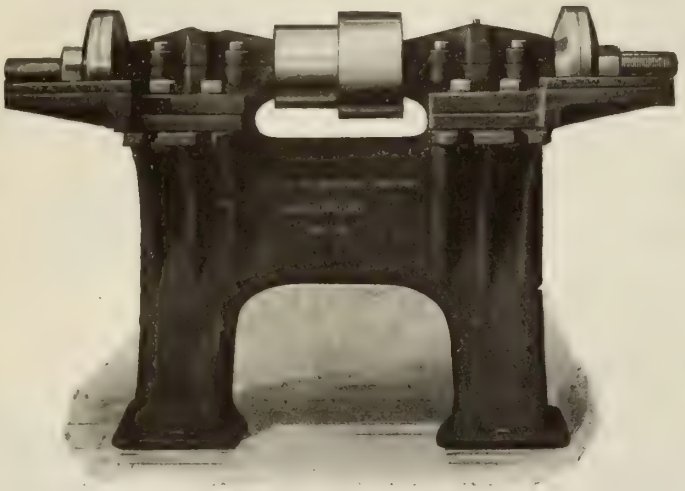
## Dominion Foundries & Steel, Limited

HAMILTON, ONTARIO


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# Grinders

## Floor, Bench, Swing, Water Tool, and Special Grinders---Polishers and Buffers



AMONG the many designs of Ford-Smith Grinders, Polishers and Buffers there is a machine exactly suited to do your work—if not we can build one.

By securing the right machine you get maximum results. Our engineers are ready to co-operate with you at all times in making a selection.

**FORD-SMITH**

**MACHINE CO., LTD.**

**HAMILTON, ONTARIO**

*Foreign Agent:* **W. E. Storey, London, Eng.**

# Heat Under Accurate Control

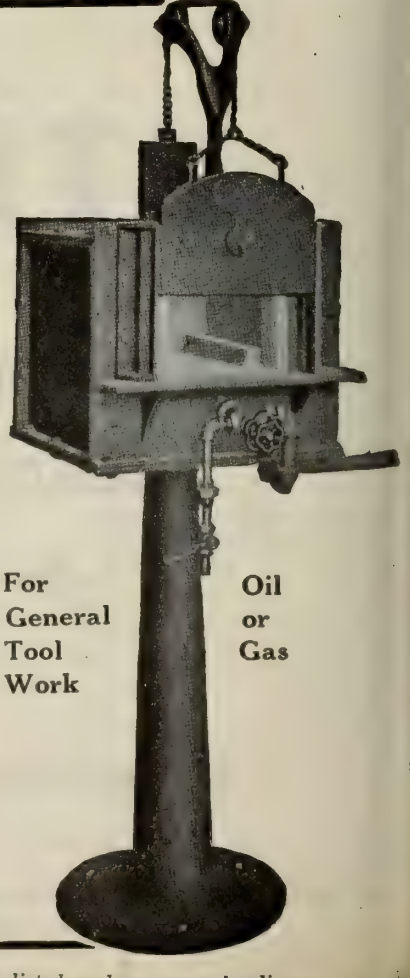
Here is an important factor in the heat treatment of metals. An intense heat, rapidly developed, and always under accurate control of the operator, is a feature that distinguishes

## BELLEVUE FURNACES

These tool forges are particularly adapted for the requirements of the small machine shop for annealing and tempering dies, cutters, reamers, etc.

Combustion is perfect and no flames come in contact with material. Built to stand the highest temperature. Doors are properly counterbalanced. In every way BELLEVUE FURNACES meet with the demand for durability, efficiency and convenience.

**Let us advise you about your heat-treating problems**



**For General Tool Work**

**Oil or Gas**

## Bellevue Industrial Furnace Company

**Julius C. Hinz, President**

**703 Bellevue Ave. - Detroit, Mich.**

***Representative in Canada: H. W. PETRIE, LIMITED, Toronto, Canada***

# BROWN-BOGGS

B B

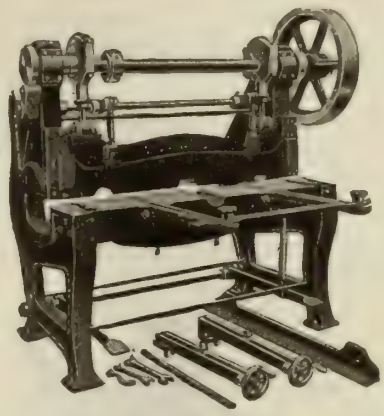
## Stands up under the excessive stress of actual service

It is not sufficient that a machine be speedy and accurate on a short trial run—it must be fast, accurate, and able to withstand the excessive stress of actual service. The losses of break-downs cannot be made up by "spurts" of efficiency.

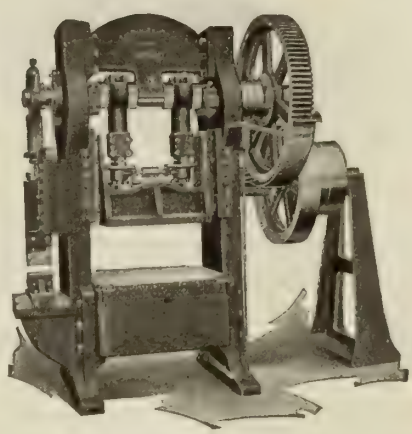
"B-B" Tools, by their dependable, year-in and year-out service, have gained an enviable reputation for "standing the gaff."

The "B-B" line comprises tinsmiths' tools and sheet metal working machines of every description; canners' and evaporators' machinery, shears of all kinds, power presses for punching, forming, embossing, blanking, etc.

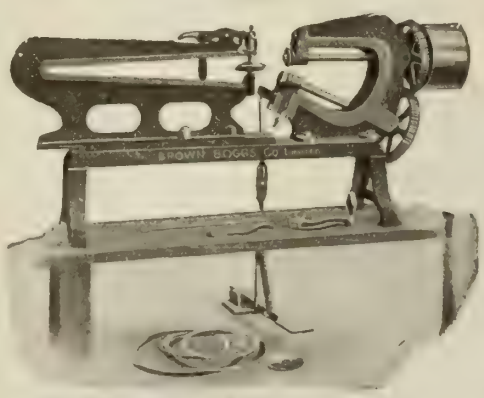
**Specify "Brown-Boggs" and you are assured of long, efficient service.**



No. 449—Shear



No. 140—Double Crank Trimming Press



No. 36—Ring and Circular Shear

# THE BROWN-BOGGS CO. LIMITED

## HAMILTON, CANADA.

# Canadian

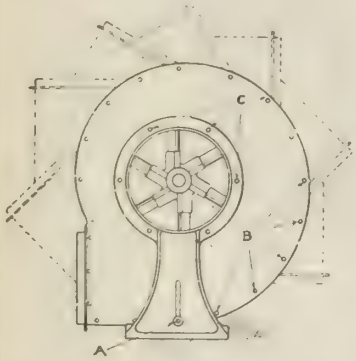
The Canadian Standard Reversible Mill Exhauster will keep your shop clean, remove sawdust, shavings, fumes, gas or any loose materials and disagreeable odors.

Insurance rates can be reduced; floors and machines covered with sawdust, chips or shavings, increase the fire risk.

Insurance companies reduce the premiums where adequate precautions have been taken to prevent fires.

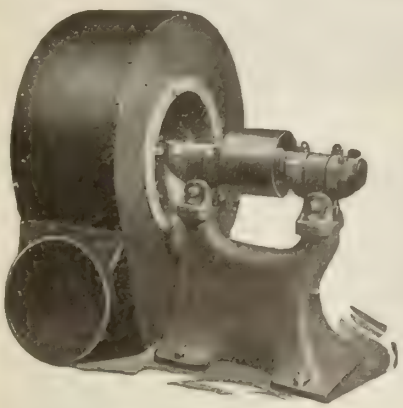
Blast Wheel — This wheel is so constructed that it will handle any kind of stringy material efficiently, such as sawdust, shavings, cotton lint. Will also handle gases, fumes, smoke, etc.






The Canadian Standard Planing Mill Exhausters have reversible housings so that the outlet can be adjusted instantly to any angle desired.

This eliminates necessity of crossed belts. Simplifies changes on alterations in piping or building.



The housing is of heavy rolled steel plate securely bolted together with angle irons. Round cast iron outlet bolted to the housing. Blast wheel mounted on heavy cast iron spider.

Every fan carefully tested by running test at speeds in excess of that required.

*Write for Catalog 16.*

## Canadian Blower & Forge Co.

Kitchener - Ontario



# GREY IRON CASTINGS

*Also*

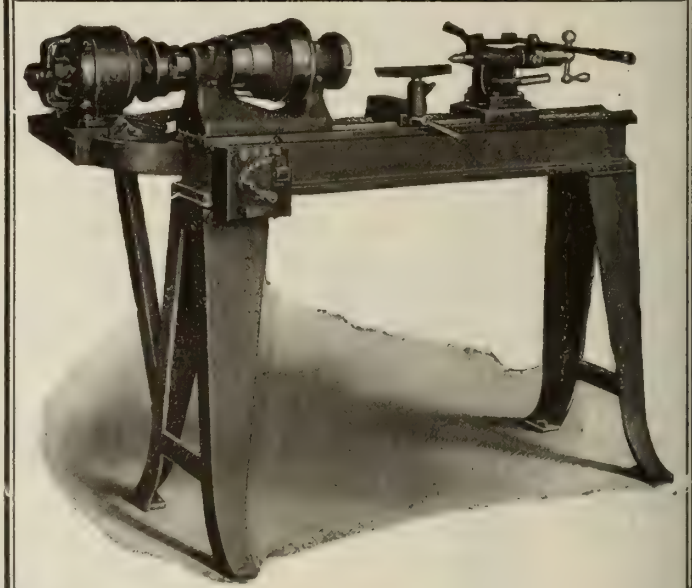
## Brass, Bronze, Aluminum, Copper, Zinc and Nickel Castings

QUALITY!
SERVICE!

## Canadian Hanson and Van Winkle Co., Limited

Toronto - - - Canada





## Built For *Service*

This BLOUNT Motor-driven Lathe is well adapted to all speed lathe uses. It is of late design, and has a number of features in which you will be interested. Provided with constant-speed motor. Lathe spindle made of hollow, high-carbon steel, ground to size and bored for Morse taper. Runs in self-oiling bronze bearings.

*"We will accept Canadian funds at par"*

J. G. Blount Co., Everett, Mass., U.S.A.

*Maximum Production Tools*



# Here's a Fair and Square Die Offer. Use It!

We are going to send you a Murchey Tap and Die on 30 days' approval. We are going to **prove** to you right in your own shop that

## MURCHEY
### TAPS AND DIES

are better and more economical than the ones you now use. It is a well-established fact that Murchey Tools actually cut production time in half.

You want to make the test, don't you? Then fill in and mail the coupon below.

Murchey Machine & Tool Co.,
75 Porter St., Detroit, Mich.

Gentlemen:—
Please send me, for 30 days' approval, a Murchey Tap and Die to thread part as shown on enclosed blue print. This in no way obligates me.

Name .....

Address .....

.....

Type machine tool is to be used on.....

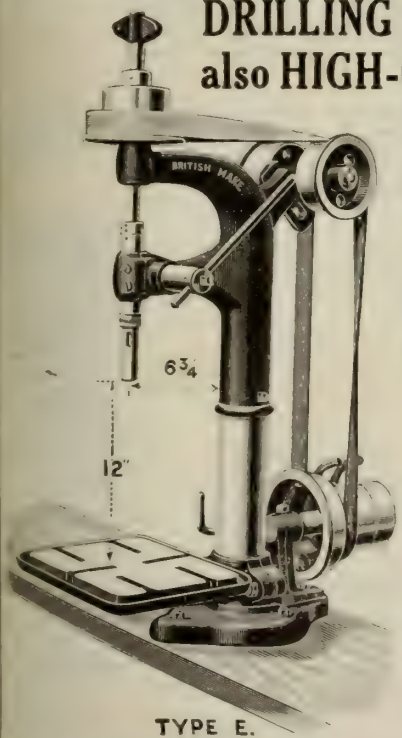
Size of shank required.....

## Murchey Machine & Tool Co.
**75 Porter Street, Detroit, Michigan**

**The Coats Machine Tool Company, Limited, 14 Palmer Street, Westminster, S.W., London, England**

**Fenwick Freres & Company, 8 Rue de Rocroy, Paris, France**

# SENSITIVE BENCH and PILLAR DRILLING MACHINES also HIGH-CLASS BALL BEARING DISC and TOOL GRINDERS




TYPE E.

**TEN DIFFERENT TYPES, ALL FROM STOCK**

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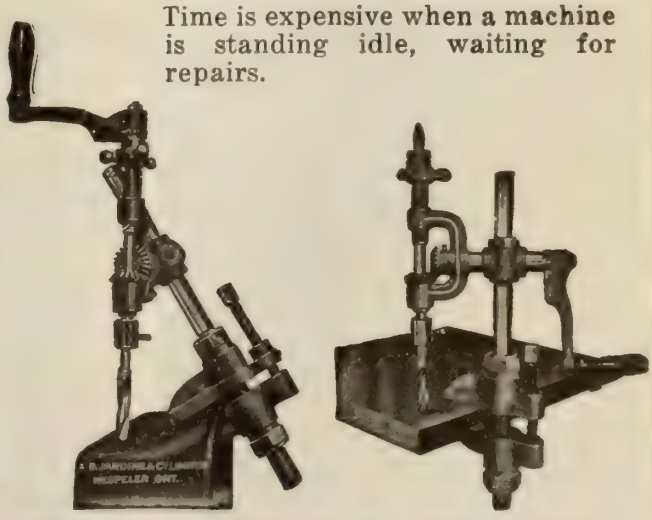
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*AGENTS WANTED*

## Beacon Engineering Co.
**TIPTON, ENGLAND**

# Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



**On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.**

**Weight, 40 lbs. Price, $26.50 net.**

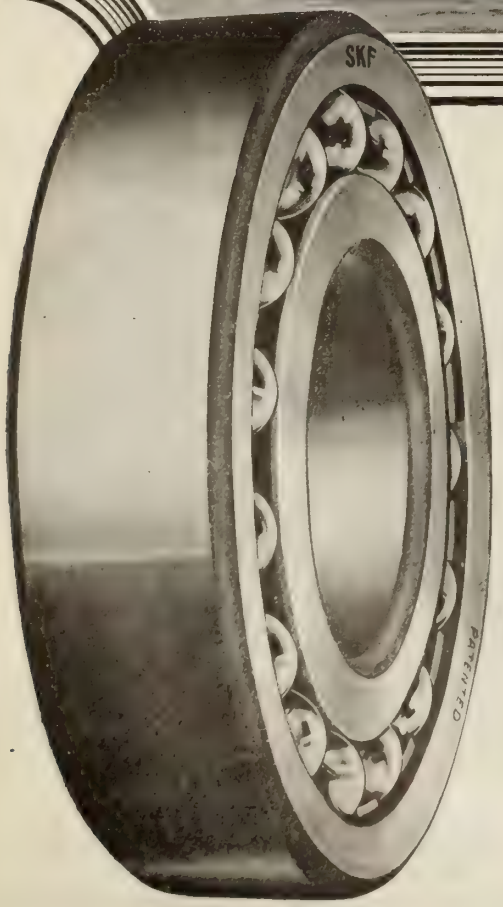
**Sold by all Machinery and Supply Houses.**

## A. B. JARDINE & CO., Limited
**HESPELER, ONTARIO**


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# SKF






## WORLD-WIDE EXPERIENCE
### At Your Command

It has taken years to gather from every part of the industrial world the information that **SKF** engineers place freely before the Canadian manufacturer.

Not to use it is to ignore hard-earned experience gained in thousands of industrial plants.

**SKF** engineers are more than doctors to troublesome transmissions or inefficient machines, they are constantly required to show ways of improving the product, and cutting costs. They also place at your service a complete industrial laboratory where new manufacturing problems are solved for the benefit of all industry.

Consult Canadian **SKF** Engineers without cost or obligation.

**Canadian SKF Company, Limited**

TORONTO - - - MONTREAL

# LINK-BELT
## Silent Chain Drives




## 98.2% Efficient

(on actual test)

LINK-BELT Silent Chain Drives can be applied to almost any shop condition.

For driving lineshafting, pumps, fans, machine tools and equipment of every kind, in every industry, they are rapidly superseding flat belts and gearing. Link-Belt Silent Chain is Flexible as a Belt—Positive as a Gear—More Efficient than Either.

Let one of our experienced power transmission engineers tell you what Link-Belt Silent Chain Drives can accomplish in your plant.

Send for 128-page pricelist data book No. 125.

**CANADIAN LINK-BELT CO., LTD**

TORONTO
Wellington and Peter Sts.

MONTREAL
10 St. Michaels Lane

675

# 30 Times Faster Than Ordinary Vises

THIS Columbian Quick-Acting Vise, with a jaw opening of 6 inches, can be opened the full length of the screw in ½ of a second. It takes 30 *times as long* to rotate the handle and open an ordinary vise of the same size.

This new vise is an addition to the many other types of machinists' vises already included in the Columbian line. It is extremely simple, there are no complicated parts to get out of adjustment. A slight pressure of the trigger with the forefinger releases the screw and allows the beam to slide freely in either direction. Made in stationary and swivel base types; 7 sizes from 3 to 7-inch jaws, opening from 4½ to 12 inches. The jaw faces are removable and may be replaced with specially shaped jaw faces.

The new Quick-Acting Vise, however, is a highly specialized vise designed for machine shops in which a great many similar pieces pass continuously through the same operation. On such work as this, in an accurately timed test, an operation requiring two settings in the vise was done in an ordinary vise in 24 seconds. With a Columbian Quick-Acting Vise the same operation was done in 15 seconds.

This is a saving of 37½%!

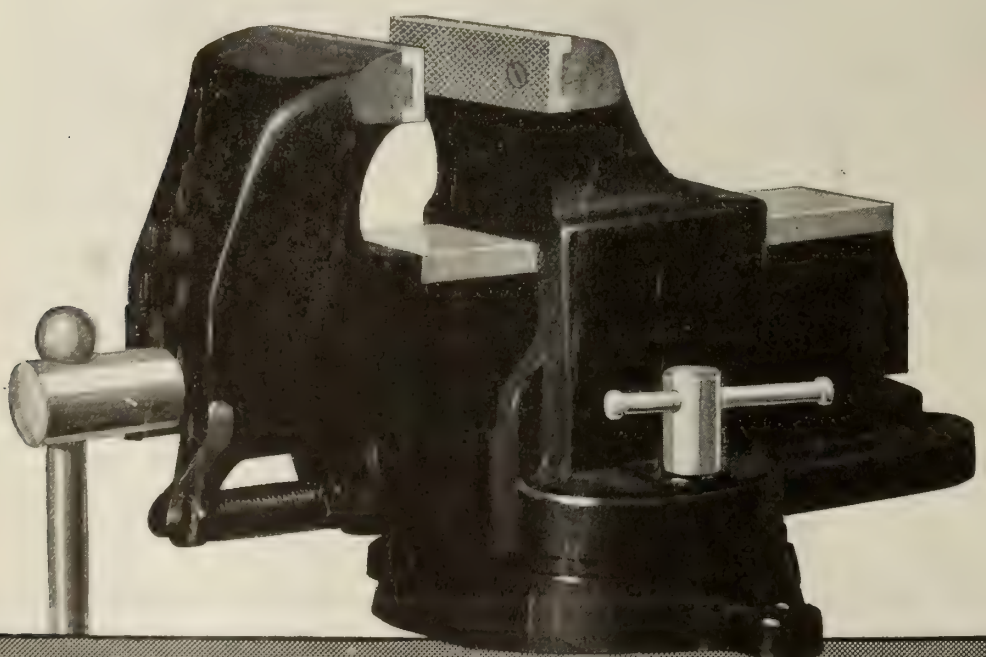
Like all Columbian machinists' vises this Quick-Acting Vise is made of malleable iron and is twice as strong as any cast iron vise of the same rating. The famous Columbian Sledge-Test proves this conclusively.

## Columbian Hardware Division

**of The Consolidated Iron-Steel Mfg. Co.**

*World's Largest Makers of Vises and Anvils*

CLEVELAND



COLUMBIAN

Sledge-Tested VISES

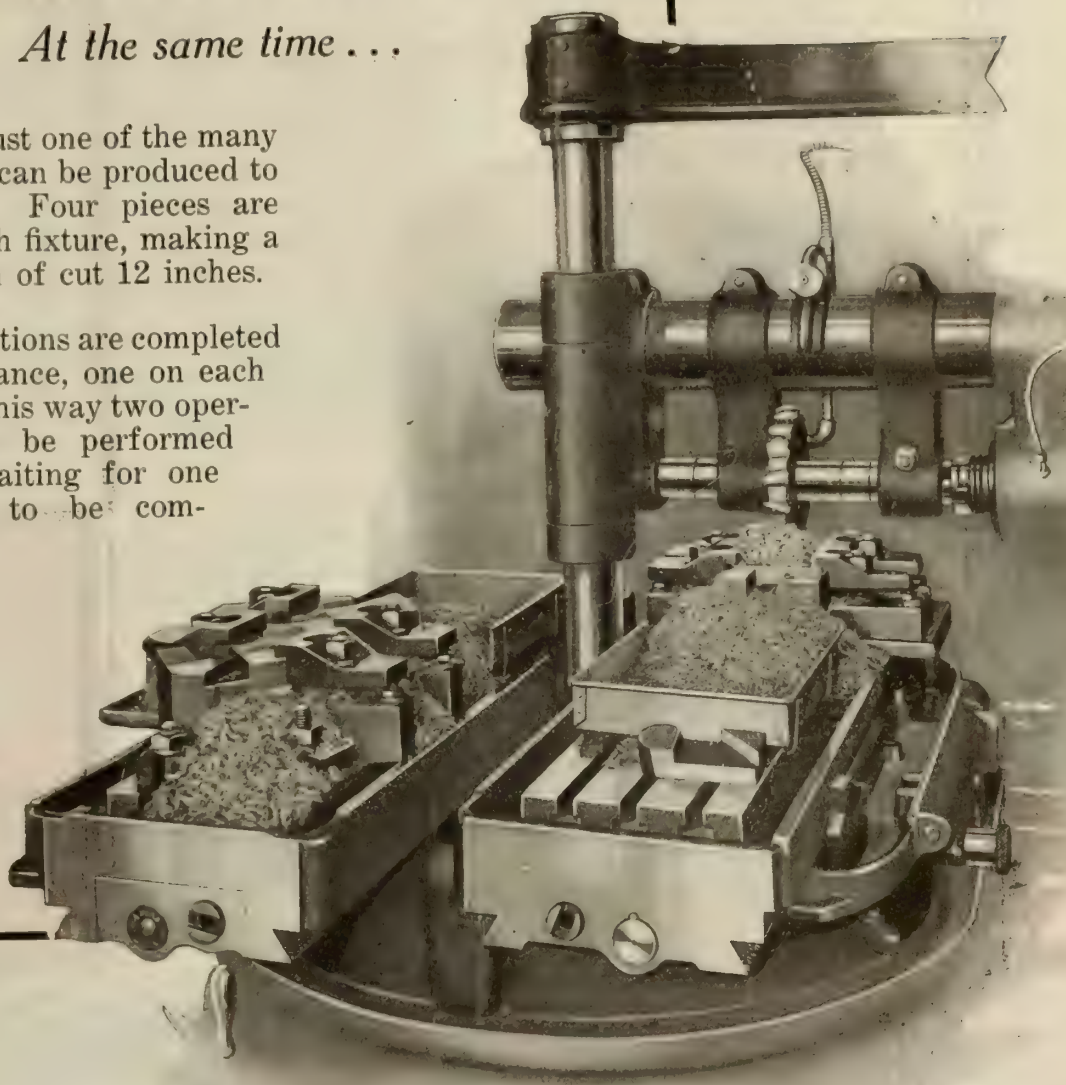
*If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.*

# Two Operations

*At the same time . . .*

Here is just one of the many pieces that can be produced to advantage. Four pieces are held in each fixture, making a total length of cut 12 inches.

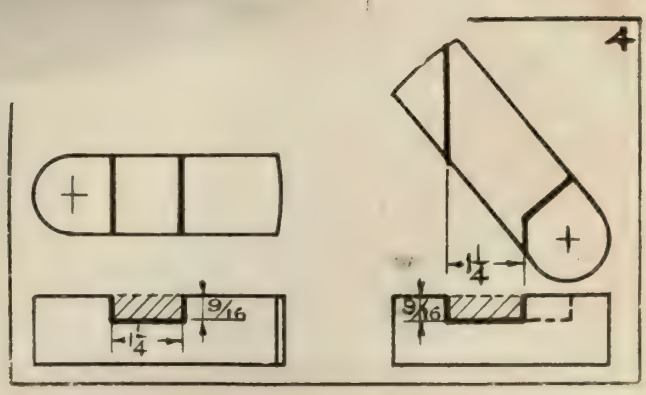
Two operations are completed in this instance, one on each table. In this way two operations can be performed without waiting for one operation to be completed.



Compare this with your work and investigate this manufacturing proposition.

No lost motion.

No marks from returning cutters.




*Canadian Offices:* POTTER & JOHNSTON MACHINE CO.

## ROELOFSON MACHINE & TOOL CO., LIMITED

*Head Office and Showrooms:*

11 Wellington Street East, TORONTO, CANADA

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## Full Time and Overtime

HEAVY service imposes a tremendous strain on your plant machinery. Every individual part of every unit must be properly lubricated to carry the load.

Scientific selection of your lubricating oils is every bit as important as the careful choice of mechanical units themselves.

Imperial Lubricants, backed up by Imperial Service, will solve your lubricating problems. Increased production, minimum depreciation and lowered lubricating costs surely follow.

There's a right grade of oil for every service condition; the quality is always uniform, with ample supplies conveniently available. Imperial Lubrication Engineers will gladly advise you on all lubricating problems.

*Write to 56 Church St., Toronto.*

IMPERIAL

**Lubricants**

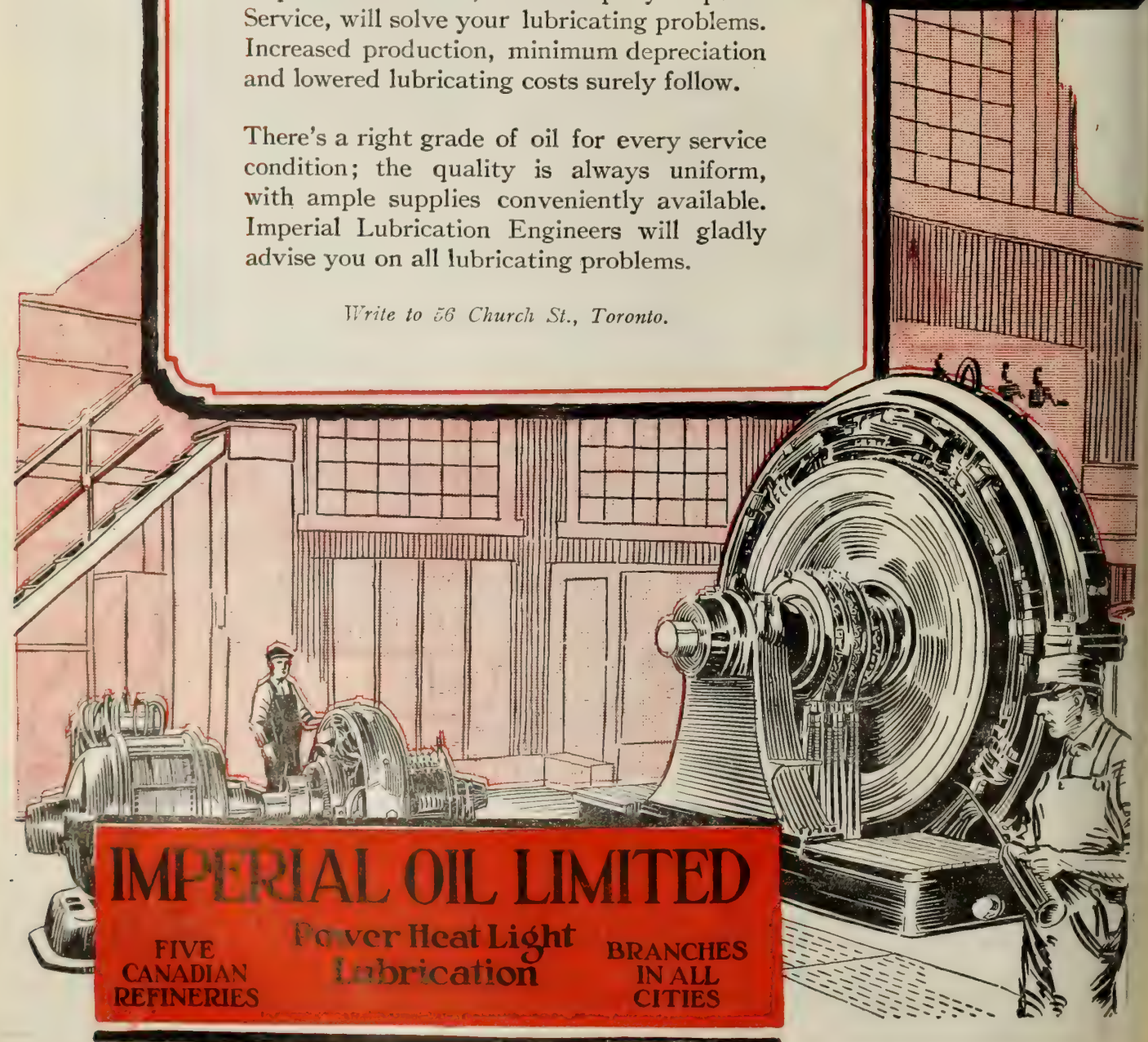
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Imperial Renown Oil
Imperial Gas Engine Oil
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**IMPERIAL OIL LIMITED**

FIVE CANADIAN REFINERIES

Power Heat Light Lubrication

BRANCHES IN ALL CITIES




# Canadian Hart Products

## GRINDING WHEELS THAT CUT FASTER AND LAST LONGER

Many of the largest shops in the country use Canadian Hart Wheels exclusively. We know the class of work these shops do and we take particular care to supply wheels of the proper grain and grade — they cut faster and last longer.




Just a line or two from you acquainting us with the nature of the work you wish to grind and we will select the "Canadian Hart" best suited for the purpose. There is satisfaction and profit in having us choose the right grinding wheels.

**MADE IN CANADA**

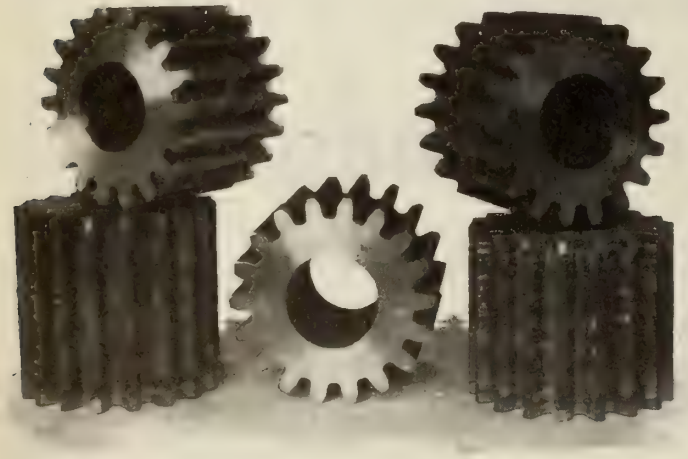
## Canadian Hart Products, Limited

**Hamilton, Ontario**

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CUT GEARS

Write for
Data Sheet No. 32
on Raw Hide Pinions



Engineering Standards useful to Draftsmen, Machine Builders and Users of Pinions.

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Hamilton Gear & Machine Co.

Van Horne St. Toronto

STEEL CASTINGS

*QUICK DELIVERIES*

**High Carbon Steel**
**Manganese Steel**
**Chrome Steel**
**Mild Steel**

*QUALITY GUARANTEED*

Sizes—½ lb. to 5,000 lbs. each

THE WILLIAM KENNEDY & SONS, *LIMITED*
OWEN SOUND, ONTARIO
ESTABLISHED 1860

CANADIAN ATLAS CRUCIBLE STEEL C
LIMITED

Made in Canada

L-XX HIGH-SPEED
ATLAS TOOL STEELS
ATLAS ALLOY STEELS

Hot Rolled, Forged Blocks and Discs
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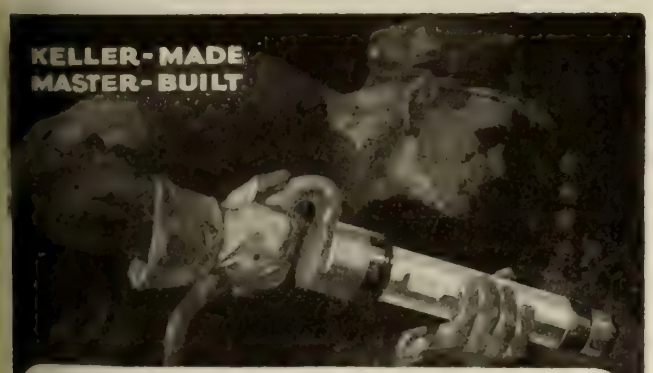



## STRENGTH

Strength is a very essential quality in a wrench, but it does not depend entirely upon bulk or weight of metal. The strength and long-lasting qualities of Armstrong Wrenches are the result of skilled combination of the Best Steel, Expert Design, Accurate Machining, and Heat Treatment. All kinds and sizes.

*Write for free Catalogue.*

**Armstrong Bros. Tool Co.**
"The Tool Holder People"
335 N. Francisco Ave., Chicago, U. S. A.




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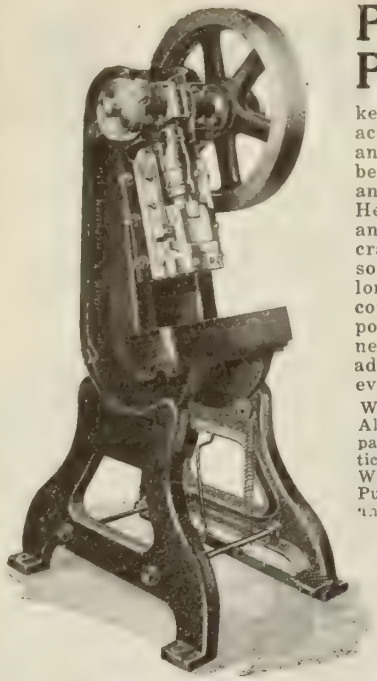
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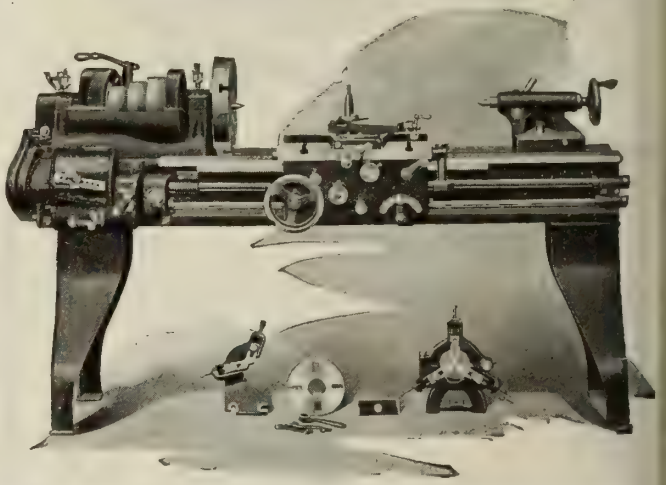
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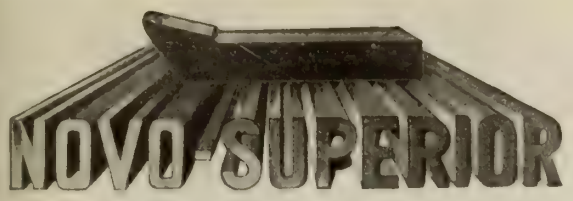
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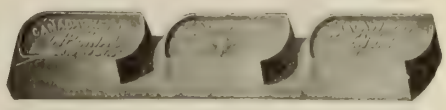
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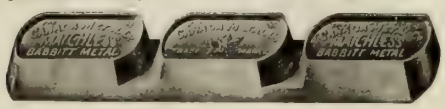



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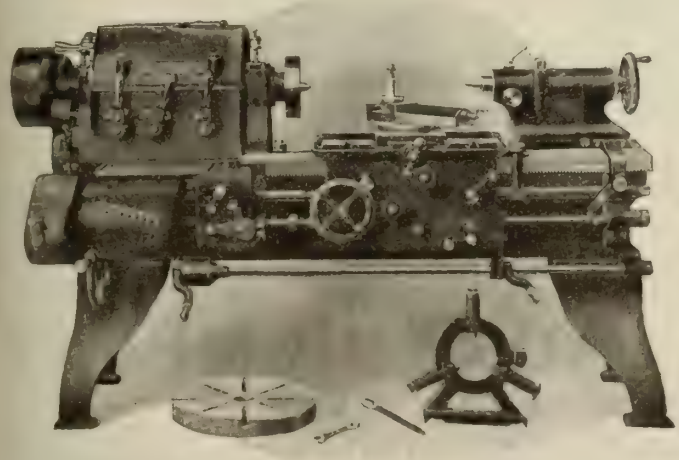
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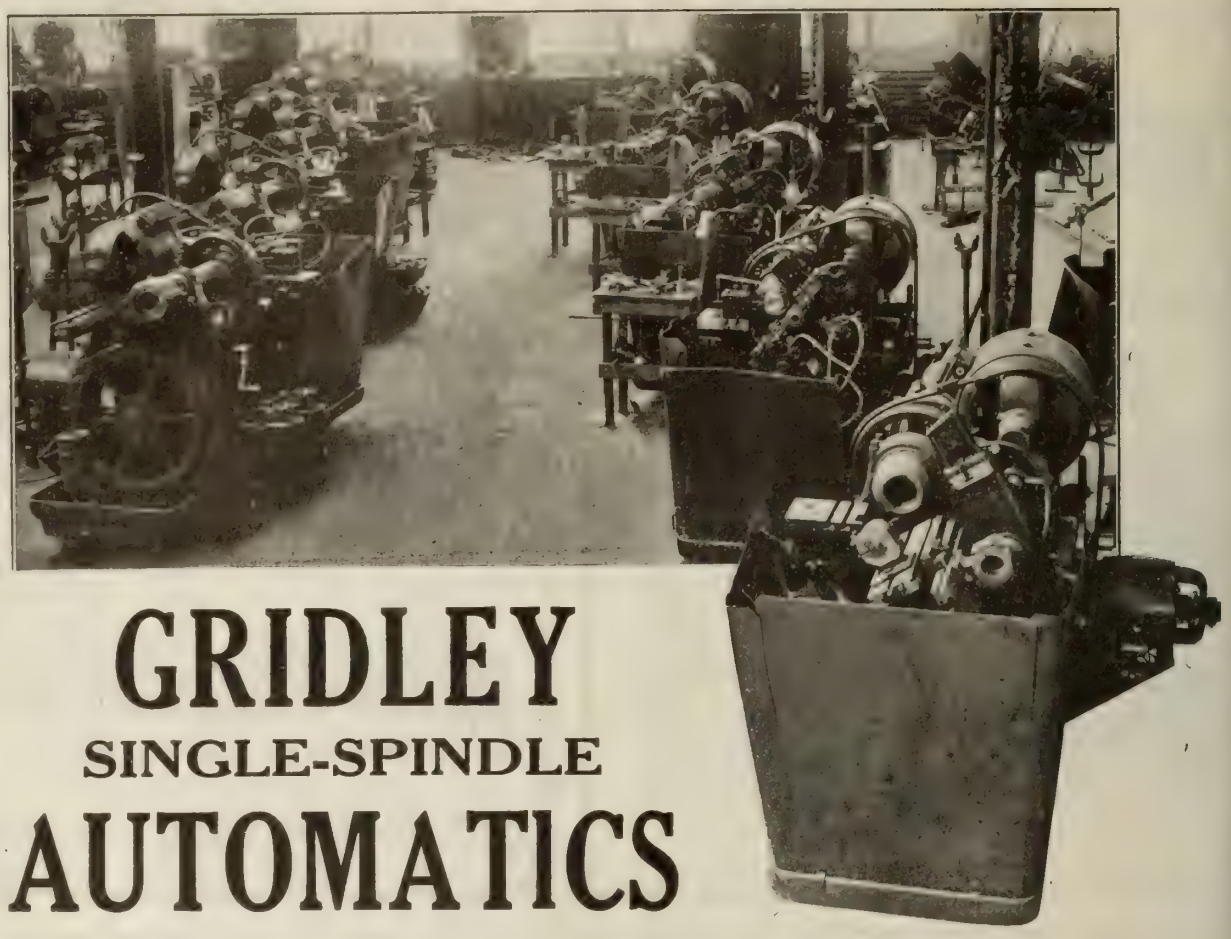
Head Casting forms oil-tight case enclosing all running parts.

In addition these lathes embody all features such as the patent quick change mechanism, the tailstock spindle locking device, the rod and screw shift, etc., forming part of the "LEHMANN" Cone Head Lathes which have acquired an enviable reputation for accuracy and production.

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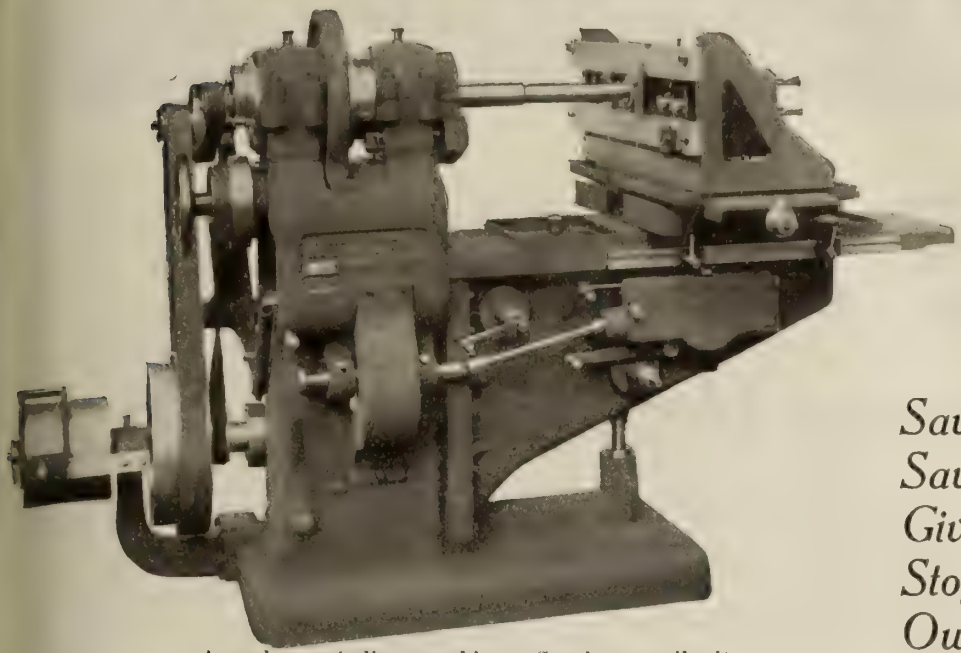
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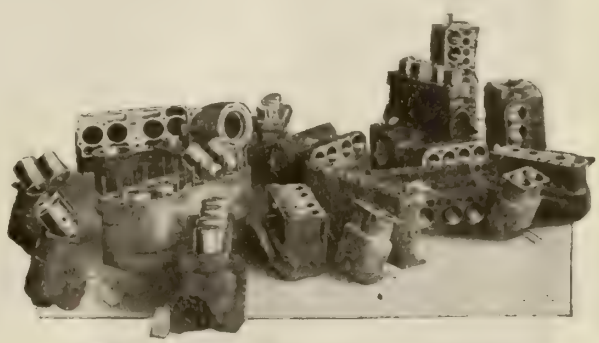
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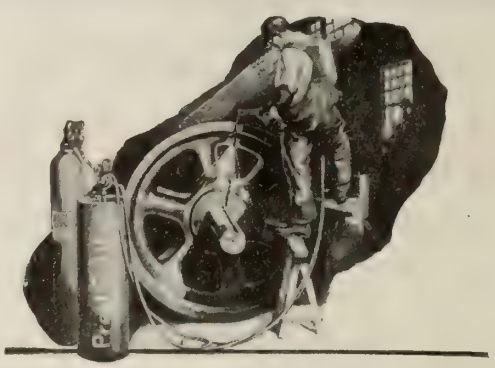
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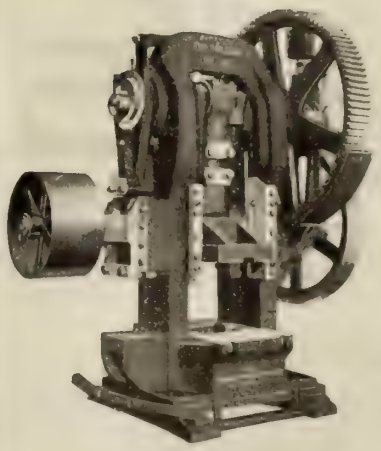
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We make a specialty of building presses to suit individual needs.

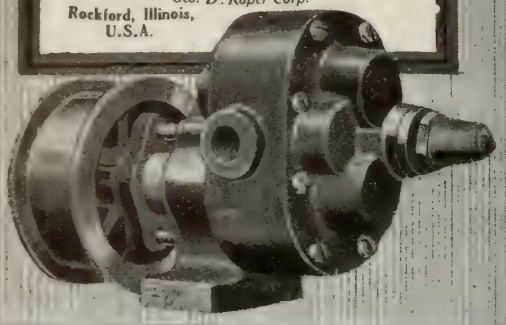
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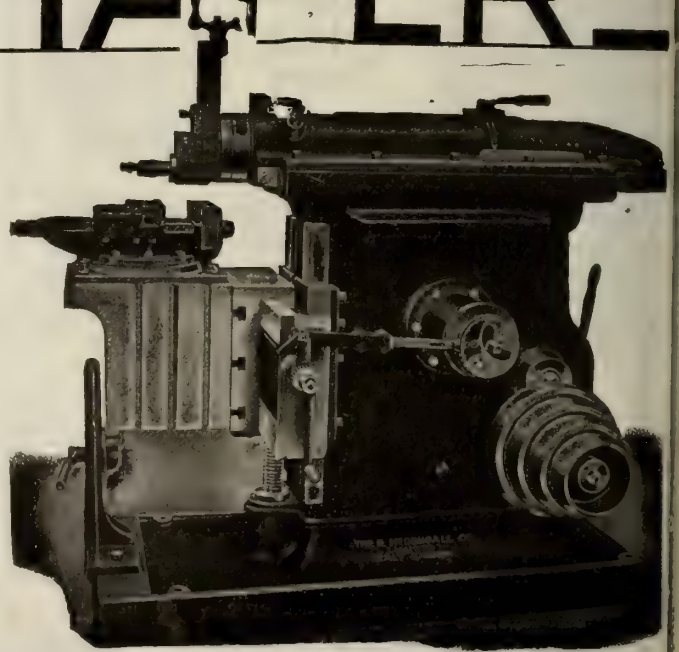
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(a) Will last indefinitely.

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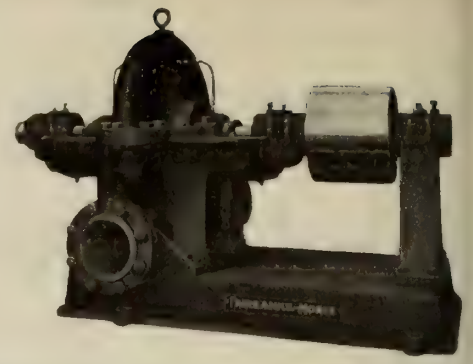
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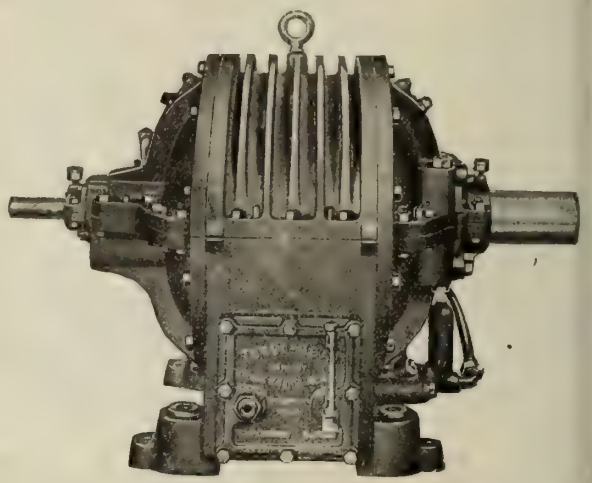
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# Fairbanks-Morse Centrifugal Pumps



combine thorough reliability with simplicity of construction. Their efficiency is surprisingly high. They can be depended upon to operate quietly and satisfactorily. Complete interchangeability of parts facilitates repairs.

## Poole Turbo-Gear has an efficiency of over 98 per cent.



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- Electrical Supplies
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- Cast Iron Pulleys
- Rope Transmission

The Turbo-Gear is a mechanical step-up or step-down speed transforming device. It is coupled between and directly to the prime mover and the driven unit. Turbo-Gear is pure torque transmission. There is no side strain on shafts or bearings. Forced lubrication, economy of space and maintenance, and absolutely quiet running are some of the other factors behind its 98% efficiency—plus.

Our nearest sales office will gladly send detailed information.

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

VOL. XXV. No. 16. April 21, 1921

# Broaching as a Production Factor

Spline broaching—keyway cutting — broaching motor frame — internal gear cutting — broaching vise jaw— broaching key slots in locks, and other interesting work.

*By J. H. Moore*

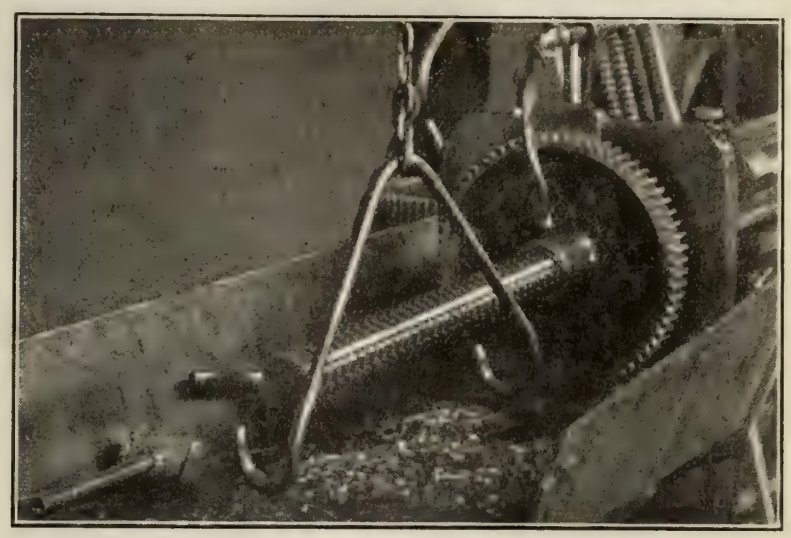


FIG. 1---AN EXAMPLE OF SPLINE BROACHING

WHAT is broaching, The average mechanic might not ask this question, but the apprentice would be almost sure to raise the point, for, if he is the right type of apprentice, he is always seeking knowledge. This does not mean that the average mechanic, or even superintendent, understands fully the scope of broaching, but in their exalted position, as the poet would put it, they leave the simple questions to the apprentice. For the benefit of those interested, here is one way in which the art of broaching might be defined.

"Broaching is the art of finishing of holes, slots and openings, or the machining of various surfaces by tools which have a series of successive cutting teeth of increasing size. This definition holds good whether such teeth are arranged singly or in multiple."

Contrary to a somewhat general impression, broaching is not a new art. As far back as the twelfth century we have record of broaching being accomplished, but, of course, the method was extremely crude. In those days they drove a suitably shaped tool through the hole by repeated blows of a heavy hammer, and it was not until about 1901 that any decided progress in the art was made.

At that time J. H. Lapointe conceived the idea of applying this principle of cutting metal, but along modern lines. The result was the designing of power-driven machinery for pulling scientifically constructed broaches through the work. Of course, all this development work took time. Mr. Lapointe then organized a company to engage in the building of such machines, also the broaches for the same. In 1911, however, he severed his connection with the firm and organized the J. H. Lapointe Co. at New London, Conn. It is to this latter firm that we are indebted for the illustrations and information to follow.

### A Talk on Broaches

At first, broaching was considered merely as a means of finishing various shaped openings quickly. But subsequent experience proved that it can also be used successfully for finishing the outside surfaces of work. Where a hole is to be broached, the work is held stationary and the broach pulled through it, but where the outside surface is to be broached, the hollow type of broach used for such purposes is held in a fixed position and the work pulled through the tool.

The broaches themselves are formed to a taper, that is, each tooth is progressively higher than the one preceding it. In this way, the edge of each tooth is able to take its share of the complete cut. The degree of taper of the broach, which is usually expressed in inches per tooth, varies according to the nature of the work to be broached, the length of the piece, and the style of machine on which the work is being done. The average taper per tooth is about .003 inch.

The style of broach used is very important. For example: in some cases it is highly desirable to nick the teeth of the broach, in this way assisting in breaking the chips. The amount of undercut on the teeth is often modified to insure a smooth cutting action, and so on. In fact, experience is a great teacher, and when in doubt it is good practice to put your problem up to the makers of the machine.

At the end of the tapered section of the broach, it is the usual practice to have about five or six teeth which are of the same height. Of course, the purpose of this is self evident, viz., to finish the surface that was roughed out by the last tooth on the tapered section.

As a general rule, the cross section of the broach is made the same shape and size as the outline of the piece to be broached, but in cases where the operation is extremely difficult, it is found advisable to use two or more broaches successfully. In fact, as many as a dozen broaches have been known to be used in some cases.

What work can be accomplished on such machines? To answer this question in detail is almost impossible in an article of this nature. Enough to say that there are some classes of work where broaching has proved very suc-

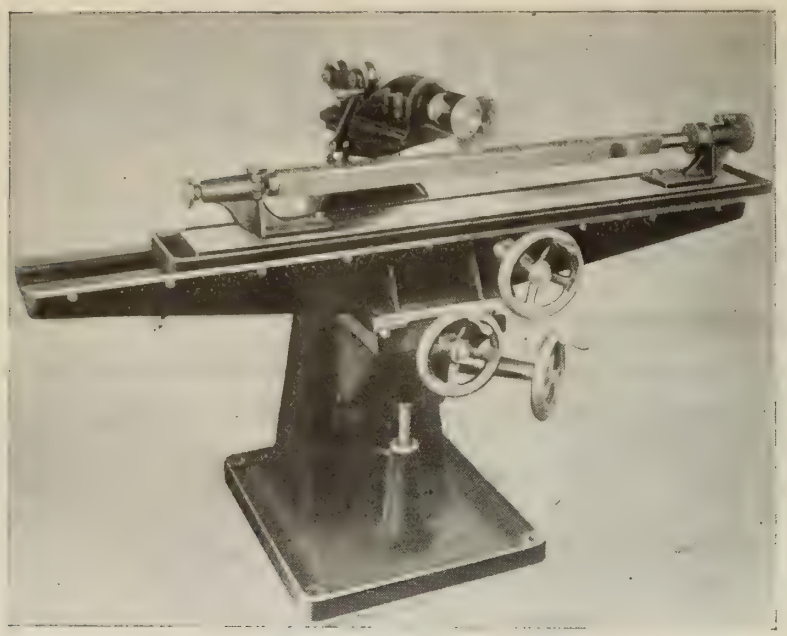


FIG. 2—THIS MACHINE WAS DESIGNED EXPRESSLY FOR THE PURPOSE OF SHARPENING BROACHES.

cessful. First let us consider internal work.

The cutting of keyways of all kinds; broaching of round, square and other special shaped openings; reamer broaching; wrenches; internal gears; grooves in various styles of work; splines; implement parts, and in fact any style of work that has a hole in it to be finished. The big point to keep in mind is productive time. Think of your present method, see if broaching can improve it, then use your own judgment.

Finishing external surfaces is, of course, the reverse operation, for, as explained previously, the broach in this case is stationary. However, it can be generally stated that former milling operations have lent themselves to this style of broaching, and serrated rolls on textile machinery have also been successfully finished by this method. However, as a general proposition, it is not feasible to make either internal or external broaches over six inches diameter.

### Is Broaching Accurate?

The accuracy secured by broaching is largely dependent upon the amount of support furnished by the surrounding walls of metal at the points where broaching is being done. In any case of cutting of metal, there is always a tendency for the work to spring away from the tool unless it is prevented from so doing by some rigid means of support. The same condition holds good in broaching. The amount of distortion is often negligible, and in many cases too small to be of importance, but it is easily understood that the highest degree of accuracy cannot be expected, or obtained, if the support around the part being broached is not adequate. It has been proved, however, that where the work, or the work holding fixture, affords the correct amount of support, the work can be held to limits ranging from .001 to .002 inch, and a broach will cut several thousand pieces before it becomes worn enough to change results.

As conditions differ considerably in the cutting of various types of metals, it is necessary to use different coolants, or, as they are sometimes called, lubricants, in order to prevent excessive heating of the broach and work. The coolant also acts as a lubricant and helps to overcome frictional resistance and consequent wear. Cast iron and brass can generally be broached dry, and in some cases aluminum is also cut dry, although many claim that kerosene should be used as a coolant.

On steel of ordinary hardness, mineral lard oil is used, this giving a combined action of cooling and lubricating. On particularly tough work, such as alloy steel, etc., white lead slightly thinned with linseed oil or kerosene is generally used.

The No. 5 machine, as made by the concern we are speaking of, has a stroke of 96 inches, so it will be seen that considerable length of work can be accommodated. The No. 0 machine has a stroke of 21 inches. These figures will give readers some idea of the range. Experience has shown that when the heat treatment of steel has been conducted to give the maximum degree of softness, the best broaching results can be obtained. A scleroscope hardness of 32 to 40 is about right, for if the metal is any softer, it will tend to tear instead of cutting freely. On the other hand, steel of a greater degree of hardness than 40 will soon destroy the broaches.

### Sharpening of Broaches

It is a matter of great importance to design the broach teeth in such a way that the cutting edges can be re-sharpened without reducing the diameter or size of the tool. This condition is obtained by leaving a land on the top of each tooth, so that when the cutting edges of the teeth become dull the front face of the same can be ground without affecting their size. It will be remembered that we have already mentioned that the last five teeth were of uniform size. As the sharpening continues from time to time, a point is finally reached when the height of the teeth begins to decrease with further grinding. The method adopted is next to start on the first of the five straight teeth, grinding this tooth so that it actually becomes the last one on the tapered section. By continuing this practice, the number of straight teeth is gradually reduced to one. When the land of this tooth has been ground away the broach has served its purpose.

However, the grinding of broach teeth is not such a task as it was formerly, for the company mentioned has produced a grinder as shown at Fig. 2, expressly for the grinding of broaches. It was originally designed for use in their own factory, but the demand became so insistent for a machine that would accu-

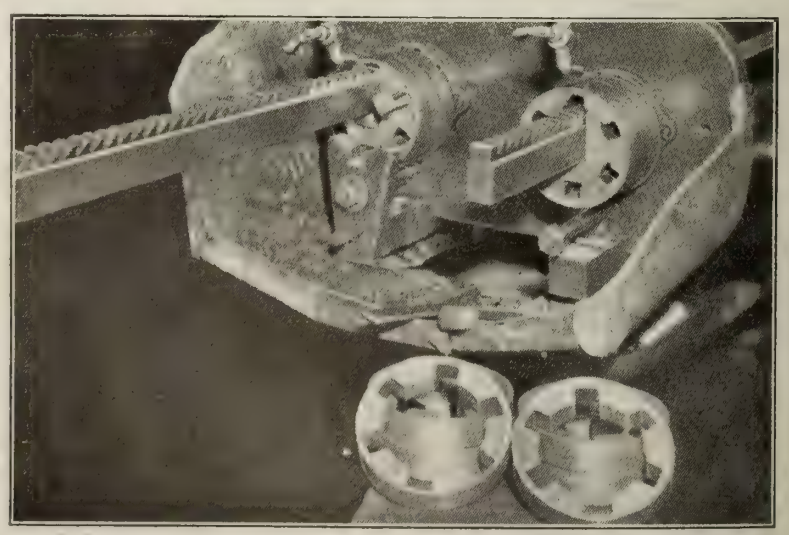


FIG. 3.—A DOUBLE BROACHING MACHINE CUTTING 216 SLOTS PER DAY.

rately grind the small and varying angles of broach teeth, that they issued it to the trade. As will be noted, it consists of a solid column supporting a vertically adjustable knee.

### The Making of Broaches.

It is an open question whether manufacturers should attempt to make their own broaches. Some corners do so, while others order direct from the makers of broaches and broaching machines. Personally, my opinion is that it pays to get your broaches made by those who understand the subject best. On one occasion I remember disassembling a large clock for cleaning. After re-assembly I had various parts left over. The clock still goes—but not as good as it used to. The same applies to broaches. You may make a broach that will do the job, but are you getting 100 per cent. efficiency out of it? However, we are not going to enter into a discussion on the subject, so let us proceed to actual examples of work performed.

### Examples of Work.

First let us consider Fig 1. Here is shown an example of spline broaching. The production on such work varies, of course, with the length and depth of cut, and it is often necessary to use a set of broaches to attain the desired depth. In this case a set of four six-spline broaches were used and the production obtained was ten finished pieces per hour.

The next example, Fig. 3, shows a double broaching machine working in a large factory at Philadelphia. The work being done is the cutting of keyways in female parts for alignment joints. Each part has six slots, and the production obtained is 216 slots per day. It might be well to mention that this output exceeded that obtained on a single machine by 80 per cent. These figures need no comment, as the significance is very clear.

Fig. 4 shows a real sized broaching job. This is accomplished on the No. 5 machine, and the operation shown is the broaching of 12 ⅝ in. by 14 in. grooves in a motor frame. These frames are 22-inch diameter, and through the use of 12 cutter bars, the twelve grooves are cut at one operation, the time per piece being only five minutes. The outer ends of the cutter bars are connected by means of radial springs that draw them to a common centre. The rear ends of the bars are cut away on the inside, so that, when the draw head is out ready for the return stroke, the cutters are drawn in toward the centre, clear of the work, which can then be easily slipped on or off the work holder or bushing on the faceplate.

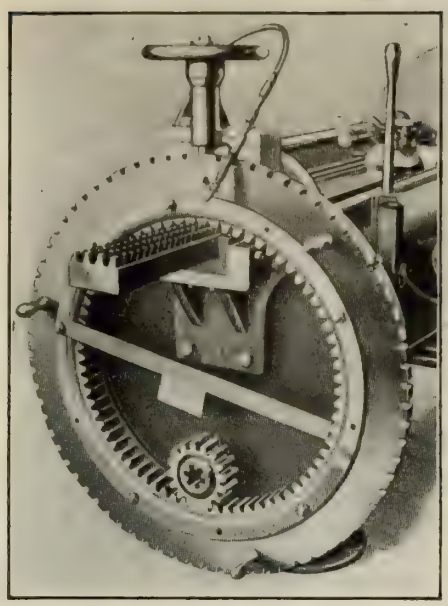


FIG. 5—A GOOD EXAMPLE OF INTERNAL GEAR CUTTING, USING A SPECIAL BROACH FOR THE WORK.

Fig. 5 depicts a fine example of internal gear cutting. This illustration shows a 22 in. gear, 3 pitch being broached. This job, although large, is completed on a No. 4 machine and, although the broaches and fixtures were rather expensive, the production obtained offset the first cost. On smaller work of this nature it is not only possible to broach all the teeth in one operation, but when the cut is comparatively short, two or three gears can be broached at one time. Of course, under such conditions, production soars, and in every case the gears are interchangeable. In a certain Detroit automobile factory internal gears 3½ in. pitch diameter, 1 in. thick, and made from 45 pt. carbon steel, are being broached at the rate of 12 per hour. This is only one case, but the production figures speak for themselves.

Fig. 6 presents an interesting piece of work. This shows a vise jaw weighing 90 pounds and having a hole 6x4½ inches to be broached. The weight of the broach used for this work is 265 pounds, and owing to its weight it is arranged with a shank on the rear end, which telescopes into a special rear bracket as shown. This bracket is securely fastened to the table, so that when the broach is disconnected from the machine it is supported in the bracket and can be rotated to clean out the chips.

After the vise jaw is slipped on the end of the broach for the operation, the machine is reversed, bringing the connecting bushing into the broach. The broach is then connected by means of a key, and the machine started for the operation. Before the shank leaves the support bracket the pressure is sufficient to hold the broach in position without the aid of the bracket. This work was done on a No. 4 machine.

Figs. 7 and 8 show two interesting jobs. The first of these illustrates the broaching of the tee slot in the breach of a U. S. naval one-pounder rifle. A set of ten broaches are used to complete the slot, and a production of one gun every hour and a half is obtained.

Fig. 8 depicts a former milling operation, that of broaching flats on a large shaft. The style of fixture used is self evident. Enough to say the work is being handled very successfully, although we have no production figures on this piece.

Let us next dwell on a few word pictures of production procured by the broaching method. On a double screw machine, connecting rods have been produced at the rate of 55 to 75 per hour, depending upon size, length of part to be broached, material, etc. In fact, with some arrangements, 100 per hour has been obtained, and as many as 20,000

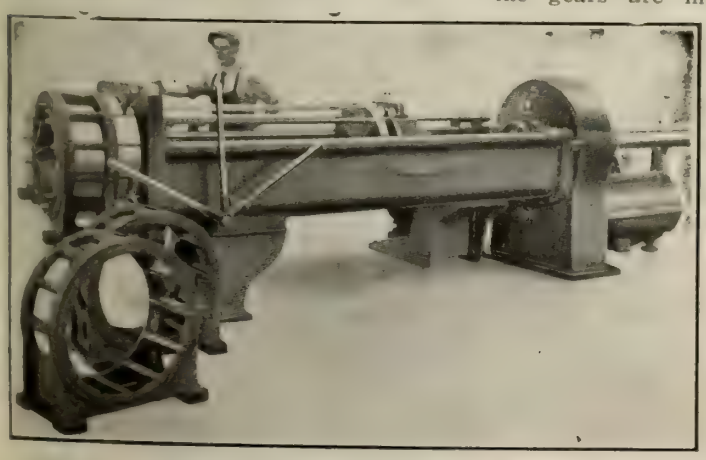


FIG. 4—BROACHING 12 SLOTS IN A MOTOR FRAME.

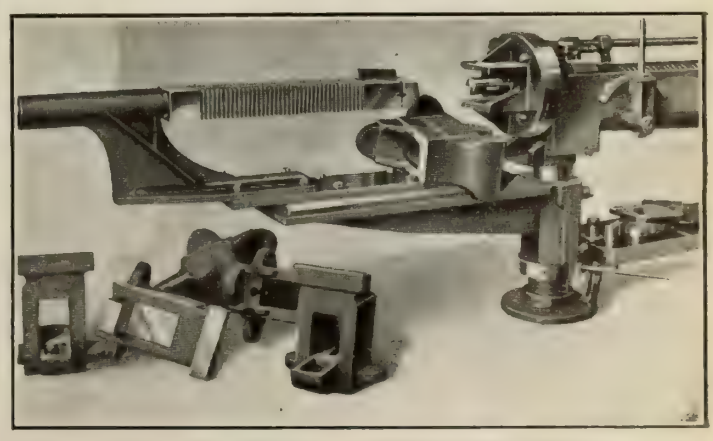


FIG. 6—BROACHING A 90-POUND VISE JAW.

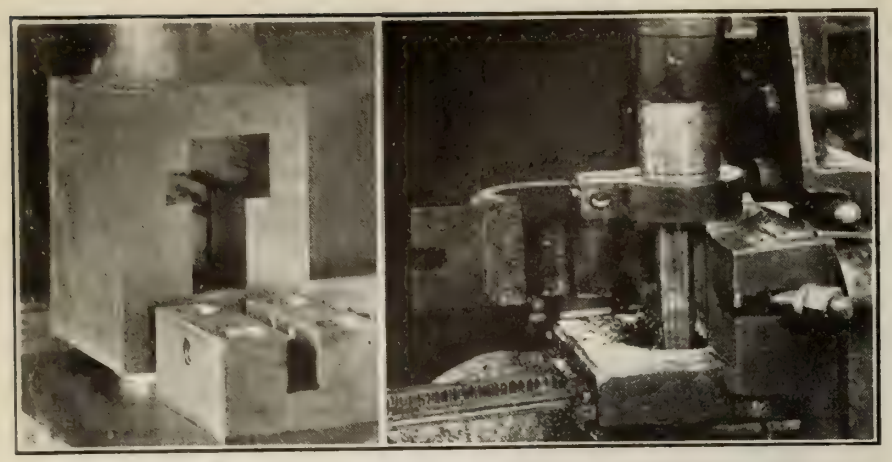


FIG. 7—LEFT HAND VIEW. BROACHING TEE SLOT IN NAVAL RIFLE.
FIG. 8—RIGHT HAND VIEW. BROACHING A FORMER MILLING OPERATION.

rods have been broached complete with one set of tools. The low cost under such conditions is readily understood.

In some plants, wrenches are being broached at the rate of 120 per hour, this figure being obtained easily, and with a very simple work-holding fixture. Automobile engine castings have also been broached very successfully; in fact, it is practically impossible to mention all the classes of work that can be broached, for new uses are being found every day.

At Fig. 9 is shown an interesting example of wrench broaching. These wrenches are broached from the rough forging, and the fixture holds eight pieces, these being all completed at one stroke. Stock to the amount of .062 in. is removed from the three jaw faces in this operation. The fixture consists of a profile projecting from a body casting to take the thrust of the broach and hold the wrenches in place. The wrench forgings, four to a side, bear against each other and are held toward the handle at each side of the fixture by two grooved sections, of which the upper is raised and lowered by a hand screw to permit the removal and the injection of the work. The broach rides in a guide and has its shanks milled away so that it is unnecessary to remove it when loading the fixture between cuts.

Allowing the machine operator as much as fifty-five seconds to unload and then put the eight new forgings in place —which is considerably more time than is consumed in actual practice—a production of 250 completed forgings is attained per hour on the single spindle machine for which the fixture was originally designed. The previous method of machining these forgings was by milling. It is claimed that the broaching method gives a considerable increase in production over milling, and that the desired accuracy is consistently maintained.

Fig. 10 depicts a lock broaching problem, and this concern gives us the following data relative to it.

**Broaching Key Slots in Locks.**

Broaching of the paracentric slots in lock plugs similar to those illustrated in the drawing is by no means a new machine shop operation. It was being successfully done at least a decade ago with vertical or push broaching machines, and before then, in one shop at least, with a rude make-shift, consisting simply of a belt travelling over pulleys to which the thin broaches were secured. But until now this rather unusual type of broaching has never been done on a horizontal or pull broaching machine.

The machine used, which is a special model of the Lapointe standard No. 1 machine, was recently built for one of the largest lock manufacturers in America. A second machine with full equipment for broaching key-recesses is now under construction for another lock manufacturer. The first of these two machines was guaranteed to broach a minimum of 100 locks per hour. This production has been easily maintained, and in fact we can now guarantee a production of 150 locks per hour on similar work. It is believed that this is considerably in excess of any previous output per man per hour.

Since, in broaching these irregular slots, it is necessary to start the cut on the external surface of the work, a positive means of holding the lock plugs as well as a rigid guide and support for the broach must be provided. The fixture is designed to hold two lock plugs and so supply two finished key-recesses after every stroke of the machine. Bolted to the main casting of the fixture are right and left hand locating blocks. At the inner edges of these blocks are bored recesses which hold the barrel-shaped work. Two clamping blocks to lock the work in place slide on the first-mentioned members. An eccentric shaft carried by the projection cast on the fixture head stands between the two clamping blocks. A turn of the shaft handle squeezes the work preparatory to broaching. At the end of the cut, the handle is again turned and springs drive back the clamping blocks and replace the work for removal. The fixture projects two feet from the face of the machine as a broach guide and is supported at its extremity by a rigid leg.

**The Broach**

Because of the extremely narrow cut, which is, as indicated in the drawing, but .056 inch wide at the least point, the broach for this lock work is an unusually delicate tool. The fragility of the cutting teeth made it impossible to cut as much metal per tooth as is, customary in the ordinary broaching of the cylinder brass, of which the locks are manufactured. This greatly increases the length of the tool so that it was necessary to provide a broach 60 inches over all. The standard No. 1 machine has a stroke of but 46 inches, so a No. 1 machine bed 20 inches longer than normal was cast for this particular job.

The 60-inch strip of tool steel was cut into ten metal wafers of equal length in order to facilitate the machining of the cutting teeth. A broach body was built to carry the two series of cutter strips, each of which was securely locked in place by a taper block bolted to this tool body. Straight slots, curved

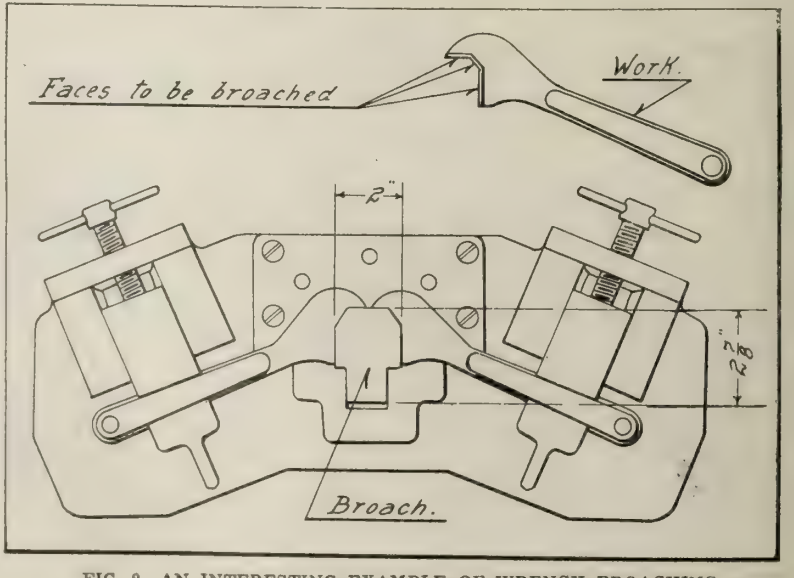



FIG. 9—AN INTERESTING EXAMPLE OF WRENCH BROACHING.



FIG. 11—TYPICAL EXAMPLES OF WORK SUITABLE FOR BROACHING.

slots, and irregular slots of any kind, except those having 90 degree or near 90 degree corners, may be broached by this method.

### Give Definite Information.

Broaching results are often handicapped by the foremen themselves, who, when desiring new broaches, write away for them, but do not include sufficient information. This condition also holds true in a more aggravated form in the case of ordering equipment for the first time, and there is no reason why executives in general should not include the information in the first place, thus avoiding delay. For example, suppose you want some cutter bars. You should then give the following information: Width of keyway; depth of keyway; diameter of hole; length of work; material to be broached; type and size machine on which tools are to be used; do you desire work bushing? what are the limits of accuracy allowed?

Suppose it is square broaches you desire, then mention the distance across flats; distance across corners; diameter of hole previous to broaching; is hole drilled or cored?; length of work; material to be broached; type of machine on which tools are to be used; whether pull bushing and guide is desired; limits of accuracy allowed, and number of pieces to be broached.

In the case of spline broaches, the last eight queries are the same, but in addition you should mention the number of splines; outside diameter of the splines, and their width. Whenever possible, include a blueprint of the piece. These instructions may seem unnecessary, but the amount of information left off the average inquiry for equipment prompts our emphasizing this point.

In conclusion, let us look at Fig. 11. Here are shown a few typical examples of work performed by broaching, and it must be considered that, after all, these are only a very few, but enough has been shown to illustrate the variety of work possible.

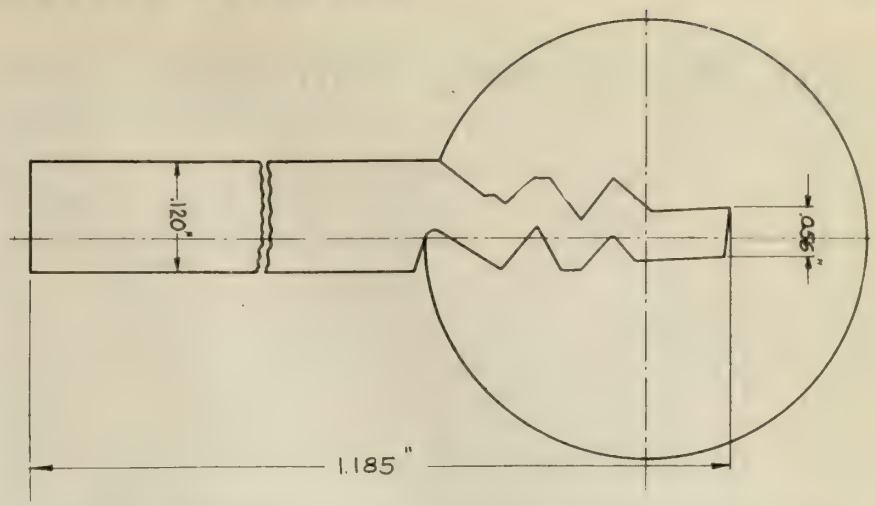



FIG. 10—SHOWING STYLE OF BROACH USED FOR THE KEY SLOT IN LOCK.

# DATA ON THE SQUARE

## RELATIVE AREAS OF THE SQUARE WITH OTHER FIGURES

Calculations based on a square of one inch on a side.

(1) A— —Area $=S^2=S \times S$. $1^2=1 \times 1=1$ sq. in.
D— —Diagonal $\sqrt{S^2+S^2}=\sqrt{1^2+1^2}=\sqrt{2}=1.4142$ in.

(2) Areas of squares vary as the squares of their sides or diagonals.
$A : a = S : S$ or $A : a = D : d$
A square 9 inches on a side is 9 times as large as one 3 inches on a side. $3^2 : 9^2 = 9 : 81 = 1 : 9$

(3) Diameter of circle of equal area.

$$\sqrt{\frac{S}{.7854}} = \sqrt{1.27324} = 1.1284 \text{ inches.}$$

(4) Length of side of square of 1/2 the area equals one-half the length of the diagonal $= \sqrt{(\frac{S}{2})^2 + (\frac{S}{2})^2} = .7071$ in.

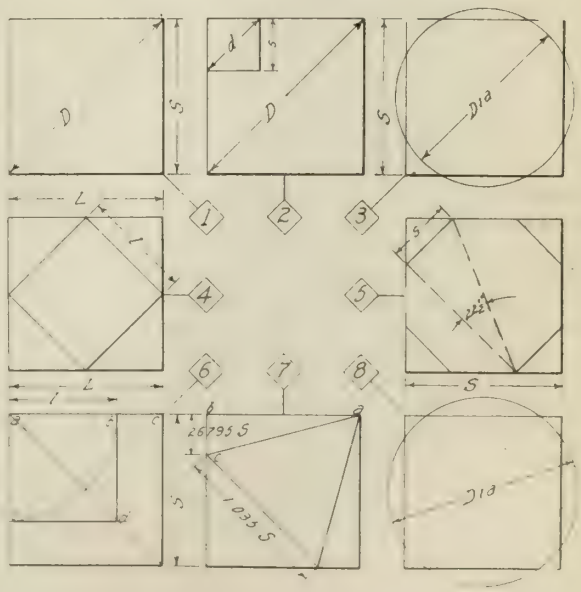
Relative areas of squares, in the ratio of 1 : 2 may be obtained graphically as shown in (4) and (6).

(5) Length of side (s) of octagon contained in square equals tangent of 22 1/2 degrees x S = .4142 x S = .4142 in.

(7) Length of side of greatest equilateral triangle contained in square equals:—

$$\frac{\text{Tangent of 15 deg.}}{\text{Sine of 15 deg.}} = \frac{.26795 \times S}{.25882} = 1.035 \text{ S.}$$

(8) Diameter of circle, the circumference of which equals the perimeter of the square, equals: $\frac{4 \times S}{3.1416} = 1.273$ S.




*Canadian Machinery*

SAVE THIS CHART FOR FUTURE REFERENCE. OTHERS ON VARIOUS SUBJECTS WILL FOLLOW.

# Can We Lessen Vibration and Chatter in Tool

## Chattering in Cutting Tools Can Be Avoided by Carefully Setting the Tools—Trailing Action is Thus Secured—Boring Bar Construction—Careful Tool Setting Will Assist Production

By F. HORNER

IF we take a lead pencil, hold it vertically, and draw it along the paper, as at A, Fig. 1, the result will be a harsh, chattering kind of action. But if the pencil is inclined, as seen at B, this vibratory influence will disappear, and the stroke will be smooth and sweet. This principle of setting the tip behind the centre or holding spot is applied in several types of cutting tools, and is advantageous because of the lessened vibration and chatter. It is only a question of radial movement of the point. Could everything be held perfectly rigid, including the work, the tool shank, and all the parts of the machine that hold and sustain it, the trailing action would not offer any advantage, but as there is inevitable spring and elasticity in most of the elements, the machinist has to circumvent the effects of this deflection.

Imagine our pencil directed forward, as shown at C, what happens is obvious. The resistance of the thrusting of the lead causes the body to bend, or the hand to give, and the penetration deepens, as indicated by the dotted curve. The centre, a, is represented in the case of tools by some portion which is the location of elasticity. In a planer or shaper tool box it is assumed to be the clapper-box pin for sake of demonstration, although other sources of weakness are the tool shank itself, the binding clamps, and the joints of the tool-box and saddle. Even the cross-rail i self may undergo torsion. In stri theory, therefore, the tool point oug

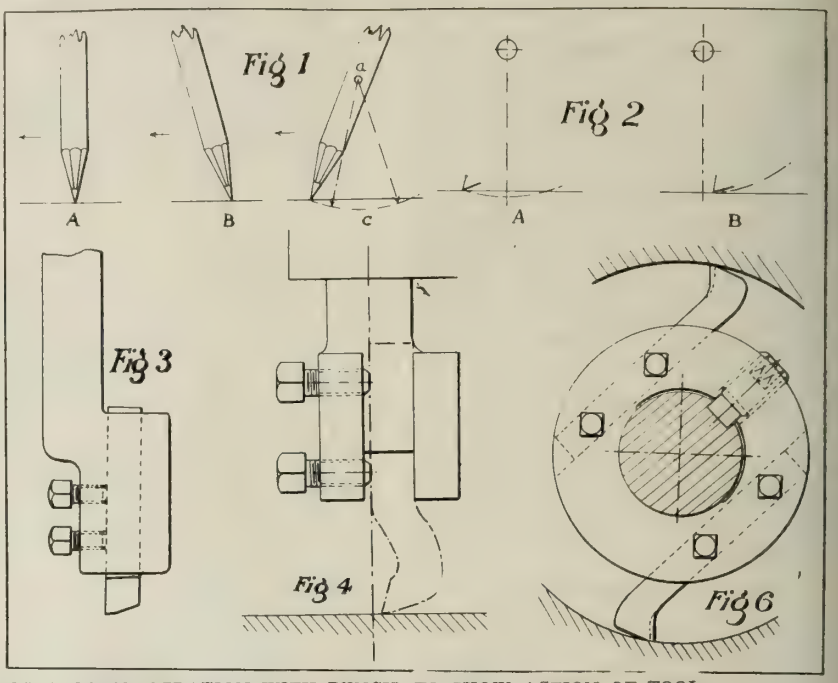



FIG. 1—DEMONSTRATION WITH PENCIL TO SHOW ACTION OF TOOL.
FIG. 2—TOOL SET BEFORE AND BEHIND PIVOT PIN.
FIG. 3—TOOL EDGE COINCIDENT WITH UNDERSIDE OF SHANK.
FIG. 4—BORING-MILL HOLDER CARRYING TOOL SLIGHTLY GOOSE-NECKED.
FIG. 6—SMALL BORING-HEAD WITH TRAILING CUTTERS. (The trailing cut.)

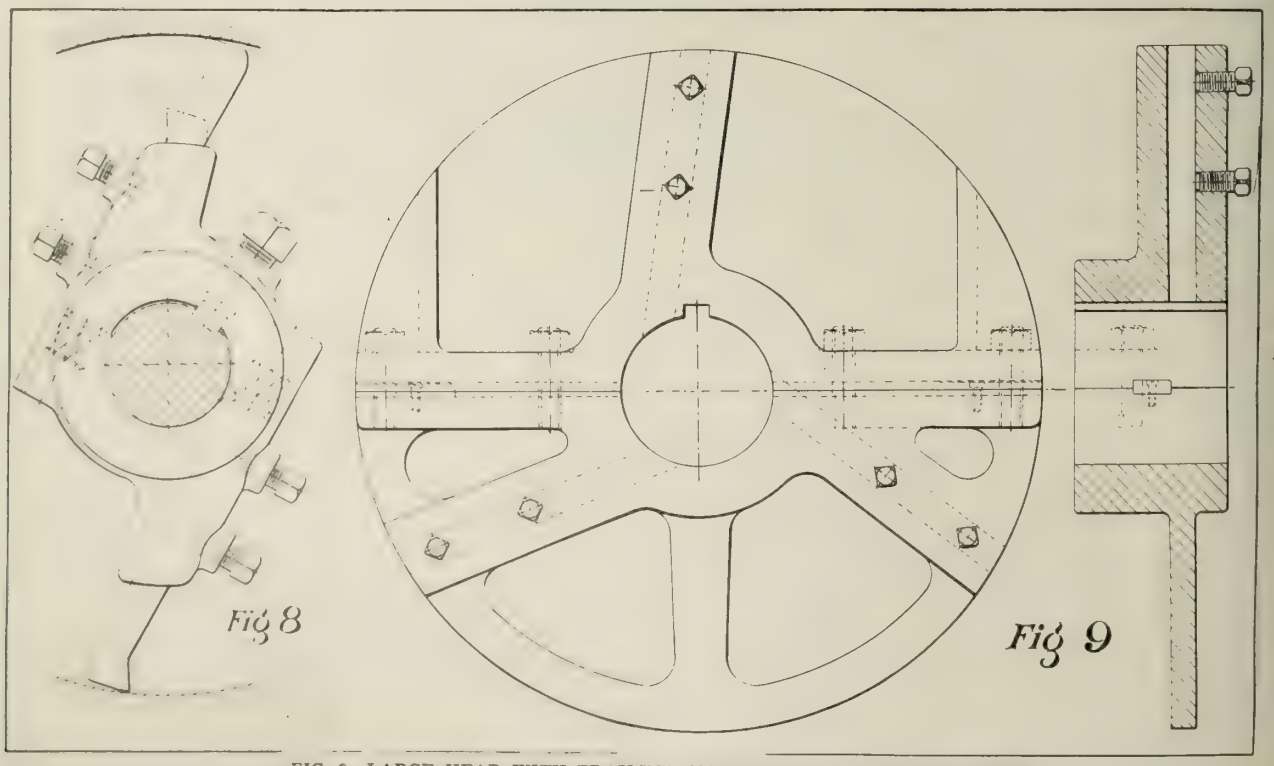



FIG. 8—LARGE HEAD WITH TRAILING CUTTERS AND END ADJUSTMENT.
FIG. 9—LARGE DISC HEAD WITH TRAILING CUTTERS.

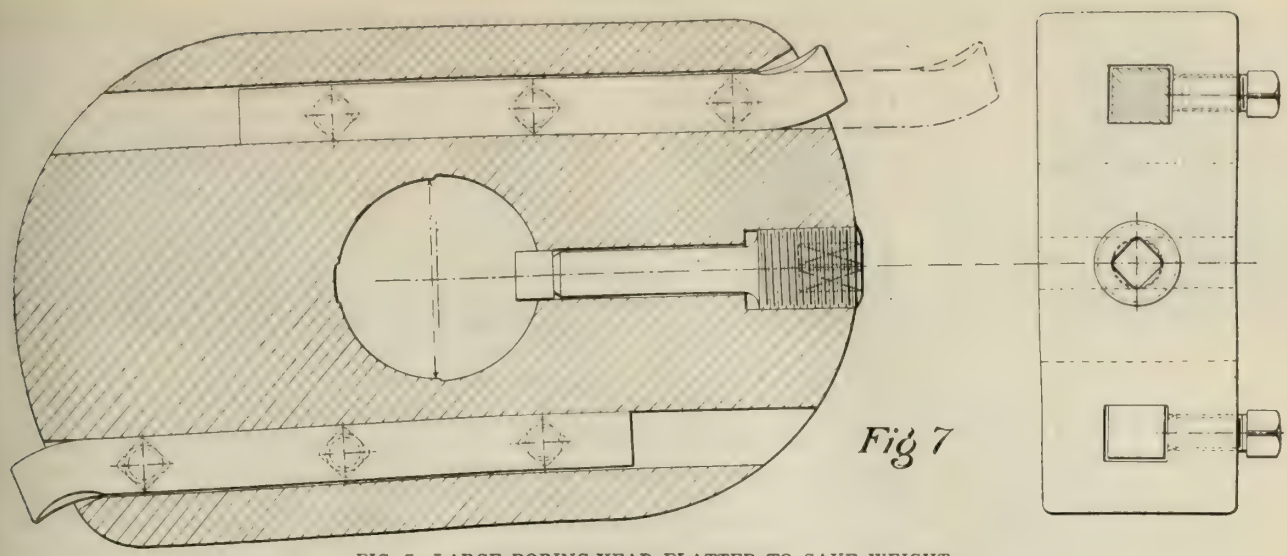



FIG. 7—LARGE BORING-HEAD FLATTED TO SAVE WEIGHT.

to lie back of all these elements, but as this is an inconvenient proposition, the pin is sometimes accepted as the pivotal centre. The tool point consequently instead of being set anywhere in front of the pin, see the diagram, Fig. 2, A, is located behind it, while B is located to a greater or lesser extent, dependent on the convenience of making and using a goose-neck solid tool or holder. This adoption of the spring principle does not necessarily imply weakness; the elasticity is there, but only for the purpose of preventing digging in, and is not comparable with the use of a spring tool of weak pattern that is employed for taking a very fine finishing cut. The only result of an attempt at heavy cutting with such a tool would be the continual evasion of cutting at every little lump or excess of metal.

An even and regular area of metal to be machined imposes little difficulty upon the tool operation, because the stress is constant and not subject to fluctuations inducing the tool edge to dip deeper at any particular spot. Such work, however, is rarely met with, as most pieces are of irregular surface, with swells and lumps, hard spots, and blowholes or other faults that cause variations in tool pressure. Hence, to relieve the machines, the tools, the work, and its fastenings of a great deal of strain and vibration, the trailing out is employed to a considerable degree, not only in planing and shaping, but in boring, and to a moderate extent in other processes.

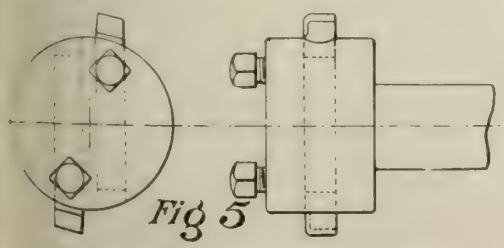



FIG. 5—BORING TOOL WITH CUTTERS BEHIND CENTRE.

As mentioned above, the approximate point of bending is not set down as a hard and fast rule, and a very general practice in regard to planing tools is to

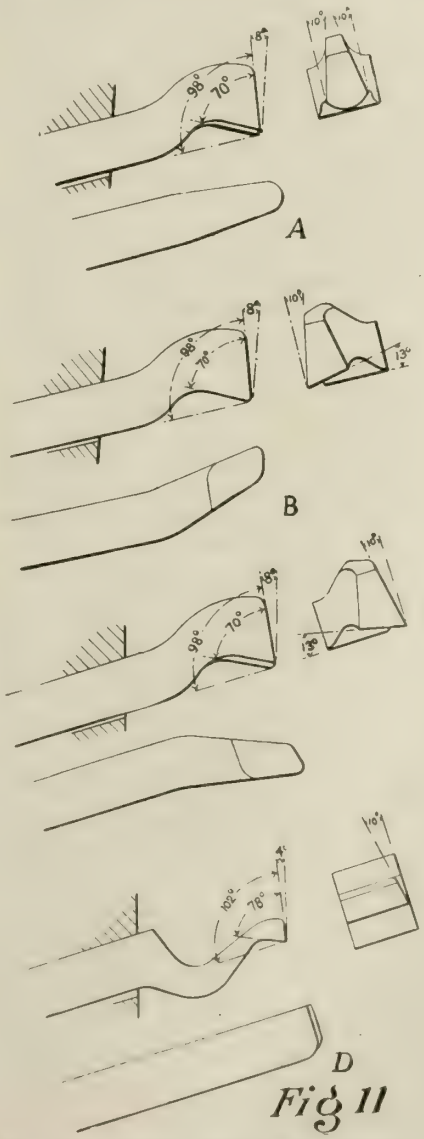


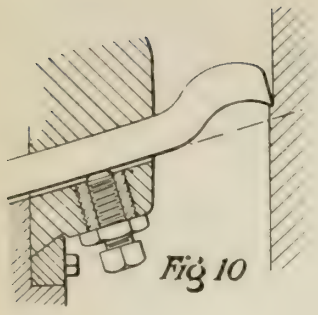

FIG. 11—STANDARD TOOLS FOR PEARN-RICHARDS MACHINE.

have the cutting edge thrown back to a distance equal to the thickness of the shank, a method that answers very well. This is also done with planing holders, such as Fig. 3, as well as with form and radius holders having flat cutters. As regards boring and turning mills, the difficulty lies in the fact that a tool must be prepared to work to the centre of the circle, hence a goose-neck shape would be inadmissible. What is done in this instance is to drop the seating of the holder back, see Fig. 4, so as to bring the face of the tool on a line with the centre. Then, if a trailing action is deemed desirable, one has only to crank a tool appropriately, more or less, such as suggested by the dotted lines in the drawing.

### Boring Bars

Boring bars, from their unsupported nature, and often undue length, are particularly subject to chattering, especially as the bores are badly cored, with irregularities, lumps, blow-holes, and sometimes ports or other openings which cause distress to the tool edges. This question is frequently a matter of relative output, for a bar with non-trailing cutters might tear through a bore in a fashion, but leave it rough and irregular with numerous digs-in. This bore would cost more to finish smooth and true than one had been machined more efficiently with trailing type cutters. The conditions vary so, however, that no hard-and-fast rules may be laid down, results depending on the strength of the bar, the hardness of the material to be bored, and the depth and regularity of cut, combined with the feed rate.

The simplest type of construction for a two-cutter bar is that represented by Fig. 5 for bars of moderate size. The head being swelled permits of sufficient metal to accommodate the two shanks side by side. A similar idea is adopted in some kinds of adjustable blade reamers and boring tools, in which the blades are expanded or contracted by a threaded collar or other medium. When



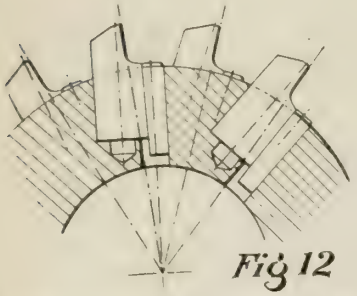




FIG. 10—ATTITUDE OF TOOL IN PEARN-RICHARDS MACHINE.
FIG. 12 MILLING-CUTTER TEETH WITH TRAILING ACTION.

a head is applied to a boring-bar and the trailing principle is desired, the cutter shanks must be disposed to pass alongside the bar, unless the head happens to be of unusual diameter. Three examples of differing designs may be noted in Figs. 6, 7 and 8. The first is suitable for diameters ranging from about 6 in. to 12 in., using heads varying from about 5 in. to 8 in.

Larger heads on this style of construction would involve unnecessary metal in the body, so lightening is done either by flatting the sides in the manner shown in Fig. 7, which provides very long life to the tools, by reason of their length, or by casting bosses on as illustrated in Fig. 8. This last design embodies adjusting screws behind the cutters, to set them and prevent slip. The top faces of the tools in these examples are ground either radial, or with top rake as required. Fig. 9 is a large disc form of head, in which the tools are set in trailing fashion. For convenience of placement and removal on the bar the head is made in halves, with a keyed and bolted joint face.

The application of the trailing cut to facing operations in the boring machines assists production, and the attainment of a good finish. In the case of the Pearn-Richards machines manufactured at Manchester (England)—on which Figs. 6 and 8 are employed—the face plate of the spindle carries a tool-holder or slide which can be fed across in either direction, propelling the tool gradually across the work face. The tool is held in the slide in the way given in Fig. 10. The formation of a few standard tools can be observed from Fig. 11, with top rake suitable for general purposes. The set comprises a straightforward tool, A, bent ones B and C, and a thin spring tool D, with wide face for the finer class of finishing.

With regard to inserted-tooth milling cutters, the conditions in these are not quite parallel with those of the tools previously considered. The amount of projection of the teeth is usually so little that the question of bending or springing hardly comes in. The endeavor to adopt the trailing action is sometimes made, with a view to securing a smoother cut, a specimen of which is offered in Fig. 12. The tooth faces are ground radial, but the tooth body is set behind the normal radial line.

## NOTES ON GAUGING

Speaking on the subject of gauging, especially in regards to the Wickman type shown in this week's new development section, the Alfred Herbert, Ltd., have the following to say:

The manufacture of various components often calls for close limits, and in spite of the increase in the employment of limit gauges to ensure interchangeability of parts, the manufacture of the necessary screws for these parts is still carried on in a haphazard and rule-of-thumb manner. The screws supplied, as will be readily understood, have usually a short life because the importance of form of thread has not been fully appreciated. When replacement screws are ordered, it is usually found that they will not fit without resort to "die-ing" down.

It would appear customary for manufacturers to set up their screw machines to components; this results in an unsatisfactory state of affairs. The component itself is a variable in that its tapped hole will vary in size between limits. The screw machines are allowed to run thus set up, until the assembly shop reports that trouble is being experienced in fitting screws in the holes. By this time the screw machine is some days ahead in production and all the screws which have been made in the interim require hand sizing.

The shape of the threads not being controlled, there is a tendency amongst automatic setters-up to use dies, which produce extremely thin threads, i.e., threads of low effective diameter, thus protracting the periods between setting up. Even if the screw becomes slightly larger on the major diameter due to wear in dies, etc., it can be forced into the hole with a screw-driver, as all the pressure is taken on the tops of the threads themselves, which, being thin, are easily crushed down.

It is not often realized that the more care that is taken by manufacturers to maintain the correct shape of the thread (a necessary condition for screws which will be a good fit and have a long useful life) the more difficult it is to maintain interchangeability. Thus one occasionally hears the argument that interchangeability threads can be produced without gauges. The thread thus produced under such conditions has the effective diameter considerably below the nominal, with a very low mechanical strength and a short useful life. Many manufacturers check their bolts or studs by a micrometer reading on the major diameter regardless of the importance of pitch or effective diameter. These screws have only to be inserted or withdrawn several times to produce a bad fit.

To remedy this state of affairs, attention is directed to the following general principles. The automatic machine should be set up to pass a standard thread gauge, preferably a gauge which will be of a limit type. The gauge itself should be periodically inspected for size, and any error due to wear of more than a predetermined amount should not be permitted, depending upon the pitch of the thread and the use to which the screw is put. The component itself should be tested by means of a plug screw gauge which should also be periodically inspected. This procedure certainly entails a new overhead charge, but the finished article will be superior in quality and will be cheaper in the long run due to elimination of fitters' work on screws. It is futile to produce screws on the machine if 50 per cent. of the output needs re-sizing later by hand.

The ring gauge has undoubtedly been a constant source of trouble to users. It labors under a number of inherent disadvantages. It is very costly to make; it is difficult to check its size when made, and the periodic inspection of it becomes a laboratory process. If the article does not screw into the ring there is no clue as to what is wrong; if it does screw in, there is no guarantee as to the kind of fit, since a ring will pass a screw of exceptionally low effective diameter (i.e., with wafer-like threads) without shake, provided the major diameter is a good fit, or due to big pitch error in the screw.

Next to accuracy of pitch the most important element of a screw is the effective diameter, which is the measure of useful life and mechanical strength. The major and core, provided the error in them is not too great, can vary to many times the limit that could be allowed on the effective diameter, and yet produce an efficient screw, if the gauging equipment is such that it will not permit the major diameter to be larger than nominal or the core shallower than nominal, and so produce interference.

From the foregoing it will be obvious that a gauge, the tolerance of which on the effective diameter can be fixed to a predetermined amount, will be a great advantage. This effective diameter must of necessity be lower than nominal. Any screwed product has an error in pitch; it would not be a commercial proposition to produce one with an error sufficiently small to be called negligible. Any particular error in pitch increases the nominal effective diameter by four times pitch error. For example, if a screw has a pitch error of plus .001 inch its effective diameter will have to be lowered by .004 inch in order to assemble in a gauge (the pitch of which would be accurate to about .0001 inch).



# WELDING AND CUTTING



## Electric Arc Welding Applied to Aluminum*

### Three Ways of Dealing With Oxidation—Current Necessary When Welding Iron or Steel—Necessity of Flux Coating and Other Points of Interest

By F. J. HEYES

EVER since the discovery of aluminium the greatest difficulty has been experienced in joining pieces of it together, either by soldering with some other metal or alloy, or by autogenous welding.

The first and greatest difficulty to be overcome is the affinity of aluminium for oxygen. In order to get any two pieces of metal to unite, it is essential that the surface should be free from any coating of solid dirt or oxide which will prevent them coming into intimate contact. The affinity is so great that even at ordinary temperatures a clean surface quickly becomes thickly coated with oxide, and at temperatures approaching its melting point it immediately becomes thickly coated, and small pieces of the metal will burn away completely. The melting point of the oxide is far above that of the metal, so that it is impossible to weld two pieces together without some flux which will dissolve or get rid of the oxide.

With a plain aluminium rod without any coating of flux, on striking the arc the metal, instead of dropping off as soon as it is melted, hangs in globules on to the end of the electrode, till they become as much as half an inch in diameter, when using a number of electrodes; they then fall on to the plate which is to be welded. These globules become thickly coated with oxide, and so does the plate, so that when they drop off they adhere to the plate only at the point where they are playing, and when cool they can be easily pulled off with the fingers. All the time that this is taking place thick clouds of fumes are given off, and eventually the pieces of aluminium which were to be welded melt, but show no signs of adhering to one another. The thick clouds of fume are probably due to the fact that some of the aluminium is vaporised by the intense heat of the arc, and burns away much more freely.

*From "Mechanical Engineer."

#### Three Methods

There are three ways of dealing with the oxidation: First, by protection of the surfaces from contact with the air and consequent oxidation, by some flux which fuses easily and will not prevent the surfaces coming together. Secondly, by solution of the infusible oxide in some fluxible substance which does not affect the quality of the weld; and thirdly, by chemical combination of the oxide to form some substance which is fusible at the temperature of melting aluminium, or a combination of these may be used.

Perfect protection of the surface cannot be obtained in practice, so that it is necessary to combine protection with solution in one form or another. Chemical combination has the disadvantage that any substance that combines with the oxide will also combine with the aluminium, and so may be used up before dissolving all the oxide, or portions of it may become embedded in the deposited metal and cause subsequent corrosion. Hence, solution of tin oxide in some solution which is chemically suitable when in contact with aluminium is the best method, if obtainable.

Chlorides of the alkaline metals are very suitable for the protection of the molten surface from contact with the air, as they melt below the melting point of aluminium and do not interfere with the making of the weld. Fluorides of the alkaline metals and of aluminium have the property of dissolving aluminium oxide without chemical combination, so that they would appear to be the most satisfactory if there were no other obstacle to their use. Bisulphates of the alkaline metals, being unsaturated compounds, can combine with the oxide, and are very useful for this purpose.

Arc welding of aluminium has been attempted by the author, using the ordinary acetylene welding fluxes, without any success whatsoever, and he reached the conclusion that it is essential to use a flux which is not easily vaporised. For this purpose he found cryolite suitable. In arc welding a small pool of molten aluminium is formed at the point being welded, the temperature of which is far above the melting point of the metal, some of the aluminium being deposited in the form of vapor. At this temperature the cryolite becomes quite fluid, and runs freely on the surface, enabling a very good weld to be made. In trying to weld with a plain electrode the aluminium hangs in globules at the end of the electrode, as already explained, and there is still a tendency for this to occur when using cryolite alone. A small percentage of chloride, however, overcomes this difficulty and renders welding easier.

#### Flux Coating

In arc welding it is essential to have a coating of flux on the outside of the electrode, as otherwise the aluminium in passing from the end of the electrode to the work becomes so thickly coated with oxide that a very large quantity of flux would be required to deal with it. Where the electrodes may be subjected to rough handling it would be very desirable to have the flux enclosed in the electrode, but as this is impossible, it becomes necessary to fix the flux on the outside of the electrode, which may be done satisfactorily with a binding of fine cotton.

In welding iron or steel a current of about 80 amperes is required for a plate about ¼ in. thick, using a No. 8 electrode, but to weld a similar sheet of aluminium satisfactorily it is necessary to use about 150 amperes. The only explanation offered for this is that aluminium is a much better conductor of heat than

(Continued on page 43)

# Tools Used in the Machining of a Roll Carrier

## Four Operations Necessary, viz.: Three Milling and One Drilling —Fixtures and Cutters Used—Advantage of Adapting Finished Surfaces as Locating Points—Simple Fixtures Are Used

By F. SCRIBER

SOME interesting tool set-ups that have been developed in connection with the manufacture of the part illustrated by Fig. 1 are described in this article. The part to be machined is made of cast brass, and a few dimensions showing its general proportions can be noted in the sketch. On account of its frail construction, it would be very easily broken if made of cast iron, so that brass was the best material, insomuch that no great strain is placed upon it, brass being sufficiently strong for the work it had to do. The piece forms a part of a textile machine for carrying two rolls, one at A and the other at B, said rolls being used to transmit motion from a cam to an oscillating arm, and the operations performed in connection with this were, first, milling across the bottom indicated as X, at the same time finishing the sides along the bottom; and second, milling inside of the large bosses A. The third operation is milling the smaller bosses B, while a fourth operation is necessary for drilling all holes in the carrier.

The fixture in which the milling of the bottom was performed is known as the gang fixture, and in it two rows of the parts are set up. The fixture is made to carry a number of parts set end to end, thus utilizing the entire capacity of the machine for what proves to be practically continuous milling. This fixture is shown in Fig. 2, while a gang of cutters used with the fixture is shown in Fig. 3, this consisting of two combined side and surface milling cutters located the correct distance apart on an arbor with spacing collars.

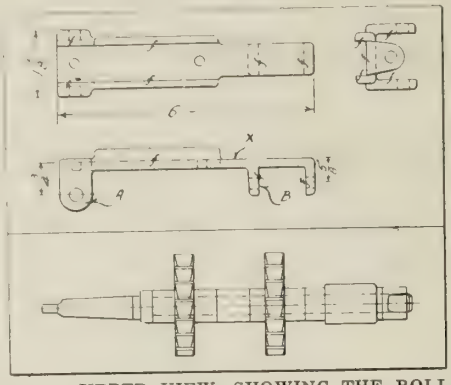


FIG. 1—UPPER VIEW, SHOWING THE ROLL CARRIER.

FIG. 3—CUTTERS USED FOR MILLING THE BOTTOMS.

Referring to Fig. 2, A is the base of fixture which is made of cast iron; the carriers are located on steel seats B, which are screwed and doweled to this base. Other steel blocks C are used to locate the work endwise, the two small bosses on the work being set over these blocks to accomplish this. Other blocks E are placed between each two pieces and against these the work is clamped sideways by means of two clamps F and G, which are caused to operate by draw bolt H when nut I is tightened, thereby drawing the two clamps together. Similar sets of parts throughout the entire length of the fixture hold other parts in place, and the fixture itself is clamped to the table of the miller (which is of the horizontal type). The operation consists of setting the work on a block, locating it endways between the bosses, and clamping it sideways against a centre block. These side-clamping members are made slightly under cut, so the tendency will be to draw the work down against its locating seats.

A rather simple fixture is shown in Fig. 4. This is used for holding two parts while the large bosses are milled inside by a side milling cutter of the correct width. In operation, two parts with the large bosses at centre of fixture are set on a steel block A and are clamped in place by a large strap B, which is forked so that the cutter can drop between it, thus milling the bosses. Nut C tightens the clamp, thereby holding both parts, and a spring D under the clamp raises the same clear off the work when the nut is loosened, thus permitting ready removal. The base of the fixture E is made of cast iron and is located in the tee slot of the milling machine by tongue F, it being obvious that advantage is taken of the finished portion, machined in the last fixture, for locating the work sideways. The vertical feed on the horizontal milling machine is used for performing this operation, the cutter being fed into the bosses the required depth, following which the table of the machine is fed horizontally, just sufficient to mill the bosses.

Again taking advantage of the finished seat on the bottom of this roll carrier, two small bosses X, Fig. 5, are next milled inside, using a cutter which will mill them the required width. This fixture has a hinged cover A, and the fixture is made to hold five parts. The base of the fixture B, which is cast iron, has a steel blank C screwed and doweled in position as shown. Five parts are

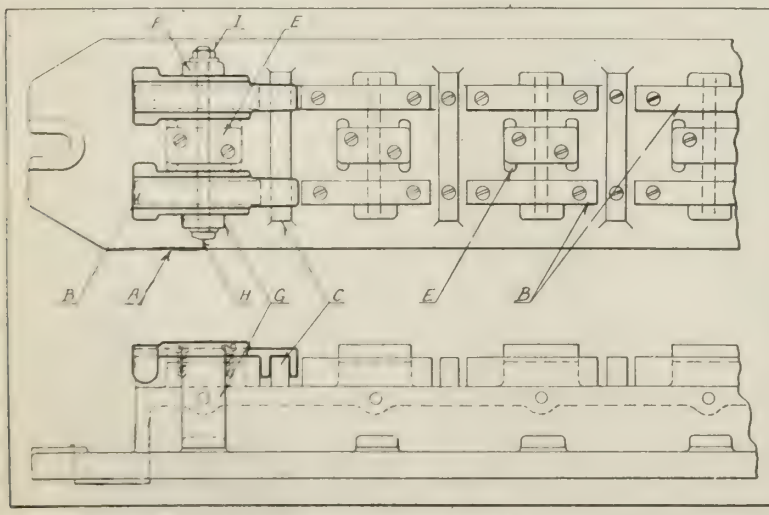



FIG. 2—FIXTURE IN WHICH BOTTOMS ARE MILLED.

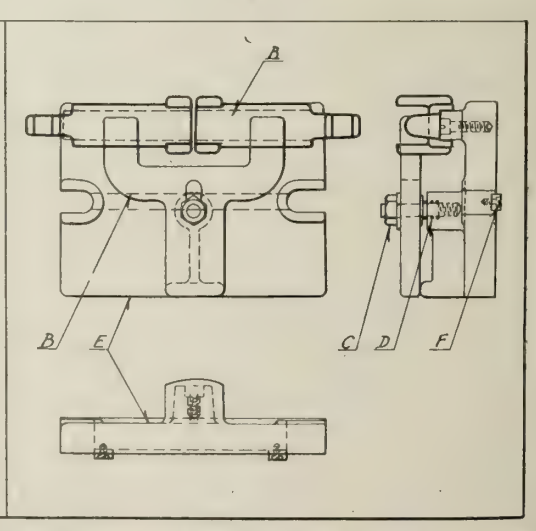



FIG. 4—FIXTURE FOR MILLING INSIDE OF LARGE BOSSES.

put on each of these blocks with the hinged cover A swung back clear of the fixture, said cover pivoting on hinged pin D. Following this, the hinged cover is swung into position as shown and is clamped by means of the hinged bolt E which carries a nut and washer; this bolt pivots on pin F. Each part is forced against the hinged cover at the side by means of set screws G locating from the outside of the bosses at X. A series of set screws H, carried in the hinged cover, clamp the work down on the steel seats. It will be seen that this arrangement permits of holding the work securely in place and locating it sideways and endways in a substantial manner while the cut is taken between the two bosses. Although the milling machine was used for this particular job, the same arrangement permits of machining on either the planer or shaper.

In the fixture shown for the first operation, Fig 2, the method of operating it is to load the first four pieces in place, after which the feed on the machine is thrown in, allowing the cutter to traverse across the work. The operator then puts other parts on for the entire length of the fixture as fast as practical and, after the fixture is completely loaded, starts to remove the pieces machined. This can be done quite conveniently, as two parts only are held by one set of clamping units; thus almost continuous operation of the machine is obtained.

The concluding illustration, Fig 6, is that of a drill jig. There are six holes to be put in this piece, one in each boss and two others in the bottom. In this jig A is made of cast iron, and carries a steel cover B, which is hinged on pin C, and is locked in place by quarter turn screw D. When putting the work in position the cover is swung clear of the jig, while the work is located on a steel block E, this block being similar to those used on the milling fixtures. The large bosses are slipped under a steel plate F, which is held to the body of the jig by screws and dowels. This plate contains a bushing G for making one hole through the bottom of the roll carrier; two bushings H and I are contained in the sides of the jig for guiding the drills which make the holes in the large bosses. A bushing J at the opposite end guides the drill that comes through the outer small bosses, while a block K is attached to the hinged cover of the jig by screws and dowels and is used for locating the work endways as well as guiding the drill through the other small bosses, the operation being to put the work in with the cover back, swing the cover over and locate the two small bosses between block K.

The hinged cover is then locked by turning the quarter turn screw D, and a set screw L carried in the cover is employed to clamp the work on the steel seat E, while the other drill guiding bushing M is contained in the cover. This jig is machined on its four sides, two ends and bottom as indicated by marks, so it will be true in the various planes from which the work must be drilled.

All of these tools are economical inasmuch as they are so simple in design. They hold the work substantially and carry at one setting a sufficient quantity of parts so that the operation keeps the operator busy while enabling him to keep the machine cutting almost continuously. In the case of the first operation, one fixture and machine was operated, and when using the second and third operation fixtures, the operator runs two machines while the drill operations, being short, require all the operator's attention.

## ELECTRIC ARC WELDING APPLIED TO ALUMINIUM

(Continued from page 41.)

iron, and as it is necessary to keep the pool of metal at the point being welded well above the melting point it is necessary to use a much higher current. When the plates being welded are cold it is impossible to weld with a smaller current, but if the work be preheated to about 400° C., a good weld may be made with about 60=80 amperes. This bears out the above explanation. As the melting point of aluminium is only 500° C., it does not require so intense a heat to keep the point being welded above this temperature if there is only about 180° C. difference between it and the surrounding portions of the material.

The welding current should increase with the thickness of the plate; for ⅛ in. thickness 120=130 amperes is required; for ¼ in., 140=150 amperes. The reason for this is that with a thick plate there is a greater area to conduct away the heat from the molten pool under the electrode than there is with a thin one. In welding a very thick plate a condition is reached where heat is conducted away from the greater part of the surface of a sphere of which the point being welded is the centre. For plates thicker than that corresponding to this condition no increase in welding current is required.

The possibility of producing a pool of metal well above the melting point at the spot being welded without heating up the whole plate to the melting point is one of the great advantages of arc welding over oxy-acetylene welding. In work which has been welded with the oyx-acetylene flame it is frequently found that the pieces have run together only on the surface, as if the operator attempts to melt the aluminium to a greater depth a large portion of the work may be melted out. This is not so likely to happen when using the electric arc, as the heating effect is much more local.

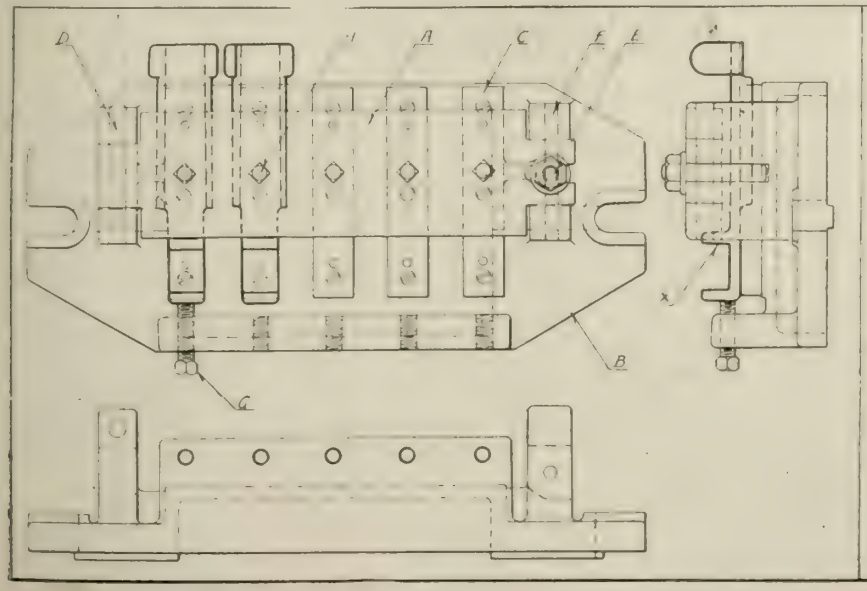


FIG. 5—FIXTURE FOR MILLING INSIDE OF SMALL BOSSES.

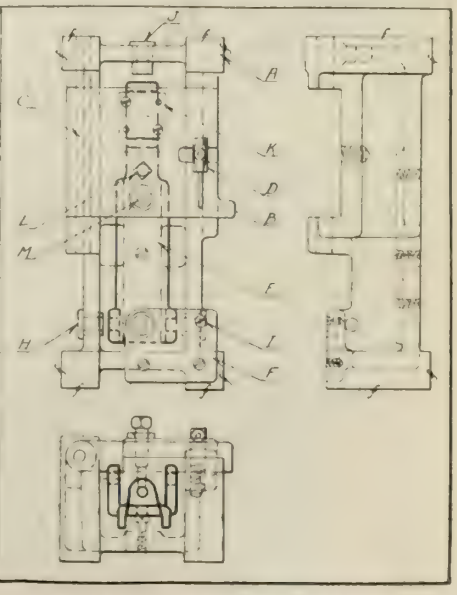


FIG. 6—DRILL JIG FOR CARRIER.



# WHAT OUR READERS THINK AND DO



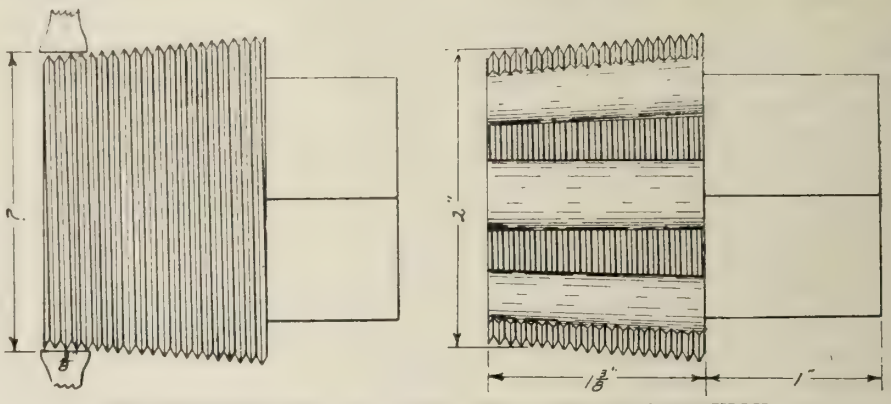
### LOCOMOTIVE BOILER MUD HOLES.

By H. BAILES.

Anyone familiar with the present method of gauging these mud holes with a plate knows that this system is inaccurate. First of all, dirt and rust adhere to the threads, and secondly, the plate only measures the bottom of thread on plug. In the rush of making a speed "test out," quite frequently the taps are not put in these holes to clean out or straighten up the threads, with the result that many plugs are blowing steam when the engine ought to be leaving the shops.

After tapping all the holes in a boiler, the writer has used with good success a set of old plugs for the purpose of gauging the size of these holes. The plugs are from 1⅞″ diameter to 2½″ diameter, these increasing by 1-16″, this making eleven plugs to the set. The size of the plug is determined by calipering the fourth thread from the end, i.e. ⅜″ from the end, or the width of a pair of outside thread calipers.

Each plug is stamped on top as follows: 1-7, 1-15, 0, 1, 2, 3, 4, 5, 6, 7, 8; 0=2″ diameter, and the whole numbers above this signify 1-16″ increase in diameter. No. 3 represents 2 3-16″ diameter; No. 4, 2¼″ diameter, and so on. Below the cipher No. 1-7=1⅞″ diameter; 1-15 1 15-16″ diameter. In use, the practice is to chalk above each hole the number of the plug used. Thus, the abbreviated method of marking comes in very handy.




THE TEXT EXPLAINS FULLY THE IDEA. READ IT CAREFULLY.

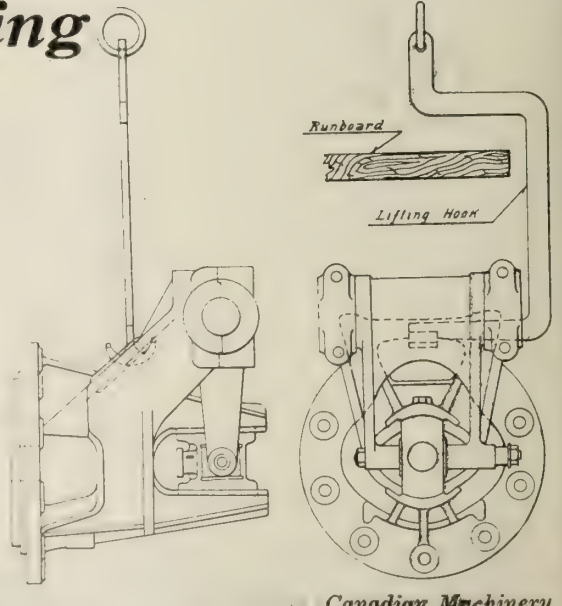
In some cases a plug may enter three or four threads only. For example, suppose this happened with a number four, or 2¼″ diameter plug. A No. 3 plug would enter this same hole to within four or five threads of the top. What would be the size to take? In such an instance, the mean diameter or 2 7-32″ would be correct, the hole to be marked 34, signifying the diameter as being the mean of these two sizes. Thus, 56 would equal 2 11-32″; 1-31 = 1 31-32″, etc. From past experience, I found these sizes comprise the standards excepting inspection holes and one or two isolated cases, viz.: 1⅝″, 1¾″, and 1 13-16″ diameter, which may be determined by inside thread calipers.

Now, substitute taps for the plugs, i.e., plugs duplicated in hardened steel, and milled with teeth for cutting purposes. The mud holes of many boilers vary from three to four sizes, so it is merely a question of measuring one hole with your scale and securing one or two plug taps above or below the size measured. By this method you are sure to use the

## *Lifting Tackle for Erecting Shop*

The drawing illustrates a lifting tackle designed for use in locomotive erecting shops for removing or installing combination back steam chest covers to cylinders, where, owing to the confined headroom difficulty has been experienced in placing covers in position. The old method—a dangerous one—was to use a bar in conjunction with a chain hanging from the crane, requiring three men and a slinger for the purpose. The hanger here shown is in the form of a U-hook, designed to clear the running board and still give a direct lift. Hook is arranged for right and left hand lift, tip of the hanger gripping the edge of the opening in the top of the cover, where the latter is perfectly balanced. With this device only one man and slinger are required, and danger of accident is eliminated.

*By F. C. H.*



taps, and besides, these taps are more effective, to my mind, in tapping new holes than the usual long standard tap.

The method of using old plugs is also expensive and inaccurate, the process being to anneal them before sending to the lathe. The lathe hand has plate sizes for one set and proceeds to chase the threads up with a hand chaser. In many cases the plugs are returned with a taper which does not correspond to the hole. In conclusion, I would suggest a set of adjustable dies, graduated similar to the plug taps, of the same taper and pitch, so that the old annealed plugs could be rethreaded by unskilled labor, using an old drill head.

## TWO STORIES OF INTEREST

By D. A. HAMPSON

Two of our planers ran continuously on "51-inch plates," as they were known in the shop. These were castings about six feet long that were made from patterns 51⅜ inches wide, which gave us ample to face to an approximate width, and also allowed plenty of clearance on the machines. One planer was a 54-inch, the other exactly 52 inches between uprights, and on this latter we had to centre our castings pretty evenly to clear.

We drilled three holes in each end for finger clamps and these clamps very nearly centred the pieces. Then, before tightening the bolts, the planer hand would check up with his scale to see how even the casting was with the edge of the table, shifting if need be to "divvy" any irregularity in width. We knew from experience that this setting would pass the uprights of the 52-inch planer—so the operator's procedure was to immediately start the motor, give the reverse lever a kick and bend over to set his cut.

He was bending over to set his tool in the work one April morning, when, presto! The gears emitted a sound of heavy pulling, the forward belt slid off and the table stopped—with half the length of the casting under the rail. Stuck! A swell in the casting, such as we had never known before, had blocked it completely.

Try as we might, we couldn't get that casting free. We even blocked up our twenty-ton jack and tried to push the casting ahead on the table. Nothing doing. The machine was a heavy switch and frog planer with a good 20 horsepower motor behind it and it had a full measure of driving power. We might have loosened the casting by the battering ram method, but this would have ruined it, at the cost of $150. Finally, we had to remove the cross rail and then we were able to shove the off-side upright away enough to free the plate. Needless to say, we never trusted the size of a casting again.

### Another Peculiar Case

Quite different from the planer event was one met with on an outside job. Our town owned a stone crusher which had been situated on the north road for ten years past. A better and cheaper supply of stone was offered at the opposite end of the city, and, as there were other advantages, it was decided to move the crusher plant to the new location. Our shop had the job of taking the machine down and setting it up again. Jim Muir, the old Scotch truckman, who did most of the heavy moving locally, was to transfer the parts as fast as we got them disassembled.

The crusher was not of the portable type—the big base casting was firmly set and bolted on a massive concrete foundation. The base was planed flat on top. On this base was bolted the heavy frame of the machine itself. We had taken off the flywheels and other assembled parts and had only to get the frame loose from the base, to take the nuts off the foundation bolts, and half our job would be done. But on outside work, it is never safe to cry "Finished" until you get back to the shop.

We took out the bolts all around, and so far as we could see there was nothing more to hold the frame to the base, so we had the boys give her a pry with the bars. That did not do and we took another look around to see if there was a bolt we had skipped or a dowel covered up with paint. There was neither. We had our fifteen-ton jack along and that made us feel secure against any little thing like a rusted fit. This jack was placed with its head under a friendly hub on the frame and one of the boys told to hurry up and pry her loose. He was a rugged lad but he called for assistance after one perplexed effort. Three men on the bar failed to raise the offending casting and the boss said to go home for the day while he thought it over.

Next morning we rigged up a gin pole over the crusher. From this we hung one two-ton and one three-ton chain hoist. Slings from these were passed around the frame.

Then each hoist was manned by three men, and three men were put on the lifting jack. At last we were really armed to attack this obstinate four-ton casting. The boss gave the word and everybody strained. Nothing doing. We tried again and again with the same result.

Sweating, the boys stopped long enough to give vent to some strong language. We had done our best and lost. The only solution we could offer was that there were tap bolts up through the bottom, but that didn't seem possible either for they couldn't be put in unless there was a pit under the base.

Just then Mr. Muir appeared with the heavy wagon to take away the piece we could not loosen. He asked to see us try it once more, and we went through the same humiliating performance. "Well, boys," said Jim, "you've done all you could do and it's not enough yet. Now, just for luck, let me take that twenty-pound sledge and tap around the bottom while you give her one more pull —as long as you've got everything rigged up, I'd like to try a few blows while you put a strain on."

And we learned something right there for at the fourth swing of the sledge—snap! That frame came loose just as nicely as anyone could ask. There was nothing but weight and rust holding those two flat surfaces together. But we had been treated to a demonstration, not soon to be forgotten, of the fact that a blow applied to a part under stress has wonderful effect.

## STRAIGHTENING ROTOR SHAFT

BY JOHN S. WATTS

I read with interest the article on straightening of rotor shaft on page 47 of Feb. 10th issue of Canadian Machinery. I noted that the editor questioned the method employed, because as he expressed it, the method adopted did not relieve the internal strain in the shaft caused by the bending. He suggested that the shaft should have been heated by a blow torch, straightened by pressure, and after being annealed at a dull red heat, trued up in the lathe.

As the bending of shafts and other parts, by rough handling in transit, or by accidental over-strain in operation, is of fairly frequent occurence, I think it would be valuable to have this matter well discussed, in an effort to determine the one best method.

That it is impossible to get a bent shaft exactly straight again, by pressing out the bend, is well known to all who have tried it, and is apparently not disputed by the editor, who specifies trueing up the shaft in the lathe, as the final operation in his criticism. To do this means turning enough off the shaft, to permit the insertion of a bush, of a practicable thickness, in the bore of the pulley, to make it fit the shaft after it is trued. The bush would have to be at least an eighth of an inch thick, thus reducing the shaft one-quarter of an inch in diameter, and seriously weakening it at the point of greatest stress.

Possibly this reduction of diameter could be made just sufficient to true up the shaft by making or purchasing a new pulley to suit, but as these motor pulleys are finished all over and balanced, on account of the high speeds they run at, in nearly all cases the delay incurred in getting a new pulley with a special bore would be fatal. Experience in straightening shafts will show that in straightening out the one bend we infallibly cause another small bend, which in this case would occur in the bearing, and for a good job we would have to true up the shaft at the bearing, and so be compelled to also re-babbitt the bearing.

The main point the editor makes is that the shaft is under the permanent

initial strain imposed when bent, and that this strain is not relieved by the heat of welding. In a long experience I have seen many bent parts straightened, mostly always cold, and have never seen any annealed after straightening, nor have I ever known any failure from this lack of annealing. It seems to me that practical experience proves that a slight bend which gives no indication of having been sufficient to impose a stress approaching the breaking stress, while it undoubtedly must have strained the shaft beyond the elastic limit does not actually injure the shaft permanently, as the strain in a comparatively short period of time disappears, presumably by readjustment of the molecules, to accommodate the new shape of the shaft. It takes, to my mind, as much pressure to straighten a shaft as it does to bend it, so that this bears out the above statement, within the limits of one or two bendings, of course.

If the bend is so severe as to cause cracks to show in the shaft, the strength of the shaft is obviously permanently impaired, and it would be useless to straighten it, but the bends actually met with are very seldom in this class. Unfortunately, we do not at present know much about the behavior of steel under stresses between the elastic limit and the breaking stress, but the fact that steel can be stressed beyond its elastic limit a few times and recover its original strength, without any treatment, is shown in actual practice. For instance, the shell plates of every boiler that ever was built are strained past their elastic limit, in rolling to shape when cold, and evidently suffer no harm from it.

Another case is that of cold twisted bars used for reinforcing concrete. This cold twisting involves stressing the bars beyond the elastic limit, and yet tests show that the twisted bar has an elastic limit at least 60 per cent. higher than the original bar, and a tensile strength about 20 per cent. higher. That cold rolled shafting is stronger than the plain shafting is well known, and other like products could be cited which prove that a material stressed only once or twice, to a point between the elastic limit and the breaking point, is no weaker than it originally was, if not indeed stronger.

In Kent's Pocket Book are cited some tests proving the truth of this, and from page 239 of the first edition I copy the following: "The common opinion that straining a metal beyond its elastic limit injures it appears to be untrue. It is not the mere straining of a metal beyond one elastic limit that injures it, but the straining, many times repeated, beyond its two elastic limits."

Finally, then, my opinion is that Mr. Quist handled the job the best way, because he got a true shaft of the original dimensions, and that the internal strains from the bending are not of any importance, if indeed they exist at all.

## EMERGENCY HINTS.

By A. L. MARSHALL.

While it is granted that the modern lathe is equipped with all thread cutting facilities, how about the poor old repair man, who must struggle along, in many cases, with very out-of-date equipment?

For example—suppose you had a few screws to cut 3-16″ diameter, 30 threads per inch, but your index showed only 28 and 32, but no 30. What would you do? Suppose the lathe you are using has a feed screw 5 pitch. Set the lathe for cutting six threads per inch and use the feed 5×6, this equalling 30. Of course, you cannot pick up the thread, but will have to run the lathe backwards before starting another cut.

Here is another dodge. Suppose a lathe will cut up to 14 threads per inch, but you suddenly need 16 threads per inch, on say a part ½″ long. You are in a hurry, so looking on your index you discover 3¼ per inch. 3¼×5=16¼ and half of this equals 8⅛. Now, the ⅛÷1-16″ = 1-128″, the amount of error, so if the job is not too important, go ahead. In any case, it's a good dodge if you're stuck.

## MAKES TRAIN-STARTING EASIER

By the use of the new electro-pneumatic brake which is just being inaugurated on some of the trains of the Pennsylvania Railroad, the starting and stopping of trains will be accomplished with more ease than heretofore. Especially with long trains it has been impossible to start a train without some shock to the passengers, but the object of the new system is to secure a rapid simultaneous application and a graduated or direct release of the brakes on all cars, regardless of the length of the train, thus avoiding the objectionable slack action between cars. A turbo-generator situated at the top of the locomotive smokebox generates direct current at a pressure of 110 volts for actuating the electric magnets on the air brake valve of each car. When the engineer switches on the current and applies the air brakes, he is enabled to make a quick, smooth and safe stop, and the objectionable slack action between the cars is thereby avoided.

# *Cylindrical Tank Data*

### *FIGURING CONTENTS WHEN PARTLY FILLED*

The sketch and formulae show the method used in finding the quantity of liquid in a partly filled tank when it is resting in a horizontal position.

Example:—An oil tank six feet in diameter and ten feet long is filled to a depth of 4 1/2 feet; how many gallons are in the tank?

The area of the tank end equals:—

$.7854\ D^2 = .7854 \times 6^2 = 28.274$ sq. ft.

To find the area of the end of the contents it is first necessary to find the area of the segment e g c h. From the formula we find that half the chord (c g) equals the square root of the product of the height of the segment and the remaining portion of the diameter.

Half the chord (c g) $= \sqrt{1.5 \times 4.5} = 2.6$

Sine of the angle c o g $= 2.6 \div 3 = .8666$

Corresponding angle equals 60 degrees.

Area of the sector e g o h $= \dfrac{28.274 \times 120}{360} = 9.4246$ sq. ft.

Area of triangle g o h c $= 2.6 \times 1.5 = 3.9$ sq. ft.

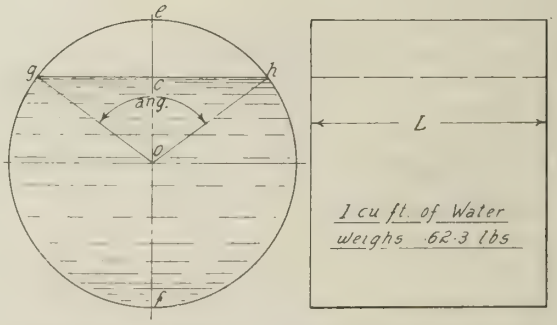
Area of segment e g c h $= 9.4246 - 3.9 = 5.5246$ sq. ft.

Area (a) of the end of contents $= 28.274 - 5.5246 = 22.7494$ sq. ft.

Volume of oil $= 22.7494 \times 10 = 227.494$ cu. ft.

Capacity $= 7.48 \times 227.494 = 1701$ 1/2 U. S. S. gallons.

Weight of contents (specific gravity of 1.2) equals $62.3 \times 227.494 \times 1.2 = 17{,}007$ lbs., or about 8 1/2 tons.




A = area of end = .7854 $D^2$ a = area end of contents

ec . cg = cg . cf cg = $\sqrt{ec \times cf}$

Sine of Ang. cog = cg ÷ og

Area of Sector egoh : A = ang. goh : 360

Area of triangle gohc = $\dfrac{gh \times co}{2}$

a = A − area of segment egch.

Vol of Tank A × L. Vol of contents = a × L

Capacity in U.S.S gal = vol in Cu. ft × 7.48

" " Br Imp " = " " " × 6.23

*Canadian Machinery*

# Improve Your Powers of Perception—Try This Contest

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.



The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

## What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

Only one contestant had a correct list this week, F. M. Conant, of the Canadian Link-Belt Co., being the gentleman in question. The scale goes forward to him at once. Who will be the next?

**CONTEST FOR APRIL 21ST ISSUE**

**Contestants are required to write us, stating to which advertisements we refer in this number.**

1—Something free—and well worth having.
2—A product that gives protection against electric shocks or heated parts.
3—Something that helps to keep products on the move.
4—How to find out about raw hide pinions.
5—A method of eliminating a certain kind of cost.
6—How to get everything you require for a certain kind of shop.
7—Something said to be almost 100% efficient.
8—A product said to cut faster and last longer.
9—Something said to be a vital necessity to present day production.
10—A product that has been produced for the past forty years.
11—An important announcement.
12—A product said to be especially adapted to drop forging plants.

**These are Correct Answers for List from March 31st Issue:**

1—Elk Fire Brick Co. of Canada, Ltd.
2—R. S. Holly
3—Landis Tool Co.
4—Carlyle Johnson Machine Co.
5—Hendey Machine Co.
6—Canadian Ingersoll-Rand Co.
7—The Bristol Co.
8—J. H. Williams & Co., Ltd.
9—Brown & Sharpe Mfg. Co.
10—Smooth-On Mfg. Co.
11—Wright Mfg. Co.
12—Gisholt Machine Co.

## Closing Date for This Contest is May 12th



# DEVELOPMENTS IN SHOP EQUIPMENT



## WICKMAN GAUGES

The Alfred Herbert Ltd., Coventry, England, with offices at 1-3 Jarvis St., Toronto, has placed on the market a line of adjustable plain and thread snap gauge known as the Wickman type.

This gauge has been developed from the plain adjustable type of snap gauge, and the frame is of high quality chilled cast iron of such a section as to reduce elasticity to a minimum. If the frame is thrown to the floor with sufficient force it will fracture. This is a safety factor. As stated by this concern, a gauge having a drop forging frame would still be intact—but on the other hand considerable error would no doubt have set in because of the heavy fall, with the result that valuable work would be spoiled.

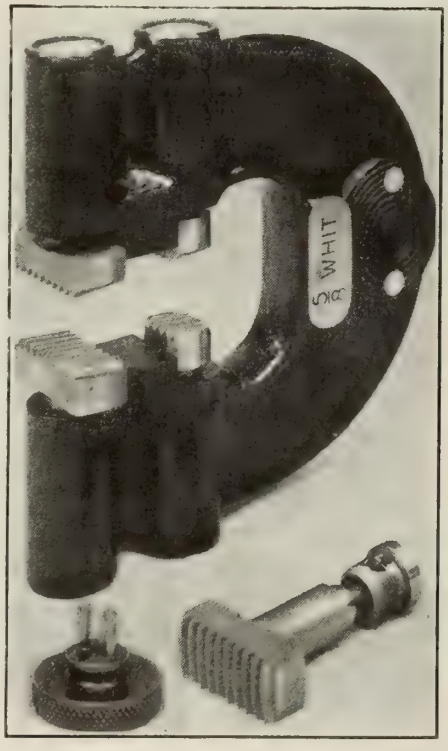
The first set of anvils are threaded in a precision lathe to true form, and after hardening are tested for pitch, and projected for accuracy of form. The various elements are also measured by means of od. V's and needles, in the same manner as a screw plug gauge.

The second set of anvils is shorter in lengths than the first set, consisting of only two or three threads which are cleared completely at the root and topped off at the crest. They merely test the effective diameter of the screw. They are calibrated by means of standard N.P.L. needles and the distance from the topped off portion to the true effective diameter is etched as a constant on the back of the anvil.

Assuming the first set of anvils set up to a hardened and ground plug (the size of which is the true core diameter of the thread to be gauged), or to slip gauges wrung up to the core diameter, the anvils will present a section of a perfect ring gauge. On the work being passed through them it will be obvious that no element of the thread on the work is larger than nominal.

Assuming that .006 inch is the predetermined limit which can be allowed as a decrease of effective diameter or thinning of this thread in order to produce satisfactory fits and long working life, the second set of anvils is set this amount below nominal by means of another plug gauge, or by means of slip gauges wrung to size. The second set of anvils will now represent the true section of a "no-go" effective ring gauge .006 inch below size, and if the work does not pass through these anvils it is obvious that the effective diameter is not below this predetermined amount and, therefore, the screw will not only assemble into the component, but will also assemble to a predetermined fit, and have a known length of useful life. If the screw will not pass the first anvils, on holding the gauge up to the light, with the screw between them, the operator can easily see what element is interfering and knows what to correct. Each of the anvils has an adjustment up to ⅛ inch, making a total adjustment of ¼ inch.

The references are merely hardened and ground steel cylindrical or slip




GENERAL VIEW OF THE GAUGE.

gauges, and these thread snap gauges can therefore be inspected periodically at a minimum cosst. In this way, there need never be an inaccuracy in the set-up gauge of more than .0003 inch. The mechanism of the gauge is so arranged that it is impossible for the anvils to get out of "square" and also the gauge is absolutely tamper-proof.

The adjusting screw is covered by the locking screw, which in its turn is covered by a lead seal, closed into the recess at the top of the gauge by means of a special press. This press indents the firm's trade-mark in the seal thus preventing any unauthorized tampering or alteration.

The adjustment of the gauge is very simple and is such as permits of extreme accuracy. The stem of the anvil, which is hardened and lapped to fit the hole, is coned out on the top end to an angle of 60 degrees, in which rests a hardened steel ball. The adjusting screw, which is also hardened, has a similar cone underneath it and presses down on the same steel ball. The locking screw, the head of which bears in a counter-bore on the top of the gauge, passes through the hardened adjusting screw, through the clearance hole in the steel ball and into a tapped hole at the bottom of the countersink of the stem of the anvil.

Two holes are provided in the head of the locking screw and a special peg spanner (with prongs which go through these holes in the slots of the adjusting screw) is used for setting the gauge. To set the gauge, screw out the locking screw with a screw driver a number of turns, drop the peg spanner in position and rotate. The pegs will drop into the slots of the adjusting screw and rotate it; the cone of the adjusting screw will push down the hardened steel ball which in its turn will force down the stem of the anvil.

By giving the locking screw an extra twist with a screw-driver, it is possible to get any desired feed between the anvil and the setting gauge. The hardened steel ball is elastically compressible to a few ten-thousandths of an inch. For example, it is possible with this adjustment to pick up a set of slip gauges between the anvils; give the locking screw an extra slight turn, and the gauge will not pick up the slips. Release slightly, and the anvils will grip the gauges once more. This system of adjustment is the finest possible and when once locked it is impossible for any backlash to be existent. When the gauge is finally sealed, tampering becomes an impossibility and an attempt to set the gauge in a vise would result in the fracture of the frame.

To sum up briefly, the claims are as follows: 1. Length of life of the adjustable thread snap gauge is many times that of the ring gauge. 2. Complete visibility of any existing errors in thread to be gauged. 3. Absolute limit on the minimum effective diameter. 4. Easily inspected. 5. Easily adjusted. 6. Absolutely tamper proof when adjusted. 7. Tests "out-of-roundness" or concentricity. 8. Combined "go" and "no-go" gauge. Only one adjustable thread snap gauge is required, which is cheaper than

the two ring gauges often employed, and 9. Maintenance charges are negligible.

In another portion of this issue is given a further discussion on gauging, which space in this department did not permit.

### QUICK ACTING DROP HAMMERS

The Massillon Foundry & Machine Co., Massillon, Ohio, have placed on the market a line of small size, quick acting drop hammers for use on light work. These hammers are built in sizes of 400, 600 and 800 pounds capacity, but other sizes can be built to meet special requirements, and the hammers can be operated by compressed air in place of steam, if so desired. The housings and base are steel castings and the cylinder is a semi-steel casting. The company has incorporated in these small hammers its design of adjustment for the ram guide that was originally brought out on hammers of larger size, to permit of the ready removal of damaged push-bolts. The guide adjusting screws are threaded through nuts set in open pockets in the side housings.

### PRODUCTION TOOL HOLDERS

The Canadian Production Tool Co., Ltd., Walkerville, Ont., have placed on the market a line of tool holders that are a radical departure from the usual type. These holders are made of steel and are of very rugged construction. They are so designed that they can even use broken or worn drills as turning tools. This, of course, applies to the type of holder using round stock. In one particular case that has been brought to our attention, a worn drill was used as a turning tool on a nickel vanadium steel piston rod with splendid success.

These holders are made for round steel, square steel and regular cutting off steel section. In some cases double blades of cutting off shape are used, these performing operations such as cutting packing rings, spacing collars, etc. Then there is the wheel lathe tool holder which is designed to eliminate forging time of heavy steel, small bits fitting this holder in place of the heavy stock. In other cases special holders are made these including draw shaper tool holders of special construction to suit conditions.

In all the holders the chief idea is rigidity and saving in tool steel cost, as tool bits can be used in place of the regular large piece of steel, and the small scrap of high-speed steel usually found in any machine shop can be utilized. The straight round turning type of tool holder is shown in the illustration, and from this readers can gather the general construction of these holders.

### ADJUSTABLE BORING BAR

A special boring bar designed for the boring of holes from 1½ to 9 inches in diameter has been placed on the market by the Murchey Machine & Tool Co., of Detroit, Mich. The construction permits of accurate adjustment of the cutters to within 0.001 inch of hole diameter. Cutters can be rigidly secured after setting. Shanks of any desired size or shape may be furnished.

### SLIP-COLLET DRILL CHUCK

The Dompier Chuck Co. of Detroit, Mich., are now manufacturing a quick-action drill chuck of the slip-collet type, specially designed for the triplex operation of drilling, boring and reaming. The collet may be inserted in the holder by the use of one hand only and may be removed from the holder by simply raising a knurled collar on the outside of the chuck. Wearing parts are made of chrome-nickel steel, hardened. The chuck is made in four sizes and holes are tapers to receive Morse shanks.

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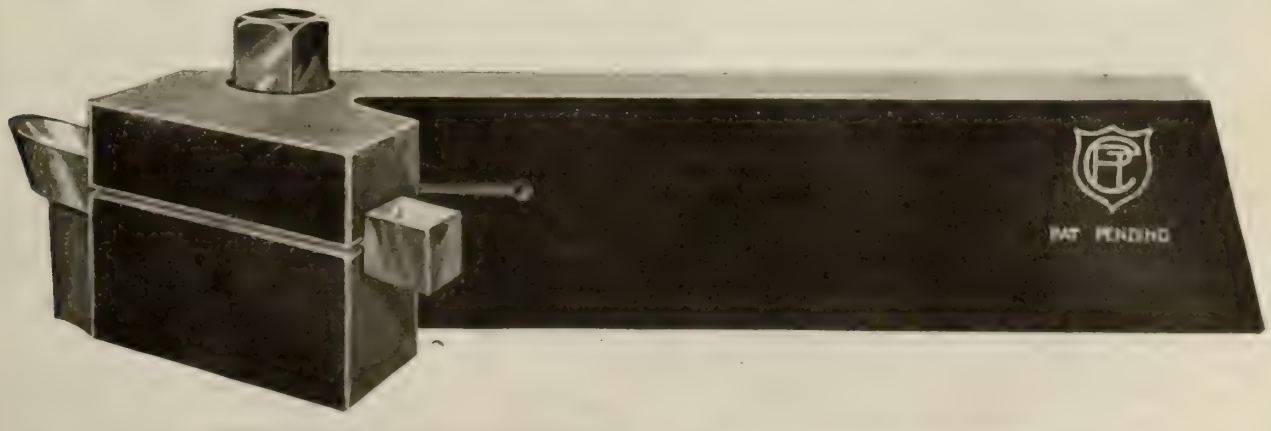
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# CANADIAN MACHINERY
## AND MANUFACTURING NEWS

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## The International Harvester Case

ONE of the most important moves made in the history of industrial relationships was that enacted at the Hamilton plant of the International Harvester, Ltd. A reduction in wages and piece-work rates was found to be necessary, owing to the changed prices at which they were selling the finished article and also owing to the dropping off in sales.

The Works Council of the plant dealt with the matter and five of the representatives of the men spent five days investigating the records of the company upon which the reduction in wages had been based in the first place. They were given every opportunity to go through production figures, cost records, orders booked, etc., in order that if possible they might bring out any other solution except a reduction in the wages of the workers.

At the end of this time they brought in their finding in which they state frankly that the company is justified in making the reduction in piece-work rates and wages, which they regretfully recommend should be accepted by the men in the plant.

It is a simple matter to share profits when times are good, but it is an entirely different affair to ask men to come and share the lean days of the company.

It must be that the Harvester people have won the confidence of the men to an unusual degree. Workers in a shop are not unreasonable when a firm will take the trouble to put all the cards on the table before the reasoning starts.

It is surely a great deal better for all concerned that representatives of the men should have gone over the records of the company's business, have an opportunity to see what the firm was doing, get in touch with the problems the executives have to face, than that they should be confronted with a typewritten notice pasted on the time clock, making the curt announcement that wages had been reduced.

One may argue that it is an easy way out for the company? Is it?

As the market stands at present, the easy way out would have been for the International to shut up shop for a period in order to get rid of the stock of implements it has piled up. The action of the men in accepting a reduction puts it up to the company, in a new way, to keep on running.

The development is interesting because it is human and wholesome. It shows that there is a place for Works Councils and kindred organizations and demonstrates that if frank honesty is established between office and shop, it is quite possible for each party to drop the gas pipe that has too long been carried up the sleeve of industrial leaders on both sides of the question.

## The New Steel Prices

THE coming of the new schedule of the U.S. Steel Corporation was not unexpected. It had been common talk for weeks and it remained only for Judge Gary to fill in the blanks that the guessers in the market had spread out before him.

In a general way the trade in Canada is pleased with the new schedule. It comes down enough to be a reasonable price and it does not come so far as to cut the ground from under the feet of those who have fairly large stocks either in warehouses or factories.

Warehouses can go ahead on their present selling prices. The new U.S. prices become the basis for operations here, but warehouse selling has been largely for liquidation for some time past.

No doubt an effort will be made to establish new market standards for this district when present stocks are lowered. Just now price-cutting is being indulged in. There may be more fancy names for the practice, but that is the actual condition.

Bar iron, for instance, is selling at so many prices that it would keep a sharp young man busy placing them on record. We hear of sales all the way from 3.50 to 4.25. The new price at Pittsburgh—and on this price Canadian mills must base their sale price—is 2.10 cents per pound. At present rates of freight and exchange, it means 3.16 put down in Toronto. If dealers are going to make a reasonable profit the new market will have to be built around four cents.

It can hardly be urged that the new prices will bring about a buying movement, although certain tonnages that have been held up awaiting the new price have been released.

The two-headed steel market has more or less disappeared and there is reason to believe that present prices will hold for a reasonable time.

Taking an average ton, that is, pooling the prices of Bessemer steel rails, plate, wire nails, steel beams, steel bars, tin plate, Bessemer iron and steel billets, we find the new schedule is $58.54 per ton, against $63.49 before. In 1920 it was $78.21; in 1919, $65.92; in 1918, $70.52; in 1917, $91.01, and in 1914, the year the war started, $30.97.

The market now has the advantage of a price on basic materials that it can accept with confidence. Heretofore no selling schedule could be absolutely relied upon and it brought with it a condition where buying was of necessity reduced to a minimum.

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"Iron Trade Review"—Examination of market trends over the past few years shows that practically all major movements in steel and pig iron have been preceded by a movement in scrap prices. The response of other prices has varied from two weeks to two months after scrap but in each case has followed unerringly.

## Russia Must Reform

CANADIAN firms are making little effort to secure trade with Russia. They have no guarantee of stability and some of them have vivid recollections of large losses following the overthrow of business order and honorable business methods there.

The U.S. Secretary of State, while expressing the sympathy of his people for the people of Russia, can see no chance for business with Russia until Russia becomes a different Russia. Production is the big chance for Russia and it is also the big chance that the present leaders of industrial and national damnation in that country wish to avoid.

The Secretary of State, on this point, says: "Production is conditioned upon the safety of life, the recognition by firm guarantees of private property, the sanctity of contract, and the rights of free labor. If fundamental changes are contemplated, involving due regard for the protection of persons and property and the establishment of conditions essential to the maintenance of commerce, this Government will be glad to have convincing evidence of the consummation of such changes, and until this evidence is supplied this Government is unable to perceive that there is any proper basis for considering trade relations."

Canadian business, we believe, will readily subscribe to that statement. There are enough industrial quicksands in our own country without reaching out to stick a leg in the Russian mess.

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Some worthy chap rose up this week and said: "In every business concern, large or small, there is, on the part of every individual, a natural eagerness and desire to get ahead, and more or less rivalry ensues as a result. It is a great mistake, however, to have uppermost in mind the idea of 'beating the other fellow to it,' some particular friend, associate or neighbor. Such rivalry breeds animosity and trouble. The surer way is to get ahead of yourself each day—never mind the other fellow."

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"American Machinist"—In one recent case of this kind a contract was taken at what seemed a very low figure and the high bidder protested that it could not be made for the price asked. So the successful bidder showed his shop time on the job to be 48 hours, as against the other bidder's estimate of 155 hours. A comparison showed modern equipment in one plant—out-of-date machinery in the other.

## ANY OF THESE EXERCISES NEEDED AROUND YOUR PLANT?

NOW, this chap whom the cartoonist has put on the flat of his back is not having a good time.

But he is having a time that is going to be good for him.

Does this man look like your business, your prices or any part of your organization?

Perhaps he may resemble some of the left-over, war-time ideas and customs.

He may represent some of your selling methods. If so, you better pull all these fat boys out and put them on the mat.

There may be some hurt feelings—there may be a few squeaks.

The truth is you have got to get on the carpet and shake out the useless material, no matter whether it's in your own system or out in the mechanical department.

Perhaps your surplus fat consists of a lot of old rattle-trap equipment that you know right well will have to be booted when operations get geared up to anything like capacity.

Those old machines have been wheezing away for years. When you are showing your friends through the plant you try and tell a good story that will raise a laugh when you are passing them. You really don't like to pull up in front of them and say: "This is my plant."

No matter where your surplus weight hangs, better get it out on the floor and start the reducing exercises.




—Harding in Brooklyn "Eagle."

**There's always some hardship about these reducing exercises.**



# MARKET DEVELOPMENTS



## New Steel List is Well Received by the Market

### Cuts Made Give Dealers and Others Holding Stocks in This Country a Chance to Get Rid of Material—Number of Prospects in the Market But Actual Business Signed is Not Large

THE Canadian steel trade seems to give a very favorable reception to the new schedule announced in the United States Steel Corporation. Dealers in steel are glad that the cuts went as far as they did and they are also pleased that they stopped where they did. Many manufacturers, for the present at least, take the same attitude, as a deeper cut would take too much ground out from under their feet and embarrass them for future operations. As the schedule stands at present the market agrees that it should form a basis for operations for the next three months and after that deviations from it, if there are any, will be small. No one claims that it is going to start a buying movement, for if that were possible by announcing a new price list, it can be taken for granted that the Corporation would have put out the new list weeks ago. The market is undoubtedly stronger to-day than before the list appeared and the bringing about of that condition was essential to better business in the future.

The machine tool trade has had a quiet week and the selling of used equipment experiences the same condition. There are a number of very good inquiries in the market, but the absence of pressing need for equipment makes it possible for the should-be buyers to keep putting off the actual purchasing of equipment.

Small tools are being taken for actual needs only and considering the low rate at which many of the shops in this district are operating, this means a slow business for the dealers.

The scrap metal market shows no more strength than it has for a good many months past. Figures quoted are purely nominal and dealers will pay them only when they have to.

Pig iron is now selling for $34.10, and car lots are about the limit of buying. One furnace is prepared to keep going until it has piled 20,000 tons.

## MONTREAL DOES NOT EXPECT ANY CHANGE BECAUSE OF NEW SCHEDULE

Special to CANADIAN MACHINERY.

MONTREAL, April 21.—Local industry seems more or less inactive at present although business is showing slight improvement in some quarters. The unemployment problem is less acute, owing to the large number of men recently started by the Tramways Company in the laying of new roadbeds throughout the city streets. The harbor is gradually assuming its normal spring activity, although it will be some weeks yet before operations are at the maximum. Reports from many merchants reflect the gradual lifting of the depression that has hung over the business world for many months, but the trend toward improvement is so gradual that it is noted only by the observing optimist.

#### Local Market Not Affected

Despite the fact that the trade has been looking forward to an announcement by the United States Steel Corporation, regarding a downward revision of prices, the reductions made last week have not yet been felt in this district. As one dealer put it: "There is practically no business going through and the matter of price has little influence on the market. We are told that some mills in the States are quoting as low as $2 on plates but even at this figure there is very little booking being done. A general revival of business must take place before buying of steel will be resumed." The interest of the trade just now seems to be centered in the coming developments in railroad circles, as it is felt that any resumption of activity is dependent on an early and satisfactory settlement of the railroad problem, both as regards to wages and freight rates. A steel merchant here, who has reported a weekly improvement for the past several weeks, again states that sales continue to increase and that they expect this month's business will surpass any previous month's since last fall. "However," said the dealer, "it will require to improve considerably more before we are back to normal."

#### Business Slowly Improving

While nothing of an outstanding character has developed in local machine tool circles, business is considered fairly good in face of the quiet industrial conditions now prevailing. "Sales are not large," remarked one dealer, "but we continue to dispose of machinery and equipment in sufficient volume to make the month's aggregate compare favorably with that of previous months." This is the substance of the remarks generally made by the average dealer and one has often to make his own calculations as to the extent of "good business." One thing is certain, and that is, that dealers and jobbing houses are getting rid of much of the stock carried over from last year before replenishing their floors or shelves with new materials. There is a gradual lowering of quotations on standard equipment. "Since the first of the year," said the dealer, "it is safe to say that a reduction of about 15 per cent. has been made on the selling prices of nearly all the principal lines." A period of anticipation seems to be passing just at present, as indicated in the remark of a dealer here this week. He said: "We are now passing through a period where any idea of profits must almost be forgotten. How long this will last, no one can tell, but we feel that we are on the verge of that long looked for 'readjustment' that will eventually lead us into the paths of a real industrial revival."

There appears to be a goodly demand for the lighter factory supplies, but heavy machinery is moving slowly. Fairly good sales of wire rope are reported.

**Metals Are Not Affected**

"The movement of metals is dependent on industrial activity and until general business shows improvement we cannot expect to see a heavy demand for ingot metals. We are disposing of quite a quantity of ingot and sheet metals but usually in small lots, the practice apparently being for consumers to purchase only what they require for immediate use." This statement regarding the metal situation might well apply to many other lines, as the policy on every hand seems to be one of careful conservatism.

## NEW PRICE LIST IS APPROVED HERE

**Schedule of U.S. Steel Corporation Will Not Make Much Difference in the Markets**

TORONTO.—The machine tool market, the steel market, can be described as "spotty." One dealer claims that business has been very poor with him for some weeks past, while the very next place will show records of shipments and orders that have made a very good showing in the same period. So a person really has to make a good many calls now in order to collect enough information to get a fairly accurate view of the real situation.

Machine tools are not moving fast. The general manager of one large firm in Toronto, discussing the situation this week, said: "Buying for the present seems to have been pretty well tied up. It is hard to see that it is a matter of price, although there are some statements put out that the reductions made by many of the makers are not final, and that better figures will be coming shortly. I can't see where this comes in at all. Judging from our own records it would not be correct to say that many sales are being held up by the price now. The used machinery market is also dull, although the wood-working end of it is showing up better than the selling of metal-working equipment."

Another dealer was quite certain that in the next two or three months he would close quite a few orders that were not yet advanced beyond the consideration stage. A number of firms had fully decided on what equipment they wished to put in, but the actual placing of the business was being held up for the present. It is a tiresome piece of business, waiting for orders that have been practically closed, but the business is good and will come into the market eventually.

The sale of small tools, reamers, cutters, taps, dies, drills, etc., is still being carried on in a very small way. The orders coming in call for such supplies as may be actually needed, but nothing more, so with the present low rate of operation in many of the plants the business coming to take care of day-to-day breakage is very small.

## POINTS IN WEEK'S MARKETING NOTES

**Armstrong, Whitworth of Canada state that lack of protection has made it necessary to close their steel tire plant at Longueuil.**

**Many dealers are selling at present with the idea of getting stocks as low as possible, regardless of what they miss in the way of profits.**

**Dominion Steel Products at Brantford are taking over the Darling Valve & Manufacturing Co., of Williamsport, Pa.**

**The machine tool market is quiet, although some interesting inquiries continue to come into the market.**

**Canadian trade seems to be well satisfied with the new schedule announced by the U. S. Steel Corporation.**

**Pig iron is now offered by Canadian makers at $34.10, following the acceptance of the $25 level at U. S. points.**

**Scrap metal market is dull, with prices nominal and trading in small quantities.**

**In the Steel Market**

The new schedule of the United States Steel Corporation has formed the topic of conversation in the steel market this week, and general satisfaction seems to be expressed at the extent of the reductions made. Most of the local warehouses have been engaged for the past three or four months in getting rid of stocks of high-cost bars, of which some of them had quite a tonnage.

Some of the independents have done as low as two cents on these and reports had it that the Corporation would go as far down as 1.75. Instead, the new price is 2.10 against 2.35, the former figure. At present rates of exchange this will mean about 3.16 laid down in Toronto, making the warehouse price around 4c, which can be regarded as fairly close to the present market. Of course, there will be profit for merchants at 4c, when they get shipments at the new price, whereas there is no money in it for them selling out high cost bars at 4c.

Structural and plate are again at a flat rate of 2.20 against 2.45 for the former and 2.65 for plate. Coming back to the same price is reverting to pre-war practice. During the war the call was for plate, and it got a premium price owing to the demand.

**The Effect on the Market**

A. T. Enlow, president of the Dominion Sheet Metal Corporation of Hamilton, a large buyer of sheets, believes the new prices will tend to stabilize the market. He holds that the independents and the Corporation will agree on prices. J. G. Near, general manager of Peckovers, Ltd., Toronto, was satisfied that the announcement would give some confidence in the market for the next three or six months at any rate.

Mr. David, of Baines & David, believed that the most that could be hoped for at the present time would be an added stability to the market. "We can't be busy and well employed here with the other part of the world not yet recovered from war," is his view. "Under the circumstances," added Mr. David, "the new price list has been very carefully compiled."

The general feeling in the market was that the time was ripe for the Corporation to come out and make its schedule known. The trade had lost confidence in any and all so-called price schedules. Even the United States Steel Corporation price was being allowed to sag in order to hold business. The attempt by independents, earlier in the week, to bolster up the market by withdrawing low figures on sheets could not succeed. There had been so many prices peddled in Canada that the buyers were dizzy, and when the trade arrives at the stage where no one believes that he is getting the best price, then buying is going to be on an ounce-for-ounce basis, covering absolute requirements and no more.

**The Real Effect**

No one is going to put forth the claim that the new schedule will mark the beginning of a buying movement. The Corporation itself could not expect that, otherwise they would have trimmed prices weeks ago. The real benefit is here — that a standard has now been fixed around which the markets and business of the future can be conducted and planned. With that accomplished, a big step has been taken toward bringing about a healthy feeling in the trade, where speculation and guessing have too long had preference over that necessary degree of confidence and certainty, without which the steel markets in general have simply been wandering around in circles.

**Varying Reports**

Trade comes to different warehouses in different volumes. Some of the yards have not done the business they anticipated in boiler tubes, for instance. This is the season when the boiler tube business should still be good. Some of the dealers, on the other hand, claim that

tubes have been among their best business this year. Shafting has also been in demand. There were many months in recent years when it was almost impossible to get shafting, and as a result there was an accumulated demand to look after.

Dealers, when asked what effect the new price would have on bars in the warehouse, stated that there was a general feeling that the price of bars in Toronto warehouses should find a level around four cents per pound. There have been some sales going quite a bit below this figure, and one case was heard of where a sale had gone as low as 3.50. This was on a tonnage that the dealer was anxious to unload, and cannot be regarded as indicating a real market level. Warehouses have been clearing out stocks, and in some cases have been applying mill prices on warehouse stocks.

### The Price of Pig Iron

Following the forcing of the pig iron market in the States down to $25, Canadian makers have placed their price at $34.14. Orders are small, one dealer regarding an order for a car of 50 tons as a pretty good piece of business this week. Canadian makers can hardly stand to make a very big profit at this new price. Some of them have great piles of coal which was brought in at a time when prices were high, and the same can be said of their ore. The price of pig has been steadily reduced. Some of the stacks are piling pig iron in their yards, one company expressing a willingness to do this to the extent of 20,000 tons, before blowing out.

# NEW PRICE OF THE STEEL CORPORATION PUTS END TO THE DOUBLE STEEL MARKET

Special to CANADIAN MACHINERY.

PITTSBURGH, April 21.—The slight advances in steel prices begun by independents, as noted last week, became general among the independents not merely in bars, shapes and plates, which were covered by the first advances made, but also in sheets and wire products. Then the United States Steel Corporation began making reductions, the result being that the Corporation and the independents are again on the same basis. The common expression is that the market is "equalized." Roughly speaking, the advances of the independents represented on an average about one-third, and the reductions of the Corporation about two-thirds of the total gap that had separated the two sets of prices.

Neither the independents nor the Steel Corporation made any formal statements as to the cause or causes of their action. One might assume that the Steel Corporation reduced its prices upon finding that it would not take as much reduction as it formerly would have to equalize the market, or one may assume that the independents made their advances from having information that the Corporation had decided to reduce its prices, and as the Corporation would of course reduce its prices to the lowest levels made by independents it would be good policy on the part of the independents to put their prices up so that the Corporation would not have so far to go.

Practically the whole trade is convinced that the latter is what occurred. The independent advance was too sudden to be a mere matter of chance. It looked decidedly as if the independents had word that the Corporation had set a time when it would reduce its prices and hastened to give the Corporation a higher basis on which to work. That the Corporation did plan the matter a trifle in advance is known from the fact that the advances started with a meeting in New York of the subsidiary company presidents, some of whom had to travel long distances to get to the meeting and had to be notified in advance.

### Price Changes

The price changes in most of the commodities can be shown in a table, as given below. The Industrial Board prices of March 21, 1919, were those of the Steel Corporation until its present reduction. The second column gives the independent prices prior to the adjustment, while the third column gives the prices to which the independents advanced and the Steel Corporation reduced:

| | Industrial Board | Independent | Present |
|---|---|---|---|
| Bars | 2.35 | 1.90–2.00 | 2.10 |
| Shapes | 2.45 | 2.00–2.10 | 2.20 |
| Plates | 2.65 | 1.90–2.10 | 2.20 |
| Black sheets | 4.35 | 3.75 | 4.00 |
| Blue annealed sheets | 3.55 | 2.80–3.00 | 3.10 |

The case of galvanized sheets was different. The Industrial Board price was 5.70c, independents having gone to 4.70c and 4.80c, according to size of order, while they advanced to 5.10c, but the Corporation did not recognize this price, naming instead 5c.

In plain wire there was another difference. The Industrial Board price was 3c, but wire was one of the three or four commodities on which the Corporation made advances in August, 1920, advancing the price to 3.25c. The independents had been quoting 3c and sometimes less, and the Corporation came down to 3c. Nails showed another divergence. They were $3.25 on the Industrial Board schedule, while the independents after going up to $4.25 and higher in 1920 got down to $3 a few weeks ago, and then advanced to $3.25, while the Corporation has reaffirmed that price. Thus nails are the only product remaining on the Industrial Board schedule.

In the products mentioned above the cutting began about February 1. In tubular goods cutting did not appear to any extent until March, and just before the Steel Corporation began making reductions the Steel & Tube Company of America, as noted in last report, made a further cut, making the total about $10 a ton below the Industrial Board or Steel Corporation prices. The independents made no effort to go up from their extreme cut prices, but the Steel Corporation instead of reducing by the same flat amount has made various reductions, which in general may be described as involving five points (a point being approximately $2 a net ton) on sizes 6-inch and under, and four points on sizes 7-inch and over, this applying to standard steel pipe, line pipe and in general to oil country goods. The smaller sizes of standard pipe were reduced less, and ⅛-inch was not reduced at all. Doubtless the independents will now advance on the smaller sizes.

Hoops and bands are reduced by the Steel Corporation from 3.05c to 2.75c. Hot rolled strips are formally quoted by the West Leechburg Steel Company at 2.75c and cold rolled strip at 5.50c.

### Effect of Equalization

The Steel Corporation, as a result of its price adjustment, will doubtless have heavier specifications and more releases against suspended orders, from its regular customers, and its operating rate may increase somewhat from the 40 per cent. or thereabouts to which it has declined, from over 90 per cent. at the beginning of the year. The independents cannot expect to book more business than they were booking in the past few weeks, but it seems they rounded up some business that was hanging fire, when they withdrew their lower quotations. The independents have been operating at about 35 per cent. lately, against 30 per cent. in both January and February. These percentages are higher than have been commonly estimated in the trade. For one reason or another the independent mill operations have been underestimated in trade talk for four months or more, while the figures here given are substantially correct.

### Prospects

When the steel industry is operating at between 35 and 40 per cent. men are naturally disposed to ask "When is it going to operate at 100 per cent?" but that is not altogether a reasonable question, for it assumes offhand that whatever the steel making capacity, it is the function of buyers of steel to give it full employment. Responsibility for the present capacity rests with the war, not with the buyers of steel, the capacity being one-half greater than just before the war, and for several years before the war the capacity had not been fully engaged for more than about half the

time. It would require a collection of favorable conditions that could properly be called abnormal to engage fully a steel making industry that has what is plainly an abnormally large capacity, and the sooner everyone realizes this fact and takes cognizance of it in his calculations the better it will be. In the first nine months of 1920, when there appeared to be heavy demand, the industry operated at only 80 per cent., being restricted by various conditions.

The fair, and really rather hopeful, prediction is that by about next October the production of steel may be about one-half greater than it is now. That would mean a rate of ingot production of about 29,000,000 tons a year, or about the average rate in 1912 and 1913, by far the best tonnage years before the war, but it would be a rate of only 55 per cent. of capacity.

## SINGLE MACHINES IN N. Y. MARKET

**Business There Has Been Done on a Small Basis and Continues in that Way**

Special to Canadian Machinery

NEW YORK, April 21.—The business readjustment proceeds slowly, but there are increasing evidences of a trend in the direction of improvement. The most constructive bit of news in the week was the announcement of the Railroad Labor Board of the abrogation of wage agreements with a part of railroad labor, which possibly will mean a saving of $300,000,000 a year to the transportation companies. On top of this, President Harding's cabinet on Friday considered steps to be taken toward a readjustment of railroad freight rates on a basis that will be conducive to a revival of business. Unquestionably much business is adversely affected by high freight rates. Secretary of Commerce Hoover stated in a public address this week that the freight rate on a bushel of wheat from the Argentine is 10 cents as compared with 30 cents from our own wheat-producing sections of the West to the Atlantic coast.

High money rates have been a deterrent factor in business, and some easing of this situation is noted in the announcement of the Boston Federal Reserve Bank of a reduction in the rediscount rate from 7 to 6 per cent. If other Federal Reserve Banks follow this action soon, there may be money available at 6 per cent. to permit construction work and other investment buying.

Meanwhile, the machine-tool trade is merely marking time. The promise of improvement within the near future which was indicated by the recent increased volume of inquiry has not been fulfilled, nor does the machine-tool trade expect much improvement until the whole business situation has cleared up.

There has been very little new inquiry for tools in the past week. Business is confined almost wholly to single machines, and the smaller manufacturers are more active in buying than the large ones.

## Pig Iron Markets

In the Pittsburgh district the pig iron market is in much the same condition as during the past few weeks, orders being limited to small lots for prompt shipment. No new inquiries of any size have come out. Foundry iron is generally quoted at $25, valley furnace, for No. 2.

Boston reports a sale of 700 tons, comprising four brands of Buffalo and Pennsylvania irons. various silicons, to a southern New England melter, and another of 300 tons Pennsylvania iron to a Connecticut foundry. These lots are resale, prompt shipment iron, and terms private.

Practically no business was done during the week at St. Louis.

The pig iron market at Pittsburgh is flat. Generally, makers of foundry iron are not inclined to go below $25, valley furnace, and one merchant interest reports having turned down 500 tons of this grade carrying a price of less than $26.

On the Chicago market many foundries which have been out of the market for a protracted period are now buying carload lots for spot shipment. Melters are continuing to purchase their needs cautiously.

The market continues dull at New York and the only business of any considerable size which has been talked about has been in connection with the cast iron segments which will be needed for the vehicular tunnel under the Hudson River, between New York and New Jersey.

There is very little activity in the local market at Cincinnati. The principal inquiries are for 1,000 tons of northern foundry iron, and a cast-iron pipe company is reported willing to buy 500 tons, providing prices quoted are satisfactory.

## Scrap Metal Market

Prices on Pittsburgh market are still downward because of the continued lack of consumptive buying, and the fact that dealers with yards do not feel they can safely lay down much material at current prices. The prices quoted in all cases represent what dealers are willing to pay for yard tonnages, and are not a good line on what the steel manufacturers or foundries would have to pay if they were in the market.

Purchases by consumers have practically ceased on the Chicago market except for hand-to-mouth buying of cast scrap. Although mill and blast furnaces have reduced the quotations on their products since the war, old material has declined relatively much further.

Scrap metals have further declined during the past week at New York and new post-war levels have been reached. A railroad which put out a list of about 6,000 tons withdrew it because of the low bids of dealers and brokers.

There has been a small movement of stove plate at $19 on the Buffalo market. Dealers report little activity.

Althought the scrap market at Boston is limited, the market is more active than it has been for several weeks.

## COMPARE NEW AND OLD FIGURES

**Reductions Recently Made In Selling Prices of Various Lines of Steel**

Here are the new prices of the United States Steel Corporation, compared with the old:

| | New Prices | Industrial Board Prices |
|---|---|---|
| 4 x 4-in. and heavier billets, per gross ton | $37 00 | $38 50 |
| Slabs, per gross ton | 38 00 | 41 00 |
| Sheet bars and small billets, per gross ton | 39 00 | 42 00 |
| Bars, per 100 lbs. | 2 10 | 2 35 |
| Plates, per 100 lbs. | 2 20 | 2 65 |
| Structural shapes, per 100 lbs. | 2 20 | 2 45 |
| Wire rods, per gross ton | 48 00 | 52 00 |
| Plain wire, base | 3 00 | 3 00 |
| Wire nails, per keg, base | 3 25 | 3 25 |
| Tin plate, per base box | 6 25 | 7 00 |
| Blue annealed sheets | 3 10 | 3 55 |
| Box annealed, black | 4 00 | 4 35 |
| Galvanized sheets | 5 00 | 5 70 |

## BRANTFORD FIRM TAKES NEW LINE

**Darling Valves Will be Made at Plant of the Dominion Steel Products in Short Time.**

BRANTFORD. — Announcement was made of the taking over by the Dominion Steel Products Co. of the Darling Valve and Manufacturing Co. of Williamsport, Pa. This company makes a line of valves for waterworks, oil lines and other pipes and hydrants, and has a reputation very high in Canada as well as in the United States, where the parent plant is located. Owing to the high duty on their products, which in the United States sell for a higher price than the products of their competitors, the market in Canada was limited, yet despite this they were used considerably, Brantford and Ottawa being among the cities which utilized their goods.

It was reported at the D. S. P. that the company was already receiving business in the new lines. The signing of the contract means that No. 1 and No. 2 plants will be opened for the manufacture of these goods as soon as necessary changes can be made, particularly in the foundry. It will take three or four weeks to bring these changes into effect and to get the plant upon a full production basis.

# SELECTED MARKET QUOTATIONS

**Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.**

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $25 00 |
| Lake Superior, charcoal, Chicago | 40 50 |
| Standard low phos., Philadelphia | 41 50 |
| Bessemer, Pittsburgh | 28 96 |
| Basic, Valley furnace | 26 00 |
| Toronto price:— | |
| Silicon, 2.25% to 2.75% | 34 10 |

## IRON AND STEEL

| Per lb. to Large Buyers | Cents |
|---|---|
| Iron bars, base, Toronto | $ 4 25 |
| Steel bars, base, Toronto | 4 25 |
| Iron bars, base, Montreal | 4 25 |
| Steel bars, base, Montreal | 4 25 |
| Reinforcing bars, base | 4 25 |
| Steel hoops | 5 50 |
| Tire steel | 5 00 |
| Spring steel | 8 00 |
| Band steel, No. 10 gauge and 3-16 in. base | 4 75 |
| Chequered floor plate 3-16 and heavier | 6 50 |
| Bessemer rails, heavy, at mill | 2 35 |
| Steel bars, Pittsburgh | 2 10 |
| Tank plates, Pittsburgh | 2 20 |
| Structural shapes, Pittsburgh | 2 20 |
| Steel hoops, Pittsburgh | 3 05 |
| F.O.B., Toronto Warehouse | |
| Small shapes | 4 50 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 3 48 |
| Structural shapes | 3 58 |
| Plates | 3 78 |
| Small shapes under 3-in. | 3 48 |

## FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

| | C.L. | L.C.L. |
|---|---|---|
| Montreal | 58½ | 73 |
| St. John, N.B. | 84½ | 106½ |
| Halifax | 86 | 108 |
| Toronto | 38 | 54 |
| Guelph | 38 | 54 |
| London | 38 | 54 |
| Windsor | 35 | 50½ |

Current surcharge, 8 per cent.

## METALS

| | Gross. Montreal | Toronto |
|---|---|---|
| Lake copper | $18 00 | $17 50 |
| Electric copper | 17 50 | 17 50 |
| Castings, copper | 17 25 | 18 00 |
| Tin | 36 00 | 39 00 |
| Spelter | 7 75 | 7 50 |
| Lead | 6 50 | 7 50 |
| Antimony | 8 00 | 8 25 |
| Aluminum | 34 50 | 30 00 |

Prices per 100 lbs.

## PLATES

| | | |
|---|---|---|
| Plates, 3-16 in. | $5 00 | $4 75 |
| Plates, ¼ up | 4 50 | 4 25 |

## PIPE—WROUGHT

Standard Buttweld Pipe S/C

Per 100 feet.

| Size | Steel Blk. | Steel Galv. | Gen. Wrot Iron Blk. | Gen. Wrot Iron Galv. |
|---|---|---|---|---|
| ⅛ in. | $ 6 50 | $ 8 50 | $ .... | $ .... |
| ¼ in. | 4 89 | 6 99 | 5 91 | 8 01 |
| ⅜ in. | 4 89 | 6 99 | 5 91 | 8 01 |
| ½ in. | 6 50 | 8 03 | 7 95 | 9 48 |
| ¾ in. | 7 99 | 10 06 | 9 95 | 12 02 |
| 1 in. | 11 82 | 14 88 | 14 71 | 17 77 |
| 1¼ in. | 15 99 | 20 13 | 19 90 | 24 04 |
| 1½ in. | 19 11 | 24 06 | 23 79 | 28 74 |
| 2 in. | 25 72 | 32 38 | 32 01 | 38 67 |
| 2½ in. | 40 66 | 51 19 | ..... | ..... |
| 3 in. | 53 17 | 66 94 | ..... | ..... |
| 3½ in. | 67 62 | 84 18 | ..... | ..... |
| 4 in. | 80 12 | 99 74 | ..... | ..... |

Standard Lapweld Pipe S/C

Per 100 feet.

| Size | Steel Blk. | Steel Galv. | Gen. Wrot Iron Blk. | Gen. Wrot Iron Galv. |
|---|---|---|---|---|
| 2 in. | $29 42 | $36 08 | $35 71 | $42 37 |
| 2½ in. | 44 17 | 54 70 | 54 11 | 64 64 |
| 3 in. | 57 76 | 71 53 | 70 76 | 84 53 |
| 3½ in. | 69 46 | 86 02 | 85 10 | 101 66 |
| 4 in. | 82 30 | 101 92 | 100 83 | 120 45 |
| 4½ in. | 95 89 | 1 20 | 1 30 | 1 54 |
| 5 in. | 1 12 | 1 40 | 1 52 | 1 80 |
| 6 in. | 1 45 | 1 81 | 1 97 | 2 33 |
| 7 in. | 1 89 | 2 37 | 2 53 | 3 01 |
| 8L in. | 1 99 | 2 49 | 2 66 | 3 16 |
| 8 in. | 2 29 | 2 87 | 3 07 | 3 64 |
| 9 in. | 2 74 | 3 43 | 3 67 | 4 36 |
| 10L in. | 2 54 | 3 18 | 3 41 | 4 05 |
| 10 in. | 3 28 | 4 10 | 4 39 | 5 21 |

**Prices—Ontario, Quebec and Maritime Provinces**

## WROUGHT NIPPLES

4-in. and under, 50 per cent.
4½-in. and larger, 40 per cent.
4-in. and under, running thread, 20%.
Standard couplings, 4-in. and under, 20%
Dd., 4½-in. and larger, net.

## OLD MATERIAL

Dealers' Average Buying Prices

Per 100 Pounds.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $ 6 00 | $ 9 00 |
| Copper, crucible | 11 00 | 11 00 |
| Copper, heavy | 10 00 | 11 00 |
| Copper wire | 10 00 | 11 00 |
| No. 1 machine composition | 8 50 | 9 75 |
| New brass cuttings | 6 00 | 8 00 |
| Red brass turnings | 7 50 | 8 00 |
| Yellow brass turnings | 5 00 | 6 00 |
| Light brass | 3 50 | 5 00 |
| Medium brass | 4 00 | 6 00 |
| Scrap zinc | 4 00 | 4 00 |
| Heavy lead | 3 50 | 4 00 |
| Tea lead | 2 00 | 2 00 |
| Aluminum | 12 00 | 10 00 |

| | Per Ton | Gross |
|---|---|---|
| Boiler plate | $10 00 | $12 00 |
| Heavy melting steel | 9 00 | 14 00 |
| Axles (wrought iron) | 22 00 | 20 00 |
| Rails (scrap) | 12 00 | 14 00 |
| Malleable scrap | 12 00 | 20 00 |
| No. 1 machine cast iron | 28 00 | 25 00 |
| Pipe, wrought | 8 50 | 8 00 |
| Car wheel | 28 00 | 25 00 |
| Steel axles | 18 00 | 18 00 |
| Mach. shop turnings | 5 00 | 6 00 |
| Stove plate | 20 00 | 20 00 |
| Cast boring | 3 00 | 7 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent |
|---|---|
| Carriage bolts, 7-16 and up | Net list |
| Carriage bolts, ⅜" and less | 15 |
| Coach and lag screws | —20 |
| Stove bolts | 55 |
| Wrought washers | —25 |
| Elevator bolts | Net |
| Machine bolts, 7-16 and over | —5 |
| Machine bolts, ⅜-in. and less | —30 |
| Blank bolts | Net |
| Bolt ends | —5 |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | +25 |
| Machine screws, fl. and rd. hd., brass | Net |
| Machine screws, o. and fil. hd., brass | Net |
| Nuts, square, blank | +25 add $2 00 |
| Nuts, square, tapped | add 2 25 |
| Nuts, hex., blank | add 2 25 |
| Nuts, hex., tapped | add 2 75 |
| Copper rivets and burrs, list less. | 27½ |
| Burrs only, list plus | 10 |
| Iron rivets and burrs | 37½ and 5 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, bright | 67½ |
| Wood screws, flat, brass | 55 |
| Wood screws, O. & R., brass | 55½ |
| Wood screws, flat, bronze | 50 |
| Wood screws, O. & R., bronze | 47½ |

## MILLED PRODUCTS

(Prices on unbroken packages)

| | Per Cent |
|---|---|
| Set screws | Less 40% |
| Square and hexagon head cap screws | Less 30% |
| Round head cap screws | Plus 10% |
| Fillister head cap screws | Less 10% |
| Flat head cap screws | Net list |
| Button head cap screws | Plus 10% |
| Studs | Less 20% |
| Semi-finished nuts up to and including 1-in. | Less 35% |
| Semi-finished nuts 1⅛ to 1½" | Less 30% |
| Semi-finished nuts 1⅝ to 2 in. | Net list |
| Coupling bolts | Plus 10% |
| Taper pins | Less 40% |
| Planer bolts without fillet | Plus 40% |
| Planer bolts with fillet | Pus 50% |
| Patch bolts | Plus 80% |
| Hollow set screws | Plus 20% |
| Thumb screws | Less 35% |
| Thumb nuts | Less 65% |

## BILLETS

F.O.B. Pittsburgh.

| | Per gross ton |
|---|---|
| Bessemer billets | $43 50 |
| Open-hearth billets | 43 50 |
| O.H. sheet bars | 39 00 |
| Forging billets | 48 50 |
| Wire rods | 48 00 |

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails, base | $4 55 |
| Cut nails, base | 5 10 |
| Miscellaneous wire nails | 50% |

## ROPE AND PACKING

| | |
|---|---|
| Plumbers' oakum, per lb. | 0 10¼ |
| Packing, square braided | 0 38 |
| Packing, No. 1 Italian | 0 44 |
| Packing, No. 2 Italian | 0 36 |
| Pure Manila rope | 0 26 |
| British Manila rope | 0 20 |
| New Zealand hemp | 0 20 |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | Net |

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | $ 0 25 |
| Solder, guaranteed | 0 27 |
| Soldering coppers, lb. | 0 62½ |
| White lead, pure, cwt. | 17 00 |
| Red dry lead, 100-lb. kegs, per cwt. | 13 00 |
| Linseed oil, boiled, single bbls. | 1 03 |
| Wood alcohol, per gal. | 2 75 |
| Whiting, plain, per 100 lbs. | 3 00 |

### CARBON DRILLS AND REAMERS

| | |
|---|---|
| S.S. drills, wire size | 40 and 5 |
| Can. carbon cutters, plus | 10 |
| Standard drills, all sizes | 40 and 5 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 and 5 |
| Bit stock | 50 |
| Ratchet drills | 10 |
| Pure turp., single bbls., gal. | 1 20 |
| Linseed oil, raw, single bbls. | 1 00 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 50 |
| Sleeves | 50 |
| Taper pin reamers | 25 off |
| Drills and countersinks | Net |
| Bridge reamers, carbon | 50 |
| Centre reamers | 5 |
| Gasoline, per gal., bulk | 0 42 |
| Chucking reamers | Net |
| Hand reamers | 10 |
| High speed drills, list net to plus | 20 |
| Can. high speed cutters, net to plus | 10 |
| American | plus 40 |

### COLD ROLLED STEEL

[At Warehouse]

| | |
|---|---|
| Rounds and squares | $7.00 base |
| Hexagons and flats | 7.00 base |

### IRON PIPE FITTINGS

| | Black | Galv. |
|---|---|---|
| Class A | 60 | 75 |
| Class B | 26 | 36 |
| Class C | 17 | 26 |

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 6 00 | $ 6 50 |
| Sheets, blue ann., No. 10 | 5 25 | 5 50 |
| Canada plates, dull, 52 sheets | 7 50 | 13 00 |
| Can. plates, all bright | 14 00 | ..... |
| Apollo brand, 10¾ oz., galvanized | .... | ..... |
| Queen's Head, 28 B.W.G. | 10 75 | ..... |
| Fleur-de-Lis, 28 B.W.G. | 10 00 | ..... |
| Gorbal's Best, No. 28 | .... | ..... |
| Colborne Crown, No. 28. | .... | ..... |
| Premier, No. 28, U.S. | 8 25 | 8 50 |
| Premier, 10¾-oz. | 8 25 | 8 90 |
| Zinc sheets | 13 00 | 15 00 |

### PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13; 5-16, $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅞ in., $9.20; ¾ in., $9.30; ⅝ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

### ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13; 5-16 in., $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

### FILES AND RASPS

| | Per Cent. |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 32½ |
| Black Diamond | 27½ |
| J. Barton Smith, Eagle | 50 |
| McClennand, Globe | 50 |
| Delta Files | 20 |
| Disston | 40 |
| Whitman & Barnes | 50 |
| Great Western-American | 50 |
| Kearney & Foot, Arcade | 50 |

### BOILER TUBES

| Size | Seamless | Lapweld |
|---|---|---|
| 1 in. | $26 00 | $..... |
| 1¼ in. | 27 25 | ..... |
| 1½ in. | 26 25 | 29 50 |
| 1¾ in. | 29 75 | 27 00 |
| 2 in. | 29 25 | 24 50 |
| 2¼ in. | 33 00 | 28 50 |
| 2½ in. | 44 75 | 32 50 |
| 3 in. | 49 25 | 40 00 |
| 3¼ in. | ..... | 48 50 |
| 3½ in. | 63 50 | 43 50 |
| 4 in. | 85 00 | 55 50 |

Prices per 100 ft., Montreal and Toronto

### OILS AND COMPOUNDS

| | |
|---|---|
| Castor oil, per lb. | — |
| Royalite, per gal., bulk | 28 |
| Palacine | 31 |
| Machine oil, per gal. | 58 |
| Black oil, per gal. | 27 |
| Cylinder oil, Capital | 1.01 |
| Petroleum fuel oil, bbls., net | 11.2 |

### BELTING—No. 1 OAK TANNED

| | |
|---|---|
| Extra heavy, single and double | 15% |
| Standard | 15 and 10% |
| Cut leather lacing, No. 1 | 2 00 |
| Leather in side | 2 40 3 00 |

### TAPES

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES

| | |
|---|---|
| Polishing wheels, felt | $4 50 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, Turkish | 8¾ |
| Pumice, ground | 06 |
| Emery glue | 30 |
| Tripoli composition | 9½ |
| Crocus composition | 12 |
| Emery composition | 11 |
| Rouge, silver | 64 |
| Rouge, powder, nickel | 38 |

Prices per lb.

### ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | 8½ |
| Grits, 80 and finer | 6 |

### BRASS—Warehouse Price

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 30 |
| Brass sheets, 24 gauge and heavier, base | 38 |
| Brass tubing, seamless | 42 |
| Copper tubing, seamless | 44 |

| | | | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 19 |
| Peerless | 22 | X Empire | 15 |
| Grand | 21½ | Ideal | 18 |
| Superior | 21½ | X Press | 13½ |
| X L C R | 16½ | | |

### WASTE

Colored

| | | | |
|---|---|---|---|
| Lion | 13½ | Popular | 10½ |
| Standard | 12 | Keen | 9 |
| No. 1 | 14 | | |

Wool Packing

| | | | |
|---|---|---|---|
| Arrow | 35 | Anvil | 22 |
| Axle | 28 | Anchor | 17 |

Washed Wipers

| | | | |
|---|---|---|---|
| Select White | 20 | Dark colored | 09 |
| Mixed colored | 10 | | |

This list subject to trade discount for quantity.

### RUBBER BELTING

| | | | |
|---|---|---|---|
| Standard | 10% | Best grades | 15% |

### ANODES

| | |
|---|---|
| Nickel | .55 to .60 |
| Copper | .38 to .40 |
| Tin | .70 to .70 |
| Zinc | .16 to .17 |

Prices per lb.

### COPPER PRODUCTS

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | $30 00 | $34 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 32 00 | 38 00 |
| Copper sheet, tinned, 14 x 60, 14 oz. | 38 00 | 42 00 |
| Copper sheet, planished, 16 oz. base | 44 00 | 48 00 |
| Braziers', in sheets, 6 x 4 base | 36 00 | 41 00 |

### LEAD SHEETS

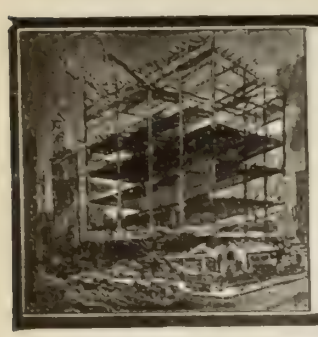
| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $ 9 50 | $14 50 |
| Sheets, 3½ lbs. sq. ft. | 9 25 | 14 00 |
| Sheets, 4 to 6 lbs. sq. ft. | 9 00 | 13 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS

| | |
|---|---|
| Acid, boracic | $ .25 |
| Acid, hydrochloric | .03¾ |
| Acid, nitric | .10¼ |
| Acid, sulphuric | .03¾ |
| Ammonia, aqua | .20 |
| Ammonium, carbonate | .23 |
| Ammonium, chloride | .22 |
| Ammonium, hydrosulphuret | .75 |
| Ammonium sulphate | .30 |
| Arsenic, white | .18 |
| Copper, carbonate, annhy. | .35 |
| Copper, sulphate | .10 |
| Cobalt, sulphate | .20 |
| Iron perchloride | .62 |
| Lead acetate | .30 |
| Nickel ammonium sulphate | 16½ |
| Nickel carbonate | .30 |
| Nickel sulphate | .17½ |
| Potassium sulphide (substitute) | .40 |
| Silver Chloride (per oz.) | 1.15 |
| Silver nitrate (per oz.) | 1.10 |
| Sodium bisulphate | .13 |
| Sodium carbonate crystals | .04 |
| Sodium cyanide, 127-130% | .39 |
| Sodium hyposulphite per 100 lb. | 6.50 |
| Sodium phosphate | .15 |
| Tin chloride | .80 |
| Zinc chloride, C.P. | .30 |
| Zinc sulphate | .08 |

Prices per lb. unless otherwise stated



# INDUSTRIAL NEWS

## NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES



## Trade Gossip

**Wants Equipment.**—Fred E. White, 163 Rothesay Ave., St. John, N.B., advises Canadian Machinery that he is in the market for some machine shop equipment. No other particulars were furnished.

**Wants Garage Equipment.** — P. A. Wagner, of Wellesley, Ont., wants some used equipment, as follows: Drill press to operate with power, power hacksaw, several grinders, and a couple of other machines.

**Business Is Good.**—Mr. P. Pocock, of the London Concrete Machinery Co., states that business in their line never was better, and is now away ahead of last year. The war hit this line of trade particularly hard, but it is now experiencing a remarkable recovery.

**Operate in June.**—Engineer Clark, in charge of the construction programme at the C.P.R. creosoting plant at Sherwood, on the outskirts of Sudbury, stated that he expected the plant to be in operation towards the end of June. Some 80 men are employed at the present time, but no more are being taken on. When the plant gets under way over 300 men will be employed.

**Agency Changes.**—The Modern Tool Co. announce arrangements whereby the E. L. Essley Machinery Co., 551-557 Washington Blvd., Chicago, Ill., become exclusive selling agents in Chicago territory for Modern and Universal grinding machines. In addition to a large sales force working from the Chicago headquarters it has branches in Milwaukee, Wis., and Moline, Ill. The Modern Tool Co. will also have their own grinding expert stationed at the Essley headquarters.

**A Busy Place.**—The National Steel Car Company, of Hamilton, has orders on its books involving an aggregate of $14,000,000. The company is operating at capacity in its rolling stock department and is also busy in the manufacture of motor trucks. The potential requirements of cars for the Canadian railways give the car builders of the Dominion a favorable outlook for the future, and the volume of orders held by the National Car Co. gives assurance of active operations for the next few months.

**Buying More Equipment.** — Assured that the debenture issue for the city's railway, the London & Port Stanley, will be approved by the Provincial Legislature, Vice-Chairman Philip Pocock announced the programme that will be put into effect as soon as the City of London Bill has received the Legislature's sanction. A new electric engine will be purchased and put into use for the summer excursion traffic, at least six new cars are to be added to the road's rolling stock, and the L. & P. S. shops are to be enlarged.

**Business Is Better.**—The Perfect Machine Co., Galt, Ont., informed Canadian Machinery that business, as far as they were concerned, was on the upgrade. They have had quite a few nice orders lately, and have good prospects of others in the near future. They are bringing out a new 18-inch drill press of the upright type, to be known as their No. 19 drill. This machine will be equipped with power feed and back geared. The design is being kept as simple as possible, all non-essentials being eliminated.

**No Depression.** — That Peterborough industries have not suffered as have those of many other cities during the present period of depression is indicated

## MEN WERE GIVEN ACCESS TO THE BOOKS AND RECORDS OF COMPANY

HAMILTON.—The Industrial Council of the International Harvester Co. has been called upon to fix the wages of the plant, about as severe a test as could be put on the organization.

On Friday of last week bulletins containing the report of the works council of the International Harvester works on the question of wage reduction were posted in the various departments of the big plant here. The report was issued yesterday, and is said to be the unanimous finding of the council, which consists of eight representatives of the employees, elected by the workers in the different departments, and an equal number of representatives of the company. The workers' representatives spent five full days in investigating the company's books concerning cost production, orders and other matters, and went into the wage returns of all the employees. As a result, the members reported, among other things, that:

"We, the employee representatives, find that owing to the lack of orders on account of the high cost of machines and large stock on hand, the company's proposed reduction of 20 per cent. on day and piece rates, and 10 per cent. on salaries, seems necessary, and wish to go on record as regretfully accepting same in hope that the plant may be kept running.

"After carefully reviewing the reductions made so far, and the further reductions necessary to meet the objective asked for, and having tried in every way, without success, to find some other way of accomplishing the result, we endorse the present method of reducing the day and piece work rates in force November, 1920, until a total reduction of 20 per cent. is reached."

The wage reductions made so far by the company on the November scale average 13½ per cent., and according to the finding of the council the company is warranted in making a further cut amounting to 6½ per cent.

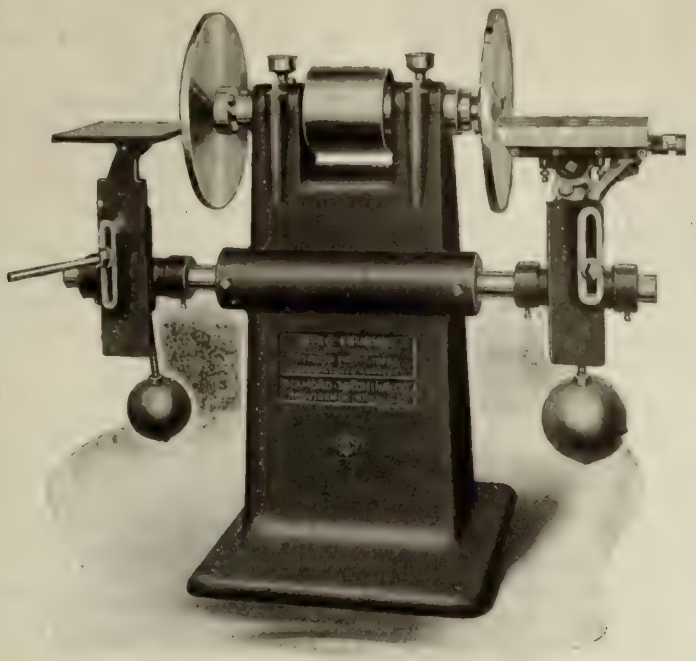
The council presented its report to F. J. Gernandt, the local superintendent, who expressed satisfaction at the finding, which he believed would be the means of averting a shutdown of the plant and turning over 1,500 hands out of work.

The works council of the Oliver Plow Works, a subsidiary of the International Harvester Company, is now preparing a report.

### Report Well Received

It is stated the finding of the council has been well received by a majority of the hands employed at the Harvester works, and will be the means of steadying the labor market, it is thought, by many other workers.

An explanation in regard to the 10 per cent. cut in the price of the company's products not taking place till next year was made by an officer, to the effect that the product marketed this year was made up months ago, with wages and material at the top price.



# DIAMOND
## DISC GRINDERS

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## *Machine Tools, Equipment and Supplies*

**At the UNITED STATES ARMY BASE, Port Newark, N.J.**
**Tuesday, Wednesday and Thursday, April 26-27-28, 1921**
**At 10 a.m. each day.**

**MACHINE TOOLS**—Including Blowers, Crane Parts, Milling Machines, Chucks, Grinders and Grinder Parts, 40-30″x28′ Niles-Bement-Pond Gun Boring Lathes, 2 Bridgeford Heavy Duty Gun Boring Lathes 36″x44′, Cut Off Machines, Textile Machinery, Pumps, Presses, Slotting Saws, Tanks, Grinding Wheels, Electric Equipment, Motors, Dynamos, etc.; Furnaces, Reaming Machines, Cochran & Bly Metal Saws, Spotting Machines, Hand Milling Machines, Bench Milling Machines, Riveters, Cutter Grinders, Profilers, Polishing Jacks, Internal Thread Milling Machines, Spline Milling Machines, Rifling Machines, Brown & Sharpe Yarn Reels, Atlas Shredders, Spencer Oilers, Pickers and Picker Feeds, 197 Barrel Drilling Machines, 91 Barrel Reaming Machines, Rifling Machines, Centreing Machines, Stamping Presses, Barrel Grinding Machines, 175 Profilers, Horizontal Drills and about 100 Defiance Wood Working Tools of various kinds, including Shapers, Drills, Boring Machines, Turning Lathes, Saws, etc.

**MISCELLANEOUS SUPPLIES**—Including High Speed Steel, High Speed Steel Tools, Pillow and Snatch Blocks, Small Tools, Copper Bars and Scrap, Brass Rods and Scrap, large supply of Milling Cutters and Reamers, Pipe Fittings and Supplies; Fuses, Gaskets, Gauges, Hangers and Shafting, Paint and Oils, Pulleys, Taps, Miscellaneous Electric Supplies and Steam Shovel Parts, Lathe Parts, Electrical Equipment, etc., etc.

**BUILDINGS**—Thirty-four Frame Buildings equipped with Steam Heat, Plumbing and Electric Lights.

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**SAMUEL T. FREEMAN CO., AUCTIONEERS, 1519-21 Chestnut St., Philadelphia, Pa.**

*If interested tear out this page and place with letters to be answered.*

by the exceptionally heavy freight shipments from this city since the first of the year, according to A. McNab, local agent for the Grand Trunk. The Peterborough Cereal, Canadian Packing, De Laval, Peterborough Milk Products and Canadian General Electric Company have maintained particularly steady shipments, Mr. McNab said. Outside of the textile industry depression has not been noticed locally this winter.

**Fosdick Announcement.**—The Fosdick Machine Tool Company, of Cincinnati, Ohio, makers of heavy duty radial drills and upright drills, have taken over all patents, drawings, patterns, jigs and fixtures covering the line of Pierle quick change, high speed, ball bearing, sensitive drill presses, from the R. K. Le Blond Machine Tool Co. This acquisition by the Fosdick Machine Tool Co. will give them a complete line of drilling machinery consisting of heavy duty radial drills, heavy duty upright drills and gang drills, and high speed sensitive single and multiple spindle drills.

**Make Metal Signs.**—Announcement is made of the reorganization of the St. Thomas Metal Signs, Ltd., under a Dominion charter for $100,000 capitalization, with F. W. Sutherland, president of the Sutherland Press, Ltd., named as president and treasurer of the new company and James T. Stewart of Springfield, Ohio, vice-president and general manager. Plans for the future development of the concern, which is the only one of the kind in Canada, are already under way and include the erection of a new factory building. The old company was formed two years ago and during that time has manufactured nearly $300,000 worth of metal signs.

**Report Favorable.**—A favorable report has been submitted by the engineers investigating the prospects for the manufacture of steel on the British Columbia coast by British industrial interests. It is several months since the announcement was made of the incorporation of the Coast Range Steel Company with a heavy authorized capitalization. It is understood that the investigators have advised the British capitalists that all the materials and facilities necessary for the manufacture of steel on a large scale are available, including hematite, magnetite, coal, and the various fluxes. An announcement as to preparations for manufacture is expected from the Britishers who are interested in the venture.

**New Plant in Galt.**—Speaking to Canadian Machinery relative to their new plant, the High Speed Tool Co., Galt, Ont., stated they hope to commence operations within a week. They will produce a full line of high speed tools such as taps, dies and gauges, also cater to work on special forming and blanking dies, jigs and fixtures. They intend specializing on their line of thread gauges, and speaking of the method of heat treatment they will employ, they stated it is an entirely new method in this country. It is said to be a process that is particularly applicable to tools such as taps, etc., where scale is not permissible. Electric furnaces will be used for heating.

**Will Extend Plant.**—Plans are under way for extensions to the John Inglis Co. plant, Toronto. Wm. Inglis, speaking to a representative of this paper this week, said the biggest part of their business at the present time was repair work, which showed that many firms are in need of new equipment. Mr. Inglis felt that an adjustment of the wage question and a restoration of the public confidence in the matter of steel and other raw materials would go far toward re-establishing business on a firmer basis. His organization is spending $75,000 on improvements for their machine shop, boiler room, foundry and on the plant generally. This, said Mr. Inglis, shows what faith they have in the future. Mr. Inglis said they had been negotiating for some time for the purchase from the city of some land directly across the road from their present site, and that he hoped to be in a position to close this deal and proceed with the building of a new foundry without further delay. Mr. Inglis left the city on Friday on a business trip to Chicago.

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W. L. Jepson, of Niagara Falls, was at a special meeting of the city council appointed city engineer at a salary of $3,000, his duties to commence immediately. D. H. Fleming, of Owen Sound, had been appointed, but his resignation was not accepted by the Owen Sound council.

## SHORT TRADE NOTES

E. W. Brocklebank, Arthur, Ont., is in the market for a 60 to 85 horsepower steam boiler and 50 to 75 horsepower engine.

The Hall Zryd Foundry Co., Ltd., Hespeler, Ont., is in the market for several motors, second-hand preferred, of 15 to 30 horsepower, 550 volts, 25 cycle, three phase, 750 r.p.m.

Fire, March 28, at the plant of the Record Foundry & Machine Co., Moncton, N.B., damaged the warehouse and shops to the extent of $70,000. Rebuilding will start immediately.

The Corundo Steel Co., Ltd., has acquired the plant of the Record Foundry & Machine Co., 17 Mill Street, Montreal, for the manufacture of cutting and percussion tools from low grade steel by a special chemical heat treating process. Oscar Schenck is managing director.

Two new industries, the Fuller Brush Co., Hartford, Conn., and the Coffield Washer Co., will establish plants in Hamilton, Ont., according to C. W. Kirkpatrick, industrial commissioner. The Coffield Washer Co., which has just been incorporated, will manufacture a new type of electric washing machine and will erect a factory.

The General Forgings & Stampings, Ltd., Merritton, Ont., has been incorporated with a capital stock of $900,000 by William S. Morlock, 107 Roxborough Street West; Sydney E. Wedd, 85 Bay Street; Roy B. Whitehead and others, all of Toronto, as provisional directors, to take over as a going concern the plant and business now being carried on by the General Forgings & Stampings, Ltd.

# BLAME LACK OF PROTECTION FOR CLOSING OF PLANT AT LONGUEUIL

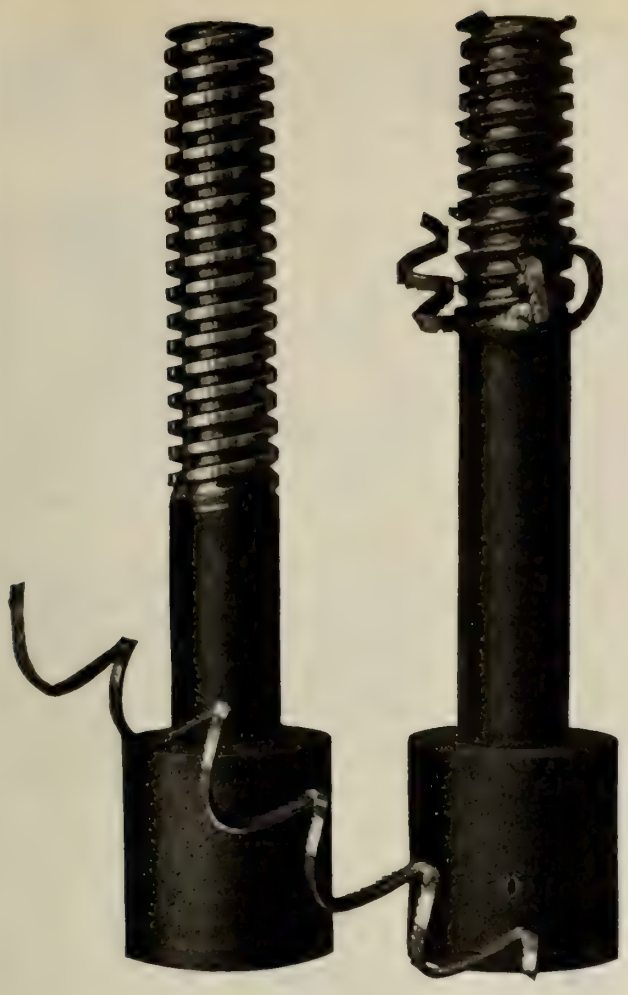
It is understood that Armstrong, Whitworth of Canada, Ltd., are contemplating closing down their works at Longueuil.

On behalf of the management it is stated that owing to the failure of the Dominion Government to give them any tariff protection on the manufacture of locomotive steel tires they closed down their tire mill some twelve months ago, and will not reopen their mills again until such protection is given. Most of the raw materials they require have to be brought from the United States and are dutiable. No protection, however, is afforded them under the Dominion tariff for their finished product. This tire mill is the only one in Canada. Messrs. Sir W. G. Armstrong, Whitworth & Co., Ltd., the famous engineers and shipbuilders of England, commenced building these works in 1914, and installed all the latest machinery. Owing to the outbreak of the European war, it was difficult for them to supply the necessary technical operators from their own works in England.

About six months ago they sent D. E. Grant to go into the situation and after being in London for some weeks he has just returned to Canada.

Armstrong, Whitworth & Co. of Canada, Ltd., will carry on their agency work on behalf of the parent firm, and the firms who are allied with them, and will continue to dispose of their stock of small tools and tool steel, water turbines, dock machinery and such like, including the Armstrong Siddeley motor car.

If this business develops as they anticipate, they intend to consider seriously the establishment of such a plant in Canada. They are already discussing some large propositions for the development of Canadian resources.



# It Was Just A Matter of Grinding

The same set of Thread Chasers cut these two threads.

Observe what a clean cut the Chasers gave on this open hearth stock after they had been correctly ground. Note how neatly the Chasers curled out the chip. Before given the right form of grind, the Chasers simply pushed out the stock.

# How To Grind Thread Chasers

**Instructions for the Care of Thread Chasers are very completely given in a 27-page booklet published by us.**

# The Book Is Free

To those having the care of Thread Chasers.

It is printed and distributed with the hope that the rules given will be followed, and if they are, it will be the means of an inestimable saving of time, money and trouble.

If you have anything to do with the care of Thread Chasers, ask us for the book. Although there is no charge for the book, it is full of value. It will cost you the price of a postage stamp only, and will save you trouble, increase your value to your employer and save a lot of money that is needlessly wasted in time and scrapped work.

GEO MET RIC

*Right Tion the Lead*

# THE GEOMETRIC TOOL COMPANY

**NEW HAVEN CONNECTICUT**

***Canadian Agents:***

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, St. John, N.B., Halifax, N.S.

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*If interested tear out this page and place with letters to be answered.*

# MONTREAL NOTES

Rumors that were prevalent some months ago regarding a large match factory that was to be built in Canada by British manufacturers seem now to be on the point of consummation, as it is stated that Sir Alexander Maguire, of the firm of Maguire, Patterson and Palmer, will shortly come to Montreal to negotiate for the erection of the necessary factories in this district.

* * *

The "Canadian Commander" and the "Canadian Leader," the last two ships constructed by the Canadian Vickers Company for the C. G. M. M., are just about completed and will undergo their final tests by the builders this week, before being handed over to the owners. The first named will be placed on the India and Far East service, under the command of Capt. M. Robertson, while the Leader will be in charge of Capt. J. D. Mackenzie and will make her maiden voyage to Australia and New Zealand by way of the Panama Canal.

* * *

At a recent luncheon of the Co-operative Electrical Society, J. D. P. Coats, of the Marconi Wireless Company, gave a short address on the subject of wireless 'graph and 'phone, accompanied by practical demonstrations. An interesting feature of the meeting was the listening to a concert being given at the plant of the company many blocks away. Mr. Coats stated that similar concerts were given at the Montreal plant every Tuesday night, and these were enjoyed by a large number of amateur wireless operators throughout Eastern Canada.

* * *

Efforts are being made by the Canadian Workers' Federation of Returned Soldiers and Sailors to hold a mass meeting in Montreal shortly, at which the Hon. C. C. Ballantyne will be asked to preside. At a recent interview with the Minister in Ottawa, a deputation of the workers received his promise to give consideration to the matter of providing work for this class of worker, but could make no definite statement as to the shipbuilding program of the Government. In stating their requests to the Minister it was asked that should contracts be awarded by the Government for the construction of new vessels that favorable consideration be given to Montreal as the place of construction.

* * *

Announcement has been made by the Marconi Wireless Company of Canada that they are constantly receiving messages at their Common Street station in Montreal, direct from Clifton, Ireland. It is only recently that such messages have come through without relay, and this achievement emphasizes the progress this company is making in the development of wireless apparatus. This local station was erected primarily for experimental purposes for the study of static conditions, so that it is with no small degree of satisfaction that equipment has been produced to receive and record uninterrupted messages over this great distance. Direct communication between Montreal and the Continent seems an early possibility.

* * *

Joliette Castings and Forgings, Ltd., of Joliette, Quebec, have recently completed the installation of a one-ton Greaves-Etchells electric furnace for the manufacture of manganese steel and alloy steel castings, particularly for the making of wearing parts for mining machinery. They have likewise installed a new five-ton Northern Electric travelling crane in the new building and extended the cleaning shop 100 feet, with a width of 40 feet, in which is installed a new continuous car annealing furnace and a complete oil storage and pumping system. They have also built a new sand blast house equipped with Pangborn sand blast. A new power house and machine shop has been erected with the necessary machinery for facilitating delivery of finished castings and specialties.

## PLANT WILL HAVE GREATER CAPACITY

**Changes Being Made To Give Larger Output for Electrical Apparatus.**

Owing to the substantial development that has taken place in the electrical equipment business of the Canadian General Electric, it has been found necessary to take over some of the space that has formerly been included in the Allis-Chalmers plant.

This will be utilized after the necessary equipment has been secured, some of which will be taken from other plants, for the making of transformers.

Mr. J. J. Ashworth, general manager of the Canadian General Electric, intimated that it would take some time to finish making the change, but that when completed the plant would be capable of much greater production of electrical equipment.

The plans of the company also call for the disposal of a large amount of used machinery, part of which was used in their war contracts.

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From 125 to 130 different weights of metal lath were in common use a short time ago. Through a conference with the Bureau of Standards, it now appears, manufacturers have agreed to reduce the number of weights of metal lath to three.

## CHANCES TO MAKE NEW CONNECTIONS

**Some of These Lines May Come Within the Scope of Output of Your Factory**

Canadian firms interested in any of these items should write Canadian Machinery for particulars, mentioning the number in each case.

2858. A London firm desires the addresses of Canadian producers of cobalt ores.

2856. **Belt dressing.** — A Manchester firm wishes to place on the Canadian market a new solid non-slip belt dressing and are prepared to appoint agents in Montreal, Toronto, Winnipeg and Vancouver.

2857. **Electrical supplies.** — A Manchester firm would like to hear from any Canadian manufacturers of electrical goods (specialties in particular) likely to be saleable in the United Kingdom.

2907. **Asbestos, leather belting, electrical material and other technical articles.**—A Milanese house is anxious to open up correspondence with Canadian firms.

2908. **Machinery, rubber goods.** — A firm in Milan would like to establish relations with Canadian firms exporting machinery and rubber goods.

2913. **Hardware and metals.**—A firm in Belgrade, Jugoslavia, would be interested to hear from Canadian exporters of hardware, iron and steel and other metal lines and agricultural implements.

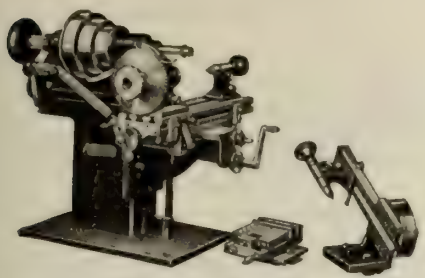
2904. **Industrial and agricultural machinery, safes, etc.** — A Sicilian firm would be glad to hear from Canadian houses dealing in industrial and agricultural machinery, safes, etc. The firm is also disposed to represent Canadian firms.

## Personal

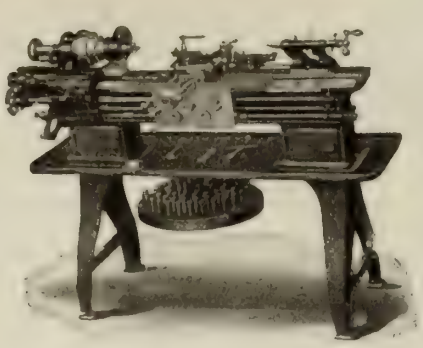
The marriage took place at Kingston, at the home of the bride, Alwington, of Miss Mabel Ford Richardson, youngest daughter of the late Senator Henry W. Richardson, and Henry Graham Bertram, of Dundas, Ontario. The groom is chief engineer of the John Bertram and Co. works in Dundas.

At a meeting of the directors of the Stanley Steel Co., Hamilton, held this week, Lt.-Col. Harry Hatch was elected vice-president and general manager of the concern. Col. Hatch graduated in mechanical engineering from Queen's University. Previous to the war he was purchasing agent for the Canada Steel Goods Co., of which his father is president. He served with distinction with the 19th battalion in the great world war. On his return he was made assistant superintendent of the Stanley Steel Works at New Britain, Conn. His latest promotion is a most important one for a young man and he will receive many congratulations.

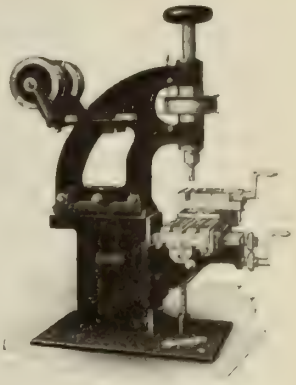
# METAL and WOODWORKING MACHINERY of all Kinds



Cataract Bench Miller, with Horizontal Head.
(Details in No. 15 Catalogue.)



Cataract Quick Change Swing Precision Lathe, with Cone Drive.
(Details in special Catalogue.)



Cataract Bench Miller, with Vertical Head.
(Details in No. 15 Catalogue.)

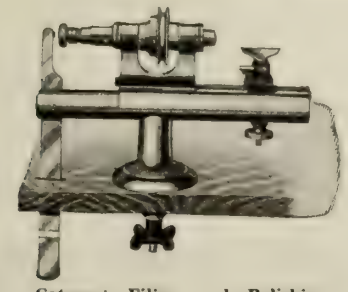


Cataract Bench Lathe with Turret Double Tool Cross Slide and Chuck Closer for the Manufacture of Duplicate Parts.

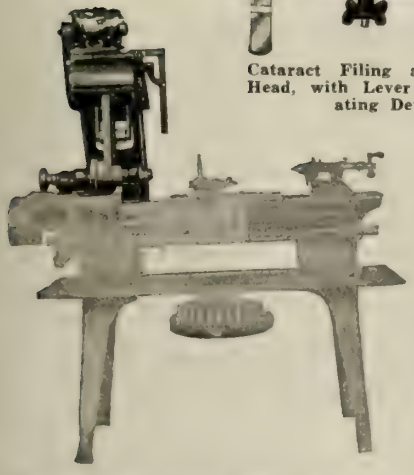
## "CATARACT"

All those features which make a tool worth while—accuracy, finest materials and workmanship, unexcelled finish and interchangeability of parts that really interchange—are incorporated in the entire line of tools manufactured by Hardinge Brothers of Chicago.

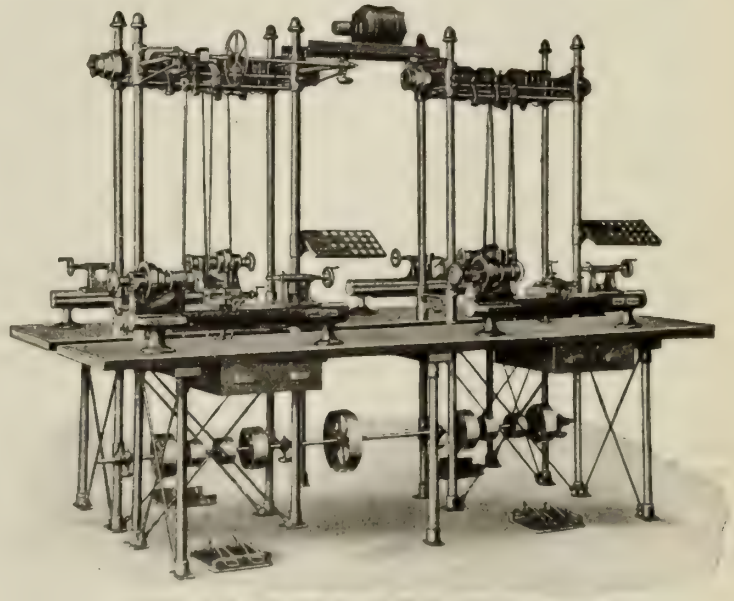
**Write us for full particulars.**



Cataract Filing and Polishing Head, with Lever Chuck Operating Device.



Cataract Quich Change Swing Precision Lathe, with Motor Drive.



Cataract R-4 Double Bench Unit with Under-Drive.
(Details in No. 15 Catalogue.)

The equipment shown above being self-contained, is particularly well adapted for tool room work, the manufacturing of duplicate parts, or for optical and jewelry manufacturers and all precision work.

G&W MACHINERY

## GARLOCK-WALKER MACHINERY CO. LIMITED

32 FRONT ST. WEST, **TORONTO** TELEPHONE MAIN 5346

# STANDARDIZING PARTS OF FARM MACHINERY IS BEING UNDERTAKEN

OTTAWA.—A. B. McCoig, member for West Kent, has made some progress with his plan for having parts of agricultural implements standardized in Canada, so that it will be easy for farmers everywhere in Canada to get repairs. The sub-committee was named by the agricultural implement manufacturers and was informed by the latter of various difficulties in the way of standardization, but it was agreed that in some respects the scheme was feasible.

Samples were submitted of ledger plates, sections and guards, as well as parts of cutting-bar by the Massey-Harris and International Harvester companies, and parts of plow-points and plow-point bolts by the Cockshutt and Verity Plow companies.

### Speak for Makers

The representatives of manufacturers present were as follows: A. W. Wallace, International Harvester Co.; George D. Graham, Frost and Wood Co.; T. Whitecomb, Smith's Falls; W. S. McFarlane, Cockshutt Plow Co.; W. A. Watts, Massey-Harris Co.; E. F. Bolte, A. L. Upton, International Harvester Co.; Wm. J. Verity, Verity Plow Co.; Messrs. George Valentine, T. Bradshaw and J. G. Hossack, of the Massey-Harris Co.

The sub-committee who met them were the chairman of the agricultural committee, Mr. R. C. Henders, and Messrs. McCoig, Harold, Wright, Nicholson and Dr. J. H. Grisdale, Deputy Minister.

Representatives of the manufacturers argued that to standardize these different parts would be to create a new group of articles which would add to the burden of local agents in the way of repairs to be carried, and also that it would interfere with the improvement of different machines or implements affected. After further parley, however, it was conceded that very material progress might be made toward standardization in the following cases:

### Five Special Cases

Ledger plates, as to shape and attachments.

Sections, as to location of rivet holes.

Plow-points, as to location of bolt holes and shape of same.

Plow-point bolts, as to shape.

Sprockets and sprocket chains, nuts for wagon skeins, and nuts and bolts generally.

At a subsequent meeting among themselves, the representatives of the manufacturers passed the following resolution:

"That the representatives of the implement companies present at the meeting of the agricultural committee are of opinion that a measure of standardization is possible on many of the articles considered and discussed with your sub-committee this morning. It will, however, be recognized that any change, even of a minor character, which may be made in agricultural implements may involve important manufacturing considerations, and therefore it is suggested that a board composed of expert engineers, to be named by your committee, and representatives of agricultural implement manufacturers, be constituted to investigate and make recommendations."

This was approved by the sub-committee and was embodied in the report to the main committee, which so reported to Parliament.

# BIG RECOVERY IN MICHIGAN PLANTS

**Steadily Moving Toward a Period of Normal Production—What Figures Say.**

Detroit.—According to compiled statements by secretaries of more than a score of Michigan cities, the State's industries show a recovery of 47 per cent. from the low ebb of the readjustment depression during the first two months of the year in the number of workers actually employed.

The improvement which set in about the middle of the first quarter of the year has gradually gained momentum until leaders in all parts of the State foresee steady progress toward normality, even though that goal is not yet in sight.

Figures compiled in the larger cities of the State indicate that their normal working forces aggregate 404,900, while at the low ebb of depression they had been reduced to 122,940. The number of men at present employed in these cities is 235,140.

### SIGNS OF PROGRESS

The contract for the plant to be erected this spring at Brandon, Man., for the Imperial Oil, Ltd., at a cost of $225,000, has not yet been let. The warehouse will be 50 by 200 feet and will be of reinforced concrete. A boiler house, which will be separate from the warehouse, will be 20 feet by 30 feet and the garage 40 by 50 feet. Local manager, D. S. L. Patterson.

The million-dollar concentrator of the Britannia Mining and Smelting Co., Ltd., Britannia Beach, B.C., which was recently destroyed by fire, will be rebuilt. General manager, E. J. Donahue.

The erection of a temporary station in the South Ward, near Queen Street, Kitchener, Ont., is contemplated by the Grand Trunk Railway.

Estimates are being prepared for the new arena and ice plant to be erected at Ottawa shortly. The arena will be situated at the corner of King Edward Avenue and York Street and will have a cold storage plant in connection with it.

# MACHINERY TRADE DULL IN GERMANY

**New Political Conditions Cause Some Uncertainty Regarding Operations of Future**

**Berlin, Germany.** — The machinery trade reports declining business. The political situation has added weight to a situation that was already bad. Foreign buyers are holding off, because they want to see whether Germany can produce successfully under the changed political conditions just forced upon Germany. It goes without saying that home buyers are also placing few orders in view of the uncertainties of the outlook. There is some inquiry for heavy machine tools; buying, however, is light. Locomotive shops have recently taken orders for about 80 locomotives for Spanish railroads, and last month it was announced that the Soviet government had arranged for 1,000 locomotives in Germany, of which 100 would be built at once. These orders were to be distributed among 19 shops. At the same time it was published that in a foreign competition for locomotive parts for Russia, German shops secured 80 per cent. of the contracts.

The German machinery trade has just organized a working council, composed equally of employers and workmen, whose object is to promote harmony in the relations of the two parties. It will also seek to reduce the costs of production through standardization and specialization of product.

# LARGE SUPPLIES OF WAR MATERIAL

**Thousands of Tons of Forging Billets Have Never Been Cleared Out of Stock**

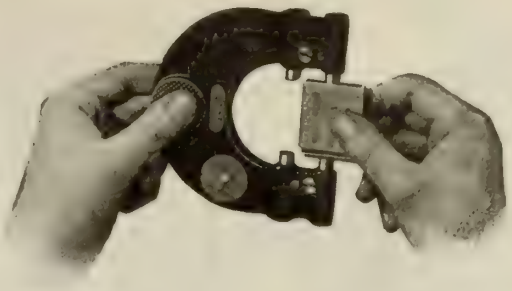
Prices to be asked by the Bureau of Supplies and Accounts, Navy Department, for the 20,000 tons of surplus steel it is to offer in the open market will be fixed at 10 per cent. less than the United States Steel Corporation bases, it is understood. Work of completing the catalogue listing the steel, most of which consists of forging billets, will be completed in about ten days. Other material in the list is comprised of plates and shapes, medium high tensile and galvanized; bars in cold-rolled, medium black and nickel, and billets, blooms and slabs, including mild steel and steel in carbon and nickel. In case the Steel Corporation prices should be changed, it is believed that the bureau would readjust its scale so as to be 10 per cent. under the prices of the Corporation.

Tonnage at Gulf and Atlantic coast navy yards will take no addition for freight, while that on the Pacific coast will carry a freight rate of 88¾ cents, based on the Government bill of lading taking a deduction of 33 1-3 per cent. under the commercial rate of $1.33.

Aikenhead's

*"Everything in Tools"*

The reputation of a manufacturer's product is his greatest asset. The firm which represents him to the purchaser must have a reputation equal to his own. Aikenhead's is the Canadian headquarters of many makers of the world's finest tools.



# Johansson
## Snap Gauges

The adoption of Johansson Gauges all over the world is due to two great factors—**they make short cuts in production** and **cut manufacturing costs.**

You will find Johansson Gauges are considered as essential shop equipment in those shops where economy and efficiency are carefully studied.

Johansson Adjustable Limit Snap Gauges eliminate the cost of making and maintaining solid snaps. They eliminate the tendency of the operator to work to "absolute dimension" and get results even in the hands of unskilled operators.

The Johansson book tells all about them. Write for your copy to-day.



## Single Spindle Hand Tachometers

Hand Tachometers supply the need for accurate, durable and handy speed recorders for all-round use. They indicate accurately the revolutions per minute, either right or left hand, of shafts and spindles; furthermore, by using the measuring disc, periphery or surface speeds are determined. The result (either revolutions per minute or feet per minute) is instantly shown on the dial without watch-timing or calculating of any sort. The slightest variation in speed occurring during a fraction of a minute is also shown at a glance. Belt slipping and consequent loss of power is, therefore, quickly detected.

# Aikenhead Hardware, Limited
**17 Temperance Street, Toronto, Ont.**

*If interested tear out this page and place with letters to be answered.*

THE "FLU" Stayed out of this PLANT




PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)

The only fountain with a bowl that prevents lips touching the bubbler paid its moderate cost over and over in all those well-ordered plants whose precautionary measures successfully barred the Spanish influenza. PURO saves lives, time and water. Write

Puro Sanitary Drinking Fountain Co.
888 F. St. Andre St., Montreal, P.Q., Canada



# MUST CONSIDER THE SEVEN "M'S" OF INDUSTRY TO MAKE A SUCCESS

SPEAKING before the Pittsburgh section of the Industrial Cost Association, on March 8, 1921, W. E. Hundley brought out some worth-while facts on "Production Costs."

When we get a good general view of the big basic sources of cost, we find that the manufacturing and marketing of an industrial product involves seven fundamental factors each spelled with an "M," which might appropriately be called "the seven Ms of industry." They are Money, Millsite, Mill, Machinery, Material, Men, Management.

Each of these factors is the primary cause of certain expenditures which begin as soon as an enterprise is launched and continue as long as it exists. It is no more difficult for a capable cost accountant to classify expenditures with respect to these causes than it is for the naturalist to tell from the characteristics of a leaf the kind of tree on which it grew. They may be readily classified into three main groups: Administration, Production, Distribution.

Money, the motive-power of industry, is obtained primarily by financing the enterprise. It represents wealth accumulated by men willing to risk the loss of it by exchanging it for pieces of paper which entitle them to participate, under certain conditions, in the profits which they feel assured will be earned by the venture, and which they believe will exceed the ordinary rate of interest afforded by other investments involving little or no risk.

### What the Return on Investment Is

This return, which they expect to receive on their investment, is a combination of interest for the use of their money and profit for conducting the enterprise, which should be in proportion to the risk involved and cannot reasonably be expected to approximate a fixed rate for all industries. This matter of interest and profit bears upon the problem, as it is still the storm center among professional cost accountants and engineers, many of whom contend that interest on investment must be included in determining cost of production, reasoning that an enterprise must pay for the use of capital before it can show a profit.

Millsite is not, of itself, the source of much expense, and has very little effect upon cost of production. Money spent for a millsite constitutes a permanent investment which can neither be depreciated nor appreciated, and on which no direct profit can be realized except through rental or sale. Taxes and maintenance are apportioned to production on the basis of space occupied by each department or building.

Mill constitutes an important element of investment which is slowly absorbed into cost of production through the medium of depreciation charges. It also is the source of certain expenditures which may readily be classified as "building expense," and apportioned on the basis of available floor space or cubic contents.

### The Most Important Item of Investment

Machinery embraces all mill equipment directly or indirectly connected with manufacturing, is the most important element of invested capital and the source of most trouble for the industrial executive, the cost accountant and the income tax examiner, in determining cost of production. It used to be difficult to persuade manufacturers that depreciation of machinery and equipment constituted an important element of cost. Now they not only swallow depreciation but hunger and thirst for amortization, obsolescence and inadequacy.

It is most important to know the actual valuation of plant equipment; the value in use. Depreciation allowances charged into cost from year to year are merely accounting estimates and cannot be depended upon as an indication of actual depreciation. Unless the reserves set up have been properly handled the balance when deducted from the book value of the assets may show a valuation that cannot be reconciled with the actual physical condition of the equipment.

Assuming a reasonably accurate cost for machinery and equipment, we have a basis for determining the charges to be made to cost of production for the gradual wear and tear which will eventually cause the scrapping or disposal of such property, regardless of how much may be spent for repairs and maintenance. But the extent to which the repairing of machinery tends to prolong its useful life is an important consideration.

### Distributing Machinery Expenses

Machinery is a constant source of expense, whether idle or operating. Idle machine expense includes the items usually referred to as fixed charges, such as depreciation, insurance, taxes, space charges, small maintenance charges. Operating machine expense covers all of the above charges plus the following, which vary more or less with production: wages of operator, indirect labor, labor expense, power, tools, supplies, maintenance and repairs, crane service, miscellaneous works expense.

Material is generally considered an easy matter to dispose of, chiefly because the tendency is to ignore most of the expenses incurred in connection with it, absorbing them as part of the "general manufacturing expense." As in the case of labor, we have both direct and indirect material costs.

Special expenses in connection with material bought for a particular job should be charged direct to the shop

RATES FOR CLASSIFIED ADVERTISING

Rates (payable in advance): Two cents per word. Count five words when box number is required. Each figure counts as one word. Minimum order $1.00. Display rates on application.

order covering it, and in some cases charges for demurrage, inspection, testing, etc., might be charged direct to a department. Otherwise, indirect material cost should be distributed on some equitable basis that would take account of weight, bulk. etc.

### Handling the Human Element

Men not only constitute the greatest problem in the industrial world, but are the direct source of so many expenses that cost accountants, as a rule, have used what they call "productive wages" and "productive hours" as an arbitrary basis for distributing all manufacturing expense. Such items as power, tools, supplies, repairs, etc., cannot be thrown into a melting pot called "burden," and distributed to production on a basis of wages or labor hours, if we are to get anything approximating actual costs. But we can and should analyze wages and the expenses incurred in connection with the employment and handling of men and classify them into groups.

Management affects administration, production and distribution but it presents no particular difficulties except in connection with production. Management of production involves a certain class of expenses which are variously referred to as "general manufacturing expense," "plant administration," etc. As a rule these expenses cannot be applied as direct charges to productive processes or operations, but there is one element that is frequently separated and handled as a productive department. Engineering and drafting can and should be handled on an hourly basis, each shop order or department being charged with the direct time of engineers and draftsmen, as reported daily, and a cost rate established to absorb all salaries and expenses.

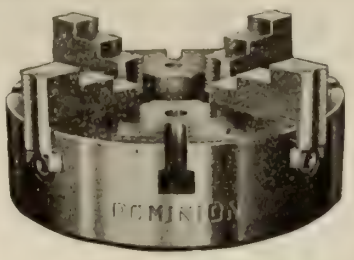
## CUTTING PRICES TO HELP TRADE

### Following Action of Steel Corporation, Action Is Taken By Some Large Firms

Chicago.—Basing its action upon the recent reduction in steel prices announced by the United States Steel Corporation, the International Harvester Co. announced a straight 10 per cent. reduction effective next year, on products in which steel is the principal raw material.

"The reduction on steel came after one year's product had been provided for, and will have no bearing on the cost of machines we sell this year," the announcement explained.

The company announced reductions of from 10 to 15 per cent. in machines made principally of wood and iron on March 7. The announcement of the more recent cut said that the new changes cover all machines not affected by the March 7 cut.


DOMINION CHUCKS

STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY



All Screws Are Reversible

SCREWS are made of the best grade steel. Both ends are broached and are heat treated after machining. They are reversible, so that either end may be used, are large enough in diameter to stand the torsional strains applied by operator when setting up his work. They are made to give the best service—and may be depended upon to stand up under the hardest usage.

DOMINION STEEL PRODUCTS CO. LIMITED
*Engineers • Manufacturers*
BRANTFORD, CANADA

PATENTS
ATTORNEYS

DROP FORGE DIES
Send us your blueprints and specifications. Entrust your requirements to experienced workmen and up-to-date equipment. Have your dies made in Canada. First-class workmanship guaranteed.
THE KIMBER & HILLIER MFG. CO.,
Thorold Road, - St. Catharines, Ont.

PATENTS
Fetherstonhaugh & Co.,
The old established firm. Patents everywhere. Head office, Royal Bank Bldg., Toronto. Ottawa office, 5 Elgin St. Offices throughout Canada. Booklet Free.

HAMILTON ENGINEERING SERVICE
LIMITED
*Consulting and Designing*
Tools, Jigs, Fixtures and Special Machinery. Let us shoulder your problems.
17 MAIN ST. EAST, HAMILTON

Rubber Mill
MACHINERY
BERTRAMS LIMITED
SCIENNES EDINBURGH

MACHINE AND BENCH VISES
Write for Prices
Superior Machinery Co., London, Canada

N.S.M.C.O.
BELTING
138 YORK ST. TORONTO

BLACK DIAMOND OVENS
OVENS
Japanning and Varnishing Ovens heated by Gas, Electricity, Steam or Coal. Kernchen Siphonage Ventilators, Bakers' Ovens, trucks, casters, etc. Write for Booklet.
Brantford Oven & Rack Co. Ltd.
*Brantford, Canada*

# Classified Opportunities

## PATTERNS

TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (ctfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

## MACHINERY WANTED

WANTED — WOODWORKING MACHINERY and mining machinery, machine tools, boilers and steam pumps, alternating or direct current motors. Contractors' equipment. Apply Box 737F, Canadian Machinery.

WANTED—NEW AND RE-MANUFACTURED gas and gasoline engines, boilers, saw-mill machinery, planing mill and sash and door factory machinery. New and manufactured iron and wood-working machinery. Electric motors, dynamos, direct connected steam operated generators, portable electric tools. Builders' hoists, elevators. Box 739F, Canadian Machinery.

### Modern Marine Machinery

Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

### Used Belting, Pulleys, Etc.

We carry right in stock a large quantity of used Belting, Pulleys, Hangers, Shafting, etc., in good condition, which we sell at half the price of new. Inquiries solicited. In writing mention sizes wanted. L. S. Tarshis & Sons, 92 Wellington St., Montreal.

PARTIAL LIST

### Machine Shop Equipment

***At Extremely Low Prices***

LATHES—All sizes and lengths of bed. Special price quoted on rebuilt 20 in. x 8 ft. C.M.C.

AIR COMPRESSOR—8 in. x 8 in. Chicago Pneumatic.

TANKS—10 Tanks 10 ft. 6 in. diam. x 29 ft. 6 in. long. 19,000 gals.
3 Tanks, 10 ft. 0 in. diam. x 39 ft. 0 in. long, ⅜ in. Heads. 22,893 gals.
Full line of other Steel Storage Tanks, open and closed, all sizes.

PUMPS 1 Triplex Power Pump, 1½ in. x 6 in. Hydraulic Machy. Co. Also 1 in. x 5 in. West Tire Setter.
1—Centrifugal Pump, 2½ in. x 1½ in. Gould.
1—Gould Triplex Power Pump, 2 in. x 3 in.

Milling Cutters and Reamers, full assortment, all sizes and shapes, at less than half price. Send us your enquiries.

**Standard Equipment & Tool Works**

Dept. K. 307 St. James St.
Main 2286 MONTREAL
(20)

### ANNOUNCEMENT

The Electric Motor and Machinery Co., Ltd., 64 Wellington Street West, Toronto, Ontario, wish to announce the commencement of their sales agency for the

**Howell Red-Band Motors Ltd.,**
makers of "the Guaranteed Motor."
(c19m)

Sales Engineer wants to sell gasoline or oil engines, portable, stationary and marine or other machinery, to jobbers and dealers in the Province of Quebec or whole of Canada. Sold total output of one factory last year. Expenses and commission basis preferred. Box 768, Canadian Machinery. (c17m)

**The advertiser would like to know where you saw his ad.—tell him.**

### Grey Iron Castings

Light and Medium-Bench and Floor Repetition Castings; Capacity 15 tons per day.
Expert Metal and Wood Pattern Work. Our advice and estimates will save you money.
Semi-finishing operations on Lathe or Grill on Castings supplied if required.
ASK US.
**THE KATIE FOUNDRY, GALT, ONT.**

REGO
## WELDING
*and*
## CUTTING APPARATUS

Oxygen, Acetylene, and a complete line of Welding and Cutting Supplies.

**Carter Welding Co.**
**of Toronto, Limited**
**7-11 Sheppard St., Toronto, Ont.**
**Phones: Adelaide 2841 and 1524**
(TF)

## CLOSING TIME

Advertisements for this section must be in our composing room Tuesday morning prior to day of issue.

In order that the announcements of your wants, machinery for sale, etc., etc., shall not be delayed, please try to have them in our office with the Tuesday morning mail.

**Canadian Machinery**

## AGENTS WANTED

AMERICAN FIRM, SPECIALIZING IN OXYacetylene welding and cutting equipment, is desirous of securing representatives and agents in Canada. Apply Box 763F, Canadian Machinery.

## BUSINESS CHANCES

WANTED—BY AN ESTABLISHED CONCERN. Twelve to fifteen thousand dollars for a period of from one to three years, to take care of business expansion. This concern will stand the fullest investigation. 8% is offered with ample security to principals only, with an opportunity of becoming permanent associates with the partners, if mutually satisfied. Box 767, Canadian Machinery. (ctfm)

## MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (etfm)

### MACHINE WORK WANTED

We are equipped to handle all kinds of general or special machine work. All operations in our plant are done under the most careful supervision and we can satisfy you as to price. Always available for consultation.

**PERFECT MACHINE COMPANY, GALT**
**Builders of Reliable Machinery.**

**Phone Park. 3550 House: Coll. 9660W**
**197 Clinton Street, Toronto**
**A. AUSTIN**
**GENERAL MACHINE WORK**
**Turret Lathe and Automatic Screw Machine a Specialty. Let us quote on your work.**
***With:*** **Garlock, Walker Machinery Co. 163 Dufferin Street.**

?

Have you tried out the Classified Advertising Section yet? If you haven't, send in copy to-day for next week's issue.

**Canadian Machinery**
***Classified Advertising Section***
**143-153 University Avenue**
**TORONTO**

# Classified Opportunities

CANADIAN MACHINERY wants a representative in every town and city where there is a metal working plant or large machine shop.

We require first of all the ability to demonstrate to mechanics the value of reading technical journals in general and CANADIAN MACHINERY in particular, and to secure their subscriptions.

Second—we want men who can tell news when they see it. Not necessarily men who can write, but men who are alert for news, and who will give us the facts, briefly and plainly.

**Canadian Machinery and Manufacturing News**

**143 University Ave. Toronto, Ont.**

---

**I am still offering machines equal to new at fifty cents on the dollar. I do not have the largest stock in Canada but I do quote the lowest PRICES**

| | |
|---|---|
| LATHES | PUNCHES |
| DRILLS | PRESSES |
| SHAPERS | SHEARS |
| MILLERS | ENGINES |
| BOILERS | BORING MILLS |
| GRINDERS | MOTORS |

**YOU can always save money and secure guaranteed equipment and production at prices that will encourage and convince the most cautious buyer if you will only send your enquiries to the man who can convince you and that man is**

**R. S. HOLLY**

**Suite 502, Kent Building, Toronto, Ont.**

***Phone, Adelaide 3147***

---

# Special Machinery Manufacturers

We have frequent requests from manufacturers in the United States for information regarding Canadian firms who are equipped to manufacture their line.

We would like to receive, therefore, the names of any firms who might be interested in inquiries of this kind. We desire the following information:

Name of firm and full address.

Description of shop and equipment.

Particulars regarding regular line, if any.

Class of work interested in securing and best equipped to handle.

Foundry equipment or connection.

This information will be filed and other necessary particulars forwarded to American manufacturers who are likely to be interested.

**CANADIAN MACHINERY**

**143 University Ave. TORONTO**

# Speed PLUS Precision

In the design of Starrett Tools, *convenience* as well as accuracy is kept well in mind.

Mechanics who use fine tools prefer Starrett Tools not only because of their accuracy, but because of their durability and convenience.

This combination of qualities—characteristic of Starrett Tools—adds *speed* to precision in making the fine measurements of modern shop practice.

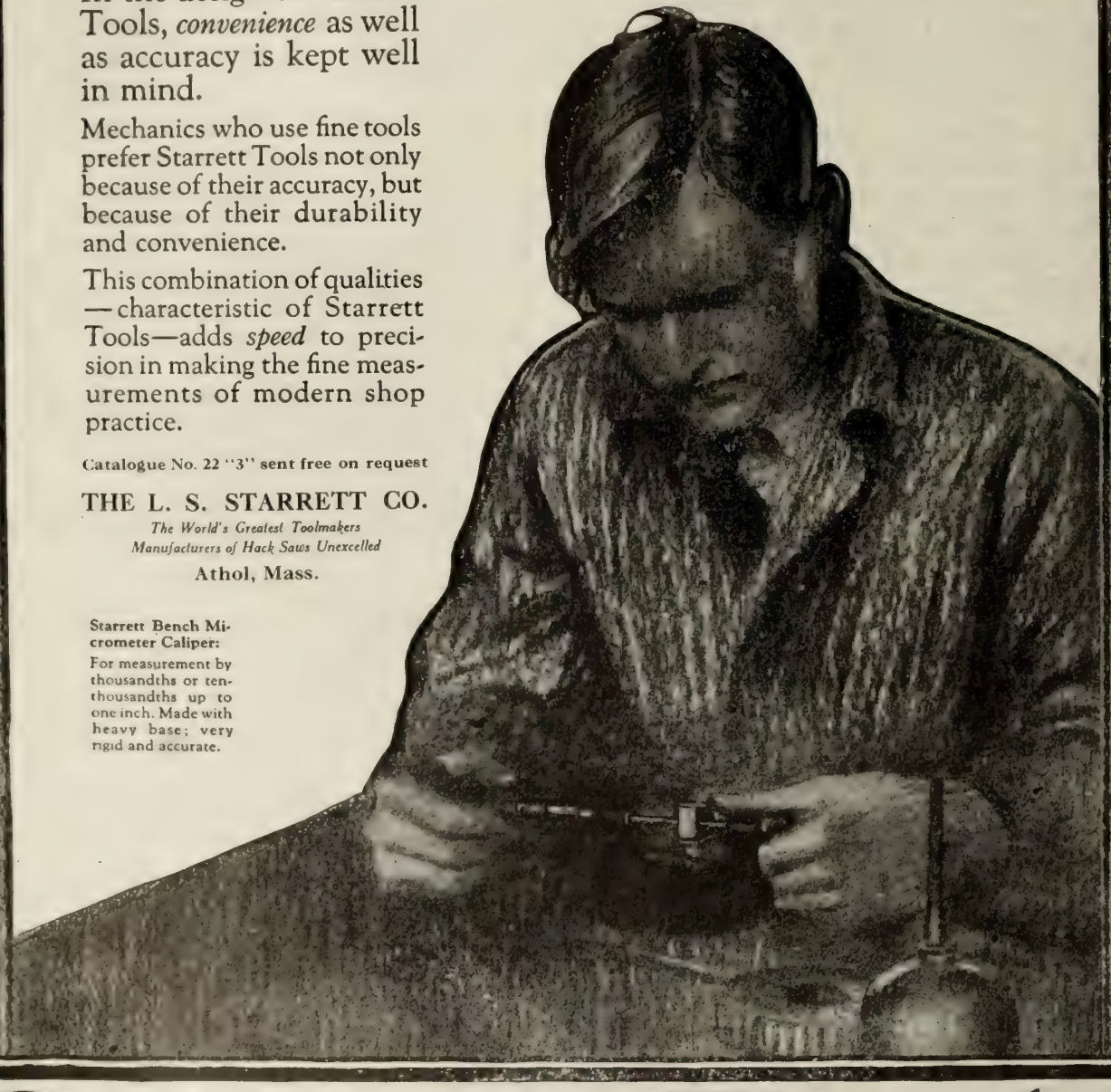
Catalogue No. 22 "3" sent free on request

THE L. S. STARRETT CO.

*The World's Greatest Toolmakers*
*Manufacturers of Hack Saws Unexcelled*

Athol, Mass.

**Starrett Bench Micrometer Caliper:**
For measurement by thousandths or ten-thousandths up to one inch. Made with heavy base; very rigid and accurate.



# Starrett Tools

STARRETT TOOLS

STARRETT HACK SAWS CUT QUICKER LAST LONGER

42-146

# IMCO TOOLS

## SPEED!

Tools capable of exceptional speed are a vital necessity to present day production. They must be capable of giving satisfaction on exacting work—even when that work is extremely urgent and *must* be rushed.

The precision possible with "Imco" Tools on speed work will convince you that they should be used on ALL your work. Try them!

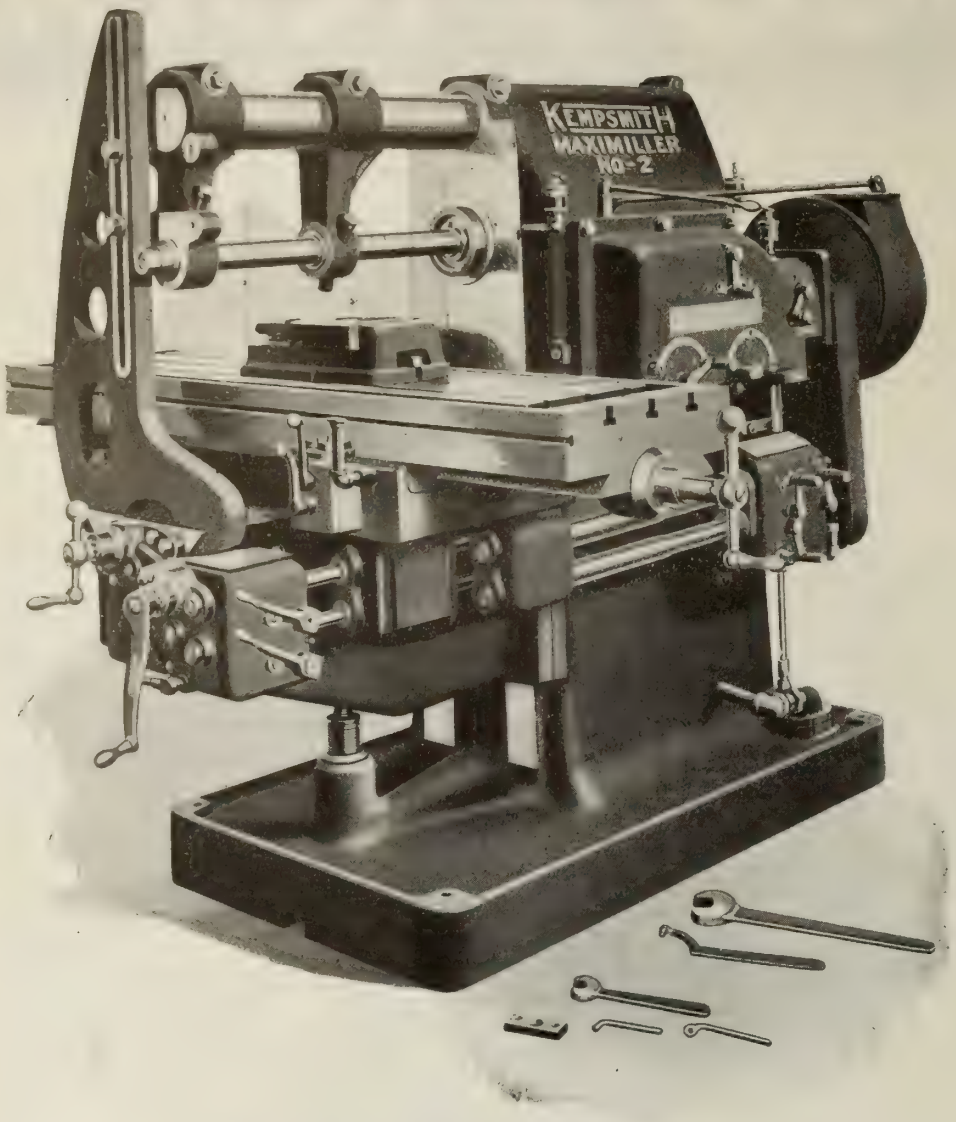
***Catalog of 3 and 4 lip drills, reamers and milling cutters upon request.***

***Eastern Representatives:***
WATT MACHINERY & EQUIPMENT CO., 344 St. James St., Montreal, Que.

**Ingersoll Machine & Tool Co., Ltd.**
Ingersoll, Ontario.
Toronto Office — 80 Bay St. Phone Adelaide 7227.
Chas. A. Strelinger Co. Ltd. Windsor, Ont.


*If interested tear out this page and place with letters to be answered.*

# KEMPSMITH




## No. 2 PLAIN MAXIMILLER

Kempsmith Millers are built in three sizes each in the Plain and Universal Cone Types, two sizes of Maximiller Geared Head Types, a Production Type, with a choice of three table ranges, and two sizes of Vertical Geared Head Type. Our Knee Type Millers can be fitted with a complete line of attachments, which greatly increases the range of the milling machine.

***Literature will be gladly sent upon request.***

## THE KEMPSMITH MANUFACTURING CO.

### MILWAUKEE, WIS., U.S.A.

FOREIGN DEALERS:—American Trading Co., 25 Broad Street, New York, N.Y. (Japan); Barandiaran & Co., 3-Alameda, San Sebastian, Spain; Bevan & Edwards Pty., Ltd., 117 King Street, Melbourne, Australia; Blair, Reed & Company, Nathan's Bldg., Wellington, N.Z.; Bloxham, Edgar, 12 Rue Du Delta, Paris, France; 245 W. 12th St., New York City; L. S. Devos, Grand Central, Palace, New York City; Herbert, Alfred, 54 Dey Street, New York City; Nielsen & Winther, Blegdamsvej 60, Copenhagen, Denmark; 24 Stone Street, New York City; Parke & Lacy Co., 60 Clarence Street, Sydney, N.S.W., Aust.; Selson Engr. Company, 85 Queen Victoria St., London, E.C., England; Corso Vittorio Emmanuele, 11, No. 9, Turin; 5 Piazzo Castella, Milan, Italy; 24 Stone Street, New York City; Pascual Teja, La Capuchinas, No. 65, Mexico, D.F.; Spliethoff, Beeuwkes & Co., Leuvehaven, W.Z., 159, Rotterdam, Holland; Turner, Hoare & Co., Ltd., Lansdowne Road, Post Box No. 195, Bombay, India; Charter & Gardiner, 55 Calle Echague Santa Cruz, P.O. Box 1201, Manila, Philippine Is.; Societe Anonyme Belge Alfred Herbert, Rue De Laeken, 35a & 35b, Brussels, Belgium.

CANADIAN DEALERS:—The Geo. F. Foss Machinery & Supply Co., Limited, 305 St. James St., Montreal, Canada; General Supply Co., 38 Toronto St., Toronto, Canada.



# TESTED BY TIME

This Adjustable Snap is no experiment. Correctly designed to meet the severest tests, it has proven its value through years of service.

Easily set to exact sizes—rigid and dependable—economical to maintain—adaptable to different sizes and changed limits—this gage helps to reduce gaging costs.

Carried in stock for your convenience by all Johansson dealers.

## Johansson Dealers

*Chas. A. Strelinger of Canada, Ltd., Windsor, Ont.* *Aikenhead Hardware Co., Toronto, Ont.*
*Williams & Wilson, Ltd., Montreal, Que.*

## *C. E. Johansson, Inc.*

POUGHKEEPSIE, N.Y.

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# STEEL TANKS

HEAVY & LIGHT
STEEL PLATE CONSTRUCTION ERECTED ANYWHERE

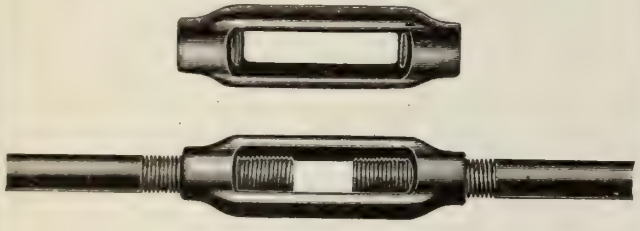
THE
TORONTO IRON WORKS
LIMITED

HEAD OFFICE:
ROYAL BANK BLDG.
TORONTO




CANADA
FOUNDRIES & FORGINGS
LIMITED

## Drop Forged Steel



SOLID—NOT WELDED

16 Sizes with / without } Stubs

Canada Foundries & Forgings
Welland, Ont.



## Desmond-Huntington Dressers

For use on the largest and hardest grinding wheels and where quick action is desired the Desmond-Huntington is the best Dresser made. It is made in the usual Huntington form, but larger and heavier. It is filling a long-felt want to those who do not find the ordinary size Huntington Cutter efficient or durable, but who prefer a cutter of that type.

We also manufacture the ordinary Huntington Dresser and Cutter. All of our cutters are made from high-grade steel and are carefully hardened and tempered to secure that grade of hardness and toughness that will give the very best results.

The Canadian Desmond-Stephan Mfg. Co., Limited
Hamilton - Ontario

Are *YOU* Represented ?

*The next issue is our used Equipment Number*
*It will be especially interesting to all.*
*Send in your classified advertisements now.*

CANADIAN MACHINERY, *143 University Ave.*
*TORONTO, CANADA*

SHEPARD
ELECTRIC CRANES & HOISTS



## A "Shepard" aids systematic assembly

Not only in the automotive industry, but in any industry systematic assembly is essential to maximum production.

Shepard Electric Hoists, cage and floor controlled types, are playing an important part in keeping the product "on the move" in many industries.

Let Shepard Engineers work with you in planning an economical and efficient system of inter-department transportation. Their services are extended without obligation on your part.

The Shepard line includes Electric Hoists of ½ to 30 tons capacity; Electric Traveling Cranes 1 to 50 tons; and cargo handling equipment for docks and ships.

SHEPARD
Electric Crane & Hoist Co.
426 Schuyler Ave., Montour Falls, N.Y.
*Canadian Representative:*
RUDEL-BELNAP, Montreal
Agents in Principal Cities
*Member Electric Hoist Manufacturers' Assn.*

# TOOL GRINDING CHART

Showing clearance and rake angles for cutting tools. 17 x 27½ inches, printed in two colors on heavy manilla stock.

A splendid thing for any tool room. One large engineering firm, in acknowledging this chart, stated that they would like two additional copies as they intended adopting it as standard in their tool room.

We would like these charts placed in every shop in the Dominion and if there is not one in YOUR tool room, write for your copy at once. IT'S FREE.

CANADIAN MACHINERY,
153 University Avenue, Toronto.

Please send me / us free, one of your tool grinding charts.

Signed .....

Firm Name .....

St. Address .....

City .....

Prov. .....

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## *A Dependable Screw Wrench*

The "W. & B." Machinists' Knife Handle Wrench possesses all the strength, toughness and rigidity that can be drop-forged into a Wrench, is easily adjusted to any size nut within its range, and does not jam under strain.

With head and bar drop-forged in one piece, extra heavy jaw oil-hardened and solid screw turned from wrought steel, it is a heavy duty wrench which (like all other Williams' Superior Wrenches) can be absolutely depended upon.

**7 sizes, 6 to 21 inches, carried in stock. Two other patterns also.**

**Ask for Screw Wrench Book.**

**J. H. WILLIAMS & CO.**
LIMITED
*"The Wrench People"*
Formerly Canadian Division of
The Whitman & Barnes Mfg. Co.
**45 Thorold Road St. Catharines Ont.**

## MORROW TALKS

Our responsibility for every Morrow Twist Drill does not end until that drill has proven itself in your service.

Before it leaves the factory, every Morrow Drill has been submitted to the most rigid test known to our drill experts—indeed, the most rigid test known to any drill maker.

Why?

Because the founder's dictum that "it pays to make the best" actuates the Company throughout its career.

Your satisfaction is positively guaranteed with every drill. Order by the name "Morrow."

Try your jobber first.

**The John MORROW Screw & Nut Co. Limited**
**Ingersoll, Canada**

**Montreal: 489 St. Paul Street West**

SKINNER CHUCKS

TRADE MARK




# A Book of Information For Chuck Users

A book that shows the various types of chucks and their uses should be helpful to the machinery buyer and machinery salesman.

A book containing this information, together with suggestions as to the care of chucks, best methods of setting up and best way to handle certain operations, should be useful to the mechanic.

We have just published such a book

## "CHUCKS AND THEIR USES"

It contains information based on more than thirty years' experience in building chucks.

We shall be glad to send to any interested person a copy of "Chucks and Their Uses." We will also send to superintendents or factory managers a supply of these booklets for distribution among the mechanics who may be able to make use of them.

There is no obligation—no charge. Our compensation is the knowledge that we are assisting users to better understand the proper use of chucks.

*Send for your copy now. No charge*

THE SKINNER CHUCK COMPANY

NEW BRITAIN CONN U S A

ESTABLISHED 1887





# The Basis of File Efficiency

The basis of file efficiency is keen cutting.

When a file ceases to cut keenly, discard it and buy a new one. Otherwise you are wasting labor-time, which costs more than files.

The following brands have teeth designed to cut keenly and they are hardened so as to hold their keen cutting qualities.

They are the standard of file quality.

KEARNEY & FOOT
GREAT WESTERN
AMERICAN
ARCADE
GLOBE

## *FILES AND RASPS*

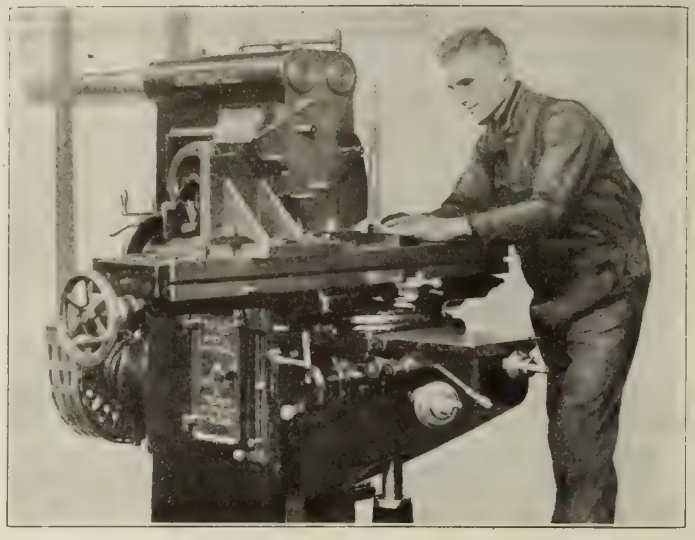
Made in Canada by

# Nicholson File Company

PORT HOPE - ONTARIO


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# MILWAUKEE MILLING MACHINES



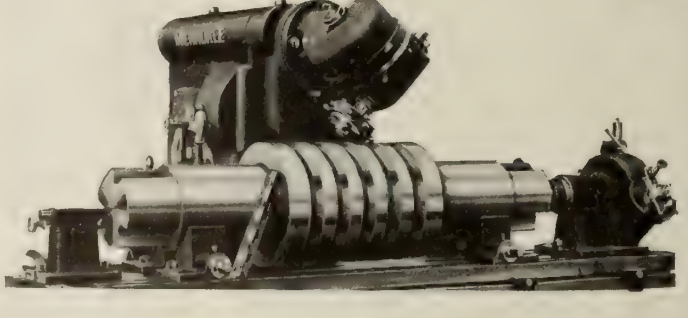
## Efficient on Light and Heavy Milling

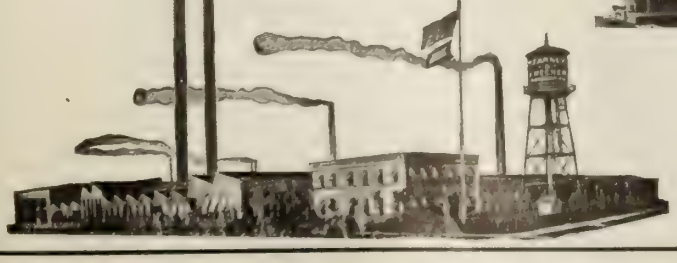
Heavy milling jobs are not unknown to Milwaukee Universal Milling Machines, while delicate and intricate ones are efficiently performed with little effort.

Both light and heavy milling operations are handled with such smoothness and accuracy that the finest results are obtained. Because Milwaukee Universal Milling Machines perform such a wide variety of work, they are particularly well adapted for the tool-room.

The jobs shown in the two illustrations are representative of "Milwaukee" adaptability. The upper illustration shows a jig being bored with a fly cutter. The lower illustrates the milling of a chilled roll with the use of a Universal Milling Attachment.

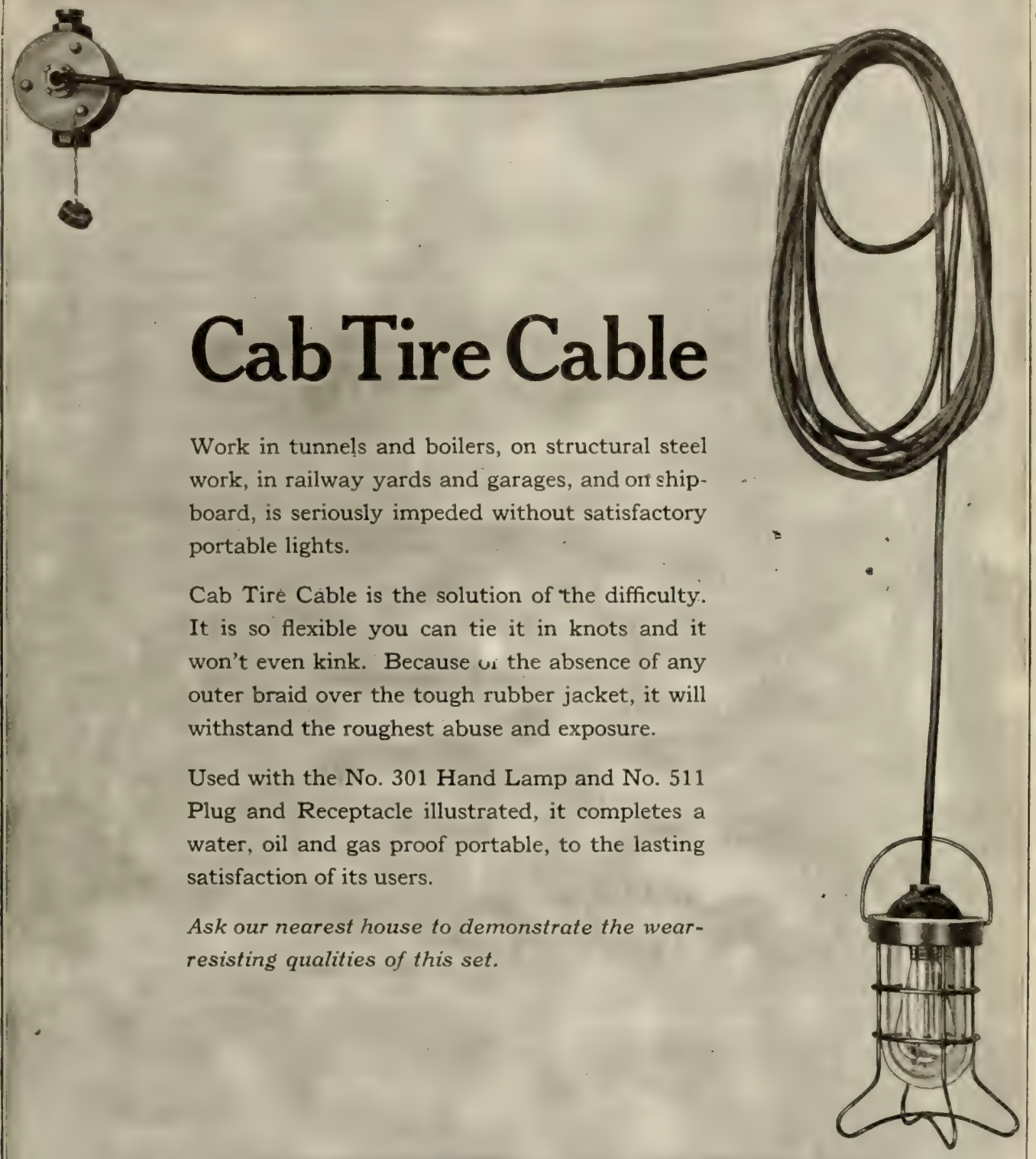
**Write for Catalogue—NOW.**





KEARNEY & TRECKER
CORPORATION
MILWAUKEE, WIS., U.S.A.

Canadian Representatives: Williams and Wilson, Ltd., Montreal; F. F. Barber Machy. Co., Toronto; A. R. Williams Machy. Co., Vancouver and Winnipeg



# Cab Tire Cable

Work in tunnels and boilers, on structural steel work, in railway yards and garages, and on shipboard, is seriously impeded without satisfactory portable lights.

Cab Tire Cable is the solution of the difficulty. It is so flexible you can tie it in knots and it won't even kink. Because of the absence of any outer braid over the tough rubber jacket, it will withstand the roughest abuse and exposure.

Used with the No. 301 Hand Lamp and No. 511 Plug and Receptacle illustrated, it completes a water, oil and gas proof portable, to the lasting satisfaction of its users.

*Ask our nearest house to demonstrate the wear-resisting qualities of this set.*

## Northern Electric Company
LIMITED

Montreal Quebec Toronto Windsor Regina Edmonton
Halifax Ottawa Hamilton London Winnipeg Calgary Vancouver

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# HANNA

## IRON ORE - PIG IRON

*Sales Agents:*

Cleveland Cincinnati Pittsburgh Toronto Buffalo Detroit




*Manufacturers:*

## The Sheffield Twist Drill & Steel Co., Ltd.

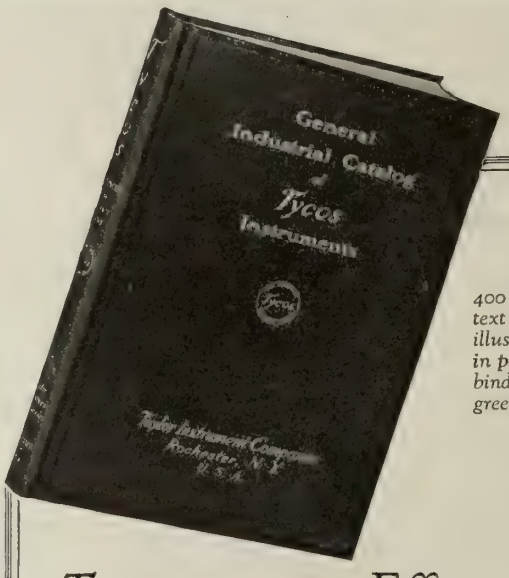
**Works: Summerfield Street, Sheffield.**

To **PROMOTE TRADE** within the **EMPIRE, CANADIAN MANUFACTURERS** will find that **"DORMER BRAND DRILLS"** meet all requirements. **QUALITY DRILLS** for quick drilling—USE **"DORMER."**

**Sheffield Engineering Supplies Limited,**
**230 Craig Street West,**
**Montreal, Canada**

## *High Speed Twist Drills*

DORMER BRAND




*400 pages of text and illustrations in permanent binding of green vellum*

## Temperature Efficiency

*Indicating, Recording, Controlling*

A book that should have a place in every industrial library. Authoritative. 1,000 illustrations. Compiled by engineers. Serves also as catalogue for *Tycos* Temperature instruments.

Sent postpaid, without obligation, when requested by executives or engineers who designate their official positions.

*Taylor Instrument Companies*

**110-112 Church St., Toronto, Ont., Can.**

*There's a Tycos or Taylor Temperature Instrument for every purpose*

# HOYT

## BABBITTS—METALS—SOLDERS

HOYT METAL COMPANY

MONTREAL TORONTO WINNIPEG



Morse
Twist Drill
& Machine Co.
New Bedford,
Mass., U. S. A.

# "MORSE" RATCHET DRILLS ARE TOUGH TOOLS

Especially designed for drilling the web of rails or in STRUCTURAL MATERIAL—They are furnished in

**Carbon & High-Speed Steel**

# GENUINE EMERY

**Sizes 180, 160, 140, 120, 110, 100, 90, 80, 70, 60, 54, 46, 40, 36, 30, 24, 20, 18, 16, 14, 12, 10, 9, 8, hole.**

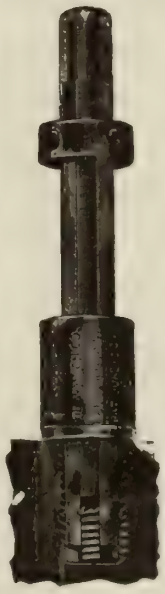
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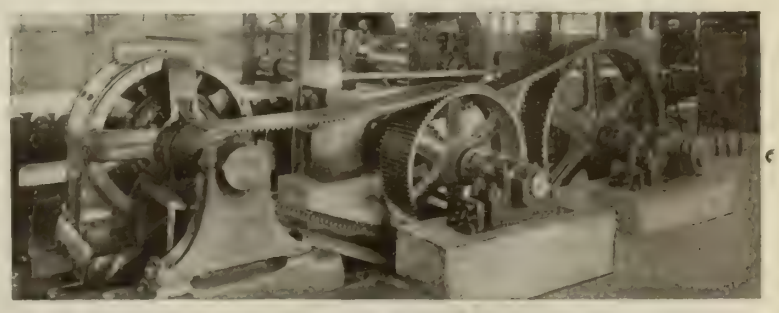
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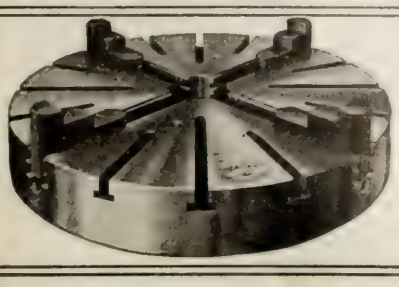
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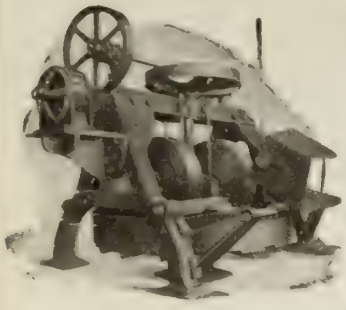
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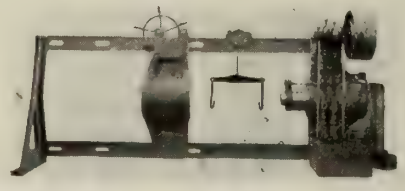
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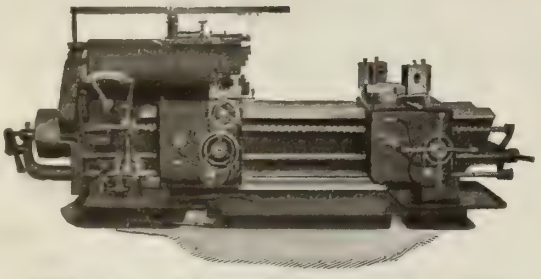
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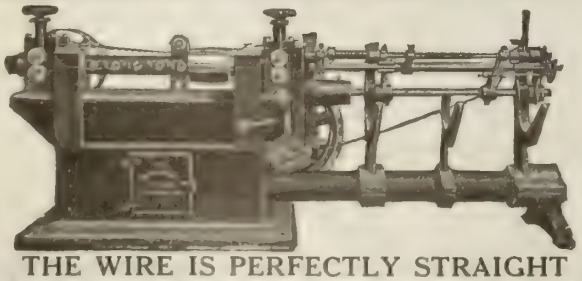
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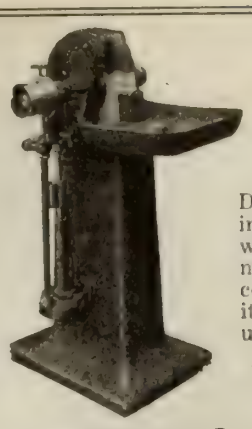
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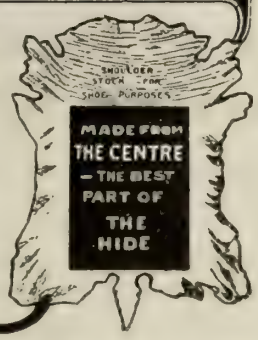
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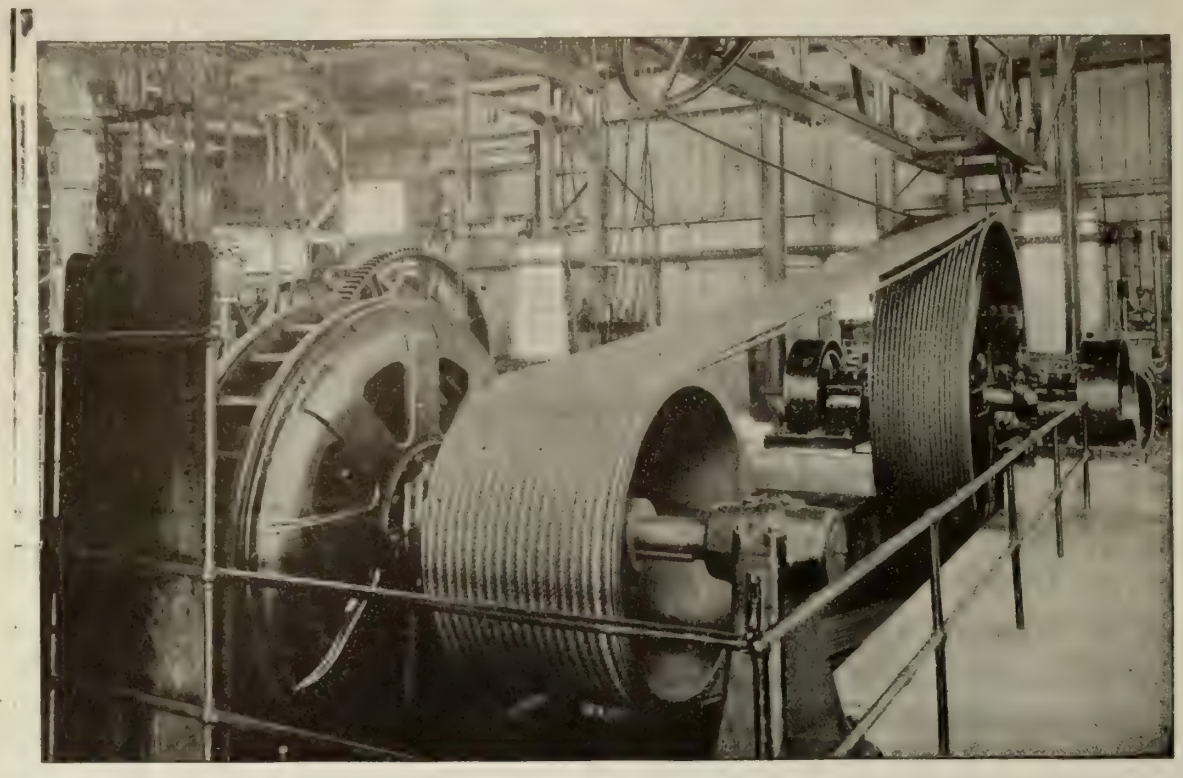
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Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Die**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Blocks, Pillow**
Can. Link-Belt Co., Toronto, Ont.

**Blowers**
Can. Blower & Forge Co., Ltd., Kitchener.
General Combustion Co. of Can., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Sturtevant Co., B. F., Boston, Mass.

**Bolt and Nut Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Bolt and Nut Machinery, Automatic**
National Acme Co., Cleveland, Ohio.

**Bolts and Nuts**
London Bolt & Hinge Works, London, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Petrie, Ltd., H. W., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Bolt Threading Die Heads**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa

**Boosters**
Sturtevant Co., B. F., Boston, Mass.

**Boring and Turning Mills, Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.

**Boring, Drilling and Milling Machines, Horizontal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa.

**Boring, Drilling and Milling Mach., Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Boring Heads**
Aikenhead Hardware Ltd., Toronto, Ont.

**Boring Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Gisholt Machine Co., Madison, Wis.

**Brakes, Magnetic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Brass**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bricks, Fire**
Elk Firebrick Co. of Can., Ltd., Hamilton, Ont.

**Bridges**
Hamilton Bridge Works Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

**Broaching Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Bronze**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bronze, Phosphor**
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bucket Carriers, Pivoted**
Can. Link-Belt Co., Toronto, Ont.

**Buffing or Polishing Machines (See Polishing and Buffing Machines)**
Blount Co., J. G., Everett, Mass.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.

**Bulldozers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Burners, Oil and Gas**
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

**Bushings**
Fisher Motor Co., Ltd., Orillia, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Cabinets, Oil**
S. F. Bowser & Co., Ltd., Toronto, Ont.

**Calipers**
Brown & Sharpe Mfg. Co., Providence, R.I.
Starrett Co., L. S., Athol, Mass.

**Cams**
Canada Foundries & Forgings Co., Welland, Ont.

**Can-Making Machinery (See Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

# BUYERS' DIRECTORY

Union Carbide Co. of Can., Ltd., Welland, Ont.

**Cars, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Castings, Aluminum**
Canada Electric Castings Co., Ltd., Orillia
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Brass and Bronze**
Algoma Steel Corp., Ltd., Sault Ste Marie, Ont.
Canada Electric Castings Co., Ltd., Orillia
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont
Electric Steel & Engineering Co., Welland, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Copper**
Can. Hanson & Van Winkle Co., Toronto, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Marine**
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Castings, Die Molded**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Ferro-Alloy**
Can. Steel Foundries, Montreal, Que.

**Castings, Iron**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia
Hanna & Co., M. A., Cleveland, Ohio
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Hyd. Press**
Can. Steel Foundries, Montreal, Que

**Castings, Monel Metal**
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

**Castings, Naval Bronze**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Nichrome**
Can. Driver-Harris Co., Walkerville, Ont

**Castings, Nickel**
Can. Hanson & Van Winkle Co., Toronto, Ont.

**Castings, Semi-Steel**
Davidson Mfg. Co., Thos., Montreal, Que
Hull Iron & Steel Foundries, Hull, Que
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

**Castings, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

**Cements, Iron**
Smooth Mfg. Co., Jersey City, N.J.

**Centering Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Chains (See Sprockets and Chains)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chains, Driving**
Can. Link-Belt Co., Toronto, Ont
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chasers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chemists**
Toronto Testing Laboratory, Toronto, Ont.

**Chucking Machines**
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Chucks, Drill**
Jacobs Mfg. Co., Hartford, Conn.

**Chucks, Drill and Tap**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Lathe**
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Magnetic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**
Columbia Hdwe. Division, Cleveland, O
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

**Cleaners, Metal, Waste, General**
Oakley Chemical Co., New York, N.Y.

**Clocks, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Clutches, Friction**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**
Can. Link-Belt Co., Toronto, Ont.

**Collars, Shaft or Set**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

**Collets**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compressors, Air**
Curtis Pneumatic Machinery Co., St Louis, Mo

**Compressors, Air and Gas**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**
Ford-Smith Machine Co., Hamilton, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Conveyor Belt Joiners**
Flexible Steel Lacing Co., Cnicago, Ill.

**Copper**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Cored Bronze Bars**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Cotter Pins**
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Counterbores**
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Countershafts**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Couplers, Car and Locomotive**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Couplings, Flexible**
Holden Co., Ltd., Montreal, Que.

**Couplings, Rigid**
Bernard Industrial Co., A., Fortierville, Que.

**Couplings, Shaft**
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

**Cranes, Electric**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.

**Cranes, Hand (See Hoists, Hand)**
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Sheffield Engineering Supplies, Ltd., Montreal, Que.

**Cranes, Locomotive**
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Cranes, Traveling**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Crank Pin Turning Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia, Pa.

**Cutters, Fine**
Holden Co., Ltd., Montreal, Que.

**Cutters, Gear**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Milling**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Machine Co., Cleveland.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.

**Cutters, Stay Bolt**
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Thread**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.

**Cutting-Off Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Cutting-Off Machines, Pipe (See Pipe Cutting and Threading Machines)**
Landis Machine Co., Inc., Waynesboro, Pa.
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Cutting-Off Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Pilot Steel & Tool Co., Montreal, Que.

**Cutting Oil Filters (See Oil Filtering Systems)**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Cataract Refining Co., Toronto, Ont.

**Cutting, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

**Cutting, Oxy-Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Dealers, Machinery (See Searchlight Section)**
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Deckle Straps**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Diamonds, Black and Rough**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond, Carbon and Bortz**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Desmond-Stephan Co., Hamilton, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Wheel Trueing Tool Co., Detroit, Mich.

**Diamond Crossings**
Can. Steel Foundries, Montreal, Que.

**Die-Castings**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Dies, Pipe-Threading**
Jones & Lamson Machine Co., Springfield, Vt.

**Die Sinking Machines, Automatic**
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

**Die Sinkers**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Screw and Thread Cutting**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

# BUYERS' DIRECTORY

**Dies, Forging**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

**Dies, Hammer**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Self-Opening, Adjustable**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Dies, Threading-Opening**
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont
Rapid Tool & Machine Co., Lachine, Que.

**Disc Cement**
Ritchey Supply Co., Toronto, Ont
Wausau Abrasives Co., Chicago, Ill.

**Dividing Heads**
Ackworthle, Ltd., John, Birmingham, Eng.
Diekow, Fred. C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Dogs, Lathe and Milling Machine**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drafting Boards and Tables**
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Drafting Materials**
American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Dressers, Grinding Wheel**
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Drill Holders**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drill Rods**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Drill Speeders**
Canada Machinery Corp., Galt, Ont.

**Drilling Machine Heads**
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

**Drilling Machines, Automatic**
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

**Drilling Machines, Bench**
Beacon Engineering Co., Tipton, England.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Electric and Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Gang**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drilling Machines, Heavy Duty**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Multiple Spindle**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

**Drilling Machines, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que
Independent Pneumatic Tool Chicago, Ill

**Drilling Machines, Portable**
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago Ill
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Radial**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Henry & Wright Mfg. Co., Hartford, Conn
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Drilling Machines, Sensitive**
Beacon Engineering Co., Tipton, England
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn
Herbert Ltd., Alfred, Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis

**Drilling Machines, Turret**
Gisholt Machine Co., Madison Wis.
Steinle Turret Machine Co., Madison Wis
Williams Machinery Co., A. R., Toronto, Ont.

**Drilling Machines, Vertical**
Aurora Tool Works, Aurora, Ind
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng
Sandinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Drills, Center**
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drills, High Speed Twist**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Drills, Twist and Flat**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.

**Dust Handling Equipment**
Can. Blower & Forge Co., Ltd., Kitchener
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass

**Electrical Instruments**
Bristol Co., Waterbury, Conn
Northern Electric Co., Montreal, Que

**Electrical Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que
U.S. Electrical Tool Co., Cincinnati, O

**Elevating Trucks (See Trucks)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Elevators and Conveyors**
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que
Main Belting Co. of Can., Montreal, Que
Mathews Gravity Carrier Co., Port Hope, Ont.

**Emery Wheels (See Grinding Wheels)**
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis I.
Can. Hart Products, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont
Ford-Smith Machine Co., Hamilton, Ont
Norton Co. of Can., Ltd., Hamilton, Ont
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Engines, Capstan**
Kennedy & Sons, Wm., Owen Sound, Ont

**Engineers, Mechanical**
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.

**Expanders, Tube**
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Eyeglasses, Safety (See Goggles, Safety)**
Prest-O-Lite Co. of Can., Toronto, Ont.
Willson Goggles, Inc., Reading, Pa.

**Fans, Electric**
Can. Blower & Forge Co., Ltd., Kitchener
Can. Fairbanks-Morse Co., Ltd., Montreal.
Northern Electric Co., Montreal, Que
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Exhaust**
Can. Blower & Forge Co., Ltd., Kitchener
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Ventilating**
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**File Handles**
Ingersoll File Co., Ltd., Ingersoll, Ont.

**Files and Rasps**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Canada Saw Co., Montreal, Que

**Filing Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Filler, Iron (See Cements, Iron)**
Smooth Mfg. Co., Jersey City, N.J.

**Fire Extinguishers**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Fittings, Pipe**
International Malleable Iron Co., Guelph, Ont.

**Flexible Shafts**
Aikenhead Hardware Ltd., Toronto, Ont.

**Flux, Galvanizing**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Fluxes, Welding**
L'Air Liquide Society, Toronto, Ont.

**Forging Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.

**Forgings, Drop**
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd., Toronto, Ont.

**Forgings, Hammer**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Foundry Equipment**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Foundry Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Frogs, Spring or Rigid**
Can. Steel Foundries, Montreal, Que.

**Fuel Oil Burning System**
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Heat Treating Coal**
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Oil and Gas**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bellevue Industrial Furnace Co., Detroit.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces and Ovens, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd Hiram, Walkerville, Ont.

**Furnaces, Tempering and Annealing**
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furniture, Machine Shop**
Garlock-Walker Mchy. Co., Toronto, Ont.

**Gages, Comparator**
Jones & Lamson Machine Co., Springfield, Vt.
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont.
Perdue, W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass.

**Gages, Measuring (See Tool Work)**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Q.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont
Starrett Co., L. S., Athol, Mass.

**Gages, Recording**
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont

# BUYERS' DIRECTORY

**Gages, Snap, Thread and Cylindrical**
Ackworthie, Ltd., John, Birmingham, Eng.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Standard**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis, Johansson Inc., C. E., Windsor, Ont.

**Gages, Thread**
Ackworthie, Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Garnet, Emery and Flint Paper and Cloth**
Ritchey Supply Co., Toronto, Ont.

**Gas, Coal Compressed**
L'Air Liquide Society, Toronto, Ont.

**Gas, Compressed**
Prest-O-Lite Co. of Can., Toronto, Ont.

**Gaskets**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

**Gear Blanks**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear-Cutting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

**Gear Testing Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.

**Gears, Cast**
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

**Gears, Cut**
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hamilton Gear & Machine Co., Toronto, Ontario.
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Gears, Dressed**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Gears, Forged**
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Gears, Herringbone**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

**Gears, Machine Moulded**
Can. Steel Foundries, Montreal, Que.

**Gears, Rawhide (See Gears, Cut)**
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear, Silent Chain**
Gardner & Son, Robt., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Can. Link-Belt Co., Ltd., Toronto, Can.
Hans Renold of Canada, Ltd., Montreal, Quebec.

**Gears, Worm**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.

**Generators, Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Generators, Electric**
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Goggles, Safety**
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

**Grab Buckets**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Grease Cups, Pressed Steel and Brass**
Can. Winkley Co., Ltd., Windsor, Ont.

**Greases, Lubricating**
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

**Grinding Discs**
Ritchey Supply Co., Toronto, Ont.

**Grinding Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**Grinding Machines, Abrasive Belt**
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Automatic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Bench**
Aikenhead Hardware Ltd., Toronto, Ont.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Grinding Machines, Center**
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines Chaser**
Jones & Lamson Machine Co., Springfield, Vt.

**Grinding Machines, Cutter and Reamer**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Cylindrical**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Die**
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

**Grinding Machines, Disc**
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Drill**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Face**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Floor and Tool**
Beacon Engineering Co., Tipton, England.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Grinding Machines, Internal**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Portable**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Power Oscillating Tool**
Herbert Ltd., Alfred, Toronto, Ont.

**Grinding Machines, Ring Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Snagging**
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Surface**
Garlock-Walker Mchy. Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machinery, Tool Post**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Universal**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.

**Grinding Wheels**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Guards, Emery Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Guards, Machinery and Window**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Guards, Electric Lamp**
Flexible Steel Lacing Co., Chicago, Ill.

**Gun-Barrel Machinery**
Steinle Turret Machine Co., Madison, Wis.

**Hack Saws, Power**
Ackworthie, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Hamilton, Canada.
Garlock-Walker Mchy. Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hammers, Chipping**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hammers, Drop**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

**Hammers, Electric**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Hammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Hammers, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hammers, Riveting**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hangers, Shafting**
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Terry & Co., John C., Birmingham, Eng.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hardening, Case-Hardening and Tempering**
Hamilton Gear & Machine Co., Toronto, Ont.

**Hardness Testing Apparatus**
Shore Instrument Co., Jamaica, N.Y.

**Heating**
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.

**Hobbing Machines**
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hobs**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Hoists, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

**Hoists, Hand**
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Hoists, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Holders-On, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Hose, Flexible Steel**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Hose, Industrial**
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Hose, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Foamite Firefoam Co., Hamilton, Ont.

**Hydraulic Leather**
Graton & Knight Mfg. Co., Worcester, Mass.

**Hydraulic Machinery**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.

**Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Index Centers**
Dickow, Fred. C., Machinery Co., Chicago, Ill.

**Igniters, Gas Engine**
Canada Foundries & Forgings Co., Welland, Ont.

**Indicators, Speed and Test**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.

**Insulation**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Jacks, Hydraulic**
Norton, A. O., Boston, Mass.

**Jacks, Planer**
Armstrong Bros. Tool Co., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que.
Crescent Machine Co., Ltd., Montreal, Q.

# BUYERS' DIRECTORY

**Jigs and Fixtures (See Tool Work)**
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Keyseating Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Keys, Machine**
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

**Knives, Machine**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Simonds Canada Saw Co., Montreal, Que.

**Knurl Holders**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lacing Leather**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

**Lamps, Electric**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**Lathe Attachments**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.

**Lathe Pans, Portable**
Canada Machinery Corp., Galt, Ont.

**Lathe Tools**
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

**Lathes, Automatic and Semi-Automatic**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Bench**
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lathes, Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
McDougall Co., Ltd., R., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Engine**
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Sidney Machine Tool Co., Sidney, Ohio.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Extension and Gap**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Lathes, Heavy Duty Projectile Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blaihill Wire Machy. Co., Ltd., Montreal.
Sidney Machine Tool Co., Sidney, Ohio
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Polishing (See Polishing and Buffing Machines)**
Ford-Smith Machine Co., Hamilton, Ont.

**Lathes, Relieving**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Lathe, Universal Hand**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Lathes, Screw-Cutting**
Jones & Lamson Machine Co., Springfield, Vt.

**Lathe, Speed and Hand**
Blount Co., J. G., Everett, Mass.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Lathes, Spinning**
Terry & Co., John C., Birmingham, Eng.

**Lathes, Threading**
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

**Lathes, Vertical Turret**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

**Lathes, Wood Turning**
Blount Co., J. G., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Lead Pipe**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Lighting Fixtures**
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont

**Linoleum Mill Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Liquid Air Plants**
L'Air Liquide Society, Toronto, Ont.

**Lockers, Clothes**
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

**Lubricants**
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Lubricating Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Machinists' Small Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Mandrels, Expanding**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Mandrels, Solid**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Measuring Machines**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Metals, Alloy**
British Smelting & Refining Co., Ltd. Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Tallman Brass & Metal, Ltd., Hamilton, Ontario.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Metalite Cloth**
Ritchey Supply Co., Toronto, Ont.

**Micrometer Calipers**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Milling Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Milling Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**Milling Machines, Automatic**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Bench**
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Hand**
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

**Milling Machines, Horizontal and Planer Type**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal Q
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Milling Machines, Plain**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Milling Machines, Universal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Mchy. Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Milling Machines, Vertical**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

**Monel Metal**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Motors, Electric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Moulded Rubber Goods**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Nail Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Nails and Staples**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Nickel, Bars, Sheets, Wire, Etc.**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Nickel Plating Outfits**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Nickel Silver**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Nitrogen**
L'Air Liquide Society, Toronto, Ont.

**Nut Tappers (See Bolt and Nut Machinery)**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

**Nuts, Finished and Semi-finished**
Galt Machine Screw Co., Galt, Ont.

**Nuts, Machine Screw**
Torrington Company, Ltd., Upper Bedford, Que.

**Nuts, S.A.E., Plain and Castellated**
Galt Machine Screw Co., Galt, Ont.

**Oil Filtering and Storage Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oil Storage Engineers**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oils**
Canadian Oil Companies, Ltd., Toronto, Ont.
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Hole Covers**
Can. Winkley Co., Ltd., Windsor, Ont.

**Oils, Soluble**
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oxygen**
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont
L'Air Liquide Society, Toronto, Ont.

**Oxy-Acetylene Apparatus**
L'Air Liquide Society, Toronto, Ont.

**Packing, Hydraulic**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

**Packing, Steam**
Can. Consolidated Rubber Co., Ltd., Montreal Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

**Paper Mill Conveyors**
Bertrams Ltd., Edinburgh, Scotland.

**Patents**
Fetherstonhaugh & Co., Ottawa, Ont.
Marion & Marion, Montreal, Que.

**Pans, Wet and Dry**
Frost Mfg. Co., Chicago, Ill

**Pattern-Shop Machinery (See Woodworking Machinery)**
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Patterns, Wood and Metal**
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Wraggis Pattern Works, Galt, Ont.

**Penstocks, Steel**
MacKinnon Steel Co., Sherbrooke, Que

# BUYERS' DIRECTORY

**Phosphor Tin**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Photographic Duplicating Machines**
Commercial Camera Co., Providence, R.I.

**Pig Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Bending Machines**
American Pipe Bending Machine Co., Boston, Mass.
Can. Fairbanks-Morse Co., Ltd., Montreal
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

**Pipe Couplings**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Cutting and Threading Machines**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**
Landis Machine Co., Inc., Waynesboro, Pa.

**Pipe Fitters' Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa.

**Piston-Ring Machine**
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Planers, Parallels**
L. & P. Mfg. Co., Niagara Falls, Ont.

**Planing Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Planing Machines, Rotary**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Pneumatic Tools**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Blount Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Pots, Steel**
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Pressed Steel Parts**
Ackworthie, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich.
Can. Fairbanks-Morse Co., Ltd., Montreal.
L. & P. Manufacturing Company, Ltd., Niagara Falls, Ont.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Presses, Drop and Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Toledo Machine & Tool Co., Toledo, Ohio

**Presses, Foot and Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

**Presses, Forcing**
Atlas Press Co., Kalamazoo, Mich.
Stewart & Co., Duncan, Glasgow, Scot.

**Presses, Hydraulic**
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Perrin Ltd., W. B., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

**Presses, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Protractors**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Propellers**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Pulleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal and Fibre**
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Pulp and Paper Mill Equipment**
MacKinnon Steel Co., Sherbrooke, Que.

**Pumps, Automobile Tire**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Pumps, Barrel and Boiler-feed**
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coolant**
Trahern Pump Co., Rockford, Ill.

**Pumps, Geared and Hand**
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

**Pumps, Lubricant and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Jardine & Co., A. B., Hespeler, Ont.

**Punches, Power**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

**Punching Machines, Horizontal**
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Racks, Cut**
Ford Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**
Holden Co., Ltd., Montreal, Que.

**Reamer Holders**
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

**Reamers, Expanding**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Reamers, Solid**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Reamers, Taper**
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Recorders, Temperature**
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Recorders, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Rheostats**
Northern Electric Co., Montreal, Que.

**Resistance Materials**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Respirators**
Willson Goggles, Inc., Reading, Pa.

**Rivets**
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

**Rivet Heaters**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.

**Riveting Machines**
Bilton Machine Co., Bridgeport, Conn.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**
Stewart & Co., Duncan, Glasgow, Scot.

**Rolls (Rubber Covered)**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rudder Frames, Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Rubber Goods, Mechanical**
Quaker City Rubber Co., Philadelphia, Pa.

**Rules, Steel**
Chesterman & Co., Ltd., J., Sheffield, Eng.

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Rust Preventatives**
Oakley Chemical Co., New York, N.Y.

**Sand Equipment**
Can. Link-Belt Co., Toronto, Ont.

**Sand Mills**
Frost Mfg. Co. Chicago, Ill.

**Sanding Machinery**
Oliver Machy. Co., Grand Rapids, Mich.

**Sand Rammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Saw Frames and Blades, Hack**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Sawing Machines, Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Sawing Machines, Power Hack**
Ackworthie, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Saw Sharpening Machines**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saw Tables, Universal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Hot and Cold**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Saws, High Speed Steel**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Metal Band**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saws, Metal, Power**
Clemson Bros., Inc., Hamilton, Ont.

**Saws, Metal Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

**Saws, Milling**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Saws, Screw Slotting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Swing Cut-off**
Oliver Machinery Co., Grand Rapids, Mich.

**Scales**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal, Q.

**Screens**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Screw Drivers, Optical, Jewelry and Novelty**
Torrington Co., Ltd., Upper Bedford, Que.

**Screw Driving Machine**
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Screw Extractors**
Cleveland Twist Drill Co., Cleveland, O.

**Screw Machine Work**
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
Tallman Brass & Metal Co., Hamilton, Ont.

# BUYERS' DIRECTORY

**Screw Machinery, Wood and Lag**
Cook Co., Asa S., Hartford, Conn.

**Screw Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Screw Machines, Automatic**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

**Screw Machines, Plain or Hand**
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio.

**Screw Machine Products**
Torrington Company, Ltd., Upper Bedford, Que.

**Screw Plates**
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

**Screws, Cap and Set**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Lock Cap**
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Machine**
Barnes Co., Wallace, Bristol, Conn.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Safety Set**
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Screws, Side Knob**
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Thumb**
Torrington Company, Ltd., Upper Bedford, Que.

**Second-Hand Machinery**
**(See Searchlight Section)**
Petrie, Ltd., H. W., Toronto, Ont.

**Separators, Moisture and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Separators, Oil and Waste**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Shafting**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Shapes, Cold-Drawn Special Steel**
Union Drawn Steel Co., Hamilton, Ont.

**Shaping Machines**
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Walcott Lathe Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Shapers, Wood**
Oliver Machinery Co., Grand Rapids, Mich.

**Shears, Hand**
Can. Blower & Forge Co., Ltd., Kitchener.

**Shears, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y.
[illegible] & Co., Duncan, Glasgow, Scot.
Toledo Machine & Tool Co., Toledo, Ohio
Williams Machinery Co., A. R., Toronto, Ont.

**Shearing Machines, Angle, Iron Bar and Gate**
Bertrams Ltd., Edinburgh, Scotland

**Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng
Toledo Machine & Tool Co., Toledo, Ohio

**Sheets, Nickel, Resist, Alloy**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Sheets, Nickel, Monel and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Side Frames, Locomotive**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Slotting Attachments**
Ford-Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

**Slotting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

**Solders**
British Smelting & Refining Co., Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Canada.

**Snap Flasks**
Oliver Machy. Co., Grand Rapids, Mich

**Special Machinery and Tools**
Brown Engineering Corp., Ltd., Toronto.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Specialties, Swaged and Headed Work**
Torrington Company, Ltd., Upper Bedford, Que.

**Spectacles, Industrial**
Willson Goggles, Inc., Reading, Pa.

**Springs**
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

**Spring-making Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Sprockets and Chains**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Squares**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Stamping, Metal**
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Stamps, Steel**
Diamond Saw & Stamping Works, Buffalo, N.Y.

**Stairways, Wrought Iron**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Steam Specialties**
Crane Ltd., Montreal, Que.

**Steel Plate**
Dom. Foundries & Steel, Hamilton, Ont

**Steels, Tool**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel Blooms and Billets**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steel, Cold-Rolled Strip**
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Steel Castings**
Dom. Foundries & Steel, Hamilton, Ont.

**Steel Forgings**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Steel, Shafting and Free Cutting Screw**
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont

**Steel, Sheet**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont
Toronto Iron Works, Toronto, Ont.

**Steel, Tanks**
Can. John Wood Mfg. Co., Toronto, Ont

**Steel, Stainless**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel Wire Rods**
Steel Co. of Canada, Ltd., Hamilton, Ont

**Steels, Alloy, Open Hearth and Electric**
United Alloy Steel Corp., Canton, Ohio.

**Steels, Alloy and Carbon**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steels, High-Speed**
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel, Magnet**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel, Structural**
MacKinnon Steel Co., Sherbrooke, Que.

**Steel Tubing, Close Joint and Welded**
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

**Stern Frames, Cast Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Straightening Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Studs**
Galt Machine Screw Co., Galt, Ont.

**Surface Plates**
Bilton Machine Co., Bridgeport, Conn.

**Swaging Machines**
Atkins & Co., Inc., E. C., Indianapolis, I

**Switches, Railway**
Can. Steel Foundries, Montreal, Que.

**Switches and Switchboards**
Northern Electric Co., Montreal, Que.

**Tablets, Bronze, Memorial**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Tachometers**
Aikenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

**Tanks, Steel**
MacKinnon Steel Co., Sherbrooke, Que.

**Tanks and Pumps, Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

**Taper Cutting Dies**
Jones & Lamson Machine Co., Springfield, Vt.

**Tap Holders**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taper Pins**
Galt Machine Screw Co., Galt, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Tapes, Measuring**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass.

**Tapping Machines and Attachments**
Ackworthie, Ltd., John, Birmingham, Eng
Archibald & Co., Chas. P., Montreal, Q.
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Taps and Dies**
Ackworthie, Ltd., John, Birmingham, Eng
Butterfield & Co., Inc., Rock Island, Que
Can. Fairbanks-Morse Co., Ltd., Montreal
Geometric Tool Co., New Haven, Conn
Greenfield Tap & Die Corp., Galt, Ont.
International Machinery & Supply Co., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taps, Collapsing**
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Teeth, Dredge Bucket**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Testing Metals and Materials**
Toronto Testing Laboratory, Toronto, Ont.

**Thermometers**
Bristol Co., Waterbury, Conn.

**Thread-Cutting Tools**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Thread Cutting Machines**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa.

**Threaded Wires**
Torrington Company, Ltd., Upper Bedford, Que.

**Threading Machines**
Acme Machinery Co., Cleveland, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Thread Lead Testing Machines**
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Thread-Rolling Machines**
Bliss Co., E. W., Brooklyn, N.Y.

**Tongs**
Hepburn Ltd., John T., Toronto, Ont.

**Tool Cases**
Rice Lewis & Son, Ltd., Toronto, Ont.

**Tool Holders**
Armstrong Bros. Tool Co., Chicago, Ill.
Bilton Machine Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Markers, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Tool Posts, Lathe**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Steels for all Purposes**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Tools, Small (See Machinists' Small Tools)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Bertrams Ltd., Edinburgh, Scotland.
Burgess & Marchand, Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
Chesterman & Co., Ltd., J., Sheffield, Eng.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield T[illegible] & Die Corp., Galt, Ont.
Hamilton [illegible]neering Service, Ltd., Hamilton, [illegible]t.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.
National Machine Tool Co., Racine, Wis.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Tool Work**
Brown Engineering Corp., Ltd., Toronto
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont

# BUYERS' DIRECTORY

**Torches, Blow**
National Electro Products, Ltd., Toronto Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Trackwork, Railway**
Can. Steel Foundries, Montreal, Que.

**Trackwork, Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Transformers**
Northern Electric Co., Montreal, Que.

**Transmission Machinery**
Bernard Industrial Co., A., Fortierville Que.
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Jones & Glassco, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Toronto, Ont.
Renold (Hans) of Canada, Ltd., Montreal Que.

**Transportation Systems (See Trucks)**
Mathews Gravity Carrier Co., Port Hope, Ont.

**Treated Bits**
Can. Atlas Crucible Steel Co., Toronto Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Trolleys and Tramways**
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Trucks**
Can. Fairbanks-Morse Ltd., Montreal Q
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Maple Leaf Mfg. Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Trucks, Industrial Motor**
Maple Leaf Mfg. Co., Montreal, Que.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Tube, Products**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Electric Welded or Oxy-Acetylene Welded**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Flexible**
Dunlop Tire & Rubber Goods Co., Ltd Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Tubing, Seamless Steel**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Seamless Steel, Brass and Copper and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Steel Products Co., Brantford, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Tubing, Welded**
International Nickel Co. of Can., Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Tubing, Welded Steel**
Tube Co. of Canada, Toronto, Ont.

**Turbines, Water**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Turret Heads**
Ackworthie, Ltd., John, Birmingham, Eng
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Turret Machines (See Lathes, Horizontal Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Cook Co., Asa S., Hartford, Conn
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis
Warner & Swasey Co., Cleveland, Ohio.

**Turrets, Tool Post**
Gisholt Machine Co., Madison, Wis.

**Unions, Pipe**
Crane Ltd., Montreal, Que

**Universal Joints**
Ford-Smith Machine Co., Hamilton, Ont
Holden Co., Ltd., Montreal, Que.

**Valves**
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Crane Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co of Can., Ltd., Toronto, Ont.

**Vises, Drilling Machine**
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.

**Vises, Metal Workers'**
Aikenhead Hardware, Ltd., Toronto, Ont.
Columbia Hdwe. Division, Cleveland, O.

**Vises, Milling Machine**
Brown & Sharpe Mfg. Co., Providence, R.I.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Victor Tool Co., Waynesboro, Pa.
Parmenter & Bulloch Co., Gananoque, Ont.

**Voltmeters**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Wagon Loaders**
Can. Link-Belt Co., Toronto, Ont.

**Washers**
Barnes Co., Wallace, Bristol, Conn.
Diamond State Fibre Co., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

**Vises, Pipe**
Columbia Hdwe. Division, Cleveland, O.
Greenfield Tap & Die Corp., Galt, Ont.

**Vises, Planer and Shaper**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Superior Machine Co., London, Ont.

**Vises, Wood Workers'**
Columbia Hdwe. Division, Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Oliver Machy. Co., Grand Rapids, Mich.

**Washers, Rubber**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Welding Apparatus, Oxy-Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Welding, Electric**
All-Weld Company, Toronto, Ont.
Carter Welding Co., Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.

**Welding Filler Rods**
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

**Welding Machines, Oxy-Acetylene**
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

**Welding, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Prest-O-Lite Co. of Can., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

**Welding Rod, Tobin, Manganese Bronze and Aluminum**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Welding Supplies**
British Smelting & Refining Co., Ltd., Montreal, Que.
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Canada, Ltd., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

**Wheels, Cast, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Wheels, Industrial**
American Pulley Co., Philadelphia, Pa.
Hull Iron & Steel Foundries, Hull, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.

**Winches, Electric**
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

**Winches, Headgate**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Winches, Stoplog**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Wire**
Barnes Co., Wallace, Bristol, Conn.
Canada Metal Co., Ltd., Toronto, Ont.
Dennis Wire & Iron Works, London, Ont
Greening Wire Co., B., Hamilton, Ont.
Northern Electric Co., Montreal, Que.

**Wire Cloth**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Wire Coiling Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Wire Rope**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Wire Straightening and Cutting Machinery**
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Schuster Co., F. B., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

**Wire, Welding**
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Wires, Special**
Dennis Wire & Iron Works, London, Ont.
Greening Wire Co., B., Hamilton, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Woodworking Machinery**
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Wrenches, Drop Forged**
Armstrong Bros. Tool Co., Chicago, Ill.
Canada Foundries & Forgings Co., Welland, Ont.

**Wrenches, Machinists'**
Armstrong Bros. Tool Co., Chicago, Ill.
Canada Foundries & Forgings Co., Welland, Ont.

**Wrenches, Pipe**
Canada Foundries & Forgings Co., Welland, Ont.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.

**Wrenches, Tap**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont

**Wrought Iron Pipe**
Steel Co. of Canada, Ltd., Hamilton, Ont.

## DIRECTORY OF DEALERS

THE Buyers' Directory of CANADIAN MACHINERY was originally intended to contain information regarding lines actually manufactured by our advertisers. We now carry the advertising of leading machinery dealers, some of whom represent scores of manufacturers in addition to being manufacturers themselves in some cases. This necessarily widened the scope of our Directory, but it would be impracticable to list all the lines handled by all the dealers. We recommend, therefore, if our subscribers cannot find what they want in our Directory that they communicate with the dealers whose names appear herewith.

### MACHINE TOOLS AND METAL WORKING EQUIPMENT

Chas. P. Archibald & Co., Montreal, Que.
The Canadian Fairbanks-Morse Co., Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
H. W. Petrie Limited, Toronto, Ont.
The Standard Equipment & Tool Co., Montreal, Que.
Chas. A. Strelinger Co. of Canada, Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Wilson-McGovern Limited, Toronto Ont.
Yeates Machinery Co., London, Ont.

### MACHINE SHOP AND FACTORY SUPPLIES

Chas. P. Archibald & Co., Montreal Que.
The Canadian Fairbanks-Morse Co., Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
H. W. Petrie Limited, Toronto, Ont.
The Standard Equipment & Tool Co., Montreal, Que.
Chas. A. Strelinger Co. of Canada, Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Wilson-McGovern Limited, Toronto Ont.
Yeates Machinery Co., London, Ont.

### POWER EQUIPMENT AND SUPPLIES

The Canadian Fairbanks-Morse Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
H. W. Petrie Limited, Toronto, Ont.
The Standard Equipment & Tool Co Montreal, Que.
Wilson-McGovern Limited, Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.

### WOODWORKING MACHINERY

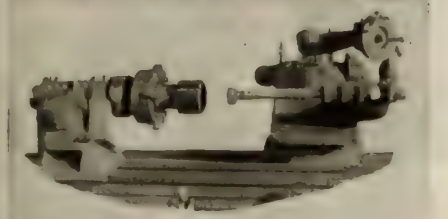
Chas. P. Archibald & Co., Montreal, Que.
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The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
H. W. Petrie Limited, Toronto, Ont.
Chas. A. Strelinger Co. of Canada Limited, Windsor, Ont.
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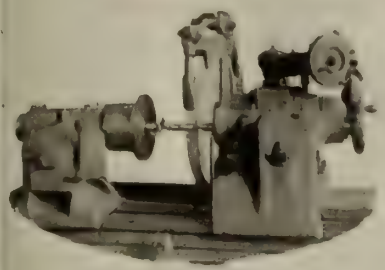

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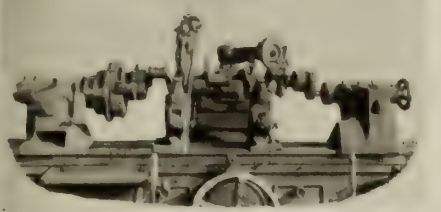
143 UNIVERSITY AVE., TORONTO, CANADA

CANADA—Montreal, Southam Bldg., 128 Bleury St., Phone Main 1004. Winnipeg, 1103 Union Trust Bldg., Phone Main 3449. Vancouver, 314 Carter-Cotton Bldg., 198 Hastings St. West. St. John, N.B., John S. Scott, General Delivery.
GREAT BRITAIN—London, The MacLean Publishing Company of Great Britain, Limited, 88 Fleet St., E. C., E. J. Dodd, Director, Telephone Central 12960. Cable Address: Atabek, London, Eng.
UNITED STATES—New York, J. J. Gillen, 1606 St. James Bldg., 1133 Broadway, Phone Watkins 5869. Boston, C. L. Morton, Room 734, Old South Bldg., Phone Main 1024. Chicago, A. H. Byrne, 405-6 Transportation Bldg., 608 S. Dearborn St., Phone Wabash 9430. Cleveland, W. L. Gifford, 1261 East 99th Street.

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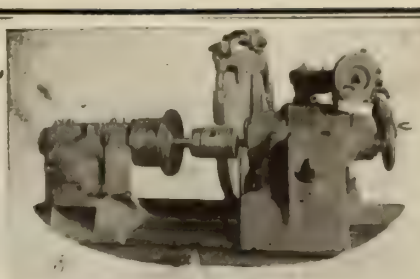


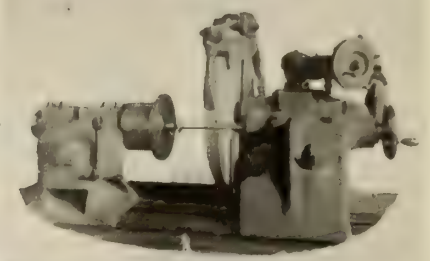


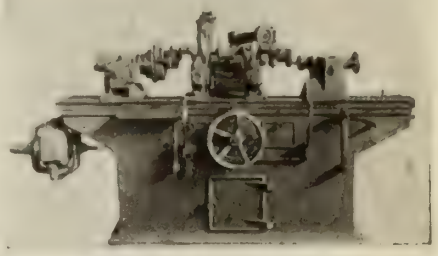
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This Landis Grinding Machine can perform all the grinding operations necessary to repair any gasoline motor as good as new.

It is designed especially for the small shop not having a large volume of similar parts. On such work it **will** show profits. We know it can be done even if you have only a small amount of repair work. Write us to-day.







LANDIS TOOL COMPANY

Waynesboro, Pa. New York Office: 51 Chambers Street


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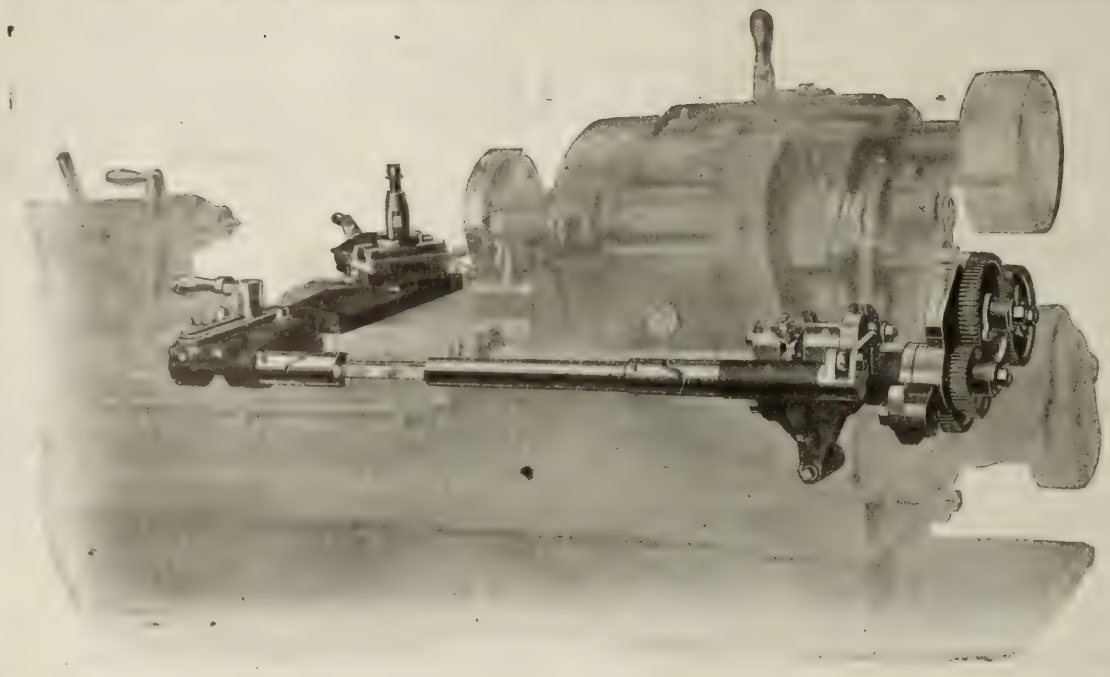
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# HENDEY



## This Spiral Relieving Attachment Produces Better Tools

In addition to all ordinary forms of relieving with straight flutes, you can, with this attachment, relieve taps and hobs with spiral flutes.

The advantage of spiral over straight flutes in tools of this character is obvious. It gives the tool a cutting edge which is square with the body of the tooth and properly balanced. As a result, the tool cuts better and faster.

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# NUTS

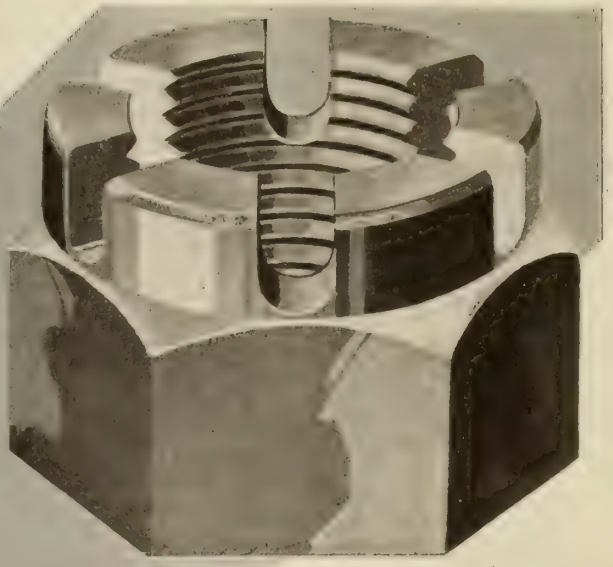
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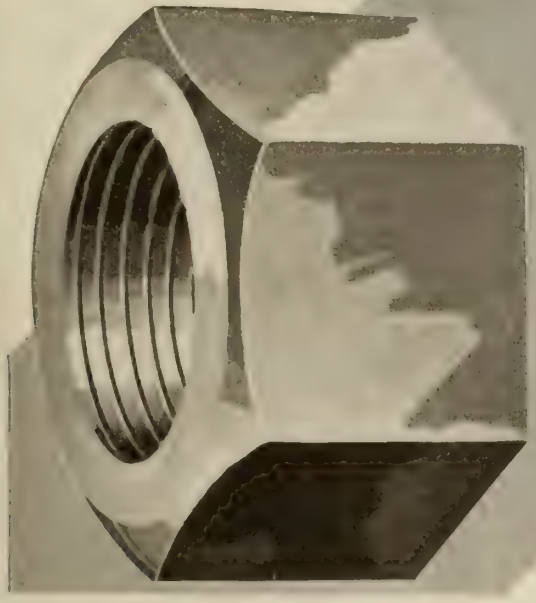
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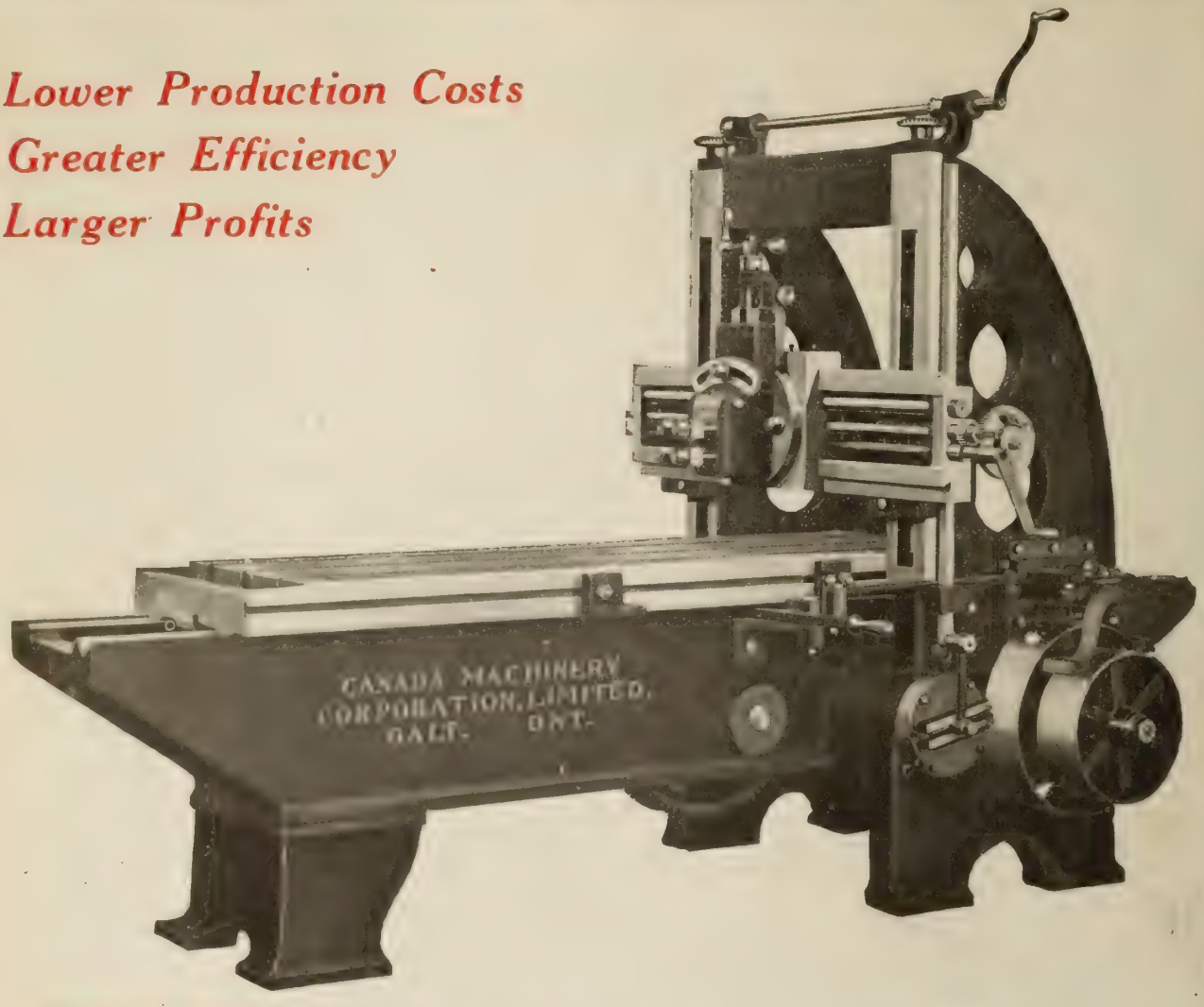
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Do you require a Planer? We are in a position to supply your needs immediately from stock.

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# CANADIAN MACHINERY AND MANUFACTURING NEWS

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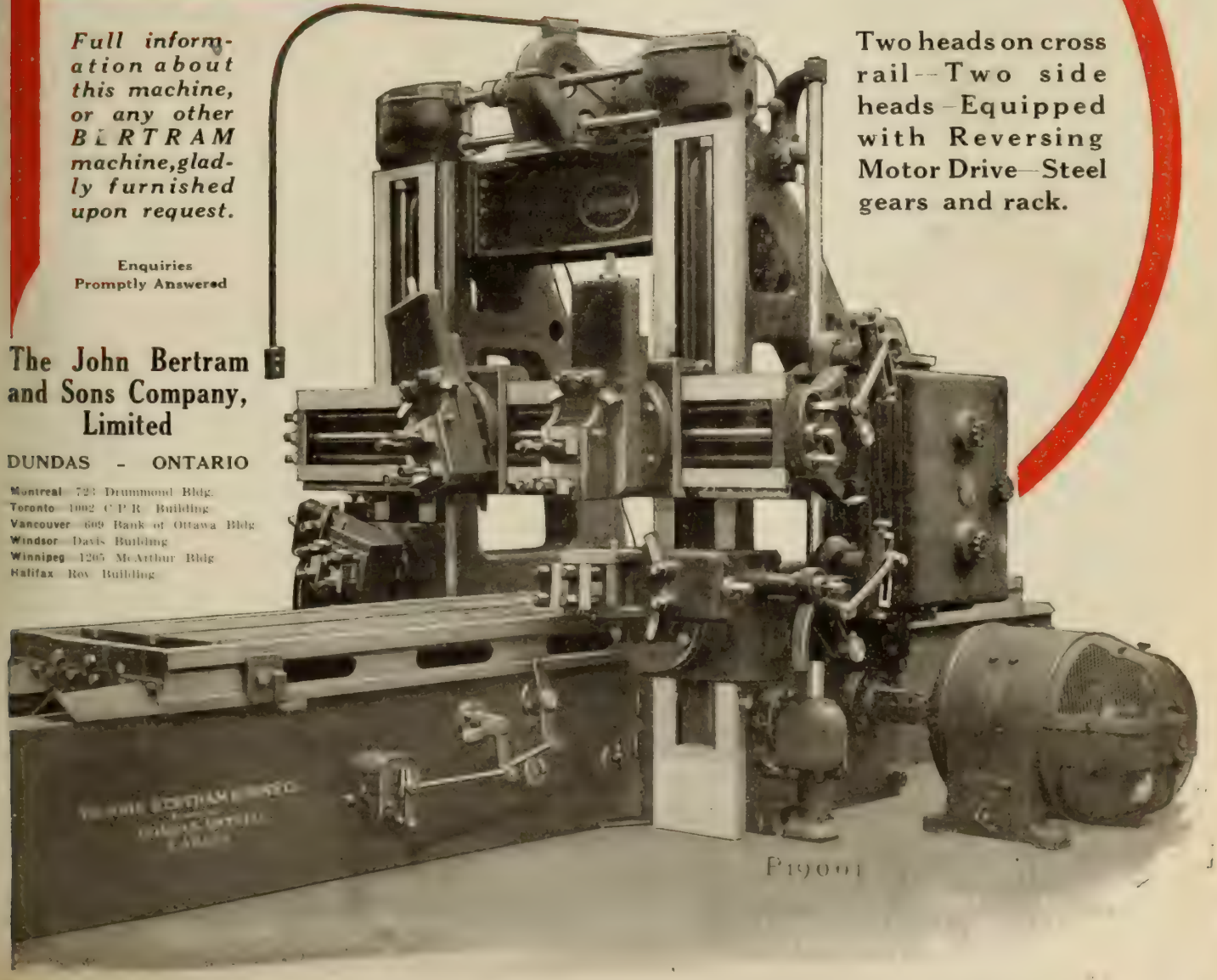

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*Full information about this machine, or any other BERTRAM machine, gladly furnished upon request.*

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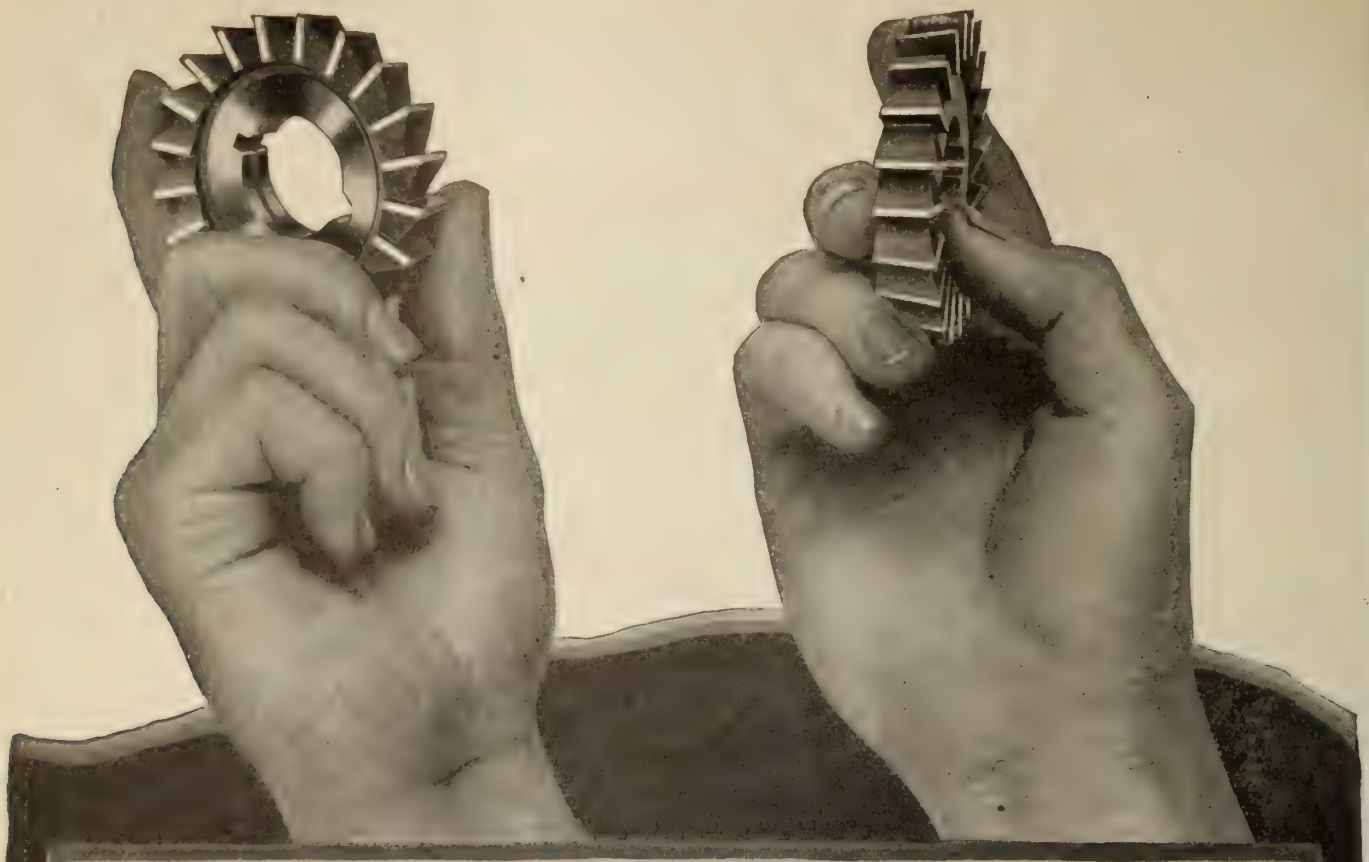
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VANCOUVER
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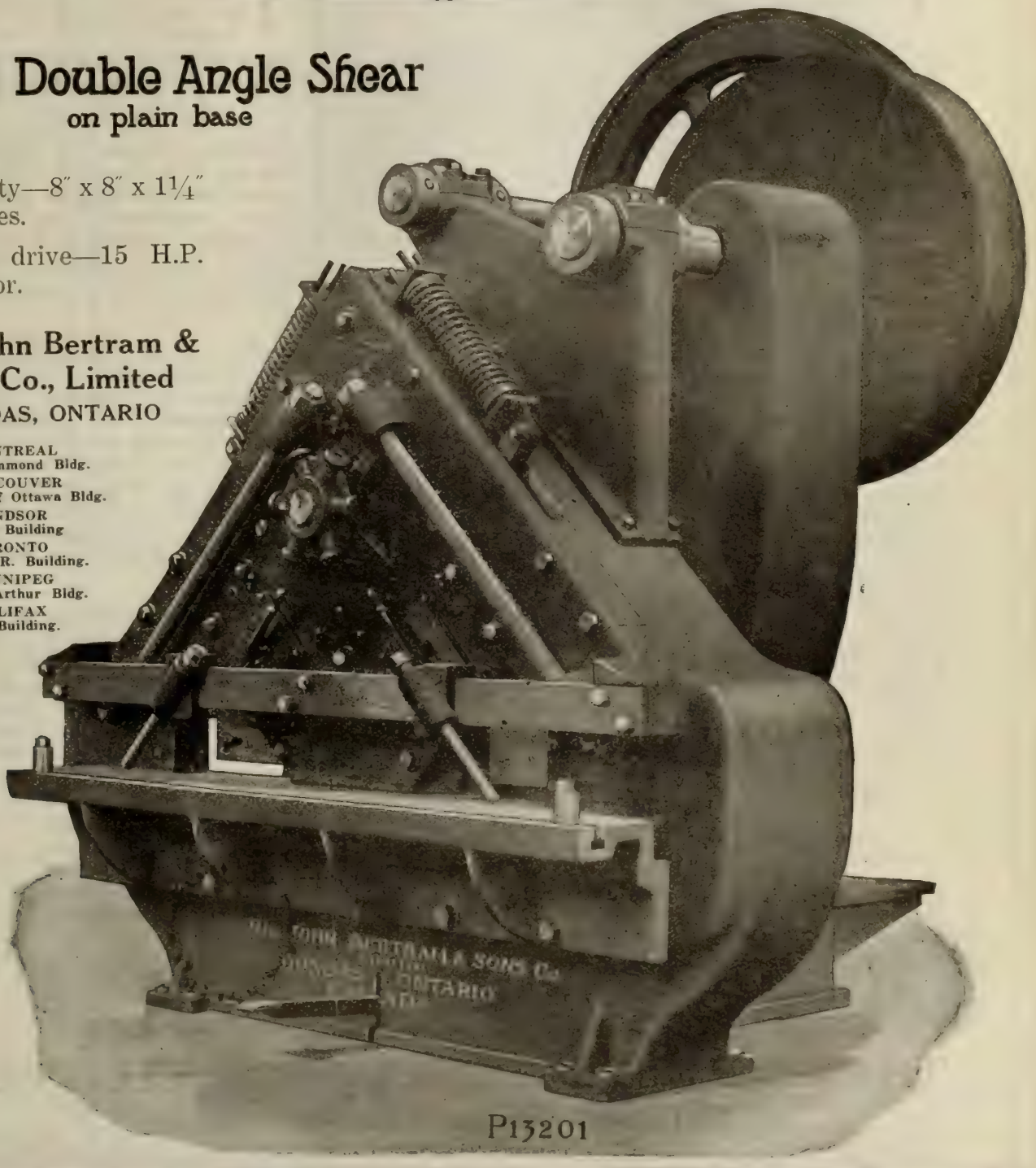
# The BERTRAM Page

## MACHINE TOOLS

## No. 8 Double Angle Shear
on plain base

Capacity—8″ x 8″ x 1¼″ angles.

Motor drive—15 H.P. Motor.




P13201

**The John Bertram & Sons Co., Limited**
DUNDAS, ONTARIO

MONTREAL
723 Drummond Bldg.
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WINNIPEG
1205 McArthur Bldg.
HALIFAX
Roy Building.

*If interested tear out this page and place with letters to be answered.*

# QUALITY and QUANTITY CIRCULATION

### *The Facts are in Demand*

THE careful buyer of advertising space demands to know the exact quality and quantity of circulation of the medium he has under consideration. Mere claims won't do any more. Cold facts must be produced—facts beyond the shadow of doubt.

Advertisers who place their messages through the columns of the MacLean Technical Papers find they get both quality and quantity circulation.

Both of these facts are actually proven by the Audit Bureau of Circulations. This A.B.C. statement counts only bona-fide, paid-for circulation. It refuses to include copies printed and distributed as specimen copies or as "bulk" subscriptions, and it tells you definitely just what kind of people read these papers.

The MacLean Technical Papers are well established. permanent powers to which anyone may turn with confidence.

**Canadian Machinery**
(Weekly)

**Power House**
(Semi-Monthly)

**Canadian Foundryman**
(Monthly)

**Marine Engineering**
(Monthly)

### *Pledges of Truth Required*

THROUGHOUT Canada you will find the great majority of sober, thinking Business Men, Engineers and Mechanics, conscientious readers of one or more of the MacLean Technical Papers. In building up this clientele of responsible readers the MacLean membership to the **Canadian National Newspapers and Periodicals Association** exerts an important influence.

Enrolment in this association demands the following pledges—"To consider first the interests of the Subscriber." "To work for truth and honesty in all departments, and among other things to supply advertisers with full information regarding character and extent of circulation."

Rigid adherence to the principles set forth above have resulted in the MACLEAN papers becoming the greatest disseminators of technical information and trade news in the British Empire.

THE monthly, semi-monthly and weekly publishing of the four papers listed above is a task that demands the utmost from a thoroughly capable organization. Technical men with years of practical experience present articles and editorials of a "better business" nature. Advertising men of proven ability plan campaigns and assist in the preparation of copy. Typesetters, press operators, proof readers, artists and even the messengers work with the all impelling incentive of better accomplishment.

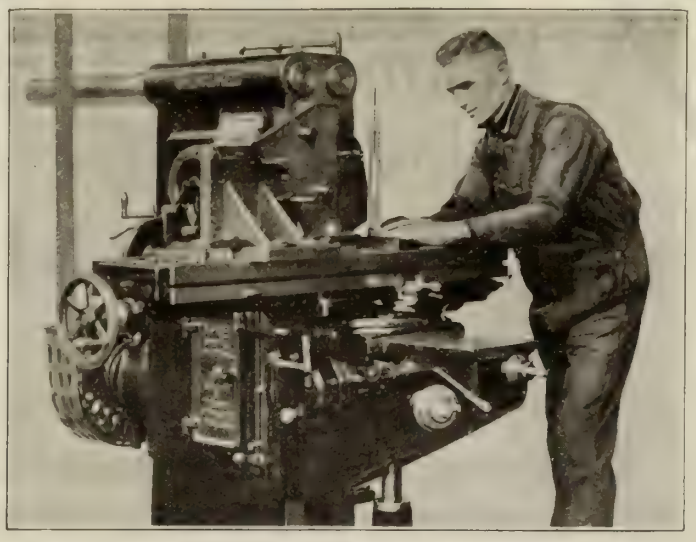
To this spirit of splendid co-operation is credited the growth from a small beginning to what is now the largest publishing business of its kind in the British Empire.

## THE MACLEAN PUBLISHING CO., LIMITED

**143-153 University Avenue, TORONTO, CANADA**

MONTREAL, WINNIPEG, VANCOUVER, NEW YORK, BOSTON, CHICAGO, CLEVELAND, LONDON, ENG.

# MILWAUKEE MILLING MACHINES



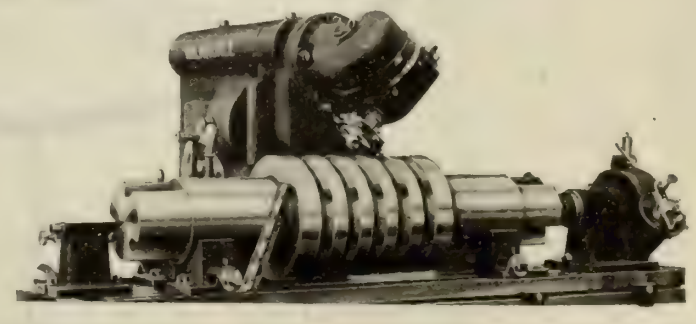
## Efficient on Light and Heavy Milling

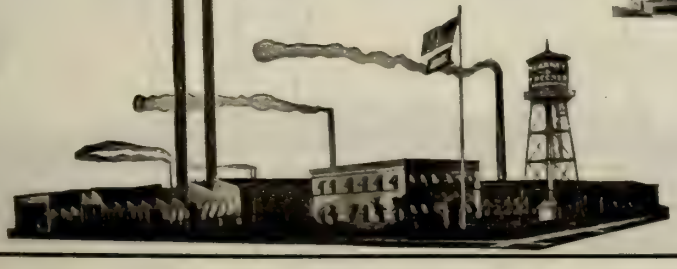
Heavy milling jobs are not unknown to Milwaukee Universal Milling Machines, while delicate and intricate ones are efficiently performed with little effort.

Both light and heavy milling operations are handled with such smoothness and accuracy that the finest results are obtained. Because Milwaukee Universal Milling Machines perform such a wide variety of work, they are particularly well adapted for the tool-room.

The jobs shown in the two illustrations are representative of "Milwaukee" adaptability. The upper illustration shows a jig being bored with a fly cutter. The lower illustrates the milling of a chilled roll with the use of a Universal Milling Attachment.

**Write for Catalogue—NOW.**





KEARNEY & TRECKER
CORPORATION
MILWAUKEE, WIS., U.S.A.

Canadian Representatives: Williams and Wilson, Ltd., Montreal; F. F. Barber Machy. Co., Toronto; A. R. Williams Machy. Co., Vancouver and Winnipeg

*Made in Canada*

# Beams and Channels Angles, Zeebars, Rounds and Squares and Flat Bars

## Open Hearth Alloy Steels

Chrome-Vanadium, Chrome-Nickel, Nickel

**All These Steels We Supply in HOT ROLLED BARS**

**We Also Furnish in**
**BLOOM, BILLET AND SLAB FORM**

**Sulphuric Acid** **Nitre Cake**

The Quality of ALGOMA Open Hearth Steel is traditional for its quality throughout Canada. You can rely upon it on every occasion

# ALGOMA

## Steel Corporation, Limited

Sault Ste. Marie, Ontario

*Sales Offices:*

MONTREAL
606 McGill Bldg.

TORONTO
Bank of Hamilton Bldg.

# NAMCO

## SCREWS - NUTS



### —and STUDS

Our stock includes all the popular sizes of S.A.E. and U.S.S. Cap and Set Screws and Plain and Castellated Nuts.

Studs and Hex. Brass Nuts and Nurls are also shipped promptly.

## Specials

to sample or blue-print in sizes up to 2¼" diameter are made up promptly. Hardened and ground product to specifications.

## THE NATIONAL ACME COMPANY
## MONTREAL, P. Q.

De Courcelles G.T.R.R.

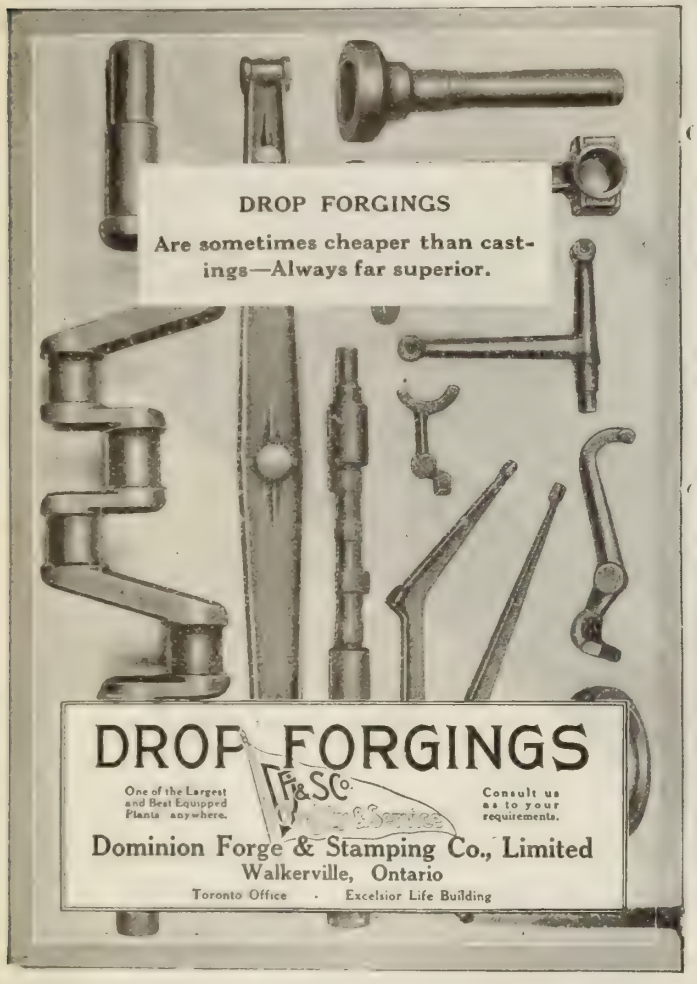
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# HANNA

## IRON ORE - PIG IRON

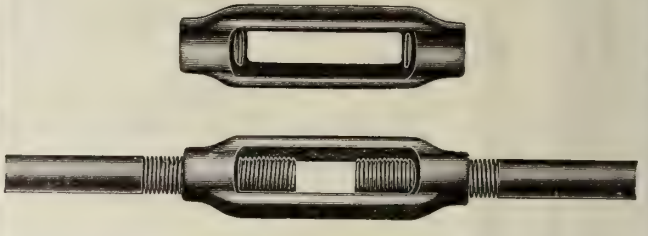
*Sales Agents:*

Cleveland Cincinnati Pittsburgh Toronto Buffalo Detroit




CANADA FOUNDRIES & FORGINGS LIMITED

## Drop Forged Steel



SOLID—NOT WELDED

16 Sizes { with / without } Stubs

**Canada Foundries & Forgings**

**Welland, Ont.**

## 3 FOR 1

Indianapolis, Ind.

The 6" **blast gate** furnished by you has proven entirely satisfactory. It is **answering the purpose of an 8" gate valve,** which would **cost several times as much as a blast gate.**

THE BAUR CARBONIC COMPANY,
(Signed) Oscar Baur, Pres.



NEW AIR-TIGHT BLAST GATE
Light, Strong, Compact, Inexpensive, Quick-Acting

You have the same opportunity to save practically two-thirds of what you now pay for gate valves.

Low in first cost and upkeep, easily and quickly operated, affording the full area of the pipe—these and other advantages make our New Air-Tight Blast Gate an ideal substitute for heavy, cumbersome, expensive and slow-acting gate valves.

This new Air-Tight Blast Gate is made in sizes from 2" to 16", threaded and flanged. Descriptive circular 210-T gives detail dimensions of all sizes. Write for copy to Canadian branch.

**W. S. ROCKWELL COMPANY**
**Furnace Engineers and Contractors**
**50 CHURCH ST. (Hudson Terminal Building), NEW YORK**
*Canadian Distributors: Drummond, McCall & Co. Limited, Montreal*



GATE VALVE
Heavy, Cumbersome, Expensive, Slow-Acting.

*If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.*

# BANFIELD

During recent years this company was compelled to decline much desirable business and many connections that would have been highly appreciated, for enquiries could not be considered without prejudice to the important Government work entrusted to us.

Present conditions suggest an opportunity for you to establish connections with a concern whose manufacturing facilities are not excelled in this country, and whose record on the important matter of service makes such a connection a real asset.

**W. H. Banfield & Sons, Limited - Toronto**

# STAMPINGS

# ELK

**BRAND**

## FIRE BRICKS

**FOR**

## Quality and Service

Remember—we make several qualities of Fire Brick. all perfectly adaptable to the purpose for which they are intended. Now, here is where our Service stands you in good stead: we recommend the class of brick particularly suitable for your purpose. In other words, we do not sell you a costly high-class brick when another class of brick suits just as well.

**Our Various Brands**

| | | |
|---|---|---|
| "Elkco" | "Keystone" | "Elk Dust" |
| "Elkco" Special | "M. D. Elk" | "Keystone Dust" |
| "Elk Steel" | "Rotex" | "Rotex Dust" |
| "St. Marys" | "Elk Ladle" | |

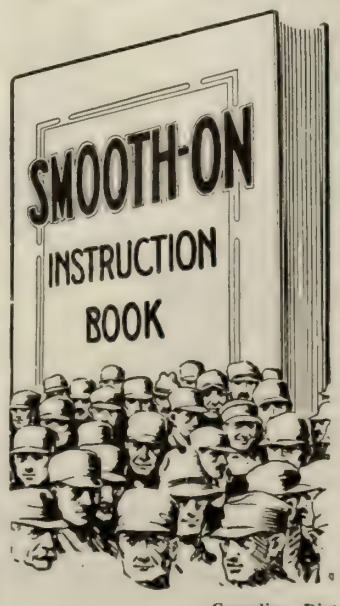
When you select Elk Brand Fire Bricks you know you are getting the right quality. Our warehouse is well stocked to supply your immediate needs.

**ELK FIRE BRICK CO. OF CANADA**
LIMITED
Sun Life Building, HAMILTON, ONTARIO

# SMOOTH-ON IRON CEMENTS

**What Other Engineers KNOW About Repair Work, This Free Book Tells YOU**

It is full from cover to cover of practical ideas developed to meet actual emergencies. There is no theory in the




**SMOOTH-ON Instruction Book**

Its 144 pages of real facts — facts that — if you knew them—might save you hours — or days — and dollars in your next repair job.

*Write for it to-day— It's FREE*

**SMOOTH-ON MFG. CO.**
**Jersey City, N.J., U.S.A.**

San Francisco Office:
56 Sacramento St.
Chicago Office:
221 N. Jefferson St.

Canadian Distributors:
CANADIAN ASBESTOS Co., Montreal, Toronto, Canada.


*If interested tear out this page and place with letters to be answered.*

# THE JOHNSON FRICTION CLUTCH

## The Case Against the Countershaft

The old familiar countershaft drive, through cross belts and tight and loose pulleys, stands accused of the following offences against efficiency.

In that it—

1. Involves needless equipment.
2. Costs too much to set up.
3. Prevents economical and systematic use of space.
4. Operates sluggishly.
5. Multiplies belt troubles and the resultant cost of upkeep.

Modern practice has discarded the antiquated countershaft for the simplicity and efficiency of the clutch drive direct from lineshaft.

**Adopt the Johnston Lineshaft Drive**

The economical, efficient and durable method of power transmission through friction control.

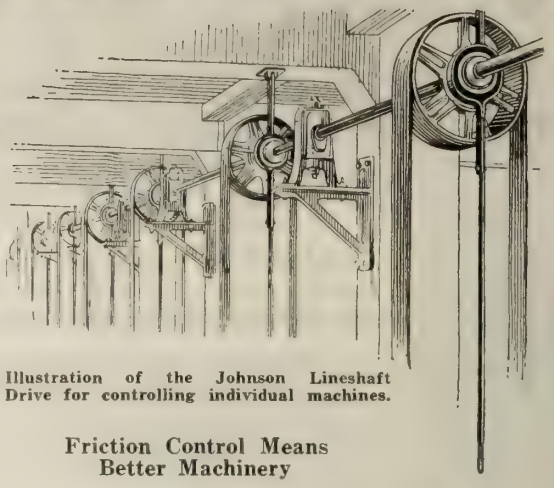
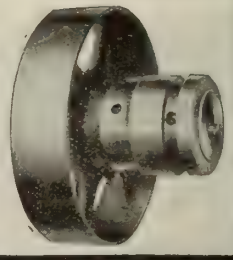


Illustration of the Johnson Lineshaft Drive for controlling individual machines.

**Friction Control Means Better Machinery**

Whether it is applied overhead or in the machine itself.

**Write for our Booklet "Clutches as Applied to Machine Building" and our Yellow Catalog.**

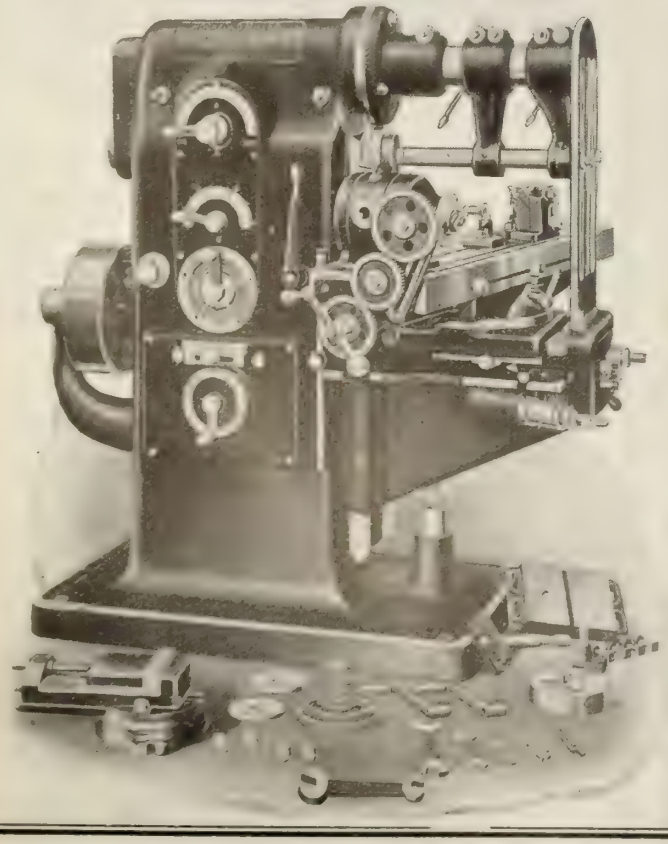


CANADIAN AGENTS:

WILLIAMS & WILSON, LTD., 84 Inspector Street, Montreal
CANADIAN FAIRBANKS-MORSE CO., LTD., Montreal, Toronto, Winnipeg

**THE CARLYLE JOHNSON MACHINE CO. MANCHESTER, CONN.**

*For work requiring the utmost accuracy—*



# ROCKFORD MILLERS

have established an enviable reputation among prominent manufacturers for accuracy, simplicity in construction and ease of operation. That they have been able to do this is credited to the great care exercised in their design, and the high-grade workmanship used in their construction.

All feeds on the Rockford are controlled by one lever — the main spindle is instantly adjustable by a single nut, and the operator can complete a job without leaving the front of his machine. These are a few of the points that have made the Rockford a favorite with the men as well as their employers. We would like to tell you more about these machines. Write us for full information.

**Rockford Milling Machine Co.**
**Rockford, Ill.**

*Canada: Rudel-Belnap Machinery Co.*
*Toronto, Ont.*

FOREIGN REPRESENTATIVES:—Great Britain, A. A. Jones & Shipman, Ltd., Leicester, England. France and Belgium, Louis Besse, Paris, France. Italy, and Colonies, Societa Anonima Adler & Co., Milano. Scandinavia, Rylander & Asplund, Stockholm, Sweden. Spain, and Portugal, Casamitjana Hermanos, Barcelona, Spain. Australia, Selson Engineering Co., Melbourne, Australia. Russia, M. Mett Engineering Co., Petrograd, Russia.

# CANADIAN STEEL FOUNDRIES LIMITED

## AMONG OUR PRODUCTS

**O. H. STEEL**
- Bolsters
- Couplers
- Draft Arms
- Locomotive Side Frames
- Machinery Castings
- Marine Castings
- Rolling Mill Rolls
- Wheel Centres

**FERRO-ALLOYS**

**MANGANESE-STEEL**
- Bucket Lips
- Crusher Jaws
- Dipper Teeth
- Mixer Teeth
- Special Trackwork

**OTHER ALLOYS**
- Crank Pins
- Crank Shafts
- Locomotive Frames
- Rolls
- Roll Shells

**TRACKWORK**
- Diamond Crossings
- Crosses
- Frogs
- Mates
- Switches
- Rail Braces
- Guard Rail Clamps
- Complete Intersection

This list is merely an indication

General Offices:
Transportation Building, Montreal

## WE CAN SUPPLY

# STEEL PLATE

—IN—

**Universal Edge** - up to 40 in. wide

**Sheared Edge** - up to 60 in. wide

**Any Thickness** **Any Lengths**

*Send Us Your Enquiries.*

## Dominion Foundries & Steel, Limited
**HAMILTON, ONTARIO**


*If interested tear out this page and place with letters to be answered.*

LEVIATHAN AND ANACONDA BELTING
ELEVATING TRANSMITTING CONVEYING

# BELTING

That ensures a big measure of efficient and economical

# SERVICE

We carry in stock Leviathan and Anaconda Belting, from 1" up, all plies, and are prepared to supply any length of belt at any time whether for conveying, elevating or transmission.

The belting comes in rolls of 500 ft., but we can supply any portion of this or one or more rolls at a moment's notice. Stocks carried at all points given in addresses below.

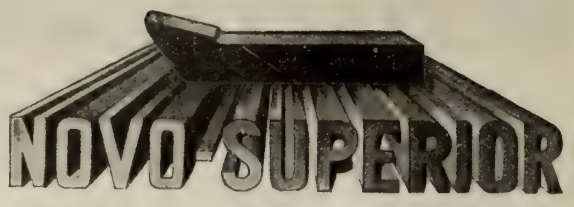
**MAIN BELTING COMPANY**
**OF CANADA, LIMITED**

MONTREAL
10 Peter Street
Tel. Main 7853

TORONTO
32 Front Street West
Tel. Main 1838

WINNIPEG
W. W. Hicks, 567 Banning Street
Sherbrooke 3012

EDMONTON and CALGARY
Gorman, Clancey & Grindley - Edmonton, Alberta




HIGH SPEED STEEL
INTRA STEEL GIBRALTAR STEEL
Tool Steel for Every Purpose
Swedish Lancashire Iron

Twist Drills, Taps, Hack Saw Blades, Milling Cutters, Files, Etc.; Music Wire for Springs, Steel Balls, Cold Rolled Tool Steel in Strips and Sheets, Circular Saws, Machine Knives.

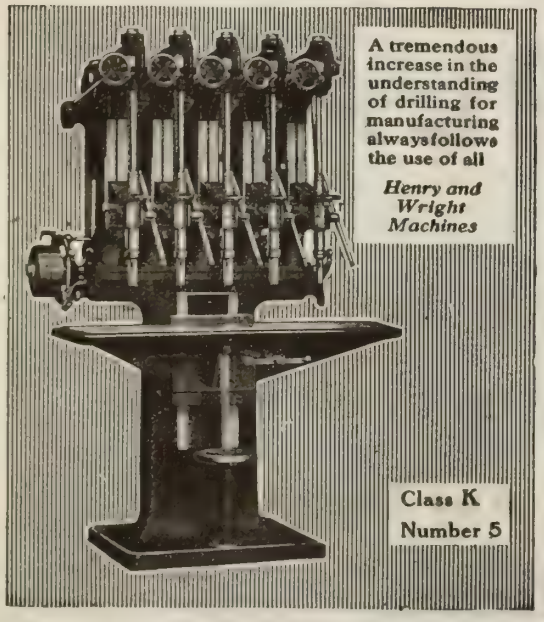
**PILOT STEEL & TOOL COMPANY,**
LIMITED
332 St. James Street, Montreal

*Sole Agents for*

JONAS & COLVER, LIMITED
Novo and Continental Steel Works
Sheffield, Eng.

H. BOKER & CO., Inc.
New York, N.Y.

# HENRY & WRIGHT
## Drilling Machines




**The Henry & Wright Mfg. Co.**
Hartford, Conn.
New York Office: 136 Cedar Street

Canadian Fairbanks-Morse Co., Montreal, Toronto, Winnipeg; A. R. Williams Machinery Co., Toronto, St. John, N.B.; H. W. Petrie, Ltd., Toronto; Williams & Wilson, Montreal; Rudel-Belnap Machinery Co, Montreal; Canada Machinery Corp., Galt, Ont.; Geo. F. Foss Machinery & Supply Co., Montreal; General Supply Co., Montreal.

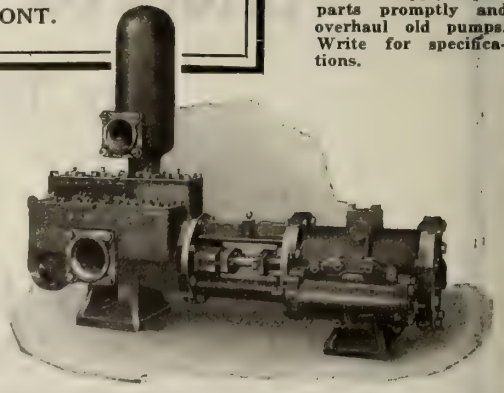
# HEPBURN
## PUMPS

*A Lesson in Economy*

Do you want a real Lesson in Pump Economy? Then go watch a Hepburn Patent Feed Pump in operation. The long, regular strokes will reveal the efficiency of the pump. The self-draining feature and the absence of levers and tappets requiring adjustment make the Hepburn the most desirable pump for many purposes.

**JOHN T. HEPBURN, Limited**
*Engineers and Iron Founders*
18-60 VAN HORNE STREET
TORONTO, ONT.

We can supply repair parts promptly and overhaul old pumps. Write for specifications.



Other Hepburn Products are Vertical Engines, Compressors, Winches, Cut Gears, Cranes, Derricks, Brick Machinery, Hydrants, Blacksmith Work and Acetylene Welding. Prices and workmanship will be right.

*If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.*

# LA SALLE

**Has an Advantage Over Other Grinders**

There is some outstanding feature of all La Salle Grinding Machines that lends it exceptional productive ability.
The American Drill Grinder is especially adaptable for grinding twist, flat and three-lipped drills, because it has automatic lip rest and caliper jaw device, which assures proper clearance on all sizes of drills automatically. Send for descriptive matter covering our entire line of grinding machinery.

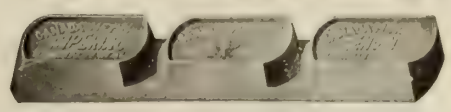


American Drill Grinder
For Wet or Dry Drill Grinding 1/8" to 2¼". Also 1/8" to 3½" dia.

**LA SALLE TOOL CO.**
La Salle, Illinois, U.S.A.

Represented in Canada by
**A. R. Williams Machinery Co., Ltd.**
64-66 Front Street W., Toronto
Halifax St. John, N.B. Monreal Winnipeg Vancouver

# WHY EXPERIMENT ?
## WE DID IT FOR YOU YEARS AGO



**IMPERIAL GENUINE**

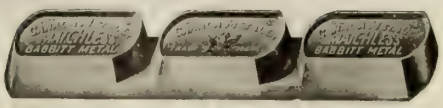



For Heavy Engines and Extraordinary Hard Work

**HARRIS HEAVY PRESSURE**

THE COPPER COATED CAKE

For Donkey Engines, Saw Carriages, Small Motors, Transmission Line Shafting and all steady heavy pressure duty.




**Matchless**

Suitable For Slow-Moving Bearings
Write For Prices

**THE CANADA METAL CO., LIMITED**
TORONTO HAMILTON WINNIPEG VANCOUVER MONTREAL

# STEEL *for*
## Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

**We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.**



Steel Ingots
*by the*
**HARMET**
Liquid Process

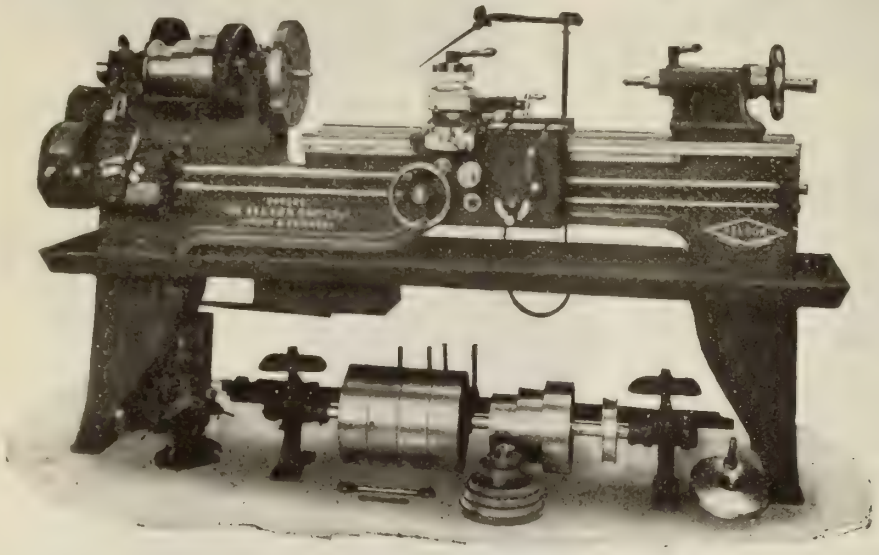
**Nova Scotia Steel and Coal Co., Limited**

*Head Offices:*
New Glasgow, N.S.

Sales Offices:
Western Room 14 Windsor Hotel
MONTREAL


*If interested tear out this page and place with letters to be answered.*

# The "SELSON" High-Speed, Vee Bed Gap Lathe



## 13" Swing

We have designed the Selson 13-inch Lathe specially for the Canadian market.

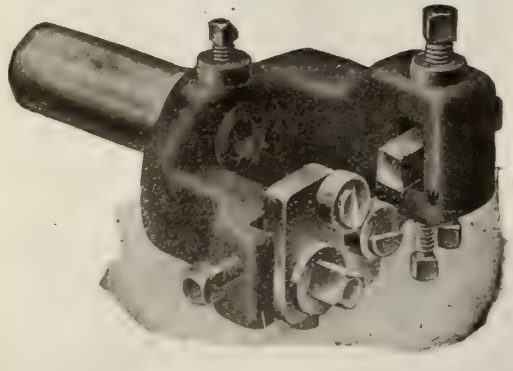
**SELSON**

***Engineering Co., Ltd.***

**SELSON HOUSE, 83 and 85 QUEEN VICTORIA STREET**
**LONDON, E.C.4, ENGLAND. WORKS: COVENTRY**

***Branches: Paris, Brussels, Turin, Milan, Melbourne, New York***

# TURRET-LATHE
## TOOLS & HOLDERS

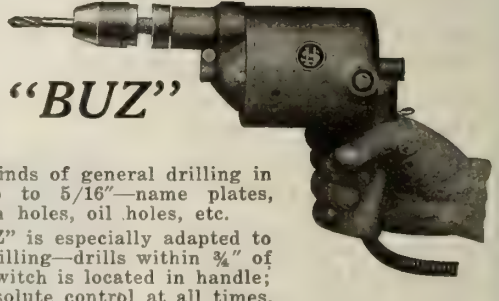


COMPLETE EQUIPMENT FOR CAPSTAN LATHES FULLY ILLUSTRATED IN OUR TOOL LIST E.

***Sales Agents Wanted***

**J. ACKWORTHIE LTD.**
COLESHILL STREET,
BIRMINGHAM
ENGLAND

# United States Electric Drills and Grinders



## *The "BUZ"*

For all kinds of general drilling in metal up to 5/16"—name plates, cotter pin holes, oil holes, etc.

The "BUZ" is especially adapted to corner drilling—drills within ¾" of corner. Switch is located in handle; under absolute control at all times. Attaches to any lamp socket, alternating or direct current, 110 or 220 volts. Guaranteed the most powerful electric drill of its weight on the market.

Order a few to-day for trial. Their time and labor saving ability will convince you you need more!

**For Sale By**
**The Canadian Fairbanks-Morse Co., Limited**
**Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver**

**THE UNITED STATES ELECTRICAL TOOL CO.**
**CINCINNATI, OHIO**

# Machine Shop and Construction Supplies

The Rice Lewis line includes Pipe Vises and Pipe Wrenches, Micrometers, Torches, Set Screws, Cap Screws, Machine Screws, High-Speed and Carbon Drills, Files and Machinists' Tools of every description.

We also carry large stocks of Bar Iron, Sheet Iron (black and galvanized), Machine Steel, Cast Steel, High-Speed Steel, Cold-Rolled Steel.



## Victor Hack Saw Blades



Durable, fast cutting blades which cut true on the toughest metals. Users find that Victor Blades cut faster and last longer than ordinary ones.

## CRESCENT
**BELT FASTENERS**



Maintain a uniform grip, the entire width of the belt. They clinch beneath the surface on the pulley side—no part in contact with the pulley.

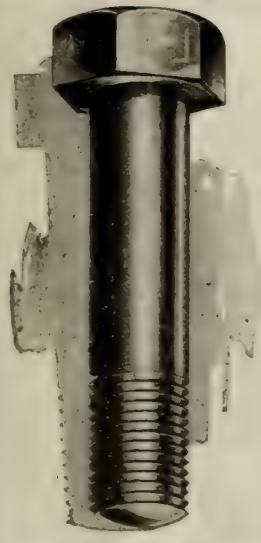
### Machinists' Tool Chests

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Your rush orders filled promptly by



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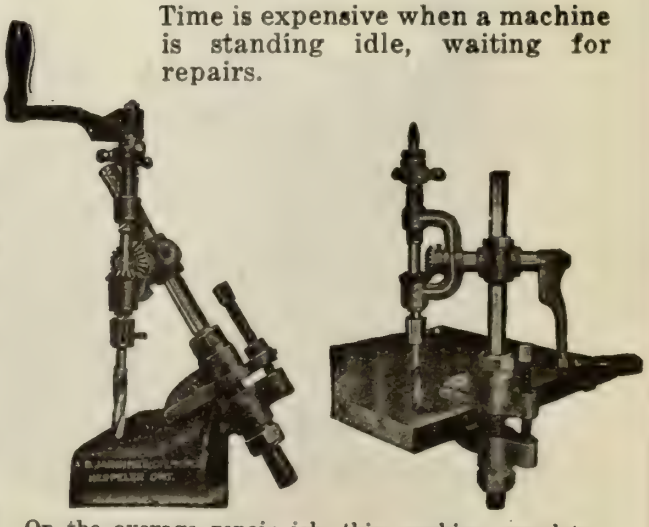
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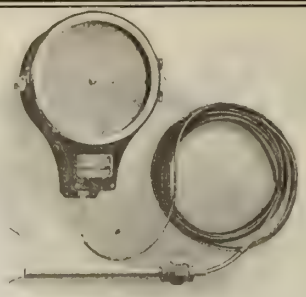
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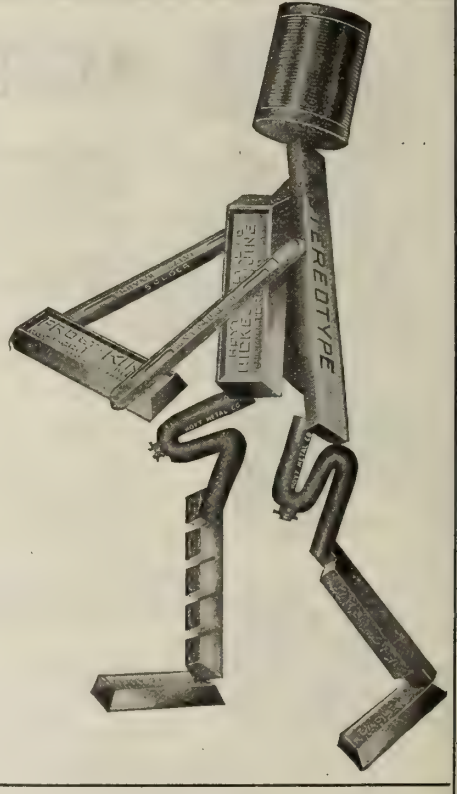
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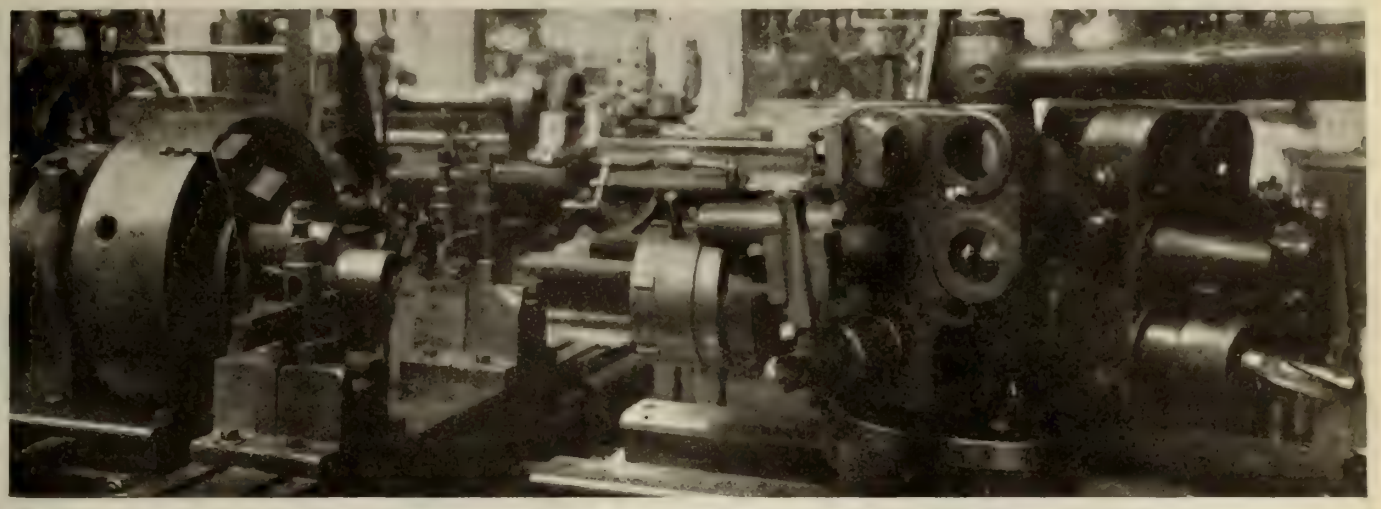
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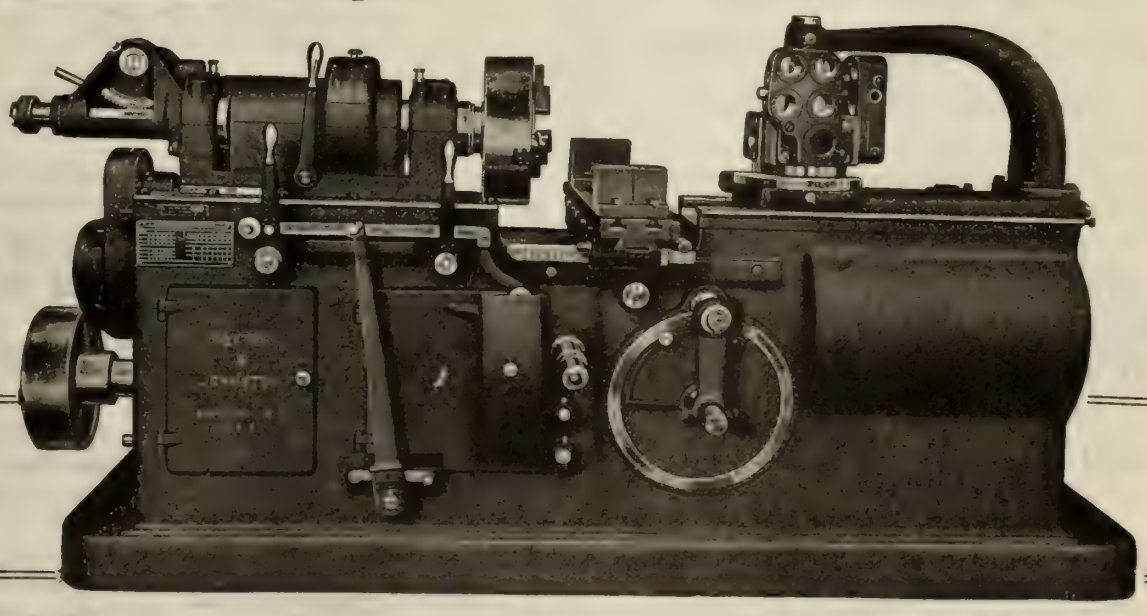
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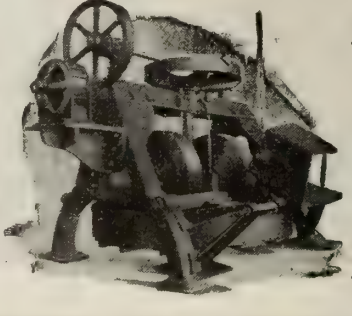
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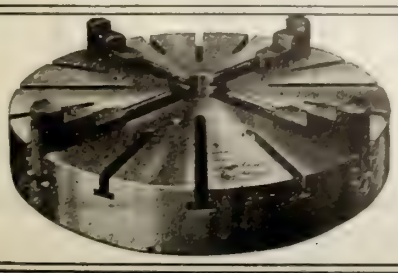
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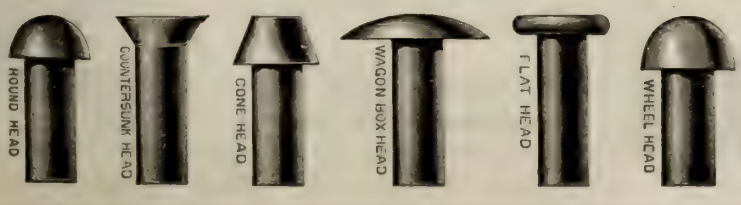
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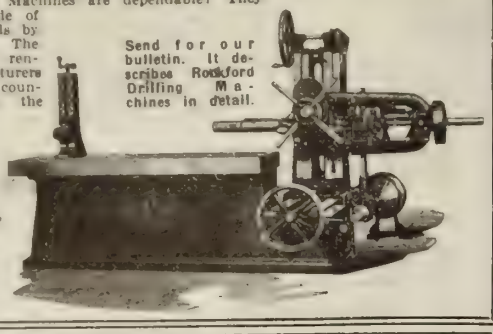



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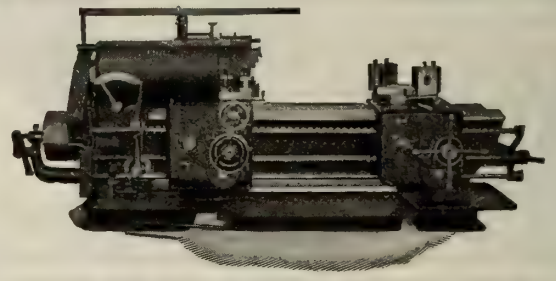
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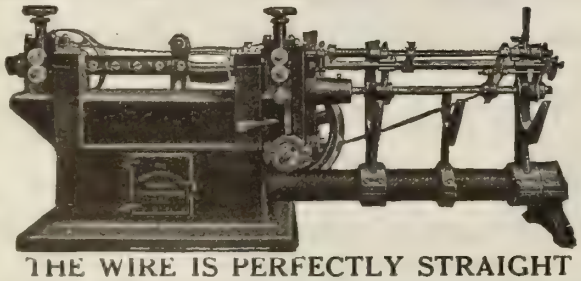


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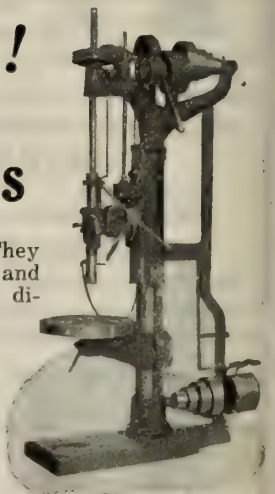
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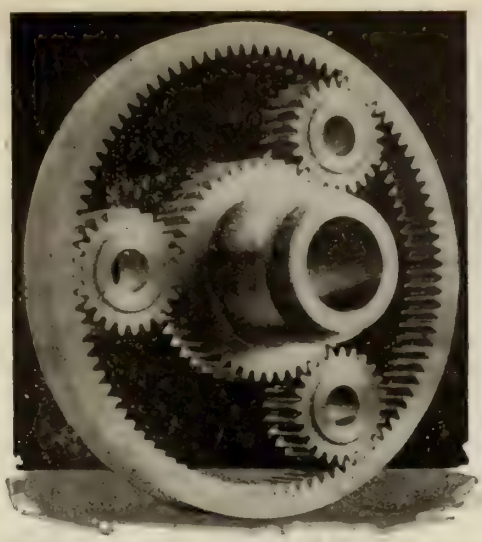
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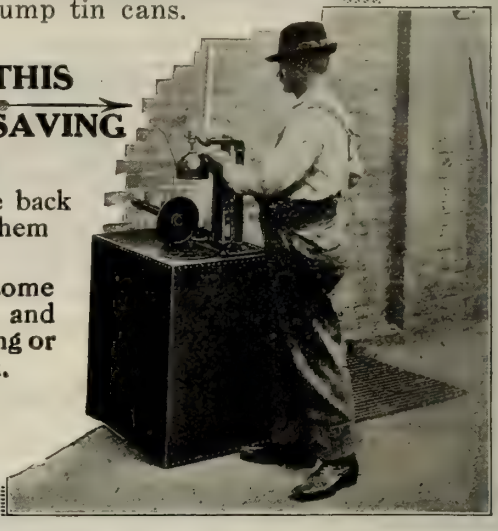
THIS ← WASTE

and fire hazzard go hand in hand where the oil is slopped around "any old way."

Handling your oil in any old way, just because it is oil, or putting it in a safe like the real money it is? On the left is shown a picture of what daily happens where oil is stored in faucet or "jigger" pump tin cans.

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Name of firm and full address.

Description of shop and equipment.

Particulars regarding regular line, if any.

Class of work interested in securing and best equipped to handle.

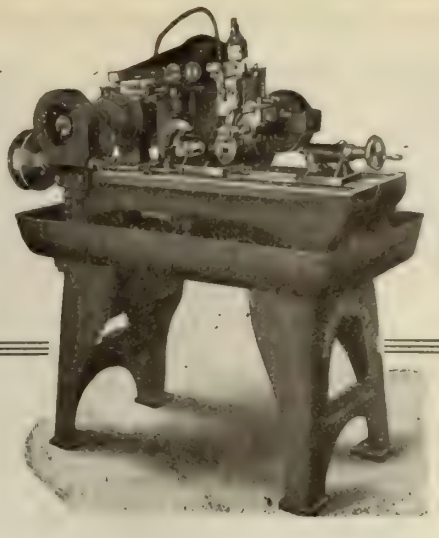
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CANADIAN MACHINERY

**143 University Ave.** **TORONTO**

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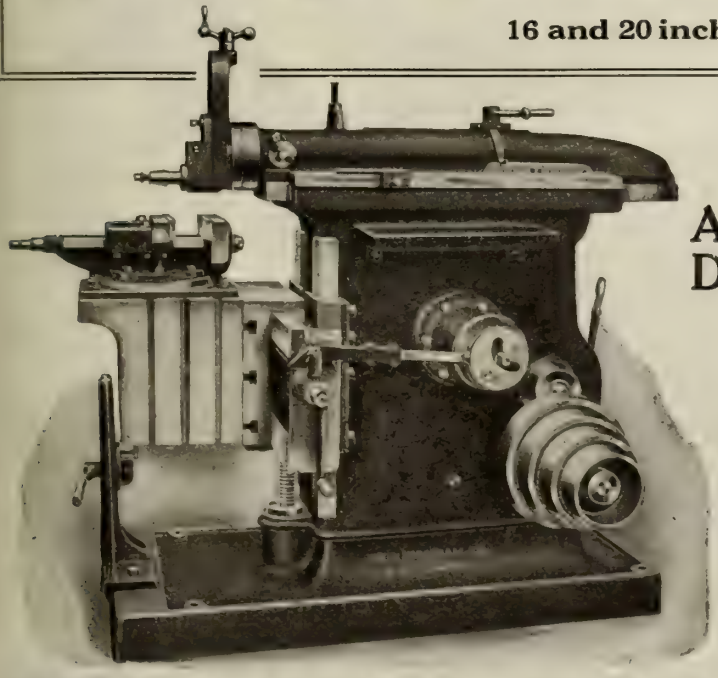
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**16 and 20 inch**

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## THE R. McDOUGALL COMPANY, LIMITED, Galt, Ont., Can.

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## BROWN & SHARPE Gear Cutting Machines

**Because of the Positive, No-Shock, Independent Action of the Indexing Mechanism**

***Accuracy is Assured by:***

The precision-cut teeth of the index wheel, which is large in proportion to the gear being cut, and the positive action of the indexing mechanism which is accelerated at the start and retarded at the end of each indexing period to eliminate shocks at any stage of the movement.

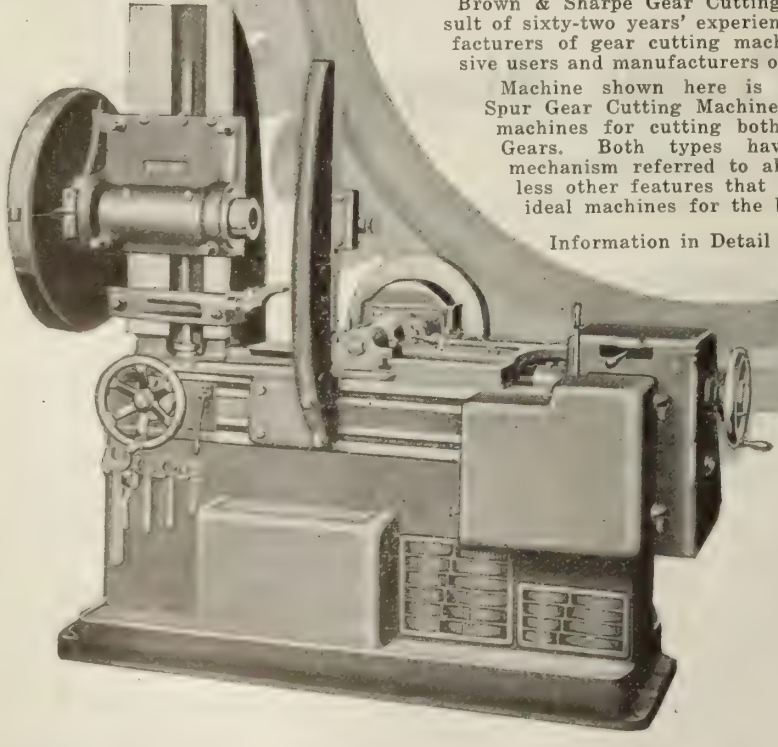
**And a High Production Rate Because**

The indexing mechanism acts independently of feed and speed of cutter, resulting in a constant, high speed in indexing, regardless of feed and speed of cutter.

Brown & Sharpe Gear Cutting Machines are the result of sixty-two years' experience, not only as manufacturers of gear cutting machinery, but as extensive users and manufacturers of precision-cut gears.

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## Brown & Sharpe Mfg. Co., Providence, R.I., U.S.A.

Canadian Representative: Canadian Fairbanks-Morse Co., Ltd.

# GISHOLT

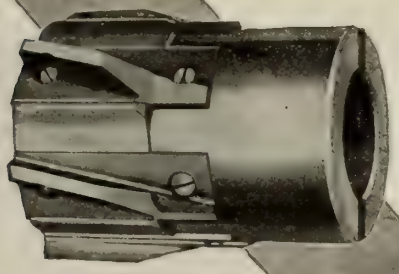
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**A solid reamer that is adjustable**
**An adjustable reamer that is solid**

A reamer that will stand feeds and speeds much greater than those usually employed in reaming.

A reamer for MANUFACTURING work, that will ream hundreds of smooth, accurate holes without regrinding—holes that will pass inspection immediately—and when dull may be repeatedly adjusted to original size. When original blades are worn out, new ones may be substituted.



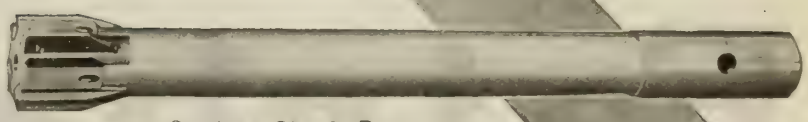
*Shell Reamer*



*Taper Shank Reamer*

**The Gisholt MANUFACTURING Reamer**

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CANADIAN MACHINERY
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VOL. XXV. No. 17. April 28, 1921

# Various Methods of Producing Threads

## Threading Locomotive Set Screws—Steel Axles—Special Nuts—Tractor Axles—Worms—Lead Screws—Fine Pitch Threads and Internal Threads.

By J. H. MOORE

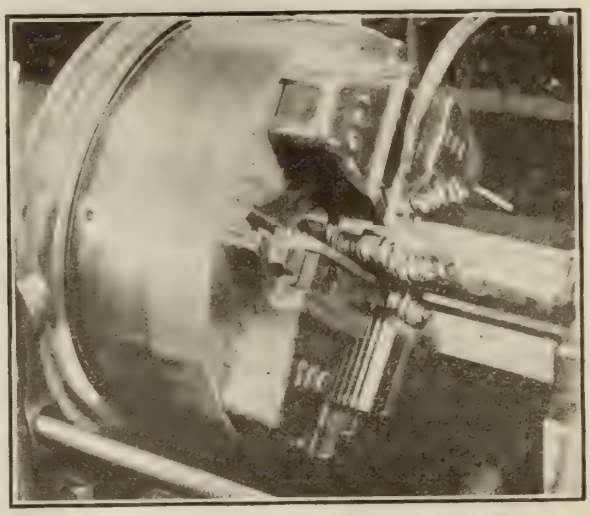


FIG. 1--SHOWING DIE-HEAD IN OPERATION.

ACCORDING to an old friend and authority, Daniel Webster, a thread is the projecting helical rib of a screw, the successive turns of which are often called teeth. This derivation is altogether too high-brow for our use, so let us simply state that a thread is something that mechanics are familiar with, have cut many a time, and hardly require a picture of to know what it looks like.

Why this peculiar introduction? you may ask. Merely to lead up to the next question, viz., How did you form the thread? Did you use a hand die? Did you use the lathe? Or did you form the thread by some other process?

The hand and lathe system requires no comment, for practically every mechanic has made threads by both these methods. But how about the manufacturing plant where duplicate threads are required in quantities? Either of the above methods is too slow, as too much care is necessary to produce approximately correct threads on the lathe. In such cases threading machines, irrespective of their type, are a necessity. Without them we could not manufacture many articles at present existing prices. Think of the bolts used on certain styles of machine tools, or even on pumps and engines. Can you see them in fancy, row upon row, circle above circle, each bolt a duplicate of the other, as far as practical need demands? Then again there is the finer screw, the thread of which must be absolutely correct. How could such threads be produced without some mechanical means to ensure a high degree of efficiency?

Believing that readers would be interested in examples of threading work performed, we have gathered together some interesting data on the subject, and will first of all start with the Landis method of producing threads. The photographs covering this method of threading were kindly supplied by the Landis Machine Co., Inc., Waynesboro, Pa., and bring out some very valuable points.

As the average mechanic knows by sight the appearance of these threading machines, we will confine ourselves to illustrations showing work performed, rather than photographs of the machines themselves. Briefly, such machines are used for obtaining production, and the standard style consists of a bed, a headstock, a die head and a carriage equipped with gripping vises. Depending on the size of work to be threaded, the machine is of proportionate strength, and in all cases they are provided with a die lubricating system. This brings us to the die itself, which is of course the main part of the machine. The die head used on the machines we are speaking of is of all steel construction, and the die proper consists of four chasers tangentially inclined to the work, to agree with the pitch of thread to be cut. Of course, adjusting mechanism is provided, this being of special design. Within the head of the die is an automatic opening and closing device which derives its action from the forward and backward travels of the carriage. The same device locks the head. Graduations are marked both right and left hand for all sizes within the range of the head. Briefly, this gives the general principles of the die head, but it by no means covers the details. Readers desiring further detail can get in touch with the company manufacturing these machines, but for the purpose of this article sufficient has been given.

These machines are, of course, made in different sizes and styles, ranging from the simple single head bolt threading type to the triple headed type. Depending upon the work to be accomplished, machines are used with or without a lead screw attachment. Then again for stay bolts, the machines are modified in design to suit this style of work, but in the main, the principle involved is the same.

Then again, there are the pipe and nipple threading machines. These vary in size and design, but all are based on the same principle, viz., that of a rotary die

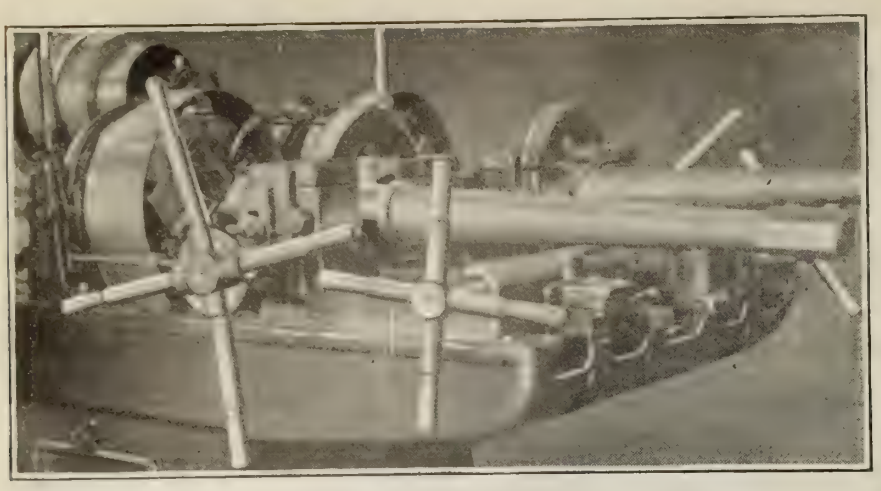


FIG. 4—THREADING CHROME NICKLE STEEL AXLES.

head. Boiling the whole matter down to a few words, the art of threading by this method consists of feeding the work into a suitable revolving die contained in a die head. Once the work has entered the die the true pitch of thread and proper diameter are assured, the die being set to proper size before commencing. Without going into further details, let us consider some examples of work performed.

### Actual Threading Work

Fig. 1 gives a good view of a die head in operation. Of course, the main idea in showing this view is to illustrate how large a chip can actually be produced, even when cutting at a rate of 30 circumferential feet per minute, as the die was, when the photograph was taken. The stock was 30 point carbon steel, this being a rather nasty material to cut. It will be noted that the chips are similar to that of a lathe tool. This is due to the fact that the die itself operates on the same principle as a lathe tool.

Fig. 2 depicts a 4 inch single head motor driven machine threading locomotive set screws, the production by this method being 700 screws every ten-hour day.

Fig. 3 illustrates a 2-inch triple head machine. This is also used in a railroad shop, and the machine shown has been in use for twelve years. The triple head type of machine is much favored in railroad shops, due to the fact that each head may be set to suit a different size bolt, this of course reducing to a minimum the time of changing from one size to another.

The next photograph, Fig. 4, shows a 1½-inch double head machine threading axles. These axles are made from chrome nickel steel, heat treated, and the last operation is that of threading. It is, therefore, very important that the thread be correct, otherwise the axle would be scrap, and all previous work would be wasted. The reason we emphasize this point is to illustrate the fact that threads turned out by machine are perfect for all practical purposes. In fact, with proper care they cannot help but be correct, the dies guarantee that. This is a big feature, for once the dies are set, a cheaper class of labor can be used than otherwise could.

Although we have refrained from showing photographs of machines only, we make an exception in the case of Fig. 5. This depicts a 4-inch single head leadscrew threading machine with extension bed for cutting threads on stay tubes and stay rods for marine boilers. The pitch of the threaded stay tubes and stay rods must be continuous, and the machine was designed for that operation. The threads are first cut on one end of all stay tubes and stay rods. The threaded end is then gripped in the carriage at the end of the extension bed. The die head, the leadscrew, and the grips are then timed, and the other end of the rods and tubes threaded. In this way a continuity of thread is obtained.

We could go on indefinitely showing illustrations of applications of this threading method. We have photographs before us depicting the threading of work in automotive plants, the machines being equipped with special arbors for holding certain portions of the work. Other photographs depict machines for threading and cutting off pipe, machines for threading axle housings, leadscrews, stay bolts, etc. In fact, any work that can be accommodated within the limits of such machines can be threaded by this method, and where the quantity required warrants it, a machine specially suited for the work can be designed.

### The Thread Milling Method

Although the previous method described is known in some small measure

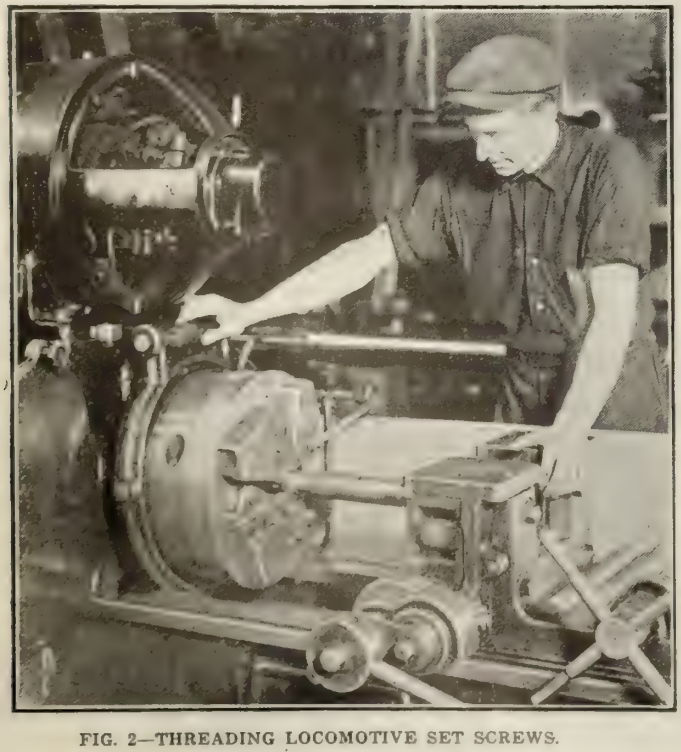


FIG. 2—THREADING LOCOMOTIVE SET SCREWS.

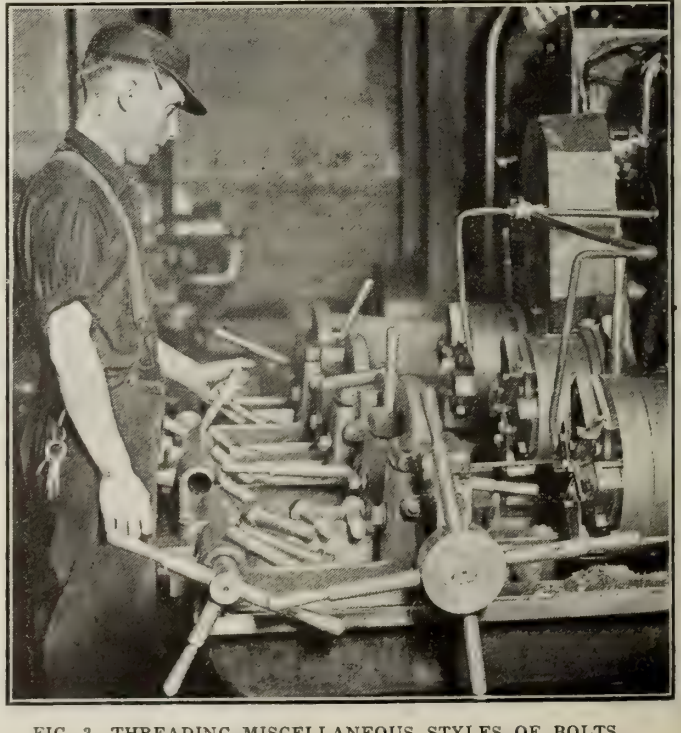


FIG. 3—THREADING MISCELLANEOUS STYLES OF BOLTS.

to the average mechanic, the system of thread milling remains somewhat of a mystery to him, not because it is difficult to understand, but because he does not take the trouble to investigate. Through the courtesy of the Smalley General Co., Inc., Bay City, Mich., and the Lees-Bradner Co., Cleveland, Ohio, we are able to discuss and show various examples of thread milling. First of all, what is thread milling?

Although not generally known, the art of thread milling is not a new process. As far back as the civil war, machines of this type were in use, but they are said to have been very crude and light. It is only within recent years that they have been developed into a commercial success. For the benefit of readers who are not familiar with the appearance of a thread miller let us refer to Fig. 6. This is what is known as a No. 23 S-G thread miller, and is primarily a singe purpose machine

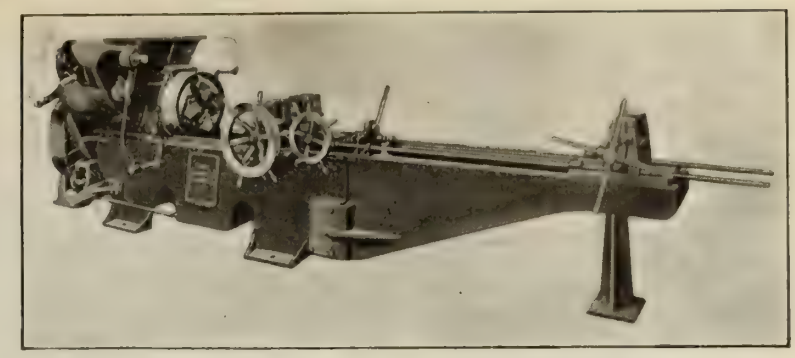


FIG. 5—4-INCH SINGLE HEAD LEAD SCREW THREADING MACHINE.

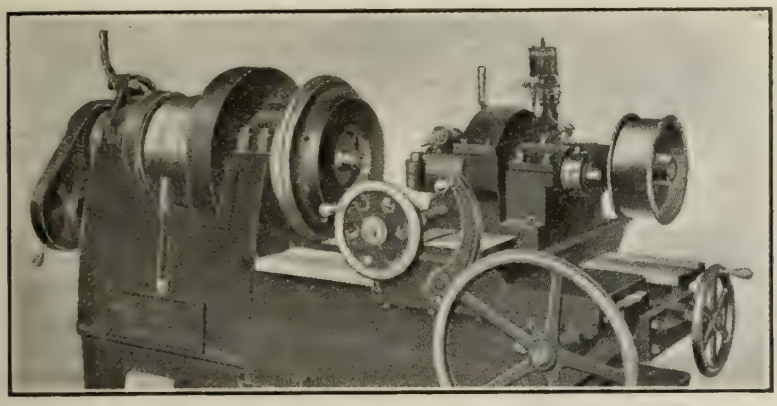


FIG. 6—A TYPICAL S-G THREAD MILLER.

designed for production work. This particular machine has three milling speeds, also three turning speeds which are proportional to the milling speeds. In some cases the three turning speeds are not embodied, but this is simply a question of design, rather than a change of principle. All S-G thread millers are based on the same principle, different types being suited for various classes of work.

Briefly, here is the action of these machines. Located on the ways is the bottom slide which, in turn, carries the top or cross slide. This cross slide is controlled in relation to the bottom slide by means of a micrometer screw by which the diameter of the thread is determined. The top slide carries the milling spindle. The milling hob is held on this spindle by means of a tapered arbor and draw in bolt.

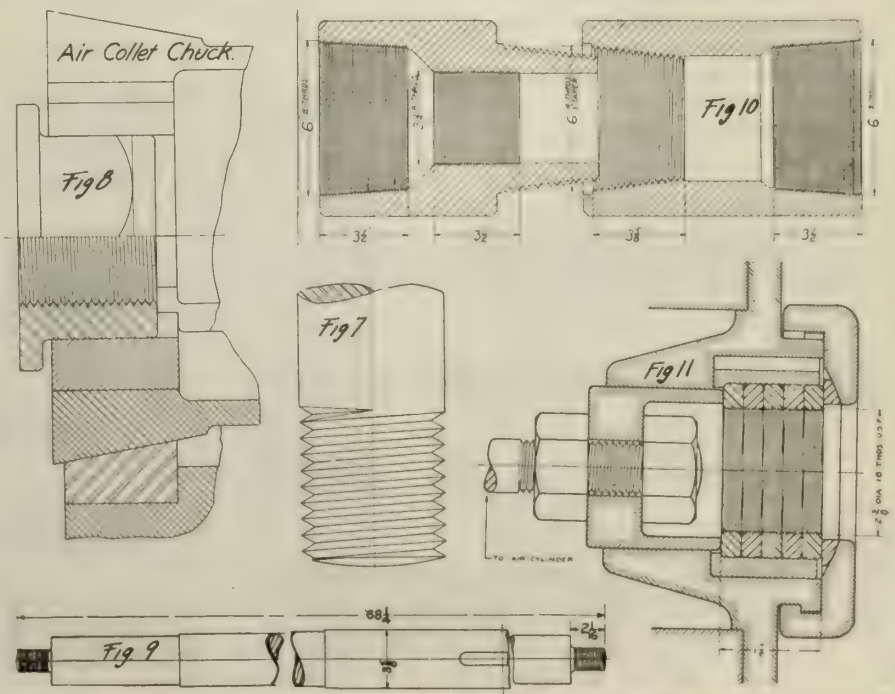
During the milling operation, while the work held in the chuck makes one revolution, the milling head is moved on the ways by the leadscrew a distance amounting to the pitch of the thread to be milled. Either internal or external, right or left hand, straight or tapered threads can be milled, although it is not possible to mill an absolutely square thread. A very slight angle is necessary for clearance, but acme threads are easily milled. When internal threads are to be milled the diameter of the hob must be slightly less than the diameter of the part to be milled in order to allow ingress and egress of the hob. This, of course, does not infer that a large hob must be used for large work. While usually a hob of large diameter would be used for milling an internal thread of large diameter, there is no particular relation between the diameter of the thread and the hob used.

In the single purpose S-G machine, milling of thread only is performed, but in the general purpose type, both turning and milling are accomplished. This, of course, enables the surfaces to be turned true with the thread, and in many cases saves an extra operation on some other machine. Of course, a lower speed is used for milling than that used when turning, but neither the tool nor the hob need to be removed during operations. In milling threads of 12 per inch or more, a direct driven spindle is used, but for coarser threads a back geared spindle is employed.

### Milling Speeds

Milling speeds depend upon several factors, the material to be milled, the rigidity of machine, quality of hob, and the finish required. In sheet and cast iron, hob manufacturers recommend a cutting speed of 80 feet per minute and .004 inch feed per revolution with a hob 2⅛ inches diameter, which gives a milling feed of approximately 6 inches per minute. As a rule, however, a well constructed machine will run about a 9 inch feed instead of 6 inch.

It should be remembered that in thread milling the roughing and finishing cut are taken at the same operation. It therefore follows that the slower the




FIGS. 7 TO 11—SHOWING EXAMPLES OF WORK PERFORMED.

milling feed the better the finish. When a polished finish is required it is good policy to slow up the machine to 5 or 6 inches per minute, or else take a roughing cut first, following this with a light finishing cut. This procedure, however, is very seldom necessary. With milling speeds running from 9 inches to 12 inches per minute, the limits can be held to .001 inch or .002 inch, depending upon circumstances. In annealed high speed or hard alloyed steels the usual milling speed is from 2 to 3 inches per minute, with a cutting speed of 35 to 45 feet.

A great diversity of opinion exists as to the saving in time, increase in production, etc., between the various methods of threading. It is not for us to take sides. We merely present the methods used, the time taken to produce certain work, and any other data that will interest readers. From this point on, it is up to the reader himself to decide which method appeals to him. For example, the thread milling fraternity frankly state that in some cases they have shown increased production over other methods, while in others they have not. Of course, they finish these remarks by emphasizing that the thread obtained by their process is superior in quality. On the other hand, the champions of the Landis, and other systems, will tell you that they can give you better production, better threads, etc., than the thread milling, and so on. In other words, it is a case of experience; take your choice; but let it be thoroughly understood that we are simply presenting for readers' benefit the examples shown, not with any idea of comparison in mind. It might be well to add, before going on with examples of work performed, that thread millers, especially of the flange type, are often provided with special attachments. For example, facing attachments, etc. These, of course, are placed on the machine to eliminate any further operations. As far as possible the machine is designed and arranged to complete the work at the one set up.

### Some Examples of Work

Let us now consider some examples of work performed on S-G machines, these being taken at random. Fig. 7 depicts a very common job, the material being No. 3 government steel 1½ inches diameter, 6 pitch thread, 1½ inches length of thread. On a ten-hour run an average rate of 1½ minutes for the operation was attained. This included facing and chamfering the end. Every thread was a forced fit, and had to pass government inspection. An air collet chuck was used.

The next example, Fig. 8, shows a special nut. The thread is 1⅝ inches diameter, 1½ inches length, and .12 inch pitch U.S. standard. The milling feed used was 9.6 inches per minute, and the material was .20 carbon steel. An air operated collet chuck was used, and this work was accomplished in a No. 2 machine. Here is a brief statement of the time for completing this nut. Chucking 5 seconds, boring and facing 1 minute 45 seconds, adjusting head for milling 10 seconds, milling 32 seconds, removing from chuck 5 seconds, this bringing the total up to 2 minutes 37 seconds.

Fig. 9 illustrates a tractor axle threaded by this method. The thread is 1½ inches diameter, 2 1-16 inches long on each end, 6 pitch U.S. standard. The material is machinery steel, and the milling feed used is 4.35 inches per minute.

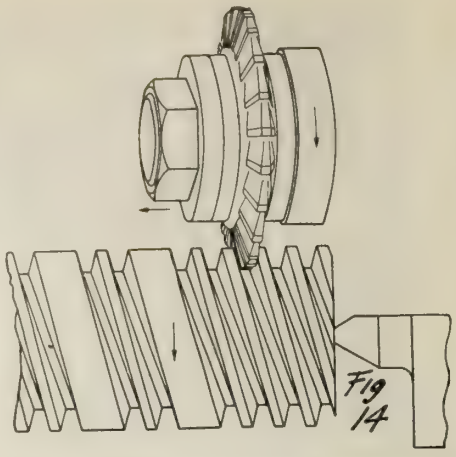



FIG. 14—CUTTING A TRIPLE THREAD LEAD SCREW.

Each thread is milled in 65 seconds, with a floor to floor time of 5 minutes 37 seconds, the balance of time being of course used up in handling. These parts were chucked through the rear end of spindle. It was a rather awkward operation as the pieces were larger in the center, and the type of chuck used would not let them through. A collet chuck with false collets would have permitted faster chucking.

The work shown at Fig. 10 is very interesting. The piece milled is a pin and box, and the thread is 3¾ inches diameter, 4 inches length, 6 pitch U.S. standard, with 3 inches taper per foot. The milling speed used is 4½ inches per minute, and the material .20 carbon steel. A hand operated screw chuck is used, and floor to floor time is six minutes. The former time of this piece, as threaded in the lathe, was 1½ hours.

Fig. 11 illustrates a good example of multiple chucking. To insure the best results from this style of chucking the parts should run close to size. The work shown was accomplished on a No. 23 machine, and the 6 inch hollow spindle on this size machine afforded a good opportunity of doing this class of work in a face plate chuck, thereby holding the parts to be milled within close relation to the main bearing.

The chuck used was air operated, and here is the time occupied: Chucking in and out 15 seconds, setting carriage and hob 5 seconds, milling 50 seconds. This makes a total of 1 minute 10 seconds or a time of 14 seconds each, there being 5 nuts chucked at one time. The thread was 2⅜ inches diameter, 1⅞ inches long, and 16 pitch. The material was machine steel, and a milling feed of 9 inches per minute was used.

Let us next pass on to another type of thread miller, namely the Lees-Bradner. From now on, the information given will be from their point of view.

### Thread Milling Work Classified

The views to follow are intended to clarify the subject of thread milling by separating the work into classes, explain-

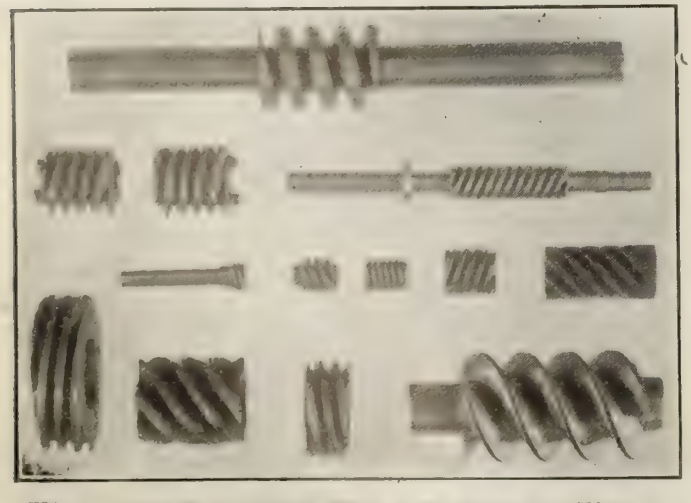


FIG. 12—VARIETY OF WORMS THAT HAVE BEEN PRODUCED BY THREAD MILLING.

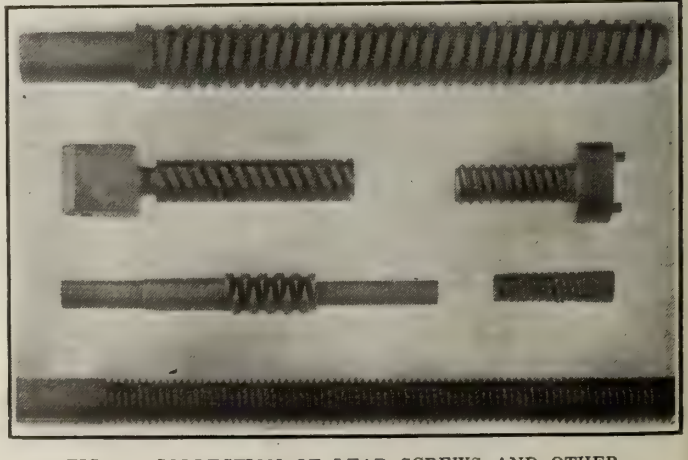


FIG. 13—COLLECTION OF LEAD SCREWS AND OTHER THREADS CUT BY THREAD-MILLING PROCESS.

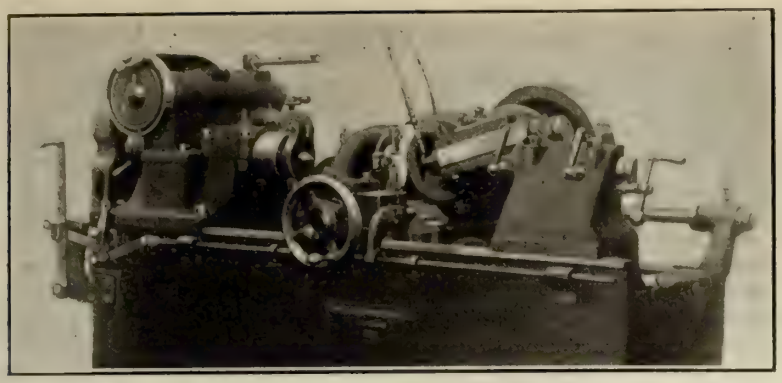


FIG. 15—A STANDARD L-B THREAD MILLER.

ing the method employed for each class of work.

Fig. 12 shows a variety of worms both single and multiple threaded which have been advantageously produced by the thread milling process. It will readily be seen that a worm with a large number of threads has a greater thread angle and approaches a helical gear in appearance. There may be times when the question arises as to whether a particular job should be called a worm or a helical gear. The differences are that in a worm we speak of the number of threads and of the "thread angle," meaning the angle between a thread and a line at right angles to the axis; whereas in helical gears we speak of the number of teeth and of the "helix angle," meaning the angle between a tooth and the axis of the gear.

A five threaded worm with 20 degrees thread angle might be called a five tooth helical gear with 70 degrees helix angle, except for the difference between the form of thread on a worm and the form of tooth on a helical gear. The threads on worms are usually cut with straight sided cutters and the pressure angles specified in a plane along the axis of the worm, whereas the teeth of helical gears are generated with hobs and their pressure angles are specified in a plane normal (at right angles) to the tooth. In addition to these differences it is customary to specify a helical gear by the normal diametrical pitch, whereas worms are specified by the circular pitch of the worm gears with which they are to mesh; the circular pitch of the worm gears being the same as the axial pitch of the worms. All of the jobs shown in Fig. 12 are specified as worms and use single cutters with straight sides at the required angles. Fig. 13 shows a collection of lead screws and other threads cut by the same process. We find this process illustrated in Fig. 14, which represents a triple thread worm or lead screw. The directions of rotation and travel are indicated by three arrows.

The problem of gearing up a thread miller to mill a thread of a given lead is practically the same as gearing up a lathe to cut the same lead. The carriage carrying the cutter moves along the bed of the machine parallel to the axis of the work a distance equal to the lead of the thread for each rotation of the work. The line drawing in Fig. 14 shows two threads finished and the third thread in process of cutting. Three passes of the cutter are required to finish the job except in the event of two cuts being taken through each thread on a worm of heavy pitch. If it is desired to take two cuts on a lead screw, the finishing is done at a separate setting to allow some time for seasoning between the two cuts.

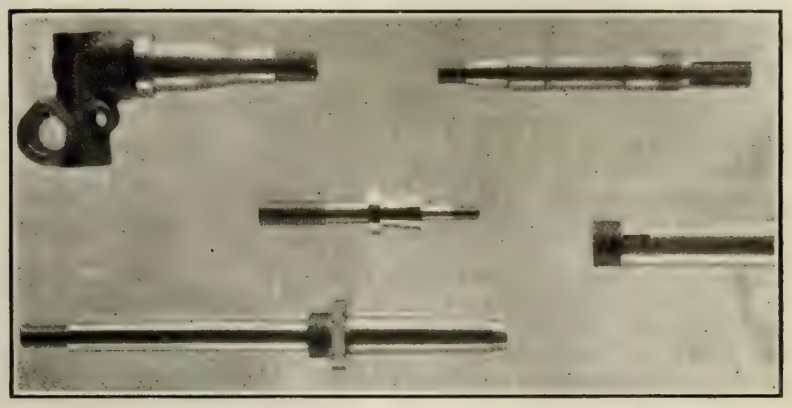


FIG. 17—A FEW EXAMPLES OF MALE THREADS THAT ARE MILLED ON PARTS HELD BETWEEN CENTRES.

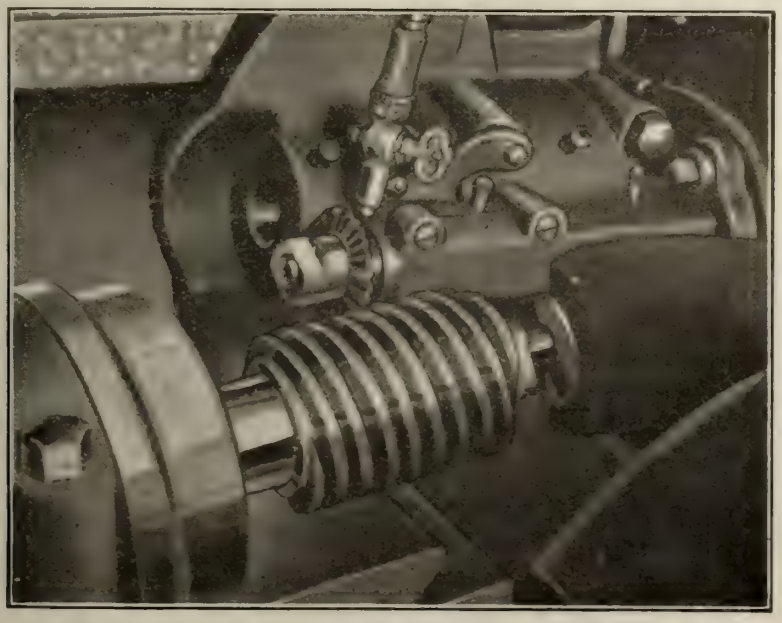


FIG. 16—THIS TYPE MACHINE IS DESIGNED PRIMARILY FOR HOBBING SPUR GEARS, SPLINE SHAFTS, ETC.

Aside from gearing up to travel the cutter one lead for each rotation of the work, it is only necessary to swivel the cutter spindle to the thread angle and arrange the work to rotate at a suitable peripheral speed for the milling feed. The question of cutter speed is merely one of material, though it should be borne in mind that a high cutter speed produces a smoother thread than a low cutter speed with any given speed of work rotation. The ratio between cutter rotation and work rotation is not fixed as it is in hobbing a helical gear.

The standard L-B thread miller shown in Fig. 15 is used for these classes of work as well as for some others which we will show later. It will be noted that the cutter spindle is arranged to swivel to the required thread angles and that the depth of the cut is controlled by a hand wheel at the front of the carriage. This hand wheel is provided with micrometer graduations and an automatic stop which insures accurate duplication of work. When multiple threads are cut with a single cutter the indexing of the work is accomplished by the indexing mechanism above the head stock. The

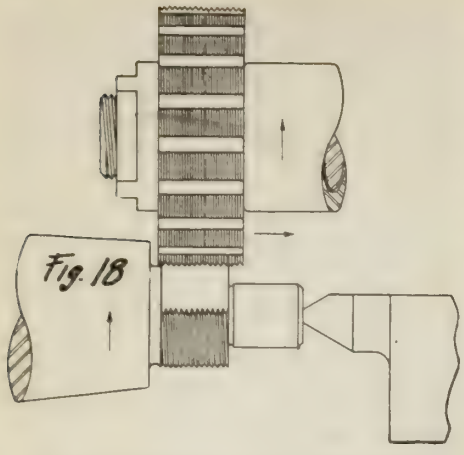



FIG. 18—METHOD OF CUTTING SUCH THREADS AS SHOWN AT FIG. 17.

machine handles work between centers or in a collet chuck.

Another machine which is sometimes used for thread milling worms is shown in Fig. 16. This is an L-B gear generator, designed primarily for hobbing spur gears, spline shafts, helical gears, worm wheels, etc. A high speed head which is special equipment provides a cutter spindle suitable for thread milling and the wide range of gear ratios available through the change gear train makes it a practical machine for the milling of worms. In many shops it is desired to produce a worm and a worm gear but the quantity does not warrant the installation of both a hobbing machine and a thread miller. In such cases the thread milling feature of the gear generator is found useful.

### Ring Type Thread Milling on Shafts

Fine pitch threads, that is, threads with a pitch of less than ¼ inch (four or more threads per inch) are milled with ring type cutters. Fig. 17 depicts a few male threads of this description on parts that are held between centers, while Fig. 18 illustrates the method of milling these threads.

It will be noted that the cutter is a gang of cutters made in one piece. It is termed a "ring type" cutter because the teeth are arranged in rings, not in the form of a thread. These ring type cutters are frequently called hobs, but since they have no lead they are not strictly hobs.

As shown in Fig. 18, the entire length of thread is milled at one rotation of the work. In ring type thread milling the axis of the cutter is set parallel with the axis of the work. The method of operation is the same as milling with a single cutter, but it is only necessary to rotate the work a trifle more than one turn instead of one turn for each thread. The cutter head is geared to travel one lead of the thread for one rotation of the work. Starting with the cutter in motion the operator engages the feed which starts the work to rotating and the cutter head to traveling; he next brings the cutter in to full depth; after the work has made one complete rotation he backs the cutter out and removes the finished work from the machine.

A comparison of Fig. 18 and Fig. 19 will make this operation clear. The operation shown in Fig. 19 is milling the smaller one of the two threads on an automobile transmission spline shaft. The larger thread is milled in the same manner on the same machine at a different setting. Should these two threads be of the same pitch the only adjustment necessary in going from one job to the other is to change the setting of the depth stop on the micrometer hand wheel. In going to a thread of much larger diameter a change would also be made in the speed of work rotation, for the peripheral speed of the work is the milling feed. In changing from one pitch to another it is necessary to change the cutter and to change the gears driving the lead screw which travels the cutter head along the bed of the machine.

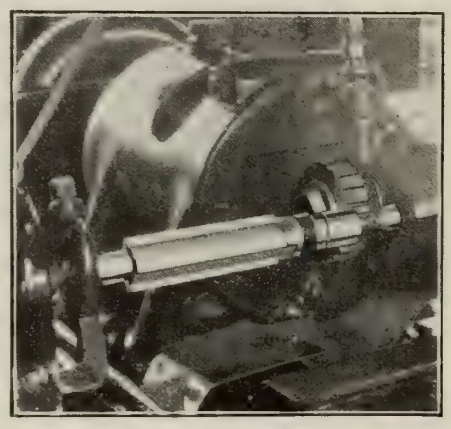


FIG. 19—MILLING A THREAD ON AUTOMOBILE TRANSMISSION SPLINE SHAFT.

The cutters employed are known as "ring type" cutters because their teeth are arranged in angular form, that is, in straight rings instead of in the form of a thread. The cutter shown in Fig. 8 is made in staggered form by the omission of each alternate tooth in each ring, but the common practice at present is to leave all of the teeth in. The distance between teeth measured parallel with the axis of the cutter is the same as the axial pitch of the thread to be cut. No correction is necessary for the difference between axial and normal pitch, for the axis of the cutter is set parallel with the axis of the work. There is a very slight difference between the pressure angle of the teeth in the cutter and the pressure angle of the resulting thread, but since this method is used on threads of relatively fine pitch and consequently of small thread angle, this difference is negligible.

The threads produced in this manner are extremely accurate and uniform results are easily obtained on quantity production. Thread millers of this type have been used in the manufacture of plug and ring thread gauges. These gauges were found to fit so closely that air holes had to be drilled to allow the mating gauges to be screwed together.

### Milling Multiple Threads With Ring Type Cutters

Fig. 20 shows an interesting application of ring type cutters to the milling of threads longer than the cutters. The cast iron drum shown is 9 inches in diameter and 40 inches long, threaded its entire length ⅛ inch pitch 1 inch lead. A ring type cutter with square teeth measuring ⅛ inch from center to center is employed on this job and the machine is geared up so that the cutter travels 1 inch for each rotation of the work instead of ⅛ inch which would be the case in cutting a single thread. At each revolution of the work the cutter travels 1 inch along the axis of the work so that the complete thread is finished in 41 revolutions of the drum. This method of threading may be compared with the cutting of a double thread worm or screw by the method shown in Fig. 3 but using a double cutter instead of a single cutter. If, for instance, we use a triple cutter on the job shown in Fig. 14 it would be possible to finish the complete thread at one cut, rotating the work as many times as the lead of the thread goes into the length of the thread. This, however, would necessitate the making of a specially formed cutter, which would really be three cutters in one. The central cutter would be the same as the one used in milling one thread at a time and the cutter would be so located on the cutter spindle that the center of the cutter comes at the point about which the cutter

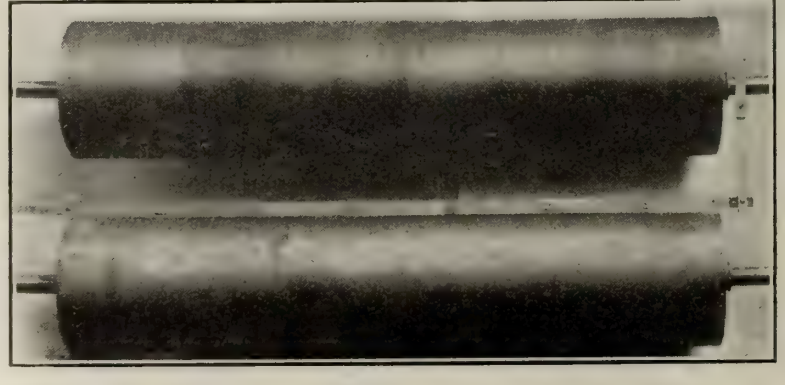


FIG. 20—THIS DRUM IS 9″ DIAMETER, 40″ LONG, AND THE THREAD IS ⅛″ PITCH, 1″ LEAD.

spindle swivels. The two outer cutters of this triple cutter would necessarily be of slightly greater outside diameter and the tooth forms would be such that all three threads would be cut the same shape. Single cutters are employed in milling multiple threads where the greatest possible accuracy is required and multiple cutters are used where production is of first importance.

### External Ring Type Jobs on Work Held in Chucks

All the parts shown in Fig. 21 are threaded externally with ring type cutters. These parts must be held in chucks or special fixtures of some sort which may be either hand or air operated. In some cases, as for instance the externally threaded ring nut shown in the lower right-hand corner, it is possible to thread more than one part at a time. This particular part is 6⅜ inches outside diameter and has a face of ¾ inch. Three of these parts are held in a special air operated chuck and the three parts are threaded at one rotation of the work spindle. This particular job is running on a standard L-B thread miller as shown in Figs. 15 and 19. The floor to floor time on the three parts is 4½ minutes, giving a production of 40 pieces per hour.

Any of the parts shown in Fig. 21 might be handled on either standard L-B thread millers or the collet type L-B miller. The choice between these two types would depend largely upon what other thread milling work it might be desired to handle on the same machine. The standard machine, for instance, handles work held between centers and is arranged to swivel the cutter spindle for use in milling worms and lead screws as shown in Figs. 12 and 13, while the collet type machine is, on the other hand, suited for milling internal threads on work held in chucks, but is not designed to handle work between centers or to tilt the cutter spindle for milling worms and lead screws.

### Internal Ring Type Jobs

Fig. 22 shows a variety of jobs that are best handled by the ring type method on the L-B collet type miller. These machines are built in a variety of sizes with various diameters of collet chucks and of holes through the work spindle. On this

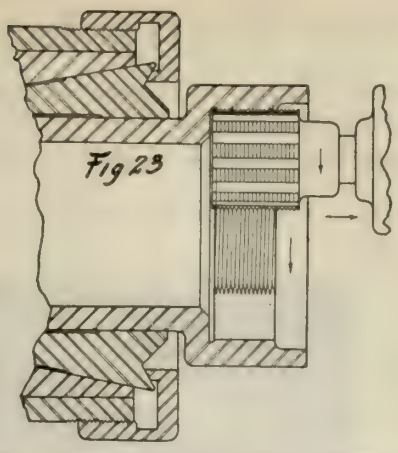



FIG. 23—METHOD OF MILLING AN INTERNAL THREAD.

type of machine the cutter spindle is fixed parallel with the work spindle and is adjustable only as to center distance between the two spindles and longitudinal position of the cutter.

The operation of milling an internal thread as shown in Fig. 23 is practically the same as the milling of an external thread as shown in Fig. 18. It will be noted that in milling internal threads it is necessary to back the cutter out of the thread and then withdraw it entirely from the work in order to remove the finished piece from the machine and place another piece in the chuck. This introduces the question of taking up back lash in the lead screw when the cutter is brought back to position to start a new thread. This is taken care of in an interesting manner. The lead screw which travels the cutter during the operation is carried on the carriage, while the movement of the carriage on the bed is controlled by the turn-stile at the front of the machine. It is only necessary that the cutter moves longitudinally a distance equal to the lead of the thread for each piece threaded. The cutter is then withdrawn from the thread by means of the micrometer hand wheel and the carriage is released so that it is free to travel along the bed of machine. The operator then withdraws the cutter entirely from the work by means of the turn-stile without disturbing the lead screw. When the new piece has been placed in the chuck the cutter is brought back to position, the carriage clamped again to the bed of the machine and the feed started at the point where it left off; thus there is no back lash in the lead screw or its driving mechanism to be taken up. The lead screw operates constantly in one direction and it is only after the entire length of the lead screw has been used up that it is reversed and the back lash taken out before the next piece is started.

Ring type cutters are designated as right or left hand according to their direction of rotation. This has nothing to do with the cutting of right or left hand threads except as it may be necessary to rotate the cutter in a certain direction in order to have the cutter feed away from a shoulder instead of toward it. In Fig. 23, for instance, the cutter is designated as "left hand" because it rotates to the left as viewed from the driven end. This designation is the same as employed for drills or reamers. This left hand cutter is, however, being used to mill a right hand thread. If a right hand cutter were used to mill a right hand internal thread it would be necessary to travel the cutter toward the work spindle instead of away from it. This would necessitate stopping the machine at the instant the thread was completed to avoid collision between the cutter and the shoulder at the bottom of the thread. With the cutter travelling away from the work as shown there is no possibility of accident if the feed stop is not set exactly, or the operator neglects his machine. No damage is done to the threads if the machine is allowed to run after the thread is finished.

### SEEK PROTECTION

Washington. — Legislation is being sought by American makers of Diesel engines to protect them against importations of this type of engine produced by foreign manufacturers at less than they can be made in the United States. The claim is made that unless sufficient protection is given either to greatly restrict or to entirely prevent importations, enough Diesel engines will be brought into this country in the next six months to equip all American ships that may be built in the next two years.

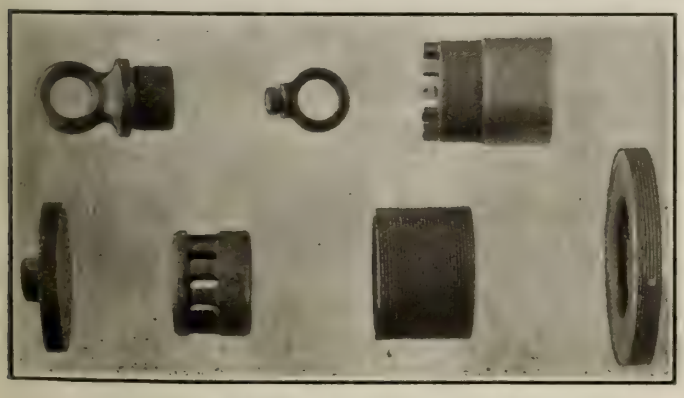


FIG. 21—EXAMPLES OF EXTERNALLY THREADED PARTS CUT WITH RING TYPE CUTTERS.

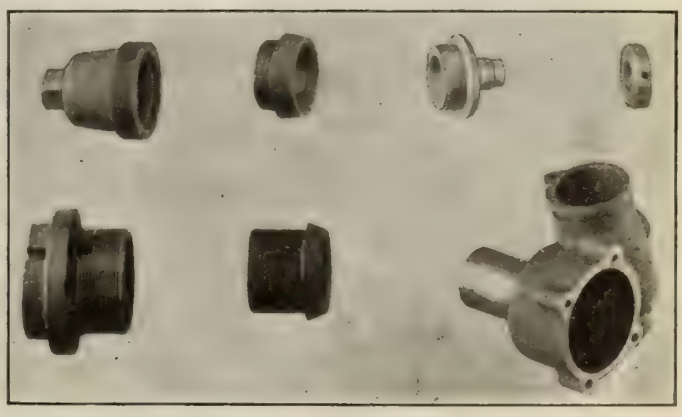


FIG. 22—SOME EXAMPLES OF INTERNAL RING TYPE JOBS.

# Machining Cast Iron Pump Body in 22 Minutes

## Pump is of Semi-rotary Type—Extreme Accuracy Necessary—Special Chuck Jaws Used—Taper Bore is Produced by Profile Method—Machining a Distributor Case for Gnome Aero Engine

By A. H. LLOYD, B.Sc., M.B.E.

CONTINUING our talk on Herbert turret lathe practice, from recent articles appearing in February 17th and March 24th issues of Canadian Machinery, we shall consider the tools used in machining a cast iron pump body. Fig. 1 depicts these tools. This pump has to be machined to a very fine degree of accuracy, otherwise it would not perform its work efficiently.

The large bore is tapered approximately 1½ deg. a side, and must be accurate in diameter and taper. The bottom face must be smooth and flat, and an exact depth from the front flange. There is also a small blind hole which serves as an end bearing for the rotor spindle. The sequence of operations is shown on the lay-out drawing at Fig. 2. The chucking is effected by means of a set of special jaws gripping through the solid metal at the bottom of the hole, and so minimising the risk of distortion. No. 1 is a centering tool for starting the drill. No. 2 is a twist drill. No. 3 combines two tools for rough facing the flange and the bottom of the large bore simultaneously. No. 4 is a standard turning head taken from a combination tool, which provides a very stiff and effective tool for rough boring the large hole parallel. No. 5 is a four-flute reamer which finish bores the small hole and squares the bottom. No. 6 is a pair of facing tools similar to 3 for finish facing—in addition to the production advantage of machining the two faces simultaneously, you have the advantage that the exact depth of the hole is assured after the cutters have been correctly set. No. 7 shows the method of producing the taper bore, which is done by a profiling method. The boring tool is mounted on a slide which can move transversely to the axis of the lathe. This is brought into position at the bottom of the large bore, and then fed into the work by a bracket on the back of the cross slide, which carries the taper former. The tool being fed into depth, the turret traverse is engaged in the reverse direction, and the profiling slide feeds away from the chuck. A spring in the slide and the pressure of the cut keep the roller on the slide against the former, the cutting tool therefore produces a tapered bore, the taper of which is governed by the inclination of the former. The former is arranged to swivel through a small amount to facilitate setting it up accurately. The machining time for this pump body is 22 minutes.

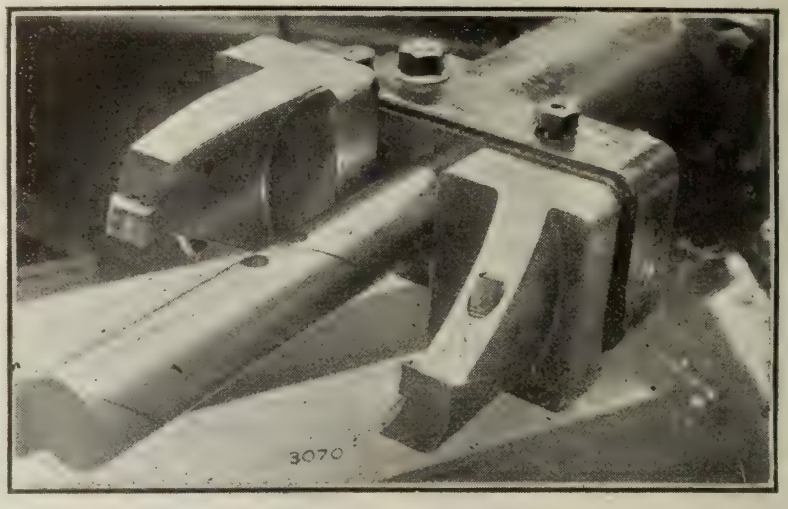



FIG. 5—CLOSE UP VIEW OF TREPANNING TOOL.

It has been said with regard to turret lathe work that the more difficult and involved it is, the greater is the economy which can be effected by the adoption of highly specialized tool lay-outs. The truth of this statement is very well demonstrated in the machining of the distributor case for the Gnome Monosoupape Aero-Engine, which is probably one of the most difficult, yet successful jobs which has been handled on a turret lathe. An idea of the shape of the piece will be seen at Fig. 3, which shows the set up for the first operation.

The finished diameter of the flange is about 14½ inches, and the overall length about 4½ inches. There is a counterbore 7 inches diameter, and an annular recess 10 inch bore, 1 7-16 inches wide, 4 inches deep, which necessitates a trepanning operation. In work of this

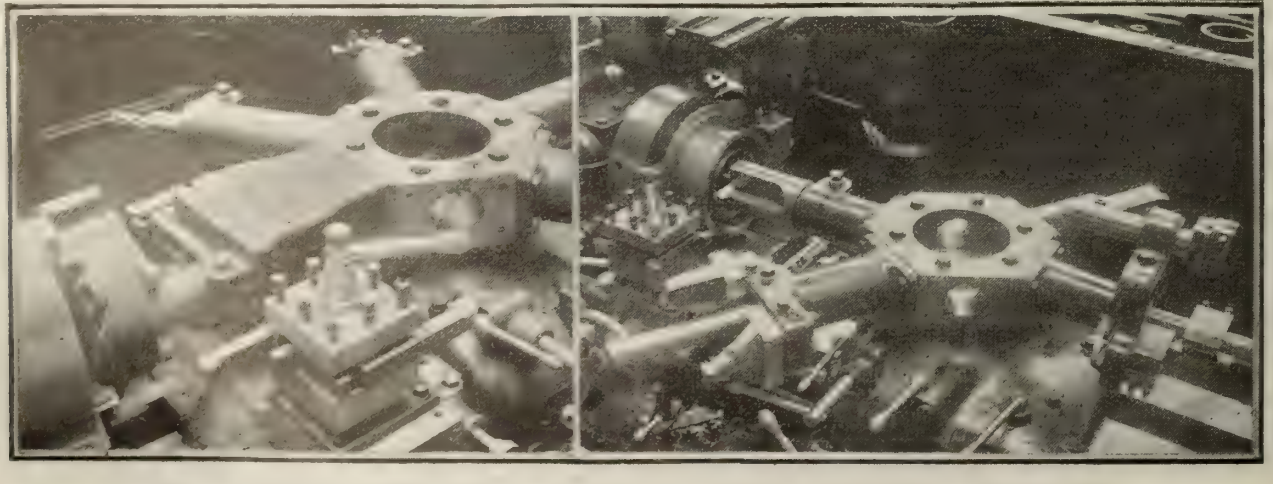


FIG. 1—LEFT HAND VIEW SHOWING SET-UP FOR MACHINING SEMI-ROTARY PUMP BODIES.
FIG. 3—RIGHT HAND VIEW. SET-UP FOR FIRST OPERATION ON DISTRIBUTION CASES.

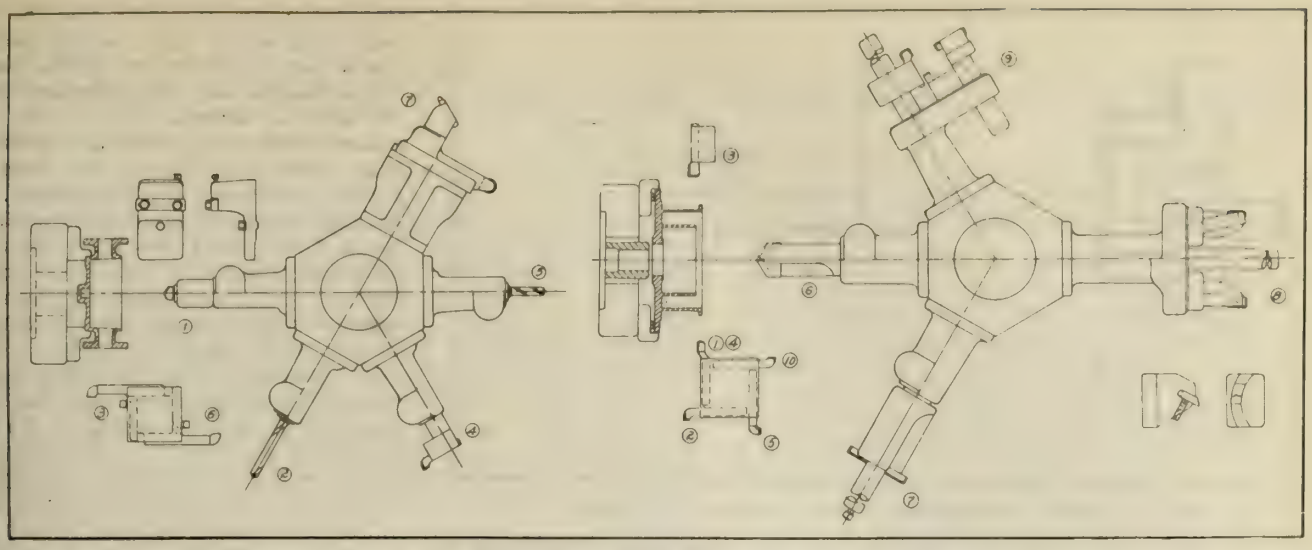


FIG. 2—LEFT HAND VIEW. SHOWING LAYOUT FOR SEMI-ROTARY PUMP BODIES.
FIG. 4—RIGHT HAND VIEW. LAYOUT DRAWING OF DISTRIBUTION CASES.

kind where the work is fragile and there is a large amount of metal to be removed, it is necessary, in order to avoid distortion in the finished piece, to rough out the work all over and then re-machine to finish sizes. In the work we have under consideration this method is used, and the lathe operations are four in number.

Fig. 4 illustrates the lay-out for the first operation, in which the forging is gripped on the large flange. The dotted line round the work shows the shape of the rough material, which is of high tensile steel, and the amount of metal to be removed. Tool No. 1 takes a rough cut along the small diameter of the forging as far as the flange. Tool No. 2 rough faces the large flange, the end, and also rough turns the bead. Tool No. 3 rough forms a gap behind the small flange to allow tool No. 4 to be used for rough turning the small diameter. Tool No. 5 then roughly forms the under cut below the bead. No. 6 is a straight flute twist drill with inserted spiral cutter, which drills right through the flange. No. 7 is a counterbore for opening up and facing the bottom of the large bore; a steady bush in the chuck is provided to pilot this tool.

No. 8 is without doubt the most interesting tool in the lay-out and is provided for trepanning the annular recess. We will consider this tool more closely presently. No. 9 is a combination tool carrying a pilot bar on which is mounted a collar with a facing cutter, taking the second cut in the large bore, and recessing the bottom of the hole. The second cutter faces the edge roughly to length, and a turning cutter takes a second cut over the small flange which is used as a location at the next operation.

### The Trepanning Tool

Fig. 5 shows a close up view of the trepanning tool. The cutters are inserted in two steel holders, bolted to a special flanged holder. The whole arrangement is piloted in the chuck by a substantial bar, and the fact that the cutters are balanced, liberally top raked, and substantially supported, enables a feed as coarse as 88 cuts per inch to be used. The trepanning tool, together with the counterbore used at the first operation, between them remove over 100 lbs. of metal. In the second operation, shown at Fig. 6, the work is clamped back on to a face-plate fixture, as shown. The tooling for this operation is of a comparatively simple nature. Tool No. 1 in the square turret is used to rough turn and face the flange and spigot, and also to rough face the boss. No. 2 is a standard combination tool which carries a boring bar for opening out the ball race and taking a second cut in the small bore. Attached to the combination tool is a special steel holder with a taper form tool for forming the bevelled side. In this case, the scale has been previously removed by a straight cut, and the surface can therefore be finished with a forming tool.

In the third operation, shown at Fig. 7 the work is chucked in exactly the same way as for the second operation, the surfaces corresponding to operation 2 are finished to size. No. 1 is a combination tool carrying a boring bar for taking a second cut in the ball race, and a form tool for finish facing the bevelled side. No. 2 is another combination tool with a boring bar for finish boring the ball race and facing to length. One of the turning heads carries a cutter for

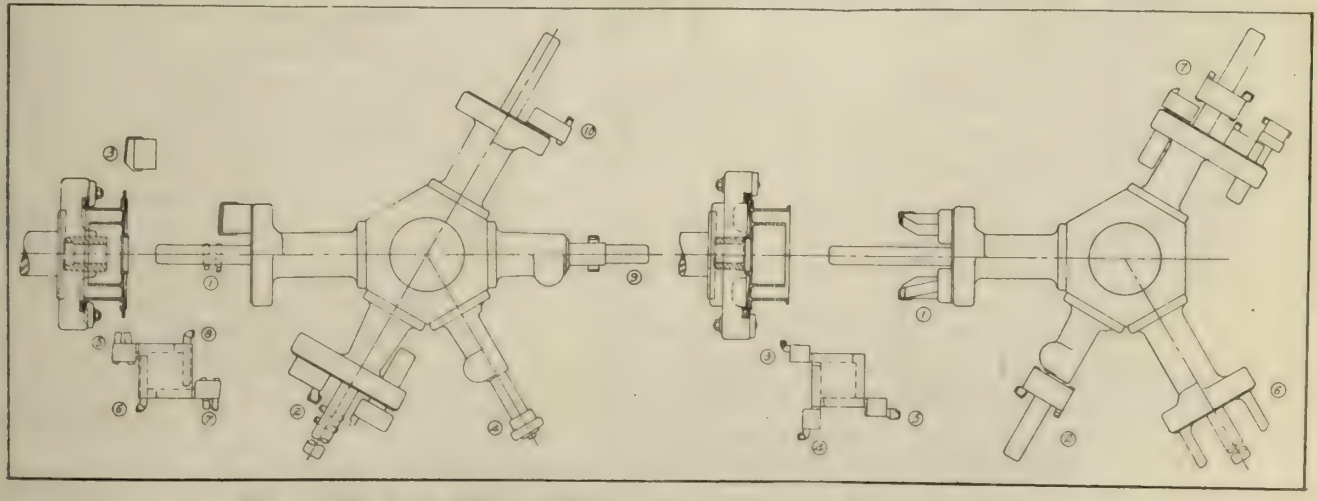


FIG. 7—LEFT HAND VIEW. SHOWING THIRD OPERATION ON DISTRIBUTION CASE.
FIG. 8—RIGHT HAND VIEW. FOURTH OPERATION ON THE SAME PIECE.

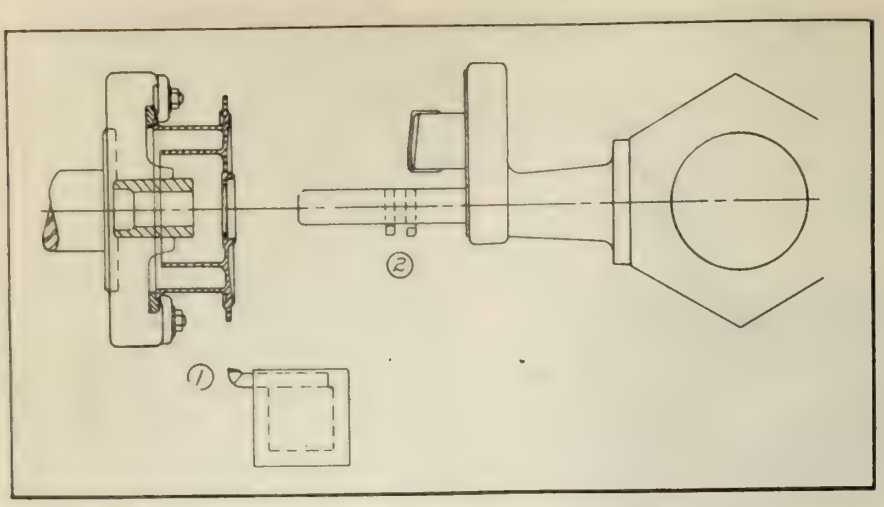



FIG. 6—SECOND OPERATION ON THE DISTRIBUTION CASE.

forming the radius on the boss, and another for finish facing the flat portion on the flange. The taper portion is formed by tool No. 3 mounted on the back cross slide tool holder. No. 4 is a revolving steady peg which is used during the cross slide operations. No. 5 is a duplex tool holder carrying two facing cutters which deal with the sides of the flange. It is necessary to finish both sides of the flange at this operation for the purpose of clamping at the next operation.

Tool No. 6 finish turns and faces the spigot. No. 7 finish faces both sides of the flange, also forms the outside of the beading. No. 8 forms the taper on the outside of the flange. No. 9 sizes the ball race diameter with a floating cutter bar which has been previously described. No. 10 sizes the spigot with a tool in the standard combination tool.

At this stage it will not be out of place to point out that it is advisable in designing faceplate fixtures to be sure that they are sufficiently substantial, so that when the work is clamped up, the fixture itself does not distort under the stresses introduced by clamping. In order to avoid excessive weight, the casting may be cored out from the back, but it should be strongly reinforced by radial ribs.

At the fourth operation a faceplate method of chucking is again used, and the surfaces corresponding to the first operation are re-machined to finished sizes. The tool lay-out is shown at Fig. 8. This view will give some idea of the proportions of the faceplate fixture. This locates from the spigot machined at the third operation. Tool No. 1 is the trepanning tool which is used at the first operation, but with another pair of cutters for finishing both sides of the annular recess. One cutter is set to do the turning and the other does the boring. Each cutter takes care of part of the facing of the bottom of the recess. No. 2 finishes the large bore and faces the edge to length. No. 3 in the square turret finish turns and faces the back of the small flange, and turns the portion in between the two flanges. No. 4 takes sizing cuts on these surfaces. No. 5 finish forms the taper below the bead and a portion of the radius on the bead. No. 6 takes sizing cuts on the inside and the outside of the annular recess with single point bars. No. 7 is a combination tool carrying a boring head with cutters for sizing the large bore and forming the radius on the boss at the bottom of the hole, sizing the small flange, finish facing the edge to length, and chamfering the large bore.

The total machining time for the four operations on this piece is 7 hours, which, having regard to the large amount of metal to be removed, the accuracy required, and the fragile nature of the work, was considered good production when compared with previous methods.

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**Plant Sold.**—The blast furnace owned by the Atikokan Iron Co. and others at Port Arthur has been sold. The city of Port Arthur, which is a shareholder in the furnace and property, ratified a resolution to dispose of the plant for $1,000,000. Two hundred thousand dollars is to be paid by the purchasers within four years and the remaining $800,000 at the expiration of the four-year term. Two months ago the Atikokan Iron Co.'s mine, said to be one of the biggest producers in the district, was disposed of to Duluth interests. It is understood that the furnace at Port Arthur will be operated in connection with the mine.

# *DATA PERTAINING TO SPHERE*

The surface area of a sphere is equal to 3.1416 times the square of the diameter. Four times the area of one of its great circles. It is also equal to the convex area of its circumscribing cylinder. Surfaces of spheres vary as the square of their diameters.

The volume of a sphere equals .5236 times the cube of the diameter. Also one-sixth of the surface area multiplied by the diameter. Volumes of spheres vary as the cubes of their diameters.

To find the volume of the segment of a sphere.

From three times the diameter of the sphere subtract twice the height of the segment, multiply the difference by .5236 times the square of the height. Or, add the square of the height to three times the square of the radius of the base, and multiply the sum by .5236 times the height.

Example: Diameter of sphere equals 20 inches, submerged to a depth of 7 inches.

Surface area $3.1416\ D^2 = 3.1416 \times 20 \times 20 = 1256.6$ sq. in.

Volume in cu. ft.

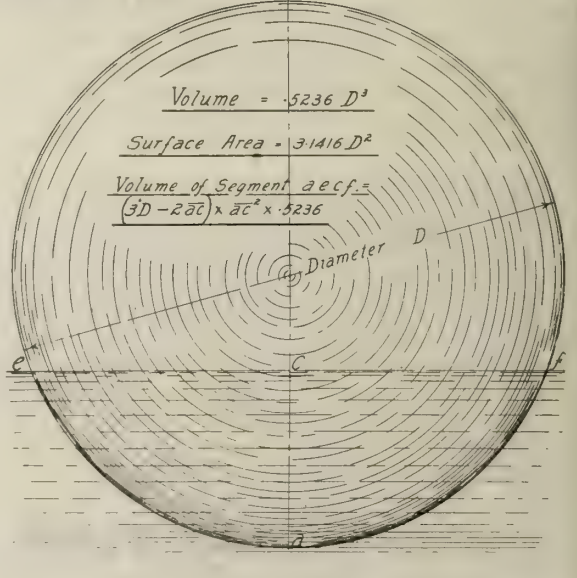
$$= .5236\ D^3 = \frac{.5236 \times 20 \times 20 \times 20}{1728} = 2.424 \text{ cu. ft.}$$

Volume of segment when (a c) equals 7 inches.

$(3\ D - 2\ ac) \times (ac)^2 \times .5236 = 46 \times 7 \times 7 \times .5236 = 1180.2$ cu. in.

Weight of water displaced $= .03617 \times 1180.2 = 426.9$ lbs.

Weight of one cubic inch of water equals .03617 lbs.




*Canadian Machinery*

# Improve Your Powers of Perception—Try This Contest

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.




The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

## What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

Only one reader submitted a correct list this week, John McNaughton, Westville, N.S., being the scale winner. Questions 2 and 12 were the ones that caused the trouble. Look at these advertisements once more and you'll see why Mr. McNaughton was correct.

**CONTEST FOR APRIL 28TH ISSUE**

**Contestants are required to write us, stating to which advertisements we refer in this number.**

1—Something that is never behind.
2—How to secure accuracy and a high production rate.
3—Something that is full of practical ideas.
4—A case where you get full value for your money.
5—An example of work worth while.
6—A case where writing, phoning, or wiring, obtains the same result.
7—Something that has proved entirely satisfactory.
8—A product that is made in one piece.
9—Something that you can rely upon on every occasion.
10—Something that is not new, yet is guaranteed.
11—A product said to fit any make of machine.
12—Something that is easily connected.

**These are Correct Answers for List from April 7th Issue:**

1—The Cleveland Twist Drill Co.
2—J. G. Blount Co.
3—H. H. Robertson Co., Ltd.
4—Puro Sanitary Drinking Fountain Co.
5—The Aurora Tool Works
6—D. K. McLaren
7—The Hendey Machine Co.
8—Ford-Smith Machine Co., Ltd.
9—Madison Mfg. Co.
10—National Electro Products.
11—Geometric Tool Co.
12—J. H. Williams & Co.

## Closing Date for This Contest is May 19th

# Milling an Automobile Clutch Shifter Yoke

ROBERT MAWSON

DURING the past few years more attention has been given and experiments made in regard to milling operations than ever before. Present-day competition, which calls for the reduction of manufacturing costs in every line, has made this necessary. The earlier types of milling fixtures were designed to only hold one or two elements, and when these were completed it was then necessary for the operator to stop the machine to unload and reload the fixture. It is easy to see that this meant a loss of valuable time, for when the machine is stopped no parts are being produced. The ideal condition, therefore, would be to arrange the machine with a fixture so that it could be run continuously. Much thought has been given to this subject, and in the present article are shown various fixtures designed for continuous milling.

The illustration, Fig. 1, shows a fixture for milling motor frames used on automobile starters, these pieces being made of cast iron. The operation shown is that of milling the base, and the fixture is designed to hold twelve pieces. The castings are first placed on a stud, which passes through a cored hole at right angles to the surface to be machined. An open washer is then slid over the outer surface of the casting and back of the serrated nut, this being next tightened up by hand. This forces the piece back against a stop pin at the rear of the tool. Between each pair of motor frames it will be observed there is a fixed steel wedge, and on the other side is a sliding wedge. The lower end of this element is made with a notched ledge or shelf, into which is pushed the hook bolt as shown. On the thread of the bolt is placed a shouldered pin nut, and after the bolt and nut have been swung into the position, the operator merely tightens the nut, when the sliding wedge is drawn down.



FIG. 4—DETAIL OF THE CLUTCH SHIFTER YOKE.

The action exerted by this wedge is to force over the casting against the fixed wedge. It can easily be seen that the two mediums of holding, the hand nut in front, and the wedges on top, enable the operator to secure the casting very rigidly against the strains exerted by the cutter. The operator stands in front of the machine and as the finished parts come round he removes them and replaces with rough castings, thus making the milling continuous.

The interesting operation of milling a large casting by the continuous method is shown in Fig. 2. This is an automobile differential gear housing and weighs 40 pounds. The fixture is designed to hold two castings and these are placed in such a position that the operator can replace a finished part with a rough casting without stopping the machine. The casting is located by means of a large plug, which fits into the cored hole through which the drive shaft enters. This plug is fastened to the wall of the fixture, thus affording a fixed locating medium. Two other stops are provided, one at each outer end of the housing. The reader may see one of these by referring to the illustration at the left immediately behind the housing not being machined. The milling operation is performed with the large inserted tooth cutter shown. With this tool set-up 22 castings have been machined per hour. The former method could only realize a production of nine per hour.

The illustration at Fig 3 shows a two spindle vertical milling machine and fixture used for machining automobile connecting rods, the fixture being designed to hold ten forgings. The tool is made with fixed steel tapered block, against which the small end of the rod is placed. The large end of the forging is located in a fixed steel vee block on one side, and half a fixed steel vee block at the other side, at the large end of the rod. A special clamp is next fastened in position, and as this is made with open washers to slide under the bolt the clamp is quickly placed. It will be observed that the clamp is made with a contour of half a vee-block, thus locating and holding the large end of the rod securely. In the centre of clamp is placed a wedge, and as this is slid across the clamp it forces out a steel block against the small end of the rod, this in turn pushing over the small end of the rod against the fixed block. The two ends

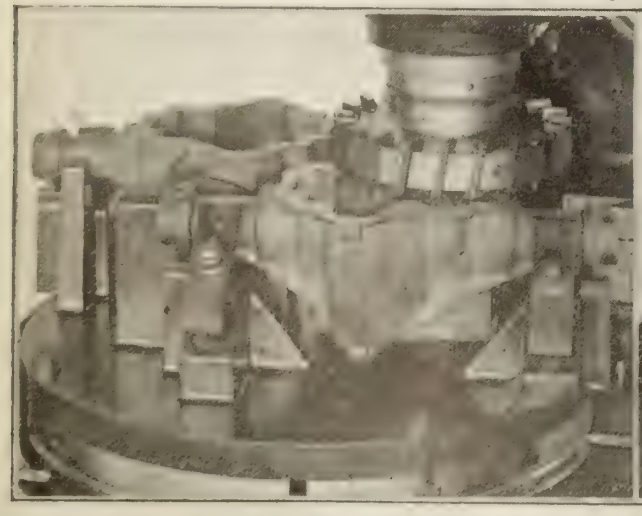


FIG. 2—MILLING DIFFERENTIAL GEAR HOUSING.

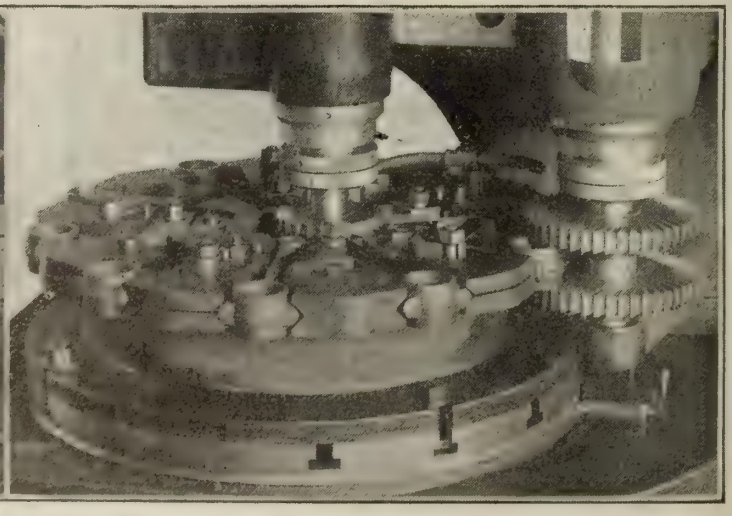


FIG. 3—MACHINING TEN AUTOMOBILE CONNECTING RODS.

of the rod are milled at once, using two sets of gauged cutters accurately spaced, and 90 complete rods can be obtained per hour.

The machining of the element shown in Fig. 4 is of interest, this being a clutch shifter yoke, also used on an automobile. The fixture designed for this work is illustrated at Fig 5. The forgings are placed into the fixture, being located for height by resting on adjustable pins at the lower end; this ensures that the surfaces machined will be in the correct location. The stems of the shifter rods, which have been turned in a previous operation, are located in vee-blocks at both ends, and the U parts of the forgings are placed between two pins to bring the pieces into the proper relative position to suit the cutters. The clamps are then tightened down, as shown. Four surfaces are machined on each forging, the cutters being properly gauged to obtain the correct spacing between the machined bosses.

It will be seen that the machine has been provided with a supporting arm at the lower end of the cutter arbor. This is a very useful addition, as the head is some distance away from the cutters owing to the construction of the fixture, and, further, the material removed is larger than under ordinary conditions where the arbor is only held above. With the arrangement shown the production obtained was 195 complete shifter yokes per hour. These examples will illustrate to the reader the great field yet open for experiment in continuous milling. It will be noticed that the fixtures required are not elaborate and that the increase in production soon offsets any expense that the investigations may require.

## SLEEPING CAR FOR TRAILER WORK

The latest use of the trailer is to adapt it for sleeping and eating accommodation for crews of workmen engaged in line-construction work for the Pacific Telephone and Telegraph Co. in California.

A train of trailers affording comfortable and sanitary living quarters for 35 or 40 men is drawn from place to place by a motor truck as construction work progresses or the work-gang is moved. Each train is made up of two sleeping cars, one combination sleeping car and office for the engineers and superintendent, one dining-car and a combination water-tank and tool car. The motor truck which draws the train of five trailers is detached on arriving at the scene of operations and used for hauling materials, etc. All the trailer chassis are of 2 tons capacity and the bodies are of railway type, 8 feet wide, with sliding windows. Length varies from 12 feet to 24 feet, the longer trailers having reversible or double-end steering control.

## COLORING STEEL

A hot mixture of 1 part black oxide of manganese and 10 parts saltpetre by weight will, according to Mechanical World, act as a good medium for coloring steel articles. The mixture should be heated in an iron pan set in a brick furnace using gas, oil, hard coal, or coke as fuel, and stirred with an iron rod before inserting the piece or pieces to be treated. The temperature may be gauged by immersing a pine stick, which should char without firing instantly. The piece should be moved up and down in the mixture until the desired color is obtained, then washed in hot soda, finishing off in hot water. The quality of the black finish this affords depends to a great extent on the finish of the work. If the articles are hardened, the heat of the mixture will draw the temper somewhat, but it may be restored by finishing off in cold water.

## SPRING MEETING OF A.S.M.E.

The 1921 spring meeting of the American Society of Mechanical Engineers is to be held in Chicago May 23-26 at the Congress Hotel. Well developed programmes will be presented by the professional divisions of the society devoted to Forest Products, Fuels, Machine Shop. Management, Material Handling, Power, Railroad, and an important session will be devoted to Training for Industries. The Chicago committee, jointly with the Western Society of Engineers, is preparing a session on "Chicago as the Rail-Water Gateway."

Visits to a number of points of engineering interest in Chicago will be arranged. Special attention is being given to the correlation of plant visits with the technical sessions. En route to the meeting, the society, jointly with the Society of Automotive Engineers, will stop at McCook Field on Saturday, May 21, for an inspection of the facilities of the field. On May 27-28, the Friday and Saturday following the meeting, a joint excursion with the Army Ordnance Association will proceed to Rock Island Arsenal, where the ordnance division will present papers and enjoy an inspection of the plant.

The programme of the Machine Shop Division at these meetings will be devoted to the effect of the automobile industry upon machine tools and machine shop practice. Four important phases of this subject will be discussed by Henry J. Eberhardt, secretary of the Newark Gear Cutting Machine Co.; Henry J. Hinde, president and general manager, Toledo Machine & Tool Co.; R. E. Flanders, manager, Jones & Lamson Machine Co.; C. B. Lord, works manager, Advance-Rumely Co.

## GASOLINE INDUSTRIAL TRACTOR.

The Barrett-Cravens Company of Chicago, Ill., has recently developed a small heavy-duty industrial tractor capable of carrying a load of 3,000 pounds, and made in a variety of styles to suit the needs and conditions of the different factories. The motive power is derived from a gasoline motor located in the front part of the machine. The drive is transmitted from the engine by means of a straight-line propeller shaft equipped with two universal joints. One casting encloses the rear shaft and the differential gearing, the latter being driven by means of a bronze worm. The wheels are cast solid and designed with invisible hubs to avoid contact with door frames or other obstructions. Wheels are provided with Timken roller bearings. Bumpers are provided at both ends of the machine.

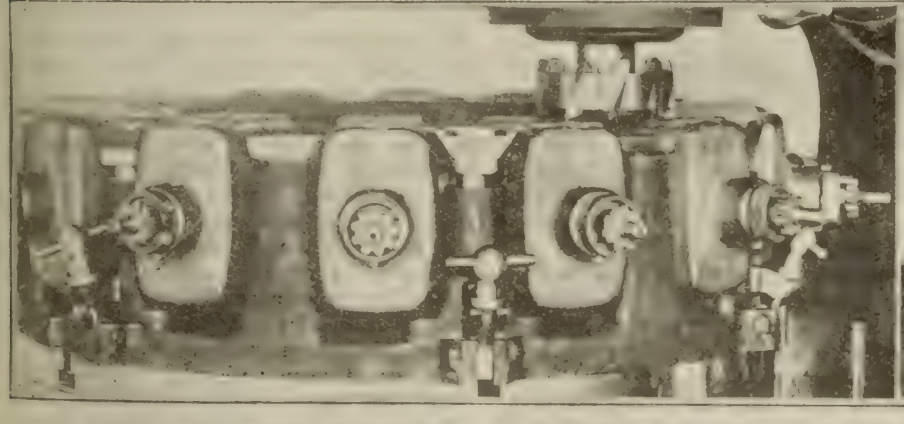


FIG. 1 -MILLING MOTOR FRAMES FOR AUTOMOBILE STARTERS.

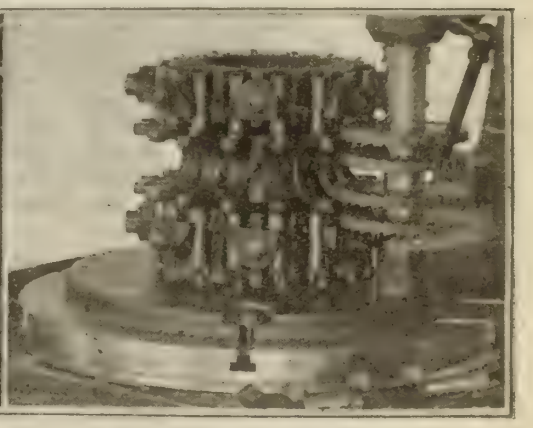


FIG. 5 -FIXTURE USED IN MILLING YOKE SHOWN AT FIG. 4.



# WHAT OUR READERS THINK AND DO



## THE MONOTONY OF MASS PRODUCTION

By JOHN S. WATTS

AS the mechanical arts advance, additional types of automatic machinery come into being. With this has been inculcated what is known as scientific management. In fact work has been pretty well reduced to the point where the fight for production should be tempered with an attempt to relieve the monotony of mass production.

It is readily conceded that the economy resulting from manufacturing in large quantities is too great to allow us to return to the slower individual methods, nor would anyone in an executive capacity assert tha the modern method of subdividing the work into operations that are repeated continuously does not become monotonous after, say, six months. Yet one cannot very well keep changing operators, for this would result in lower output, and an increase in spoiled material, not to speak of possible damage to the machines through lack of knowledge.

It is also well recognized that the higher the intelligence of the operator the quicker he will rebel against doing monotonous work. To those who perhaps do not agree with me as to monotonous tasks, let me suggest the following: Make rows upon rows of similar figures over and over again. Do not stop to sharpen pencils. Work only with prepared pencils. It will surprise you how soon you tire of the task. Better still, if you have a gang of men working for you at some set operation, take the place of one of these for a few hours, and you'll soon agree with me as to the monotony of it. What then is the solution?

To overcome the monotony by changes in the work, or in the operation, must, perforce, militate against the efficiency gained by the standardization of the work, but it is possible that even so this may be the best solution, and, if so, the point to be aimed at would be to make the changes just sufficiently frequent to make the monotony bearable, thus balance the efficiency lost in changing the work against that gained in retaining the trained operator. In practice this would most easily be accomplished by training each operator to do a number of operations, changing them from one operation to another whenever their efficiency began to fall off through the discontent engendered by the sameness of the work.

To change the method of doing the work would be difficult on operations other than hand operations such as assembling. But it would seem that if an operation has been subjected to a motion study, and the exact motions specified for the operation are followed consistently that the muscles used would from constant repetition of the same action become tired quickly, and that, even from the standpoint of the motion study expert, it would be better to have more than one set of motions laid out, then the operator could change from one to the other from time to time, bringing into action another set of muscles, at the same time relieving the monotony to some extent.

The above covers in a general way the possibilities that are open in the way of changes to the work of the operation, without departing too far from the essential requirements of repetition work.

Let us next take up the question of relieving or counteracting the effect of the monotony by some influence outside of the work. To determine what may be possible on these lines, we would do well to study those things which we do for pleasure, although some part of these things may be monotonous. Take walking. In itself it is a most monotonous thing, being a repetition of the same motion, just as the best examples of scientific motion study. Nevertheless this exercise is about the most universal form of amusement we have.

Analyzing the reasons why walking, though monotonous, can become a pleasure, we find that it is mainly because of what is to be seen during the walk, the pleasure being in the continual change of scene, and the expectation of what is to be seen. The performance of repetition work in a factory under scientific management is analogous to walking through a tunnel in its psychological effects, and the cure may be found in making this work analogous to walking along a pleasant country road or a busy city street.

The fact that we are able to control our muscular actions, as in walking, while at the same time using other of our senses to enjoy the sights, proves that we can think of more than one thing at a time. We may say, then, that it is possible for us to do work, which is simple in itself and calls only for a repetition of the same motions, and which can be controlled by one portion of our brains while the rest are idle, or enjoy some other sensation.

That class of work which requires the whole skill and intelligence of the worker, while being repetition work, cannot be monotonous, as its demands for continual concentration to overcome the difficulties arising furnish sufficient excitement to keep away the feeling of monotony. In fact, it is only that class of work which does not require the use of a fair percentage of brain power which is monotonous.

The operation of automatic machinery, or the execution of work by methods specified by motion studies, is monotonous, because as little as possible is left to the skill of the operator, and the less use that is made of his brains the more successful is considered the operation. Therefore the more we succeed along the lines of scientific management, the more monotonous will the work become.

It would seem necessary therefore to find some means to give this excess idle brain power pleasurable stimulus from outside. I say from outside, because to

### HOW ABOUT THIS?

*Has this story impressed you favorably or otherwise? We want readers' views on this subject, but request that replies be kept as brief as possible. Boil down your suggestions so that we get the real cream of the idea. It is perhaps not generally known that in some tobacco plants in Florida the monotony question has been thought over carefully with the result that a system is installed whereby a competent reader sits upon a raised platform and reads popular novels to the operators, while they are busy on their monotonous tasks. Judging from some of the popular novels we have read, we are of the opinion that this would not help to relieve the monotony—but why go further, for we are tempted to start what Mr. Watts terms a satirical criticism of the system—and yet it has brought wonderful results as far as we can learn.*

leave it to the operator to furnish this stimulus from within himself is to invite disaster. This can easily be proved by a simple experiment, involving the doing of simple work, such as that of a draftsman section lining. This work used up only a small part of his thinking capacity, and if the section lining continues over a large surface, he will infallibly begin to think of other things to keep it from getting monotonous, frequently with the result that he becomes so engrossed in the secondary matter that he fails to control properly the section liner and makes some foolish mistake. Having to furnish some interest from outside the operator, it must obviously be done through one or more of the five senses with which we are endowed, namely, sight, taste, touch, smell or hearing.

The first, sight, is, of course, absolutely necessary. The second, taste, does not appear to hold much prospects of helping us, as it is obviously impossible to be using it continuously without danger of upsetting the digestion of the operator. It would anyhow be too expensive to feed chocolates to our machine operators, and, on second thought, we find that the operators have tried this themselves, the male ones by chewing tobacco, the females, gum, apparently with some good results, since they continue the practice, but with insufficient results, however, to answer our purpose, since it evidently does not entirely overcome the feeling of monotony. To encourage a still greater indulgence in chewing would be injudicious, as it has been known for operators, under sudden stress, to swallow their chew, with disastrous results to themselves and to the efficiency we are aiming for.

The sense of touch, like that of sight, is practically used up in the actual operation being performed, and is therefore not available for other purposes. That of smell holds possibilities, inasmuch as it is entirely dormant, in most operations (outside of a tannery), but to have a flower bed just outside the window is possible only in summer, and to have a spray of perfume descending upon a disgruntled worker does not appear to me as though it would cause a change for the better in his disposition, although I confess it would be very interesting to watch the effect of unexpected showers of varying perfumes on the operators, from a safe distance, of course.

We have left the sense of hearing, which is generally little used in the actual work, and is therefore available for our purposes. To attempt to use this sense by giving speeches or other spoken entertainment would demand too much attention on the part of the operator and need not be argued at length. The only distraction left is that of music, either vocal or otherwise, and it would seem possible to arrange, where the noise of the machinery itself was not too great, that something might be accomplished along this line, the point to be aimed at being to have the music just sufficiently varied and interesting to take up attention enough to relieve the monotony, without distracting it too much from the performance of the work in hand. That human nature itself seems to point to this as the desired outlet for its superfluous energy is indicated by the tendency to whistle or sing on the part of almost everyone when engaged in some simple, easily performed task. This whistling at work is an unfailing indication of the progress of the work, as when you hear a man whistling you may know he is progressing easily, but let him strike a difficulty and instantly he ceases to whistle and puts his whole mind to the solution of the problem before him and will not recommence his song until the difficulty is overcome and plain sailing is before him again. The action is automatic, the whistling ceasing precisely when its need ceases and recommencing whenever required, without in the least unduly distracting the attention from the work in hand.

When we come to think it over, we find that the military have used this idea for a long time, by having their own bands accompany the regiments on their marches. In the European war when it was impossible to have the bands accompany the soldiers, it was found a great help to start the soldiers singing when the tedium of a large march began to tell upon them. If, then, we had a leader, human or mechanical, to lead in the singing or whistling, whichever appealed to the individual operator, each one would naturally, without thought, join in, or drop out, just as the demands of his work upon him required, and sufficient variety be injected into the day's work to relieve the strain of monotony.

I strongly appreciate the possibility of someone writing a very humorous satirical criticism of the above, indeed I must confess to an insistent temptation to do it myself, as the possibilities of a really funny skit on this proposal are too good to lightly pass over.

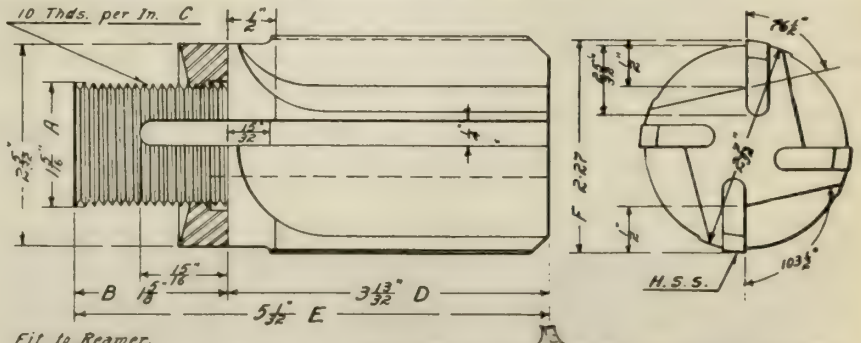
Nevertheless I put forward the idea, in all seriousness, as one that holds the solution of what is becoming a serious problem.

# Reamer Data

An inserted blade reamer, to be a success, must be rigid. After many experiments, here is the type of reamer adopted by the International Harvester Co., Ltd., at Hamilton, Canada. As will be noted, certain proportions are adhered to, and the construction in itself is rather novel.

For efficiency in milling of blade slots, the washer as shown was made. Previous to that, the slots could not be milled far enough to allow the blade to sit down correctly, but now the slots are milled slightly farther than necessary and the washer on assembly takes the thrust of blade. A study of this style of reamer will well repay mechanics in general.

*By J. H. Moore*




INSERTED CUTTER SCREW SHANK REAMERS

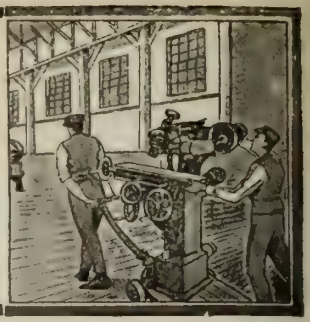
| A | B | C | D | E | from F to | No. of Flutes |
|---|---|---|---|---|---|---|
| 1" | 1 5/8" | 12 | 3 1/2" | 5" | 1 3/8" 1 1/2" | 4 |
| 1 1/8" | 1 5/8" | 12 | 3 1/2" | 5" | 1 1/2" 1 3/4" | 4 |
| 1 5/16" | 1 5/8" | 10 | 3 1/2" | 5 1/4" | 1 3/4" 2 1/4" | 4 |
| 1 1/2" | 1 5/8" | 12 | 3 1/2" | 5 1/2" | 2 1/4" 3 1/2" | 6 |

*Canadian Machinery.*

HERE WE HAVE CONDENSED INFORMATION OF REAL VALUE. CLIP THIS OUT FOR FUTURE REFERENCE.



# DEVELOPMENTS IN SHOP EQUIPMENT



## SPLIT BELT PULLEY.

The S. K. F. Co., Ltd., Toronto, Canada, have placed on the market a line of new split belt pulleys which have some special features well worth mentioning. These pulleys are made in sizes from 8 inch to 60 inch diameter, these having a difference of 1 inch up to 24 inches, of 2 inches up to 40 inches, and of 4 inches up to 60 inches diameter.

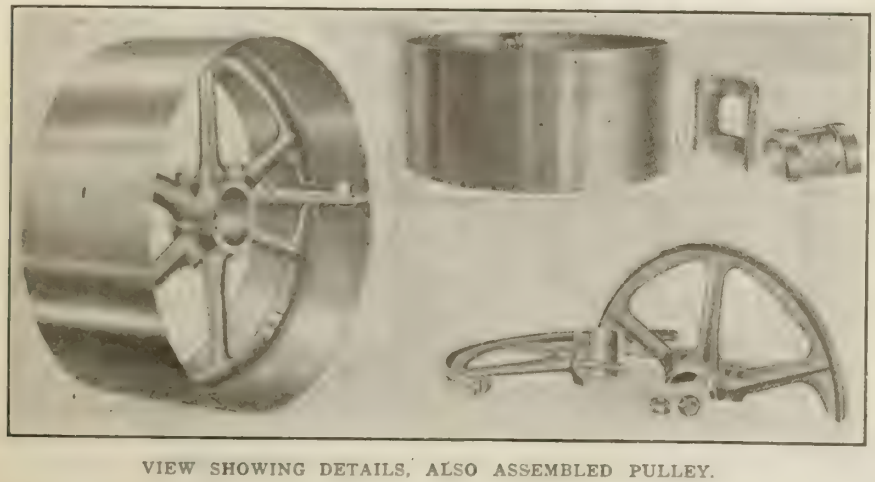
Standard interchangeable rims are made in widths from 3 inches to 9 inches, increasing by 1 inch for pulleys with single spyder, and with flat or crowned faces. For belts of greater width, pulleys having two spyders are made with rims 11 inches, 13 inches, 16 inches, in one width, and with flat face only.

Reference to the illustration tells the story in itself. As will be noted, the pulleys consists of the following parts: A cast iron spyder made in two similar halves is provided with suitable fastening bolts. These halves are machined to receive interchangeable shaft bushes, or S.K.F. ball bearings of the adapter type as necessary. The periphery of the spyder is machined and a groove cut to receive the snugs (as they are called) formed in the rim by press tools, this, of course, preventing lateral movement of the rims. The adjacent ends are notched to locate rim balance weight.

The rim is made from suitable quality steel to withstand high tensile strength, and is finished by cold rolling. The ends are flanged and pierced to receive the two stretching bolts. A balance weight of sheet iron is placed within the rims when assembling, and is located by notches as already mentioned. No shaft keys are required on this style of pulley as they are intended for line shaft drives to machines or main drives to line shafts from electric motors.

The chief feature in this pulley is the interchangeable rim. Its advantage is self apparent, for rims up to 9 inches wide are interchangeable with those of lesser width on the same spyder and bush where necessary. Intermediate drives to line shafts, up to 2½ inch diameter, originally installed for continuous driving, may be converted for intermittent use by the substitution of a wider rim with flat face on the driving pulley, and the addition of a second driven pulley with crowned face, into which may be inserted ball bearings of the adapter type to carry the belt as a loose pulley.

It might be imagined that the adoption of the bushing system without keys would limit the use of these pulleys to light duty drives. However, this is not the case, for the company claims that they recommend with confidence these pulleys for main drives which are reasonably steady, such as those from electric motors to line shafts, driving machines in groups where a main belt is working at 3,000 feet per minute, or more; for instance, a line shaft speed of 250 r.p.m. transmitted through a pulley 48 inch diameter. It is, however, in the case of line and countershaft pulleys, where these pulleys will find their greater scope.



VIEW SHOWING DETAILS, ALSO ASSEMBLED PULLEY.

## DRILL GRINDING MACHINE

The Bickford-Switzer Co., 50 Norwood Street, Greenfield, Mass., has recently placed on the market the drill grinding machine as illustrated. This machine is intended for the sharpening of twist drills from ⅛ inch up to ¾ inch diameter. Drills can be ground commercially perfect at considerable speed, according to this company's literature, and it is said that a drill ground on this machine will not cut more than .002 inch larger than its own size. One minute only is required for setting up and grinding. The drill is held in a chuck, and by turning a crank is given a combined rotative, eccentric and swinging motion. The two lips are brought consecutively in contact with the wheel, with the result that when one lip is sharpened or ground to a certain point, the other is also. The grinding is said to be always central and true with the axis of the drill. The shank end of drill is held by means of a cup center, while the front end is held by two jaws which locate and grip the body of the drill.



DETAIL OF THE DRILL GRINDER.

The abrasive wheel is enclosed in a guard, and driven directly by means of a

mall electric motor, which can be furished for either direct or alternating urrent. It can be fed towards the drill, eing sharpened by means of a small andwheel.

After clamping the drill in place in the huck, the carriage on which it is mount-d can be moved toward the wheel by neans of a hand-lever moving horizonally. The crank at the left is then urned, so as to produce the necessary notion of the drill. In this way the oint of the drill is ground and sharp-ned. The mechanism is arranged so hat it is also possible to bevel off the enter corners of the cutting lips, it be-ng stated that this method increases the endurance of the drill.

### SAFETY PRESS GUARD

Kartzmark and Sons, Hamilton, Ont., have placed on the Canadian market a new press guard known as the Kartzmark safety guard. This guard, although well known in the States, has never been brought into Canada until the present time. Various firms on the other side have them in use at present.

The illustrations shown herewith show its general characteristics. The guard works with the press. At the downward movement of the treadle of the press, the guard moves down. It must go down all the way, that is, it must go down and settle over the block of the die, for the latch on the guard remains locked until it does. As will be noted in one of the illustrations, the operator's hand upon the block locks the latch we speak of and halts the hammer. In this way the careless operator receives nothing worse than a slight squeeze for his carelessness.

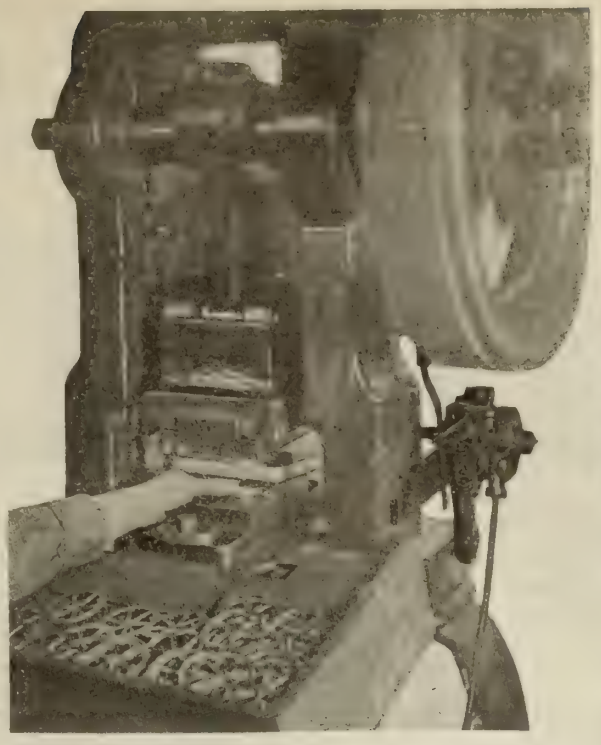
It is stated by the manufacturers of the device that production is not deterred through the use of the guard, but 15% to 35% additional work has been obtained in many cases. The positive self-guarding features and mechanical construction of this guard are fully protected by suitable patents.

### BALANCING AND DRILLING MACHINE.

A combined balancing and drilling machine has been added to the lines manufactured by the Rockford Tool Company of Rockford, Ill. It is designed for the final balancing of crank shafts and flywheels after they have been assembled. The same fixture may be used for similar operations where the flywheel is carried on an arbor or mandrel. In the latter instance the drill passes through a bushing in one of the standards which guides it to the work. Ball-bearing spindles are provided for the balancing discs, which are made of hardened steel. The machine can be arranged for belt or motor drive.

### SHAPER GUARD

The Lang Manufacturing Co., Guelph, Ont., have placed on the market a shaper guard as shown in the accompanying illustration. This is known as the Whetstone guard, and it is for use on all classes of woodworking. The fixture requires only one hole in the work table, and is said to give the worker absolute protection against the revolving knives. The guard has a swivel arm as shown, and can be adjusted to any angle, at the same time holding down the stock securely. The fixture is equipped with a roller of rubber for finished stock, also with a shoe for working on long stock.



SHOWING HOW THE PUNCH CANNOT INJURE THE HAND.



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# CANADIAN MACHINERY
## AND MANUFACTURING NEWS

Published in the Interests of the Machinery, Manufacturing, Iron, Steel, and Metal Working Industries.

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## The Rate of Wages

IT is, perhaps, only natural that labor should make a fight to maintain wages that were paid during war years.

The trouble that is being experienced to-day in readjusting wage schedules to conform with to-day's conditions is the price we are paying for ever allowing war work to get on a money-grabbing basis.

Once a man gets his wages on a higher level, he brings up his home conditions—and when there is danger of this increase being taken away, he has the backing of the home to a large extent in resisting such a move.

A man who is employed has only one thing to offer for sale, viz., his labor power. It makes no difference in what capacity he comes. He may prefer the word "ability" or "services" to "labor power," but it is a distinction without a difference.

He sells his labor power according to the market value, the same as any other commodity is disposed of. If the market is in his favor, then he is in a seller's market and can get his price. If his commodity, labor, is a drug on the market, then it is a buyer's market, and the man who has labor to sell ceases to be in a position to dictate either figures or terms.

There may be some exceptions to these rules, but they govern the great majority of cases.

To-day the buyer of labor is in control of the market and he has to regulate the price he can pay in accordance with the price at which he can sell his finished product in the lowered markets of the world.

We are all subject to certain economic laws and little is to be gained by trying to make ourselves imagine they have ceased to operate.

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Every speaker of any prominence who assays to discuss public affairs has told us what is wrong with our National Railways. And summed up, the address runs like this: "The C.P.R. is a well managed affair."

## An Evening Well Spent

HAVING answered the questions in the weekly contest in Canadian Machinery, an official of one of the leading machine tool firms in United States writes: "Your contest is all that you claim, and it proved to be not only interesting, but constructive as well, which no doubt is a view taken by many of your readers. Your magazine afforded me many hours of interesting reading and it was not until I had read every article that I decided to try the contest. I considered it an evening well spent."

## A Need of the Times

SELDOM has such a straight and accurate analysis of conditions been presented as that contained in an address by James S. Alexander, president of the National Bank of Commerce in New York. Addressing the National Association of Cotton Manufacturers at Boston, he made use of the following:

"Too many people to-day hope and expect something will be done for them although their interests would be best served by their doing a full day's work for their pay. There is an effort on the part of workers to retain the advantages won during the abnormal war period of shorter hours, higher pay and easy work, regardless of the present lack of an economic basis for the continuance of such conditions. The fundamental principle of enlightened labor leadership to-day should be to inculcate a return to the doctrines of an honest day's work for an honest day's pay. Inflated wages and the non-competitive conditions of the war and the later boom period produced inefficiency and irresponsibility.

"It is essential to the welfare of labor itself to banish this attitude, not because individual efficiency and a full return of value received in the pay envelope mean bigger profits for the employer, but because they mean better times for the workers themselves. Workers cannot, in the long run, consume more than they produce. If wages are too high in relation to the exchange value of the product, wages must come down, for no wage can be permanently maintained at a point above what it is worth measured in terms of other products.

"Further, employers must not seek to drive wages below their true value thus measured. There is this reciprocal personal responsibility involved in the relation of workers and employers,—on the one hand to render efficient service for every dollar demanded, on the other to render over to labor every dollar earned."

Not only is there a responsibility for employers and employees, but also for merchandising business in general. Without the active co-operation of retailers to quickly give consumers all possible advantage of lower prices, it is going to be a hard matter to make wage adjustments on a fair basis and unless they are made on such a basis, they are going to be neither satisfactory nor permanent.

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## Some Good Issues Coming

MAGNETIC chucks will be discussed in an interesting article in May 5th issue of Canadian Machinery. The particular consideration will be their application to surface grinding. The magnetic chuck is coming into its own in the mechanical field in a way that would surprise and amaze the old-timer.

Then in the issue of May 12th, roller bearings in industry will be featured. This is a matter that should be of particular interest to executives generally.

An expert in the business is furnishing the leading article for May 19th, which will deal with the method of gear shaping automobile gears. Various fixtures used in doing this work will be shown.

Every issue has something of direct interest to the practical shop man.

## EFFICIENT FOREMEN GREAT HELP IN RUNNING THE SHOP

**Mechanic Needs to Have a Good Training and Education to Live Up to His Opportunity**

By N. W. K.

"WHAT is the greatest problem you have to face in the management of your plant?" I asked Mr. Kenneth Dunn, superintendent of the McClary Mfg. Company.

"The difficulty of obtaining good foremen," was the immediate reply. "And what I mean by good foremen are men who are fully trained, both technically and as executives—men who can figure on estimates and costs, understand time chart principles—in other words, men who can be relied upon to administer their different departments efficiently."

Mr. Dunn went on—"The trouble with the average foreman of to-day is that his early education has been sadly neglected. That's not the man's fault. It's the fault of the educational system. By far the greater number of to-day's foremen started to serve their apprenticeship at very immature ages, many of them just at the age when they should have been developing their brains instead of their arms.

"You know, I am a firm believer in every boy being fitted for life with a proper education. Every boy should have at least a few years in high school. A great many of the things we learned in high school were looked upon by us at the time as unessential, especially," he continued, "subjects like Latin, Greek, algebra and numerous other studies so irritating to the average boy. But in reality subjects of this sort are splendid brain food and teach a boy to think for himself, a faculty with which every man must be endowed if he is to go far in the industrial world to-day.

"The manufacturer of to-day wants as foremen men with brains who know how to apply them. Keen business competition demands this. Every effort is being made to cut down costs and excessive costs are in the main due to inefficient methods and wastage of material, due to ignorance on the part of the employees. Now it's up to the superintendent to see that a plant is run economically and efficiently, but where he has many different departments in his care he must depend on his foremen and if these fail through lack of education to keep their end up, well, something's going to happen."

"Do you think an intelligent reading of technical books and papers would go far towards solving the trouble?" I asked.

"Well, yes, to a certain extent," he replied. "Personally, I'm a great believer in technical papers and subscribe for a great number. What I have in mind, however, is an improvement even on the technical paper. Some of the most prominent American universities, such as Yale and Columbia, are strongly advocating the training of promising workers in the various branches of industry who will later develop into good executives. This matter has received the co-operation of many of the leading American manufacturers, who are sending some of their more promising workers to these universities, where special courses of study in executive and higher technical training are given. I am firmly of the opinion that this will become a regular practice with our own Canadian manufacturers when such courses take their place on the regular curriculum of Canadian universities."

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"Iron Age"—Workers at many iron and steel plants have accepted reduced wages; lower prices have been named on many iron and steel products. Farmers have seen the prices of their products decline until all profit on their 1920 crops has been wiped out. Both manufacturers and wage earners in many lines are now looking to the railroad workers to accept such reductions as will make possible a lowering of freight rates and aid in the readjustment for which the whole country is waiting.

## A Man of Many Parts

IN an appreciation of the late C. E. Duncan, general superintendent of the Algoma Steel Corporation, appearing in "The Algoman," of Sault Ste. Marie, is the following:

"To many, Charlie Duncan was a formidable man, a man hard to meet, hard to talk to; they feared him. But humanity being the peculiar characteristic of all great men, he was an eminently human fellow—in fact a great big boy, in heart. True, he was gruff and abrupt, at times; his was a rapier tongue in repartee; he was a great judge of human nature and a great manager of men; he knew the steel game from top to bottom; he detested subterfuge and camouflage; it was useless to try to resort to such with him. They wouldn't pass muster. He knew all the tricks. The only way to corral his interest and goodwill, was to go absolutely straight with him. Then he became your backer and friend and champion against all comers.

He dearly loved a fight, even for the fight's sake or to try out the mettle of a subordinate and he well nigh despised any one who feared him. He told the writer an incident illustrative of this, some weeks before he died. He said that, once, he had had occasion to give a department head a "raking over the coals" about something. This latter felt very badly over it and came to his office almost in tears, to explain the matter. "Do you know," he proceeded, telling of it, "I'd have thought ten times more of that chap if he had burst open my office door, thrown his hat on the floor, jumped across my table and bearded me, saying,—'See here, Duncan, d—— you, what do you mean by jacking me up this way?'"

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## Using the Bulletin Board

THE use of a bulletin-board as an educational feature is a valuable asset when utilized in a common-sense way and without fear or favor. At a time when business conditions make changes in the plant necessary much of the fear of these changes may be removed by the right kind of explanation on the bulletin-board. J. H. Lloyd, in "The Iron Age," comments as follows:—

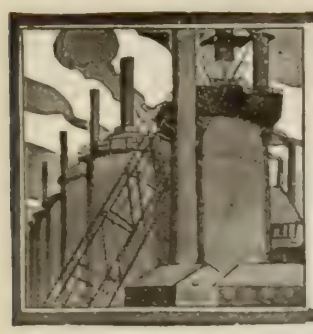
"Within six months after bulletin-boards were placed in a forge shop every one of 155 men was converted to bulletin-board principles. Increased production resulted, and there was a material decrease in the consumption of fuel oil, fire brick, light, and so on. At the end of every month letters from the assistant manager, showing what had been accomplished in cutting costs, were posted on the bulletin-board, so that all could read them. A bulletin-board exerts the same power that a newspaper does."

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WRITING to the Brantford Expositor recently on "What Is Brantford's Greatest Need," A. B. Muir, of the Goold, Shapley & Muir Co., says: "Brantford's greatest need at the present time is for the farmers to stop holding off from buying the implements they are in need of, with the expectation of a big drop in agricultural implements. Generally speaking, manufacturers have been hit hard the past few years by the great increase in raw materials and wages, not being able to increase their prices in proportion. Most of the farmers have made their old machines hold out longer by repairing. Perhaps a number borrowed their neighbor's and some rented others. This is the chief reason for the slump in employment and industrial stocks at the present time."

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ON the front cover of Canadian Machinery is a little "Read and Pass On" table that is becoming quite popular in a number of shops where the paper is send from one department to another. Very often one member of the staff will see an article that he knows will interest some person in the organization—it probably contains information he should have. The little "Pass On" table makes it easy to send this on through the office mail in the usual way.



# MARKET DEVELOPMENTS



## Only One Recognized Steel Market is Left Now

### Prices Have Been Equalized, And it Seems Certain That There Will Be No Change For Some Months to Come—First Month In Second Quarter Shows No Marked Change

THE first month of the second quarter has passed, but there has been no noticeable change in business in the iron, steel and machine tool market. There are lines where the new prices of steel will not be felt for some time to come. Implement makers, for instance, will in many cases not be using the lower priced steel until well on in 1922, as they have a lot of stock on hand to be worked up and also a large supply of machines made up but not sold. Many other industries are situated similarly.

Canadian steel merchants are not finding any difference in their bookings since the new prices came into effect. There seems to be a feeling that the schedule will hold for some months to come and from this there is no doubt more strength to the market that will have a tendency to keep prices from sagging, but there is still a lot of material on hand that merchants are anxious to clear out at whatever they can get for it. Buyers are always keen to try and build market values around a cut price that may have very little relation to actual conditions at all.

Machine tool trade is quiet and the bringing out of quite a lot of used equipment is not helping the sale of new machines.

An official of the largest firm of scrap metal dealers in the Dominion puts forward an interesting claim for his business this week. He remarks that fully fifty per cent. of the dealers have gone out of business during the past few months and adds: "There will be no improvement in business until there is an improvement in the scrap metal trade. Iron and steel will not move well until the iron and steel scrap lines have started to rise. The same will hold true in regard to copper. It has happened in every period of this nature before. Coming events cast their shadows before, and they fall in the scrap yards. Watch and see," he concluded.

## VARIED REPORTS COME OUT ABOUT CONDITION OF TRADE IN MONTREAL

Special to CANADIAN MACHINERY.

MONTREAL, April 28,—The steel situation in this district has steadied considerably following the adjustment of prices by the United States Steel Corporation. There have been no pronounced signs of increased buying, but the added confidence that has been created by the knowledge that price quotations have become more uniform will probably have the desired effect upon the trade. There is no definite assurance that prices are as low as they will go, but it is almost certain that no further reductions will be made for some time.

"One thing that has developed as a result of the lowering of prices by the Steel Corporation," said a dealer here, "has been the establishment of fixed prices on many lines of commodities. The range of quotations that prevailed a few weeks ago has practically disappeared, as nearly all the independents have adopted the figures set by the Corporation. We tried to purchase a lot of plate from a mill that a couple of weeks back were quoting around $2, but were advised that the price was now $2.20. Reports seem to confirm the belief that the Corporation's quotations on plates are now quite general." When asked as to the possible period through which this new price list would be effective, the dealer would not commit himself. "We would not care to make a prediction as to the duration of these quotations, but it is reasonably certain that no material change will take place for some time. The labor question is still unsettled and this is the pivot on which conditions swing. The new price quotations may be based on premeditated action regarding labor, and if so, prices may remain unchanged even after labor is cut; but on the other hand, it would not be surprising to see a further decline before midsummer."

Apart from slightly increased inquiry the market has not been affected by the developments in the States. Dealers here state that the motor trade is more active and that sales have increased to some extent, but general demand for other lines remains unchanged.

#### Machine Tool Inquiry Improves

The varied remarks of dealers as to the business being carried on makes it difficult to define, with any degree of accuracy, the present status of the machine tool situation. The statements range from "very dull" to "the best week we have had this year." These conditions, however, could be likewise qualified, particularly the latter, as the "best week" might be considerably below what would be thought normal for this time of the year. Apart from the actual receipt of the orders, there appears to be a better tone regarding the summer's business.

"We have had some good inquiries," remarked a dealer, "and are expecting that they will be followed by business very soon. We have disposed of quite a bit of wood working machinery and construction equipment during the past few weeks. Metal working lines are not very active but a fair volume is still moving."

#### Non-Ferrous Lines Back

Aside from the fact that scrap quotations on non-ferrous lines have been revised upwards, after a couple of weeks at what might appear ridiculously low prices, the market has developed nothing of exceptional interest. The low prices quoted brought few inquiries owing to the fact that the trade is not buying and producers of scrap have little available material. The dullness of trade at the present time makes price a secondary consideration. Scrap dealers look for a quiet period throughout the summer, and do not anticipate any marked change

until steel industry in general becomes more active. Dealers are quoting 8½ cents on light copper and from 10½ to 11 cents on other grades. Medium brass has returned to 5½ cents per pound. Steels are quiet with few changes. Machine cast iron is quoted locally at $22.50 per ton, and car wheels at $25 per ton; these are the only changes.

## MOST ORDERS ARE FOR SMALL AMOUNTS

**Scrap Markets Have Only Half the Dealers That Were In a Few Months Ago**

TORONTO.—The machine tool trade moves slowly. In some places one hears reports of a better month's business than was done during the same period a month ago. None of these claim anything big in the way of sales or prospects, and at best they are running well behind the showing of last year.

If business is going to come as a result of the salesmen going after it, there should be some returns shortly. Anything that looks like a prospect is being cultivated to the fullest extent, and the chances are that any known prospective buyer knows more about machine tools now than he ever did before, that is if he has given a hearing to all the men who have started in his direction.

Fortunately the warerooms in this district were not carrying much stock when the recent reductions in prices were made. During the last year or so of the war, and for a year after, it was almost impossible to place a stock order for any of the well-known makes of machine tools, the makers insisting that dealers should be supplied only with bona fide sales shipments. While this seemed a poor condition at the time, it has since worked out for the best, as dealers have not had the trouble of having to dispose of high-priced machines after the makers have announced reductions.

The sale of small tools is limited to actual needs. In some cases dealers are hardly getting the trade that would come in the ordinary way. There are several shops that have close working connections with others, and supplies are shipped from one to the other, in order to make available supplies last as long as possible. An anxiety to get high-price tools worked out may also have something to do with this habit.

Carbon drills are in demand in many of the orders that are going through now, which means that the turnover of the dealer is smaller owing to the lower price of the carbon as compared with high-speed. For instance, half-inch carbon drills are selling at $1.86 against $7.35 for high-speed in dozen lots.

### Steel Markets Spotty

Steel merchants differ in the reports they have to offer about the business that is being done in their warehouses. Some of them have made good progress in the work of getting rid of their stock, while others are still busily engaged in selling off. It is this practice of clearing out that makes it harder than usual to state market figures that will be found correct under all circumstances. Some of the warehouses that find a chance to get rid of a large tonnage in a line they do not wish to handle will give a close figure in order to move it out. In other cases the stock, which was taken in when dealers were glad to get anything that looked like steel, is not up to the standards in the way of size and length. A close price is not a market price, but it is remarkable how these few low prices that have been given are carted around the market, and what publicity and prominence they receive. The fact that one lot of bars was sold in this market at 3.40 was picked up by the writer at a number of points. As stated before in these pages the new market for bar mill material must be built around 4c., and it is difficult to see how, having regard to new prices and present costs of doing business, a profitable trade can be done at a lower figure.

Orders continue to be small in the steel warehouses. Perhaps the limit was reached when one of the yards sent out an order that weighed four pounds.

### Gets Some Business

Another warehouse had advertised a certain line in several papers, and followed this up by a circular letter. A few days after a salesman started out to follow up in the next step, and a certain amount of business rewarded the effort.

Still another dealer, commenting on this, says: "It takes more than a low price to close the business just now. The low price can pretty well be taken for granted. Any salesman who goes out now is empowered to name a low figure, but it takes real selling plus the low price."

Some of the merchants from the steel market have found out that during the pressure of a year or so ago some of the smaller industries, when they had an opportunity to buy, took on a much larger tonnage than they can get away with now with business moving on a much lower scale.

### Number Dropping Out

A representative of one of the largest scrap metal yards in the Dominion is authority for the statement that about 50 per cent. of the scrap metal yards in the country have gone out of business during recent months. "Only the well-established yards can stand such a period as we have been going through, and there is nothing to indicate an improvement. The scrap metal market must improve before other lines do. This may seem to be a queer statement, but it is an absolute fact, and anyone who watches markets over a period of years can prove that it is so. Until the prices of iron and steel scrap strengthen you are not going to see an improvement in the lines into which these go. Until the copper market gets better you are not going to see an improvement in the lines into which copper goes. Coming events cast their shadows before, and they fall right in the scrap yard. Watch and see," was his parting advice.

## POINTS IN WEEK'S MARKETING NOTES

**Pittsburgh reports that the whole steel market is now equalized as both the Corporation and independents are quoting the same prices.**

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**The independent steel mills are rolling about 40 per cent. of their capacity now against 32 in March and 30 in February.**

—

**Small tools are moving slowly just now. Some English made drills are selling below the Canadian-made article.**

—

**The process of clearing out stocks in the steel warehouses is still going on and a good many sales are made at prices that do not reflect actual market conditions.**

—

**The scrap metal market continues poor. It is estimated that at least 50 per cent. of the dealers have gone out of business during the last six months.**

—

**The largest dealer in scrap metals in Canada makes the interesting claim that there will be no improvement in the iron and steel business until there is a strengthening in iron and steel scrap prices.**

## PRICES HAVE HELD BUILDING BACK

**Cleveland Prospects May Change After the Matter of Wages Comes to a Showdown**

CLEVELAND, April 27.—One reason for the slump in American business is the high building labor cost, and the refusal to lower the same. The Cleveland Street Railway employees took a reduction of 20 per cent., in fact they volunteered to put this into effect, but the building trades are holding out, and May 1 will see the climax when present contracts expire.

The following are some of the rates now in effect on some of the trades:

Plumbers, steamfitters and electricians, $1.39½ per hour.

Carpenters, bricklayers and steel contractors, $1.25 yer hour.

Hod carriers and laborers, $1 per hour.

Cleveland has through sheer necessity completed this last year some large office buildings, five theatres, and also has several under construction. Other than from sheer necessity nothing has been built since 1916, but after the fight on May 1 there will be a revival in building and conditions will improve.

# INDEPENDENTS HAVE PICKED UP AND ARE RUNNING AT BETTER RATE

Special to CANADIAN MACHINERY.

PITTSBURGH, April 28.—Practically the whole steel market is now equalized as between the Steel Corporation and independents, as both parties are quoting the same prices, and the market may also be considered stabilized since there is very little chance that in the near future the Steel Corporation will reduce its prices farther or that the independents will cut prices.

Steel prices are now quotable as follows:

| | |
|---|---|
| Billets | $37.00 |
| Slabs | 38.00 |
| Sheet bars | 39.00 |
| Small billets | 39.00 |
| Forging billets, f.o.b. Pittsburgh or Youngstown | 42.00 |
| Rods, Pittsburgh | 48.00 |
| Bars | 2.10c |
| Shapes | 2.20c |
| Plates | 2.20c |
| Hoops | 2.75c |
| Wire | 3c |
| Wire nails | $3.25 |
| Standard steel pipe | .....62½ per cent. basing discount |
| Blue annealed sheets | 3.10c |
| Black sheets | 4c |
| Galvanized sheets | 5c |
| Tin plate | $6.25 |

### The Steel Corporation

As to the future of prices, it is plainly the present policy of the Steel Corporation not to reduce its prices farther, until conditions change fundamentally. The Corporation would hardly reduce prices farther without reducing wages, and it does not desire to do this, at least at present. There is a possibility that it would be disposed to reduce wages after two adjustments now in abeyance are made, these being wages and working conditions on the railroads and in the building trades respectively. However, even at that the Steel Corporation might modify its wages considerably without furnishing a basis on which a reduction in its selling prices could be predicated, because it contemplates at some time eliminating the twelve-hour day, though not necessarily by replacing it with a straight eight-hour day as carelessly assumed and commonly reported, and in that way incomes of men might be reduced without the wage cost of producing steel being made less. The Corporation has absorbed several large items as it is. The Industrial Board prices of March 21, 1919, being regarded as fair, the Corporation has:

(1) Absorbed the wage advance of February 1, 1920.

(2) Has absorbed the freight rate advances of August 26, 1920.

(3) Has absorbed the recent reduction made in its selling prices from the Industrial Board schedule.

### The Independents

The independents are in no mood to indulge in another crusade of price cutting, for several reasons. The recent cutting, from about the beginning of February to the early part of April, did not bring them much business, and it is plain now that there is not a great deal of business to be had, not enough to give them an economical operation. If they had a light operation at present prices and could get a full operation by cutting prices slightly it would pay as their costs would be greatly reduced, but the additional business, if any at all additional could be secured, would not give them enough lower cost to justify the concessions. This is the theory, one that all the independents subscribe to now, but, of course, it does not follow that the independents will never cut prices again. They may become restive after a time, or suspicious of each other.

### Manufactured Steel

Some manufactured steel products, made from the regular rolled steel products of the mills, have lately been reduced, and a little summary may here be given, the following prices being those now accepted as representing the market:

| | |
|---|---|
| Standard railroad spikes | 3.30c |
| Small spikes, ½, 7/16 and ⅜-inch. | 3.65c |
| 5/16-inch. | 4.25c |
| Boat and barge spikes | 3.85c |
| Track bolts | 4.50c |
| Cold finished steel bars | 3.10c |
| Cold rolled strip | 5.50c |
| Button head structural rivets | 3.50c |
| Cone head boiler rivets | 3.60c |
| Chain, 1-inch proof coal | 6.35c |

Some of these prices are more or less in keeping with the prices of the rolled products from which they are made, but others show much larger percentage spreads above the raw material than obtained before the war. That is probably true of the majority of things made from steel, so that the ultimate buyer, who is the real consumer, does not get the full benefit of reductions the steel mills have made. While the steel mills never think of criticizing their customers in a matter of this sort, it is obvious that the actual consumption of steel, if to any extent it is regulated by the price the consumer must pay, is not entirely subject to the dictation of the steel mills, in their making of prices at which they will sell their products. In some quarters outside the trade, including some banks and John Skelton Williams, former controller of the currency, there has been criticism of the steel mills for not reducing prices, on the ground that the steel producers could broaden the consumption by reducing their prices. This criticism, it will be seen, is not altogether well directed.

### Orders

The independents seem to have corralled a fair-sized lot of business as they were withdrawing their old prices and advancing to a somewhat higher level, and this is giving them a somewhat better operation for a time, say an average rate for the independents as a whole of about 40 per cent. of capacity, against about 32 per cent. in March and 30 per cent. in both February and January. Since prices were equalized the independents have booked very little fresh business, and they are hardly likely to just at present, considering particularly the fact now developed that in some commodities the extreme prices done were much lower than the prices commonly quoted. Before the readjustment, for instance, carload lots of black sheets were quoted at 3.75c and carload lots of galvanized at about 4.75c, but it is now admitted that sales were made at many dollars a ton below these figures. The buyers involved, therefore, will hardly be in haste to make additional purchases at the 4c and 5c prices now being quoted.

As to the Steel Corporation, it is booking very little absolutely new business, and does not expect to do so. Its business must come in the form of releases against orders previously suspended, and in specifications against old contracts, the Corporation having reported 6,284,765 tons of unfilled obligations as being on the books March 31. Thus far not much increase in releases and specifications is reported, but some is to be expected. The Corporation operated at 40 per cent. of capacity or a shade less in the past two weeks, and it is quite possible may get up to a 50 per cent. operation within the next two or three weeks.

### Pig Iron and Coke

Bessemer, foundry and malleable iron remain quotable at $25, valley, there being no new developments. Last reported transactions in basic iron were at $23, valley. Lately several producers, particularly steel works, that had been quoting $23 have gone up to $25, but there appears still to be some $23 iron offered. Demand is very light. The rumor that the Sharon Steel Hoop Co. has just bought 5,000 tons of basic at $22.50, valley, is wholly without foundation. The company did not buy and was not even in the market. The United Alloy Steel Co. has had an inquiry out for 10,000 tons but is hardly expected to buy any tonnage.

# BELIEVES PRESENT MARKET IS ABOUT AS LOW AS COSTS PERMIT

IN a recent issue of Iron Age, H. H. Pleasance, of the United Alloy Steel Corporation, has an interesting letter dealing with practices in the steel market, and making some rather pointed comments on market tendencies. The letter follows:

So much has been said and written on the subject of the immediate future of the steel business that consumers have been awaiting the recently announced price schedule with unusual interest. Their future business depends fully as much upon the stability of the steel market as does the steel business itself.

If the consumer could only realize that the last schedule published really brought prices down to the lowest possible level and a safe one for the rest of the year little attention would be paid to current pessimistic rumors preparing for a big midsummer slump. The industry as a whole has adjusted itself as far as it can, at least until the present surplus of steel scattered all over the country is used up. How can we possibly expect normal business unless there is an immediate realization of the present schedule as equitable for the year 1921?

Just as soon as a sale is made that is below the present schedule everybody jumps to the conclusion the market has gone to the dogs. You who undertake to keep the country posted on market prices jump at the chance to tell the public that the price has already been shaded. The real facts are never brought out. Very frequently sales are made of material that has been held in stock for a long time. The analysis may be somewhat out of line and the producer offers it at a figure merely to liquidate his inventory. At that moment this new price is published, and the consumer becoming fearful of the shadow, crawls into his hole until winter is over. He persists in assuring us he too can buy at prices of his own making.

This process cannot be eliminated but it can be reduced. We all realize this is a buyer's market, but is the buyer growing fat on his price reduction propaganda? We claim not. He will realize it, too. But will he wait until we are in the midst of the worst slump we have yet seen—probably—unless we unite to stop it? During the war every industry pledged loyalty to our Government and gave it 100 per cent. Why not encourage industry by pledging that we will continue the present schedule for the remainder of the year and dispense with current reports which tend to disturb business and postpone more indefinitely the date of normal production, full dinner pails and a prosperous United States of America?

H. H. Pleasance.

# JAPAN WANTS THE SMALL POWER MOTOR

**Department of Trade Wants Canadian Firms to Make a Bid For This Business**

Yokohama.—Some months ago an inquiry was published in the Weekly Bulletin for small electric motors of ¼ and ⅛ h.p. for the Japanese market, but apparently no interest was shown owing to the fact that at that time Canadian manufacturers were fully occupied with domestic business. From the same source have again come inquiries for these motors, and Canadian manufacturers of electrical goods should not lose this opportunity of placing their products on the Japanese market. These electric motors are used for very many purposes in Japan. Electricity is procurable practically in any part of the country, and as a result the small household manufacturer, who makes some small article in his own home with the help of his family, will have a small electric motor to turn his machine. The silk filatures and spinning mills use hundreds of these motors. In fact, its use is almost unlimited at the present time.

The British concern in Kobe which is making inquiry for these motors is importing them from St. Louis in the United States. The ¼-h.p. model costs approximately 65 yen landed in Japan, while the ⅛-h.p. costs about 40 yen landed. This will give Canadian manufacturers some idea of the competition they must meet, but it is earnestly requested that Canadian manufacturers will make a bid for this business.

Further information and the address of the firm requiring these motors may be had on application to the Department of Trade and Commerce, quoting file No. T.C.-2-110.

## Pig Iron Market

Pittsburgh reports the new price named by both the independent steel companies and the Carnegie Steel Co. has not served to attract buyers. It is understood, however, to have brought some specifications to the Carnegie Steel Co. on old orders. Makers of refined iron bars report no improvement and most plants are idle. One stack which has been banked for several weeks will be going into blast May 1.

Current business is confined to carloads and the lowest producer's price quoted is $24 local furnace for No. 2 foundry on the Chicago market.

Sales on the New York market during the past week amounted to 9,000 to 10,000 tons placed by cast-iron pipe and other buyers. Prices show a wide range. The lowest are considered to be $24 furnace on No. 2 foundry, $25 on No. 2X and $26 on No. 1 foundry, but in some cases several dollars higher have been paid.

The United Alloy Steel Corporation, Canton, are inquiring for 10,000 tons of basic iron for May delivery, but has not yet definitely decided whether it will buy this iron or blow in its furnace.

The Boston pig iron market is practically at a standstill, with but few sales and no new specific inquiries developing.

The establishment of a market is impossible, and quotations are not available that would bear any relation to an actual transaction, owing to a complete absence of any demand at St. Louis.

At Birmingham the middle of the month found the $25 base for Birmingham iron remaining only for car lots.

With the exception of a Columbus, Ohio, melter, who is in the market for 1,000 tons of basic and 100 tons of low phosphorus, delivery to extend over the next five months, inquiry is limited to one and two carload lots in the Cincinnati district.

On the Philadelphia market there has been a slightly increasing demand during the past week. A number of sales ranging from a carload to a few hundred tons have been made.

## Scrap Metal

There has been practically no change in general conditions on the Pittsburgh market, except that between the fact that producers are not pressing much material for sale and expectations of a fuller operation of steel plants as a result of the price stabilization, the market has a somewhat steadier undertone.

The market at Chicago has taken a firmer tone, as dealers are looking forward to better trade. Several hundred tons of heavy melting steel were bought at from $11.25 to $11.50 per gross ton.

Several railroads have withdrawn their lists in the New York district, owing to the lowness of the prices bid for scrap. There is a scarcity of No. 1 machinery cast, steel car axles, shafting, stove plate and pipe, though the other grades have accumulated freely because of the few sales to plants.

Cleveland reports a little better feeling in the scrap market, which is attributed to the establishment of new prices by the Steel Corporation. There were very few transactions during the week.

Prices on borings, turnings, locomotive tires and car wheels are 50c lower, and iron axles have been bought at $3 below previous quotations on the Cincinnati market.

# SELECTED MARKET QUOTATIONS

**Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.**

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $25 00 |
| Lake Superior, charcoal, Chicago | 40 50 |
| Standard low phos., Philadelphia | 41 50 |
| Bessemer, Pittsburgh | 28 96 |
| Basic, Valley furnace | 26 00 |
| Toronto price:— | |
| Silicon, 2.25% to 2.75% | 34 10 |

## IRON AND STEEL

| Per lb. to Large Buyers | Cents |
|---|---|
| Iron bars, base, Toronto | $ 4 25 |
| Steel bars, base, Toronto | 4 25 |
| Iron bars, base, Montreal | 4 25 |
| Steel bars, base, Montreal | 4 25 |
| Reinforcing bars, base | 4 25 |
| Steel hoops | 5 50 |
| Tire steel | 5 00 |
| Spring steel | 8 00 |
| Band steel, No. 10 gauge and 3-16 in. base | 4 75 |
| Chequered floor plate 3-16 and heavier | 6 50 |
| Bessemer rails, heavy, at mill | 2 35 |
| Steel bars, Pittsburgh | 2 10 |
| Tank plates, Pittsburgh | 2 20 |
| Structural shapes, Pittsburgh | 2 20 |
| Steel hoops, Pittsburgh | 3 05 |
| F.O.B., Toronto Warehouse | |
| Small shapes | 4 50 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 3 48 |
| Structural shapes | 3 58 |
| Plates | 3 78 |
| Small shapes under 3-in. | 3 48 |

## FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

| | C.L. | L.C.L. |
|---|---|---|
| Montreal | 58½ | 73 |
| St. John, N.B. | 84½ | 106½ |
| Halifax | 86 | 108 |
| Toronto | 38 | 54 |
| Guelph | 38 | 54 |
| London | 38 | 54 |
| Windsor | 35 | 50½ |

Current surcharge, 8 per cent.

## METALS

| | Gross. Montreal | Toronto |
|---|---|---|
| Lake copper | $18 00 | $17 50 |
| Electric copper | 17 50 | 17 50 |
| Castings, copper | 17 25 | 18 00 |
| Tin | 36 00 | 39 00 |
| Spelter | 7 75 | 7 50 |
| Lead | 6 50 | 7 50 |
| Antimony | 8 00 | 8 25 |
| Aluminum | 34 50 | 30 00 |

**Prices per 100 lbs.**

## PLATES

| | | |
|---|---|---|
| Plates, 3-16 in. | $5 00 | $4 75 |
| Plates, ¼ up | 4 50 | 4 25 |

### PIPE—WROUGHT

**Standard Buttweld Pipe S/C**

Per 100 feet.

| Size | Steel Blk. | Steel Galv. | Gen. Wrot Iron Blk. | Gen. Wrot Iron Galv. |
|---|---|---|---|---|
| ⅛ in. | $ 6 50 | $ 8 50 | $ .... | $ .... |
| ¼ in. | 4 89 | 6 99 | 5 91 | 8 01 |
| ⅜ in. | 4 89 | 6 99 | 5 91 | 8 01 |
| ½ in. | 6 50 | 8 03 | 7 95 | 9 48 |
| ¾ in. | 7 99 | 10 06 | 9 95 | 12 02 |
| 1 in. | 11 82 | 14 88 | 14 71 | 17 77 |
| 1¼ in. | 15 99 | 20 13 | 19 90 | 24 04 |
| 1½ in. | 19 11 | 24 06 | 23 79 | 28 74 |
| 2 in. | 25 72 | 32 38 | 32 01 | 38 67 |
| 2½ in. | 40 66 | 51 19 | ..... | ..... |
| 3 in. | 53 17 | 66 94 | ..... | ..... |
| 3½ in. | 67 62 | 84 18 | ..... | ..... |
| 4 in. | 80 12 | 99 74 | ..... | ..... |

**Standard Lapweld Pipe S/C**

Per 100 feet.

| Size | Steel Blk. | Steel Galv. | Gen. Wrot Iron Blk. | Gen. Wrot Iron Galv. |
|---|---|---|---|---|
| 2 in. | $29 42 | $36 08 | $35 71 | $42 37 |
| 2½ in. | 44 17 | 54 70 | 54 11 | 64 64 |
| 3 in. | 57 76 | 71 53 | 70 76 | 84 53 |
| 3½ in. | 69 46 | 86 02 | 85 10 | 101 66 |
| 4 in. | 82 30 | 101 92 | 100 83 | 120 45 |
| 4½ in. | 95 89 | 1 20 | 1 30 | 1 54 |
| 5 in. | 1 12 | 1 40 | 1 52 | 1 80 |
| 6 in. | 1 45 | 1 81 | 1 97 | 2 33 |
| 7 in. | 1 89 | 2 37 | 2 53 | 3 01 |
| 8L in. | 1 99 | 2 49 | 2 66 | 3 16 |
| 8 in. | 2 29 | 2 87 | 3 07 | 3 64 |
| 9 in. | 2 74 | 3 43 | 3 67 | 4 36 |
| 10L in. | 2 54 | 3 18 | 3 41 | 4 05 |
| 10 in. | 3 28 | 4 10 | 4 39 | 5 21 |

**Prices—Ontario, Quebec and Maritime Provinces**

## WROUGHT NIPPLES

4-in. and under, 50 per cent.

4½-in. and larger, 40 per cent.

4-in. and under, running thread, 20%.

Standard couplings, 4-in. and under, 20%

Dd., 4½-in. and larger, net.

## OLD MATERIAL

Dealers' Average Buying Prices

Per 100 Pounds.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $ 8 50 | $ 9 00 |
| Copper, crucible | 11 00 | 11 00 |
| Copper, heavy | 10 50 | 11 00 |
| Copper wire | 11 00 | 11 00 |
| No. 1 machine composition | 9 50 | 9 75 |
| New brass cuttings | 7 00 | 8 00 |
| Red brass turnings | 7 50 | 8 00 |
| Yellow brass turnings | 5 00 | 6 00 |
| Light brass | 3 50 | 5 00 |
| Medium brass | 5 50 | 6 00 |
| Scrap zinc | 4 00 | 4 00 |
| Heavy lead | 3 50 | 4 00 |
| Tea lead | 2 00 | 2 00 |
| Aluminum | 12 00 | 10 00 |

| | Per Ton | Gross |
|---|---|---|
| Boiler plate | $10 00 | $12 00 |
| Heavy melting steel | 9 00 | 14 00 |
| Axles (wrought iron) | 22 00 | 20 00 |
| Rails (scrap) | 12 00 | 14 00 |
| Malleable scrap | 12 00 | 20 00 |
| No. 1 machine cast iron | 22 50 | 25 00 |
| Pipe, wrought | 8 50 | 8 00 |
| Car wheel | 25 00 | 25 00 |
| Steel axles | 18 00 | 18 00 |
| Mach. shop turnings | 5 00 | 6 00 |
| Stove plate | 20 00 | 20 00 |
| Cast boring | 3 00 | 7 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, 7-16 and up | Net list |
| Carriage bolts, ⅜" and less | 15 |
| Coach and lag screws | —20 |
| Stove bolts | 55 |
| Wrought washers | —25 |
| Elevator bolts | Net |
| Machine bolts, 7-16 and over | —5 |
| Machine bolts, ⅜-in. and less | —30 |
| Blank bolts | Net |
| Bolt ends | —5 |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | +25 |
| Machine screws, fl. and rd. hd., brass | Net |
| Machine screws, o. and fil. hd., brass | Net |
| Nuts, square, blank | +25 add $2 00 |
| Nuts, square, tapped | add 2 25 |
| Nuts, hex., blank | add 2 25 |
| Nuts, hex., tapped | add 2 75 |
| Copper rivets and burrs, list less | 27½ |
| Burrs only, list plus | 10 |
| Iron rivets and burrs | 37½ and 5 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, bright | 67½ |
| Wood screws, flat, brass | 55 |
| Wood screws, O. & R., brass | 55½ |
| Wood screws, flat, bronze | 50 |
| Wood screws, O. & R., bronze | 47½ |

## MILLED PRODUCTS

(Prices on unbroken packages)

| | Per Cent |
|---|---|
| Set screws | Less 40% |
| Square and hexagon head cap screws | Less 30% |
| Round head cap screws | Plus 10% |
| Fillister head cap screws | Less 10% |
| Flat head cap screws | Net list |
| Button head cap screws | Plus 10% |
| Studs | Less 20% |
| Semi-finished nuts up to and including 1-in. | Less 35% |
| Semi-finished nuts 1⅛ to 1½" | Less 30% |
| Semi-finished nuts 1⅝ to 2 in. | Net list |
| Coupling bolts | Plus 10% |
| Taper pins | Less 40% |
| Planer bolts without fillet | Plus 40% |
| Planer bolts with fillet | Pus 50% |
| Patch bolts | Plus 80% |
| Hollow set screws | Plus 20% |
| Thumb screws | Less 35% |
| Thumb nuts | Less 65% |

## BILLETS

F.O.B. Pittsburgh.

| | Per gross ton |
|---|---|
| Bessemer billets | $43 50 |
| Open-hearth billets | 43 50 |
| O.H. sheet bars | 39 00 |
| Forging billets | 48 50 |
| Wire rods | 48 00 |

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails, base | $4 55 |
| Cut nails, base | 5 10 |
| Miscellaneous wire nails | 50% |

## ROPE AND PACKING

| | |
|---|---|
| Plumbers' oakum, per lb. | 0 10¼ |
| Packing, square braided | 0 38 |
| Packing, No. 1 Italian | 0 44 |
| Packing, No. 2 Italian | 0 36 |
| Pure Manila rope | 0 26 |
| British Manila rope | 0 20 |
| New Zealand hemp | 0 20 |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | Net |

# LeBLOND
## HEAVY DUTY
## Universal Millers

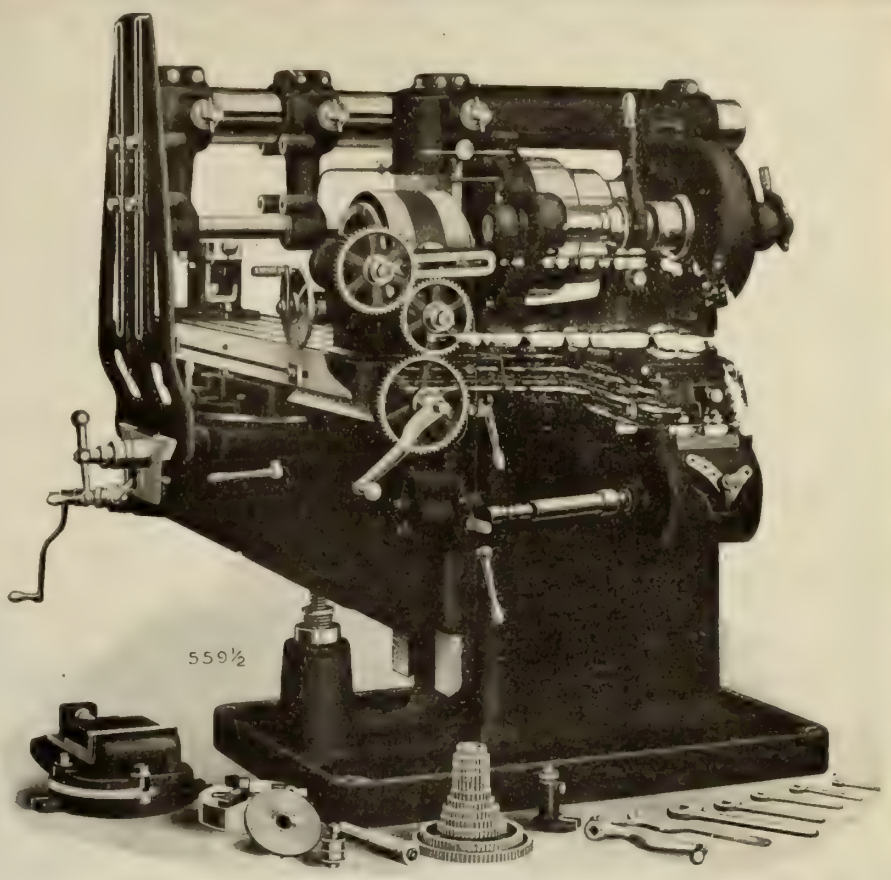
Are not only Tool Room Machines, but as a manufacturing proposition appeal to the careful buyer.

Their long life insures ample returns for the investment made.

May we explain to you their many advantages and the convenience of their control?

**Carried in Stock by**

**The A. R. Williams Machinery Co.**
LIMITED
TORONTO





# The Week's Events in Montreal Industry

The successful contestant this year for the gold-headed cane annually presented by the Montreal Harbor Commissioners to the captain of an ocean liner first bringing his ship to the port goes to Captain Michael Doyle, of the Cunard freighter Venusia, which arrived last Thursday night from London.

* * *

At the organization meeting of the Corporation of Professional Engineers of Quebec, held at the headquarters of the Engineering Institute of Canada, A. R. Decary was elected president. Adhemar Mailhiot has been re-engaged as registrar and offices have been opened in the Dandurand Building, where all communications will be addressed. The object of the new organization is to bring together engineers from all parts of the Dominion and assist in the ethics of the profession. It is also the intention to so organize the profession through the Dominion that in time a Dominion registration may be provided, thus enabling engineers to practise in any province.

* * *

At a meeting held last Thursday under the auspices of the Canadian Workers' Federation of Returned Soldiers and Sailors, the Hon. C. C. Ballantyne was the speaker of the evening, during the course of which he was presented with a gold membership badge of the Federation. During the course of his remarks Mr. Ballantyne stated that tenders would soon be asked by the Government for the construction of an ice breaker, and expressed the hope that the workers present would co-operate with the shipyards here so that they would be in a position to quote with some prospect of securing the contract for a Montreal firm.

* * *

At the last meeting of the Montreal section of the Engineering Institute of Canada, an address was given by G. E. Newill, the general manager of the Robb Engineering Works, of Amherst, N.S., on the development of turbine construction, and in particular, on the achievement of the Dominion Bridge Co., of Lachine, in building a turbine power installation for the British-American Nickel Co. at Sudbury. It will be interesting to know that this is the first time that an engineering firm in Canada has accepted the challenge to construct a large power turbine of this character, running as it did in about a quarter of a million dollars and requiring all the precision of mechanical discernment and nicety that might be needed in the making of a full jeweled watch to be propelled by steam.

## STEEL OF CANADA BOARD RE-ELECTED

Hamilton.—At the eleventh annual meeting of the Steel Company of Canada, it was reported that the company had made profits of $3,924,041.50 during the year, which was considered very satisfactory. This amount remained after deduction was made for repairs, maintenance, improvements and provisions made for inventory reserve and income tax payments.

The following officers were elected:

Directors—Cyrus A. Birge, A. J. Brown, J. H. Duggan, Lloyd Harris, Robert Hobson, Ross H. McMaster, Hon. John Milne, F. G. Osler, Sir Thomas White, K.C.M.G.; Hon. Smeaton White, Charles S. Wilcox.

Executive officers: Charles S. Wilcox, chairman of the board; Robert Hobson, president; Ross H. McMaster, vice-president; H. H. Champ, secretary and treasurer; H. S. Alexander, assistant treasurer; Corbett F. Whitton, assistant secretary.

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | $ 0 25 |
| Solder, guaranteed | 0 27 |
| Soldering coppers, lb. | 0 62½ |
| White lead, pure, cwt. | 17 00 |
| Red dry lead, 100-lb. kegs, per cwt. | 13 00 |
| Linseed oil, boiled, single bbls. | 1 03 |
| Wood alcohol, per gal. | 2 75 |
| Whiting, plain, per 100 lbs. | 3 00 |

### CARBON DRILLS AND REAMERS

| | |
|---|---|
| S.S. drills, wire size | 40 and 5 |
| Can. carbon cutters, plus | 10 |
| Standard drills, all sizes | 40 and 5 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 and 5 |
| Bit stock | 50 |
| Ratchet drills | 10 |
| Pure turp., single bbls., gal. | 1 20 |
| Linseed oil, raw, single bbls. | 1 00 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 50 |
| Sleeves | 50 |
| Taper pin reamers | 25 off |
| Drills and countersinks | Net |
| Bridge reamers, carbon | 50 |
| Centre reamers | 5 |
| Gasoline, per gal., bulk | 0 42 |
| Chucking reamers | Net |
| Hand reamers | 10 |
| High speed drills, list net to plus | 20 |
| Can. high speed cutters, net to plus | 10 |
| American | plus 40 |

### COLD ROLLED STEEL

[At Warehouse]

| | |
|---|---|
| Rounds and squares | $7.00 base |
| Hexagons and flats | 7.00 base |

### IRON PIPE FITTINGS

| | Black | Galv. |
|---|---|---|
| Class A | 60 | 75 |
| Class B | 26 | 36 |
| Class C | 17 | 26 |

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 6 00 | $ 6 50 |
| Sheets, blue ann., No. 10 | 5 25 | 5 50 |
| Canada plates, dull, 52 sheets | 7 50 | 13 00 |
| Can. plates, all bright | 14 00 | ..... |
| Apollo brand, 10¾ oz., galvanized | .... | ..... |
| Queen's Head, 28 B.W.G. | 10 75 | ..... |
| Fleur-de-Lis, 28 B.W.G. | 10 00 | ..... |
| Gorbal's Best, No. 28 | .... | ..... |
| Colborne Crown, No. 28 | .... | ..... |
| Premier, No. 28, U.S. | 8 25 | 8 50 |
| Premier, 10¾-oz. | 8 25 | 8 90 |
| Zinc sheets | 13 00 | 15 00 |

### PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13; 5-16, $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

### ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13; 5-16 in., $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

**Prices per 100 lbs.**

### FILES AND RASPS

| | Per Cent. |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 32½ |
| Black Diamond | 27½ |
| J. Barton Smith, Eagle | 50 |
| McClennand, Globe | 50 |
| Delta Files | 20 |
| Disston | 40 |
| Whitman & Barnes | 50 |
| Great Western-American | 50 |
| Kearney & Foot, Arcade | 50 |

### BOILER TUBES

| Size | Seamless | Lapweld |
|---|---|---|
| 1 in. | $26 00 | $..... |
| 1¼ in. | 27 25 | ..... |
| 1½ in. | 26 25 | 29 50 |
| 1¾ in. | 29 75 | 27 00 |
| 2 in. | 29 25 | 24 50 |
| 2¼ in. | 33 00 | 28 50 |
| 2½ in. | 44 75 | 32 50 |
| 3 in. | 49 25 | 40 00 |
| 3¼ in. | ..... | 48 50 |
| 3½ in. | 63 50 | 43 50 |
| 4 in. | 85 00 | 55 50 |

Prices per 100 ft., Montreal and Toronto

### OILS AND COMPOUNDS

| | |
|---|---|
| Castor oil, per lb. | — |
| Royalite, per gal., bulk | 28 |
| Palacine | 31 |
| Machine oil, per gal. | 58 |
| Black oil, per gal. | 27 |
| Cylinder oil, Capital | 1.01 |
| Petroleum fuel oil, bbls., net | 11.2 |

### BELTING—No. 1 OAK TANNED

| | |
|---|---|
| Extra heavy, single and double | 15% |
| Standard | 15 and 10% |
| Cut leather lacing, No. 1 | 2 00 |
| Leather in side | 2 40 3 00 |

### TAPES

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES

| | |
|---|---|
| Polishing wheels, felt | $4 50 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, Turkish | 8¾ |
| Pumice, ground | 06 |
| Emery glue | 30 |
| Tripoli composition | 9½ |
| Crocus composition | 12 |
| Emery composition | 11 |
| Rouge, silver | 64 |
| Rouge, powder, nickel | 38 |

**Prices per lb.**

### ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | 8½ |
| Grits, 80 and finer | 6 |

### BRASS—Warehouse Price

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 30 |
| Brass sheets, 24 gauge and heavier, base | 38 |
| Brass tubing, seamless | 42 |
| Copper tubing, seamless | 44 |

| | | | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 19 |
| Peerless | 22 | X Empire | 15 |
| Grand | 21½ | Ideal | 18 |
| Superior | 21½ | X Press | 13½ |
| X L C R | 16½ | | |

### WASTE

**Colored**

| | | | |
|---|---|---|---|
| Lion | 13½ | Popular | 10½ |
| Standard | 12 | Keen | 9 |
| No. 1 | 14 | | |

**Wool Packing**

| | | | |
|---|---|---|---|
| Arrow | 35 | Anvil | 22 |
| Axle | 28 | Anchor | 17 |

**Washed Wipers**

| | | | |
|---|---|---|---|
| Select White | 20 | Dark colored | 09 |
| Mixed colored | 10 | | |

**This list subject to trade discount for quantity.**

### RUBBER BELTING

| | | | |
|---|---|---|---|
| Standard | 10% | Best grades | 15% |

### ANODES

| | |
|---|---|
| Nickel | .55 to .60 |
| Copper | .38 to .40 |
| Tin | .70 to .70 |
| Zinc | .16 to .17 |

**Prices per lb.**

### COPPER PRODUCTS

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | $30 00 | $34 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 32 00 | 38 00 |
| Copper sheet, tinned, 14 x 60, 14 oz. | 38 00 | 42 00 |
| Copper sheet, planished, 16 oz. base | 44 00 | 48 00 |
| Braziers', in sheets, 6 x 4 base | 36 00 | 41 00 |

### LEAD SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $ 9 50 | $14 50 |
| Sheets, 3½ lbs. sq. ft. | 9 25 | 14 00 |
| Sheets, 4 to 6 lbs. sq. ft. | 9 00 | 13 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS

| | |
|---|---|
| Acid, boracic | $ .25 |
| Acid, hydrochloric | .03¾ |
| Acid, nitric | .10¼ |
| Acid, sulphuric | .03¾ |
| Ammonia, aqua | .20 |
| Ammonium, carbonate | .23 |
| Ammonium, chloride | .22 |
| Ammonium, hydrosulphuret | .75 |
| Ammonium sulphate | .30 |
| Arsenic, white | .18 |
| Copper, carbonate, annhy. | .35 |
| Copper, sulphate | .10 |
| Cobalt, sulphate | .20 |
| Iron perchloride | .62 |
| Lead acetate | .30 |
| Nickel ammonium sulphate | 16½ |
| Nickel carbonate | .30 |
| Nickel sulphate | .17½ |
| Potassium sulphide (substitute) | .40 |
| Silver Chloride (per oz.) | 1.15 |
| Silver nitrate (per oz.) | 1.10 |
| Sodium bisulphate | .13 |
| Sodium carbonate crystals | .04 |
| Sodium cyanide, 127-130% | .39 |
| Sodium hyposulphite per 100 lb. | 6.50 |
| Sodium phosphate | .15 |
| Tin chloride | .80 |
| Zinc chloride, C.P. | .30 |
| Zinc sulphate | .08 |

**Prices per lb. unless otherwise stated**

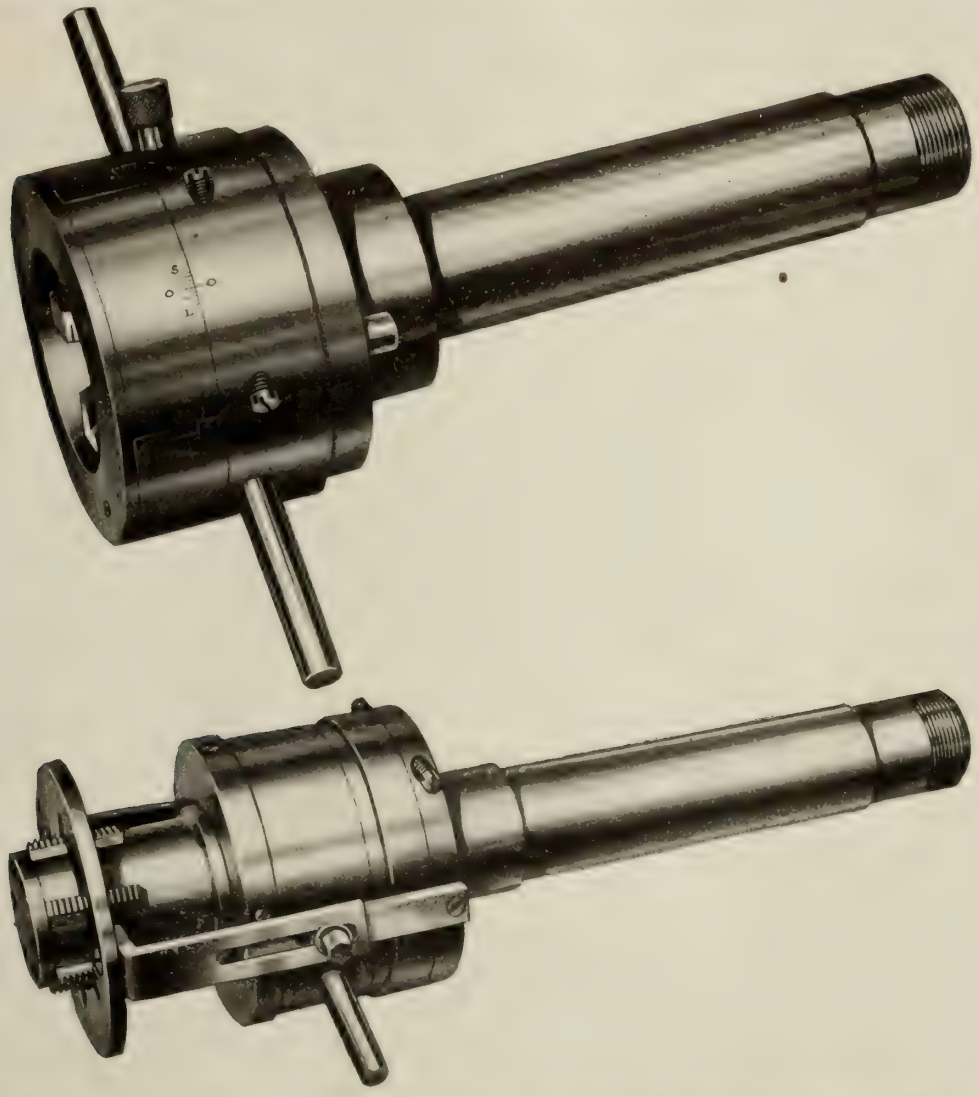
# GEOMETRICS

## For Cutting Screw Threads

GEO MET RIC

*Right on the Lead*

**Self-Opening and Adjustable Die Heads and Collapsing Taps made in many styles for the many makes of Machines employed in producing Screw Theads.**



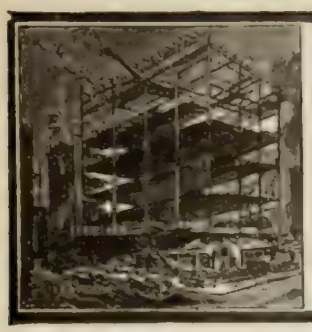
**Geometric Die Heads and Collapsing Taps are furnished with specially threaded shanks to fit them for use in the special threading fixture provided on the Gridley Single Spindle Automatics. Whatever make of machine, there is a Geometric to fit it.**

## THE GEOMETRIC TOOL COMPANY

**NEW HAVEN CONNECTICUT**

***Canadian Agents:***

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, St. John, N.B., Halifax, N.S.



# INDUSTRIAL NEWS

## NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES



## MONTHS YET BEFORE LOW STEEL PRICES WILL BE OF ASSISTANCE

ALTHOUGH a new schedule has been announced in steel prices, it will be some months yet before a number of the large users can take advantage of the new prices.

The agricultural implement makers, for instance, make their purchases months in advance. It is necessary to do this in order that they may be sure of supplies coming along regularly in conformity with their manufacturing schedule.

Speaking of these conditions, J. N. Shenstone, of the Massey-Harris Co., said, "It will probably be well on in 1922 before we shall be able to take advantage of cheaper steel. It is impossible for a lower price to have an immediate effect on our business. Right now the sheds and warehouses around here are full of machines that have been made at a high price, and we have a lot of material that has yet to be worked up. In this way it will be some months yet before the lower priced material starts to make its way into our shops."

Mr. Gifford, works manager of the Toronto plant, left at the first of the week for South Africa, where a shipment of machinery has been sent.

The Russian situation is being watched with interest from the London office of the firm. A number of different proposals have been put forward to sell machinery to Russia, some of them carrying with them proposals to pay for the same in oil and leather. There is nothing yet to indicate that the Russian people are in any state to trade with on a safe and profitable basis, and the Massey-Harris Co. have made no move to re-open their business in that country.

## WANT BUSINESS FROM THESE FIRMS

**People Abroad Who Want to Sell Goods if Canadians Can Supply Them**

Firms wishing to secure information about any of the following should apply to this paper, mentioning the number in each case:

2921. **Engineering and structural materials.**—A responsible Canadian firm of contractors and consulting engineers established in London who are interested in public works contracts in certain British colonies invite Canadian manufacturers of engineering and structural materials wishing to obtain export business to submit to them full particulars to practise in any province.

2925. **Electrical material.**—A Milanese house wishes to buy electrical material in Canada.

2934. **Electrical supplies.**—A dealer at Zagreb, Yugoslavia, would be glad to hear from Canadian exporters of textile and other lines suitable for the Yugoslav market.

2937. **Hardware and metals.**—A firm in Belgrade, Yugoslavia, would be interested to receive particulars from Canadian exporters of hardware, iron and steel and other metal lines and agricultural implements.

**Goodyear Changes.**—Control and management of the Goodyear Tire & Rubber Co. will pass from F. A. Seiberling, now president and general manager, to an investment bankers' committee as the result of plans for refinancing definitely announced. The committee representing the bankers will control the management of the company for a maximum period of twenty years, this being the maturity of an issue of $30,000,000 Goodyear first mortgage twenty-year 8 per cent. sinking fund gold bonds which will be offered for public subscription.

**Conditions Better.**—There are signs of a revival of business among the factories of St. Catharines. Some of them, notably McKinnon's, are taking on new men daily, and have several hundred men at work. The big plant was practically shut down this winter, but has now a rush of orders, and may have to put on a double shift for a time. The Consolidated Rubber Co. has lately spent a large amount of money on its engine house at Port Dalhousie, which seems to indicate that the present shutdown will not be for very long.

**Formed New Connection.**—D. J. Beatty, formerly advertising manager for the Northern Electric Co., has resigned to go into partnership with G. L. MacGillivray in the G. L. MacGillivray & Co., Ltd., 103 Notre Dame Street West, Montreal. This company was recently formed to look after the selling interests of the following firms in Eastern Canada: Edwards & Co., Inc., American Insulator Corporation, Waterbury Manufacturing Co., Chase Metal Works, Parker Supply Co., Inc., R. M. Radio Co. of London, Eng., the Prometheus Electric Co. For some time prior to enlisting for overseas service, Mr. Gordon MacGillivray was assistant supply sales manager for the Northern Electric Co. at Montreal.

**Engineer for Sarnia.**—It is likely that the selection of a city engineer for Sarnia will be made shortly. It is understood that from among forty applicants, who represent the entire Dominion from Halifax to Vancouver, the choice has narrowed down to two, who will be brought there for personal interviews with the council.

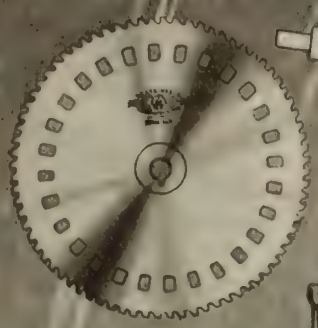
**Change in Name.**—In connection with the formation of the Hamilton Car Co., Ltd., the following announcement is made: The National Steel Car Corporation, Ltd., of Hamilton, Ont., took over the plants and effects of the National Steel Car Co., Ltd., as a going concern, and is now operating the business under the title of the National Steel Car Corporation, Ltd. To prevent confusion on account of the similarity of names, the National Steel Car Co., Ltd., has changed its corporate name to that of the Hamilton Car Co., Ltd. The Hamilton Car Co., Ltd., owns certain stock and effects pending final liquidation, but is not in the business of building railway car equipment.

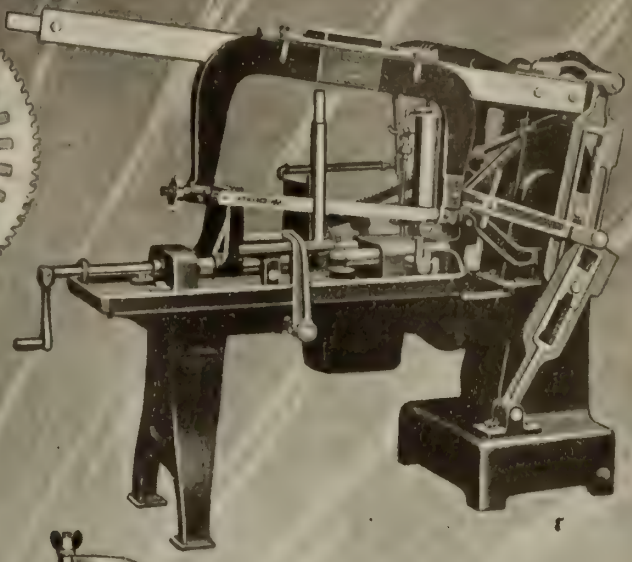
**Important Steps.**—According to reports to the Canada Research Council from the Associate Committee of Mining and Metallurgy it is now regarded as highly probable that the vast deposits of low-grade magnetic iron ore can be successfully smelted in Canada on a commercial scale. The Lignite Utilization Board reported that it has now every reason to believe that in the near future it will be successful in producing on a commercial scale from the low-grade lignites of Western Canada briquettes equal and in some respects superior to anthracite coal.

C. Rehden & Son, Bowmanville, are preparing plans for foundry to cost $60,000.

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are noted for their efficiency. Their use will increase your production.

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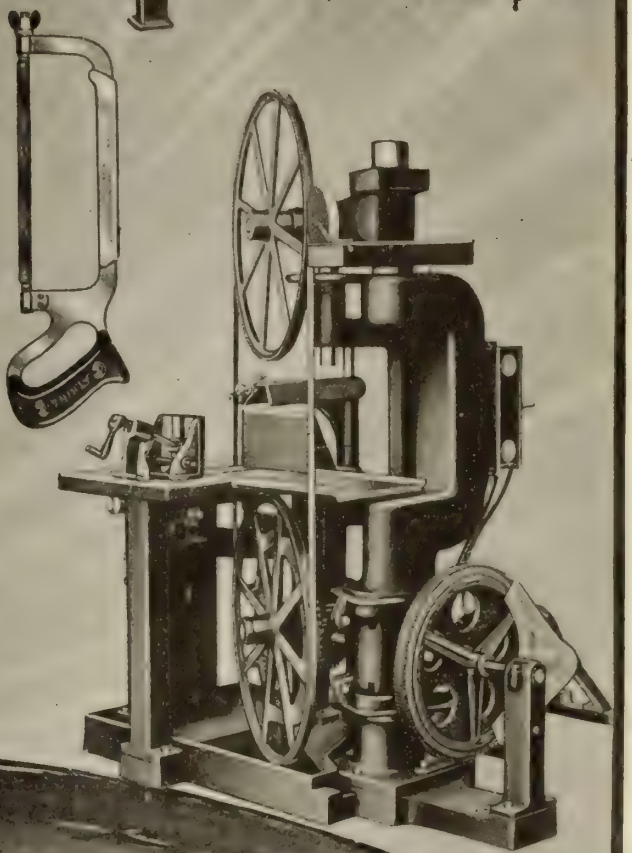
## E. C. Atkins & Co.

Established 1857

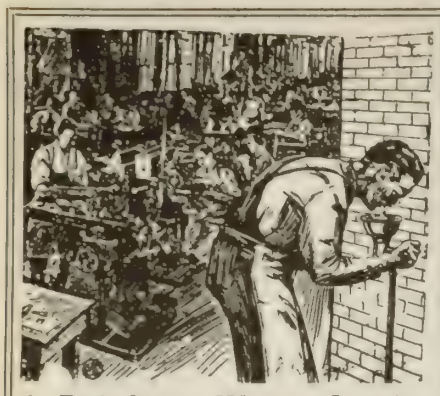
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A Drinking Water Service that will last a LIFETIME

What you pay for a few ordinary drinking cups will meet the cost of the

PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)

DRINKING CUPS ARE UNSANITARY but "the Puro" delivers clean, fresh water at a temperature of 15 per cent. to 35 per cent. in water bill.

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Rubber Mill MACHINERY
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## Scrap Yard To Be The First to Reflect Turn of the Market

An improvement in the market conditions, or in business generally, must be preceded by an improvement in the scrap metal trade. That is the statement of one of the best informed men in the business.

"It has been so in many past experiences and it will be true again in the present case. Iron and steel will show no improvement until there is a betterment in the scrap of these lines and the same can be said of copper. There will be no movement in goods that copper goes into—and they are numerous—until there is a stiffening of prices in the scrap market.

"It is true," our informant concluded, "that coming events cast their shadows before, and in this case the shadows must first fall on the scrap yards. Watch and see."

## BIG INCREASE IN POWER COSTS

### How These Charges Have Been Increased During the Last Few Years

Cost of power occupied the time of Paul M. Lincoln, the noted American electrical engineer, in his address to the Electrical Engineering Institute at the Physics Building of the University of Toronto.

Mr. Lincoln dealt largely with fixed charges and operation ratio of electrical plants throughout North America. He showed that the price of every raw material had increased tremendously since before the war, and that this made an enormous difference in the price of operation of electrical plants then and now.

### A Steady Increase

The actual operation cost dropped from 1910 to 1914, the average drop running about 5 per cent., but since 1915 there has been a rapid and steady increase in power house costs.

Mr. Lincoln estimated that the cost of a power plant to-day would run to 225 per cent. more than it did in pre-war times. This means that the public must pay, in the same ratio, these increased charges.

In plants which are operated by coal power, Mr. Lincoln showed that the coal costs during the past few years had considerably enhanced the cost of power. Further, he stated that the cost of labor in operation of power plants might be taken at 85 per cent. in excess of what it was in 1914. In total, he fixed the ratio of expenses in power operation from 1914 to 1920 as approximately 2½ to 1.

### A Slight Mistake

"Oh," exclaimed the fair boarder, as a couple of calves scampered across the meadow, "what pretty little caflets!"

"Yew air mistaken, ma'am," said the old farmer. "Them's bullets."

### MECHANICAL YEAR BOOK

The 1921 edition of the Mechanical World Year Book, published by Emmott & Co., Ltd., 65 King St., Manchester, England, is well worth a place in any bookcase, desk or toolbox. To go over the details in brief space is impossible, but here are a few of the subjects covered: Steam and steam engine, constructional details of same, notes on condensing plant, notes on steam turbines, steam boilers, boiler construction, riveted joints, safety valves, boiler mounting and setting, boiler chimneys, notes on superheating, gas engines, oil engines, Diesel engines, suction gas producers, properties of metals and alloys, structural iron and steel work, beams and girders, strength of materials, shafting, keyways, and gearing.

Following this are the subjects of gear cutting, milling machine practice, notes on grinding, limit gauges, standards of limits, verniers and micrometers, Morse taper shanks, ball and roller bearings, notes on belting, rope driving, chain gearing, friction and lubrication, water and hydraulic work, hydraulic data, steam heating, notes on screw cutting and miscellaneous tables of considerable use to mechanics in general. The English price of this book is 2s. 6d., and the Canadian price, including postage, would be between 75 cents and a dollar.

The Joseph Stokes Rubber Co., Welland, Ont., whose plant was built last fall, have completed the installation of machinery and intend to start on quantity production within a few days.

### Dissipated Wretch!

A small, hen-pecked, worried-looking man was about to take an examination for life insurance.

"You don't dissipate, do you?" asked the physician, as he made ready for the tests. "Not a fast liver or anything of that sort?"

The little man hesitated a moment, looked a bit frightened, then replied in a small piping voice: "I sometimes chew a little gum."

### TRADE GOSSIP

The Gove Motor Car Co., Detroit, Mich., contemplates the construction of a factory.

The erection of a three-story garage is planned by Patrick Labell, 721 Dorchester Street, Montreal.

An addition will be erected to the cement plant of the Middleton Cement Products Co., Middleton, N.S.

An addition will be erected to garage at cost of $15,000 by J. Van Sickler, 374 Dupont Street, Toronto, Ont.

The Glem Motors, Ltd., has been incorporated with head office at Toronto and capital stock of $1,000,000.

Smart's Brockville Furnaces, Ltd., is capitalized with capital stock of $100,000 and head office at Brockville, Ont.

The Abrams West Columbia Oil Co., Ltd., has been incorporated with capital of $1,000,000 and head office at Toronto.

The Canada Iron Foundries, Fort William, are contemplating the erection of addition to foundry at a cost of $150,000.

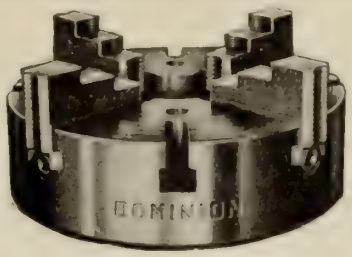
The West Gas Improvement Co., Manchester, England, has been awarded the contract for the construction of carbonizing plant costing $125,000 for the Victoria Gas Co., Victoria, B.C.

Permit has been granted to the British Canadian Oil Co. for the erection of a motor service station at the southeast corner of Bloor and Shaw Streets, Toronto.

**Nearing Completion.**—The Carbon and Alloy Steel Co., who are installing an electrical steel mill at Fraser, Ont., near Niagara Falls, have progressed with their plant to a point where the electrical equipment is now being placed in position. The mill, which will specialize in carbon and tool steels, should be in operation within the next six weeks.

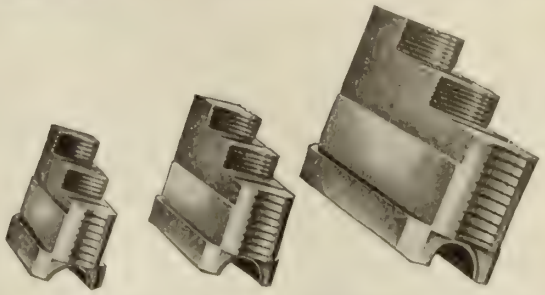
**New Plant Starts.**—The electric steel foundry of the J. W. Cumming Mfg. Co., New Glasgow, N.S., is now in operation, under the direction of J. M. Robertson, Montreal, the designing engineer of the plant, and C. A. Pascoe, metallurgist, and Sanford Davis, electrical engineer, of Montreal.

**Purchasing Agents to Meet.**—The second annual convention of the Purchasing Agents' Association of Canada will be held in Toronto on May 14th at the King Edward Hotel. Every purchasing agent, whether a member or not of any of the associations now formed, is cordially invited to attend. Matters vital to every industrial company and purchasing agent will be discussed.


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STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY



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THEY are drop forgings, made of best quality steel, heat-treated and hardened. The threaded portion of jaws form a half nut for the setting-up screws. Have stood the test of heavy duty work in our own shops where accuracy was the only accepted standard.

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THE KIMBER & HILLIER MFG. CO.,
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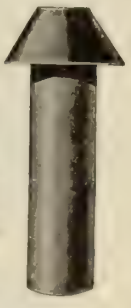
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# SAVING GAGES THAT WERE USED IN THE TURNING OUT OF WAR MUNITIONS

Working quietly in Washington since shortly after the armistice, John O. Johnson, head of the gage section of the War Department, has been engaged in the task of gathering together and storing away in places where they can be found when needed all the gages used in the manufacture of arms and ammunition in plants of all descriptions throughout the country. Until recently Mr. Johnson had the rank of major, but was honorably discharged. He continues, however, as head of the gage section, which was created after the war.

It is estimated that the value of the gages is approximately $30,000,000. The collection and preservation of these instruments is a step forward in carrying out a general policy which has for its object the maintenance by the War Department at all times of the necessary minor attachments, such as dies, jigs, special tools, etc., by which machinery used in commercial manufacture may be changed almost over night for making parts of arms and ammunition.

Since the gage section was created Mr. Johnson has been at work supervising the collection into the various Government arsenals of all gages and special tools which were used by private plants in the manufacture of arms and ammunition. Considerable progress has been made in this undertaking and in cataloging and filing of these instruments.

The policy of "manufacturing preparedness" is the result of the efforts of Representative John Q. Tilson of Connecticut, who has been urging the plan upon the War Department since 1913 and made frequent appeals for it as a member of the House Committee on Military Affairs before the United States entered the war. His efforts have been partly successful, as is indicated by the work being supervised by Mr. Johnson. It is expected that his plan will be put into complete operation. It already has been submitted to President Harding, and Representative Tilson will confer with Secretary of War Weeks soon with reference to the program.

Mr. Johnson, who comes from New Haven, Conn., formerly was associated with the Winchester Repeating Arms Co. Shortly after the outbreak of the European War, he was employed by the Imperial Munitions Board of Canada to supervise the placing of contracts in the United States for the manufacture of gages for the Canadian government. Being an expert on gage manufacture, he was invited, upon the entrance of the United States in the war, by the ordnance bureau of the War Department, to accept a commission in that corps. He gave up his work with the Canadian government and accepted a commission as captain of ordnance of the United States Army, being promoted subsequently to the rank of major.

In an article recently contributed to the Army Ordnance Journal, Mr. Johnson says that he expects to complete the work of conserving the gages by June 21. The net result will be that the Ordnance Department, through the gage section, will be able to tell at any time just what gages are on hand, the condition of each gage and its exact location. "In case of emergency, where quick expansion would be imperative, complete sets of gages on each component could be selected and distributed so that every contractor would receive his immediate needs, which would hold him over until more gages could be made. By this method the contractor would be ready to begin work as soon as his machines and equipment were arranged, and would save considerable time in getting into quantity production."

# HAVE CUT PRICE OF IMPLEMENTS

**How Old Country Iron and Steel Trade Is Trying To Get Buyers To Take Hold**

Manchester.—In an endeavor to stimulate demand, and in a measure to meet competition emanating from certain foreign countries, reductions in many lines of iron and steel manufactures have recently taken place. Northampton forge is now selling at £8 at the furnaces, and foundry iron at £8 15s. per ton. Staffordshire unmarked bars have fallen £2 per ton, the present selling price being £24 10s. The Lancashire price is £22 per ton.

Owing to keen competition from Belgium, nut and bolt iron has fallen to £22 per ton. Gas strip records a reduction of £1 per ton, the price now being £26.

A fall of £3 per ton on steel strips and hoops has brought the ruling price to £20. Steel prices are steadily falling. Belgian billets are offered in the midland counties of England at £9 per ton.

A further decline in the values of black and galvanized sheets took place last week, which left the prices at £20 and £24 10s. per ton respectively.

In the Cleveland iron district the general slump in trade has been keenly felt, with the result that the ironmasters have decided to cut prices. Further, the influx of Belgian (and probably German) pig-iron, which is considerably cheaper than the Cleveland product, has had a deterrent effect on the sales of the latter district. A fall of 75s. per ton since the end of last year is recorded in connection with Cleveland pig-iron. No. 1 is now £7 15s.; No. 3 G.M.B., £7 10s.; No. 4 foundry, £7 9s.; No. 4 forge, £7 7s. 6d.; mottled, £7 7s. 6d.; and white iron, £7 5s. —all for domestic consumption. For export an additional 5s. per ton is added. Belgian pig-iron is said to be offered at £7 per ton delivered.

The drop in hematite values has brought No. 1 down to £9 2s. 6d., and mixed numbers down to £9 per ton.

# GERMANS CAN SELL TOOLS CHEAPER THAN THE BRITISH CAN MAKE THEM

The Department of Overseas Trade, through the Toronto office, sends the following information exclusively to Canadian Machinery:

At the annual meeting of the Machine Tool Trades Association a proposition was put to the meeting that the members should refrain from dealing in German machinery. This resolution was defeated by a large majority, a fact which has caused a good deal of comment, and a certain amount of misunderstanding. The following statement may serve to make the position clear.

In the first place it was seen that the resolution would be ineffective in securing the desired object. There are firms outside the association who would, it was felt, immediately take advantage of such an action to obtain trading agreements with German firms, and it would thus result that firms factoring United Kingdom machine tools would not be able to do the full amount of business in British goods otherwise possible, since buyers naturally prefer to give their business to firms offering the widest range of goods. Secondly, some firms are avowed opponents of protective measures, whether by state action or by resolution, and these opposed the measure on general grounds. The latter is not, however, a general attitude. At present most firms cannot meet the position created by the rate of exchange, by which German goods can be sold at a price less than the cost of the materials in the United Kingdom, and many feel that if the exchange position were rectified the United Kingdom manufacturer would, by efficient production, defy competition. These firms are in favor of some measure of protection which would remove the disadvantage caused by the low rate of exchange, at any rate for the home market.

It may be of interest to observe in connection with this and other industries, that a measure is being introduced into parliament intended to deal with the situation in the home market caused by the low rate of exchange of continental currencies.

# Machinery Stock List

## *In Stock at Toronto*

### TURRET LATHES

1—Gisholt "H," 21", Standard Turret Lathe, complete.

### ENGINE LATHES

1—McDougall 26" x 14', D.B.G. and Q.C.G. Engine Lathe.
1—20" x 10' Walcott, D.B.G. and Q.C.G. Engine Lathe.
2—26" x 12' Walcott, D.B.G. and Q.C.G. Engine Lathes.
1—20" x 8' Walcott, D.B.G. and Q.C.G. Engine Lathe.
1—18" x 8' Walcott, D.B.G. and Q.C.G. Engine Lathe.
1—14" x 6' Walcott, D.B.G. and Q.C.G. Engine Lathe, with taper attachment.
1—Reed-Prentice 14" x 6' Toolroom Lathe, Q.C.G., Gear Box taper attachment, draw-in chuck, one collet and regular equipment.
1—Reed-Prentice 14" x 6' Toolroom Lathe, Q.C.G., taper attachment, compound rest relieving attachment, draw-in chuck, and one ½" collet and oil pan.
1—Seneca Falls 12" x 6' Toolroom Lathe, Q.C.G., Taper Relieving and draw-in attachments and pan bed.
1—Seneca Falls 12" x 6' Toolroom Lathe, Q.C.G. and pan bed.
1—Seneca Falls 12" x 6' Toolroom Lathe, Q.C.G. and standard equipment.
1—Seneca Falls 11" x 6', Quick Change Gear Lathe.
1—Seneca Falls 9" x 4', Plain Engine Lathe.

### SCREW MACHINES

2—No. 2 Brown & Sharpe Automatic Screw Machines.
1—No. 0 Brown & Sharpe Automatic Screw Machine.
1—Warner & Swasey (used) No. 4 Hand Screw Machine, pan bed, friction head, without power feed to turret.
3—Foster No. 4 Hand Screw Machines (used), with friction head, pan bed, without power feed to turret.

### MILLING MACHINES

2—Brown & Sharpe No. 1 Universal Milling Machines.
2—Brown & Sharpe No. 2 Universal Milling Machines.
1—Brown & Sharpe No. 2A Universal Milling Machine.
1—Ford-Smith No. 2 Universal Milling Machine.
1—Ford-Smith No. 3 Universal Milling Machine.

### BOLT THREADING MACHINES AND ACCESSORIES

1—Landis 1" Double Head Bolt Threading Machine with leadscrew attachments.
1—Landis 1½" Single Head Bolt Threading Machine.
1—Landis 2" Single Head Bolt Threading Machine.
3—Landis ½" Rotary All Steel Bolt Die Heads.
3—Landis 1" Rotary All Steel Bolt Die Heads.
3—Landis 1½" Rotary All Steel Bolt Die Heads.
2—Landis 2" Rotary All Steel Bolt Die Heads.
1—Landis 1¼" Automatic Die Head.

## *In Stock at Montreal*

1—Gisholt 21" Std. Turret Lathe, 3½" Spindle, comp. with set boring and turning tools.
1—McDougall 26" x 14', D.B.G., Q.C.G. Engine Lathe.
1—McDougall 20" x 10', S.B.G., P.C.G. Engine Lathe.
1—Walcott 26" x 12', D.B.G., Q.C.G. Engine Lathe.
1—Walcott 20" x 10', D.B.G., Q.C.G., Engine Lathe.
1—Walcott 20" x 8', D.B.G., Q.C.G. Engine Lathe.
1—McDougall 18" x 8', D.B.G., Q.C.G. Engine Lathe.
2—Walcott 18" x 8', D.B.G., Q.C.G. Engine Lathes.
1—Walcott 18" x 8', D.B.G., Q.C.G. Engine Lathe, complete with pan bed and taper attachment.
1—Walcott 16" x 6', D.B.G., Q.C.G. Engine Lathe.
1—Walcott 14" x 6', D.B.G., Q.C.G. Engine Lathe.
1—Seneca Falls 12" x 6', Style E Tool Room Lathe, draw-in chuck, one collet, ¼" taper attachment.
1—Seneca Falls 12" x 6', Style E Tool Room Lathe.
1—Seneca Falls 12" x 6', Style H Tool Room Lathe, pan bed.
1—Seneca Falls 11" x 5', Style E Tool Room Lathe, draw-in chuck, one collet, ¼" taper attachment.
1—Seneca Falls 9" x 4', Tool Room Lathe with pedal attachment.

### BALERS

1—Climax Hand Baler, No. 2, capacity bale 14 x 18 x 28.

### BOLT MACHINES

1—No. 734 Wells Bolt Threading Machine with friction countershaft, cap. ¼ to 2".
1—Landis 1½" Single Head Threading Machine without chasers.
1—Landis 2" Single Head Threading Machine without chasers.
1—Landis 1½" Double Head Threading Machine without chasers.
2—Landis 1" Bolt Cutter Heads without chasers.
2—Landis 1½" Bolt Cutter Heads without chasers.
2—Landis 2" Bolt Cutter Heads without chasers.
1—1¼" Landis Automatic Screw Cutting Die Head without chasers.

We have in stock large assortment chasers (About 345 Sets)

### DRILLING MACHINES

2—No. 3 McDougall 20", B.G., Power Feed Drills, cap. 1¼".
2—No. 14 Perfect Column Drills, cap. 9 16" drills.
1—5/16" McKenzie Column Drill.
1—No. 18 Perfect Bench Drill, cap. 5/16" drills.
1—No. 15 Perfect Bench Drill, cap. 9/16" drills.
1—5/16" McKenzie Bench Drill.
1—No. 1 10" Burke Sensitive Drill, cap. 0 to ⅜".
2—Buffalo 10" Bench Drills, 9/16" capacity.
2—No. 28 Canedy Otto Sensitive Bench Drills, 0 to ½".

### RADBORE DRILLING ATTACHMENT

1—No. 5, Milling Machine Type.

## The Canadian Fairbanks-Morse Co., Limited

*"Canada's Departmental House for Mechanical Goods"*

| | | | | |
|---|---|---|---|---|
| Halifax | Ottawa | St. Catharines | Winnipeg | Calgary |
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| Montreal | | | | Victoria |

# Fairbanks-Morse

# Classified Opportunities

## FOR SALE

ELECTRIC STORAGE BATTERY LOCOMOtives for sale. Two. 36-inch gauge. Complete and in good condition. R. T. Gilman & Company, Dept. "E." 211 McGill Street, Montreal. (c1m)

FOR SALE ONE ALLIGATOR SHEAR. 7" blade. Capacity 1-½" round cold soft steel. Canadian Atlas Crucible Steel Co., Ltd., Welland, Ont. (c17m)

ONE 50 K.V.A., SINGLE PHASE OR 3 PHASE 60 cycle, A.C., 2300 volt, generator and exciter. Box 770, Canadian Machinery. (c17m)

ONE 2 PHASE, 60 CYCLE, 220 VOLT CROCKer-Wheeler preferred, 15 H.P.; one 2 phase, 60 cycle, 220 volt, Crocker-Wheeler preferred, 20 H.P., both 1200 R.P.M., complete with base and standard pulley, starter with no voltage release. Box 771, Canadian Machinery. (c17m)

SIX 35-50 H.P., 300 R.P.M., 3 PHASE, 60 cycle, 550 volt; six approximately 20 H.P., 3 phase, 60 cycle, 550 volt motors. Box 772, Canadian Machinery. (c17m)

**MACHINE WORK WANTED**

We are equipped to handle all kinds of general or special machine work. All operations in our [illegible] are under the most careful supervision [illegible] satisfy you as to price. Always available for consultation.

**PERFECT MACHINE COMPANY, GALT**
Builders of Reliable Machinery.

Phone Park. 3550 House: Coll. 9660W
197 Clinton Street, Toronto
**A. AUSTIN**
GENERAL MACHINE WORK
Turret Lathe and Automatic Screw Machine a Specialty. Let us quote on your work.
*With:* Garlock, Walker Machinery Co.
163 Dufferin Street.

PARTIAL LIST
**Machine Shop Equipment**
***At Extremely Low Prices***

LATHES—All sizes and lengths of bed. Special price quoted on rebuilt 20 in. x 8 ft. C.M.C.

AIR COMPRESSOR—8 in. x 8 in. Chicago Pneumatic.

TANKS—10 Tanks 10 ft. 6 in. diam. x 29 ft. 6 in. long. 19,000 gals.
3 Tanks, 10 ft. 0 in. diam. x 39 ft. 0 in. long, ⅜ in. Heads. 22,893 gals.
Full line of other Steel Storage Tanks, open and closed, all sizes.

PUMPS -1 Triplex Power Pump, 1½ in. x 6 in. Hydraulic Machy. Co. Also 1 in. x 5 in. West Tire Setter.
1—Centrifugal Pump, 2½ in. x 1½ in. Gould.
1—Gould Triplex Power Pump, 2 in. x 3 in.

Milling Cutters and Reamers, full assortment, all sizes and shapes, at less than half price. Send us your enquiries.

**Standard Equipment & Tool Works**
Dept. K. 307 St. James St.
Main 2286 MONTREAL
(20)

## MACHINERY WANTED

WANTED — TWO 3-PHASE, 60-CYCLE, 2300-volt, 150 to 200 K.W. generators to run at speed of 720 r.p.m. or less, with sliding base and shaft for pulley drive. Generator should have outboard bearing and each complete with exciter and switchboard. Switchboard must be equipped with generator, field switch and rheostat; exciter field switch and rheostat, generator main oil switch, voltmeter, ammeter, instrument transformers and exciter ammeter. Box 774, Canadian Machinery. (c17m)

WANTED—STEAM ROLLER—ONE NEW REvolving steam shovel and concrete mixers. Box 773, Canadian Machinery. (c17m)

## MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

**Used Machinery For Sale**

1—12" x 5' Engine Lathe.
1—16" x 6' Bertram Lathe.
1—18" x 8' Stevens Lathe
1—12" Drill Press
1—26" Drill Press
1—36" x 36" x 10' Bertram Planer.
CHARLES P. ARCHIBALD & CO.,
285 Beaver Hall Hill - - MONTREAL
(52)

**Modern Marine Machinery**

Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

**Used Belting, Pulleys, Etc.**

We carry right in stock a large quantity of used Belting, Pulleys, Hangers, Shafting, etc., in good condition, which we sell at half the price of new. Inquiries solicited. In writing mention sizes wanted. L. S. Tarshis & Sons, 92 Wellington St., Montreal.

**Grey Iron Castings**

Light and Medium-Bench and Floor Repetition Castings; Capacity 15 tons per day.
Expert Metal and Wood Pattern Work. Our advice and estimates will save you money.
Semi-finishing operations on Lathe or Grill on Castings supplied if required.
ASK US.
THE KATIE FOUNDRY, GALT, ONT.

**REGO**
**WELDING**
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**CUTTING**
**APPARATUS**

Oxygen, Acetylene, and a complete line of Welding and Cutting Supplies.

**Carter Welding Co.**
**of Toronto, Limited**
7-11 Sheppard St., Toronto, Ont.
Phones: Adelaide 2841 and 1524
(TF)

## POSITIONS WANTED

DO YOU REQUIRE A MECHANICAL ENgineer, or shop superintendent? If so, I am open to accept a position of this nature from May 15th. Can supply first-class references. Have record for lowering cost of production. Will be pleased to talk matters over with anyone interested. Was 8 years with one concern. Box No. 775, Canadian Machinery. (c18m)

## PATTERNS

TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (ctfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

## BUSINESS CHANCES

WANTED—BY AN ESTABLISHED CONCERN. Twelve to fifteen thousand dollars for a period of from one to three years, to take care of business expansion. This concern will stand the fullest investigation. 8% is offered with ample security to principals only, with an opportunity of becoming permanent associates with the partners, if mutually satisfied. Box 767, Canadian Machinery. (ctfm)

**ANNOUNCEMENT**

The Electric Motor and Machinery Co., Ltd., 64 Wellington Street West, Toronto, Ontario, wish to announce the commencement of their sales agency for the
**Howell Red-Band Motors Ltd.,**
makers of "the Guaranteed Motor."
(c19m)

Sales Engineer wants to sell gasoline or oil engines, portable, stationary and marine or other machinery, to jobbers and dealers in the Province of Quebec or whole of Canada. Sold total output of one factory last year. Expenses and commission basis preferred. Box 768, Canadian Machinery. (c17m)

**USED MACHINERY**
**in Good Condition**

GRINDERS
1—No. 70 Heald Internal.
1—No. 75 Heald Internal.
1—10x24 Landis Plain.
1—Blount Wet Tool Grinder.
1—Globe Tool and Cutter.
1—No. 1 American Surface.

LATHES
1—18x10 ft. Bed McDougall, Q.C.G., Taper Attachment.
2—18" Davis Engine Lathes, 8-ft. Bed, Change Gears, D.B.G.
1—16" Davis Engine Lathe, 8-ft. Bed, Q.C.G., F.B.G., Turret and Cut-off Attachment.
4—16" Speed Lathes, 6-ft. Bed.
4—11" Speed Lathes, 5-ft. Bed.
3—No. 2 Warner Swasey Turret, 14".

DRILLS
1—20" Power Speed Drill, C.B.F.
2—Two-spindle, High Speed H.F. Allan B.B. Vertical Drill, hand feed, adjustable table, single head.
1—4-spindle Francis Reed Drill.

SCREW MACHINES
1—No. 4A Smurr & Kamen, G.F.H. and Power Feed.
1—1½ x 8 Acme 18" Power Feed Turret, G.F.H.
2—6" Racine Power Hack Saws.
1—12" Crank Shaper.
1 No. 1 Burke Bench Miller.
1—6" Witton Centering Machine.

**F. A. TENNISON**
858 Dupont St., Toronto Jct. 3682

*If interested tear out this page and place with letters to be answered.*

MACGOVERN & COMPANY UNLIMITED POWER MACHINERY

We have for sale the following

## Small Sized A. C. Generators

3 Phase, 60 Cycle

| K.W. | Volt | Make | R.P.M. |
|---|---|---|---|
| 15 | 2300 | Ft. Wayne | .... |
| KVA 20 | 2300 | Fairbanks-Morse | 1800 |
| 25 | 2300 | Ft. Wayne | 1800 |
| 30 | 2400 | Westinghouse | 1200 |
| KVA 30 | 2300 | Fairbanks-Morse | 1200 |
| KVA 35 | 2300 | Allis-Chalmers | 1200 |
| 37½ | 2300 | Westinghouse | 1200 |
| 42 | 2300 | Electrical Machinery | 1200 |
| 45 | 1150 | General Electric | 1200 |
| 50 | 550 | Crocker-Wheeler | 1200 |
| 50 | 2300 | Fairbanks-Morse | 300 |
| 50 | 2300 | General Electric | 900 |
| 60 | 2200 | Warren | 600 |
| KVA 60 | 2300 | Electric Machinery | 900 |

**MacGOVERN & COMPANY, INC.**

285 BEAVER HALL HILL, MONTREAL

Offices: New York, Pittsburgh, Seattle. Plant: Linden, N.J.

Buyers and Sellers of New and Used Machinery

*Would you buy a used machine if you knew that it was practically new?*

## OF COURSE YOU WOULD,

especially if you could buy at

## A SAVING———YOU CAN.

Look these over—it might be here.

| | |
|---|---|
| 1—26" x 12' C.M.C., 3 step cone, D.B.G., Q.C.G., hollow spindle, face plate, follow rest, complete with countershaft and regular equipment; can be inspected under belt | $900 |
| 1—No. 4 Greenard Arbor Press, like new | 125 |
| 1—No. 9 Hendey Whitmore Double End Punch and Shear, ½" in ½"; can be inspected under belt | 500 |
| 1 20" Barnes Drill, W and L feed, T and L pulley, in A1 condition | 150 |
| 1—50 H.P. International Harvester Gas Engine, Mogul type, in A1 condition | 675 |
| 1—175 H.P. John Inglis steam engine, 90 lbs. | 500 |

A full line of lathes, millers, grinders, drills, motors, planers, engines, boilers, presses, shapers, wood-working machinery—all for immediate delivery.

The above is only a partial list of good as new machines that you can buy to-day far below the price that new ones will ever be. Send me your inquiries and let me convince you that I am right there with the goods and the lowest prices.

**R. S. HOLLY**

Suite 502, Kent Building Telephone Adelaide 3147

TORONTO, ONTARIO

# BAIRD - DETROIT

## SPECIAL OFFER

## 2 USED NO. 2A WARNER & SWASEY UNIVERSAL HOLLOW HEXAGON TURRET LATHES

Geared Head, Power Feed to Turret and Cross-Slide, 2⅝" hole through spindle, Chucks, Tools and Countershaft

CAN BE INSPECTED IN OUR DETROIT WAREROOMS

## PRICE F.O.B. WINDSOR, ONT., EACH $1160

DUTY PAID - FUNDS PAID IN CANADIAN CURRENCY

### OTHER BARGAINS

1 Used 3" Model A Cleveland Automatic.
3 Used ⅝"-⅞" Model A Cleveland Automatic.
1 Used 1¼" Model A Cleveland Automatic.
6 Used No. 1 Fraser Universal Grinders, capacity 8" x 20".
3 Used No. 200 Heald Rotary Surface Grinders, 8" chuck.
1 Used 12" Persons-Arter Rotary Surface Grinder, with generator attached.

**W. J. BAIRD MACHINERY CO.**

JEFFERSON AT BRUSH ST., DETROIT, MICH.

*If interested tear out this page and place with letters to be answered.*

# Garlock-Walker Machinery, Limited

567 Banning St.
WINNIPEG
Man.

32 Front Street West
**Toronto**
*Warehouse:*
163 Dufferin Street
*Telephone:* Adel. 6356

334 St. James St.
MONTREAL
Que.

*Interior View of Our Warehouse*



## MACHINERY SERVICE

This little glimpse into a corner of our warehouse will give you some idea of our ability to serve you when you want iron or woodworking tools, new or used.

Over 20,000 square feet in this warehouse is filled with every variety of equipment for machine shops and woodworking factories.

You will find Garlock-Walker service thoroughly dependable. Let us know what machinery you require.

List of new and used machinery in stock for immediate shipment and priced to sell under present conditions.

*If interested tear out this page and place with letters to be answered.*

### LATHES

1—144″ x 12′ Berg Pit Lathe (used).
1—36″ x 18′ Putnam (used).
1—36″ x 16′ London (used).
1—30″ x 12′ Blaisdell (used).
1—30″ x 14′ Niles-Bement-Pond.
1—26″ x 14′ Niles-Bement-Pond, Q.C.G.
1—24″ x 10′ Milwaukee, Q.C.F.
1—24″ x 12′ C. M. C., Q.C.G.
1—20″ x 10′ Rahn (used).
1—20″ x 6′ Le Blond Heavy Production (used).
1—18″ x 8′ Milwaukee, Q.C.F.
1—18″ x 8′ Rae, Q.C.G.
1—16″ x 6′ Reid, Q.C.G.
1—14″ x 6′ Hamilton, Q.C.G.
1—12″ x 8′ Le Blond Tool Room, Q.C.G.
1—12″ x 6′ Worcester, Q.C.G.
1—8″ Rivett Precision Bench with Cabinet and Attachments.
1—7″ Cataract Precision Bench, Chasing Attachment, Turret and Double Tool Cross-Slide.
1—7″ Cataract Precision Bench, Standard Equipment.
3—American Brass Lathes, 18″ x 6′ Bed, with Turret (used).

### GAP LATHES

1—38″ x 54″ x 12′ Bertram.
1—22″ x 40″ x 16′ McDougall.
1—21″ x 30″ x 7′ South Bend.
1—20″ x 38″ x 12′ C.M.C.

### TURRET LATHES

2—American, 24″, Power Feed to Turret.
2—Davis, 24″, Power Feed to Turret.
2—Oliver, 18″, Power Feed to Turret.

### SCREW MACHINES

12—Millhollands, No. 4, 1⅝″ Capacity.
1—Garvin, 12 S.P., Capacity 1 7-16″.
1—Prentiss, Capacity 7-16″.

### SCREW MACHINES

1—Wells, 1″ Capacity.
1—Warner & Swasey, No. 2.
1—Hartford, Full Automatic, Capacity 1⅝″.
1—National Acme, No. 54.
1—National Acme, No. 53.

### SPINNING LATHE

1—No. 5 Bliss Spinning Lathe, 24″ Swing x 5′ 9″ Bed, Full Attachments.

### SHAPERS

1—16″ Mackenzie (new).
1—16″ Rae.
1—16″ Butler.
1—24″ McGregor-Gourley.

### PLANERS

1—42″ x 42″ x 20′ Putnam, 1 Head.
1—48″ x 48″ x 14′ Patch, 4 Heads.
1—36″ x 36″ x 24′ Sellers, Open Side, 3 Heads.
1—30″ x 30″ x 10′ Pond, 1 Head.
1—24″ x 24″ x 6′ Powell, 1 Head.

### MILLING MACHINES

1—Briggs High Duty, Type "A," 22″ Traverse (new).
1—Briggs High Duty, Type "B," 42″ Traverse (new).
1—Ryerson-Owen No. 3 Universal (new).
1—Ford-Smith No. 3 Universal (used).
1—Ford-Smith No. 3 Plain (used).
1—Cincinnati No. 4 Plain (used).
1—Whitney Hand Miller, 18″ x 6″ Table (used).
1—Ford-Smith Plain Dividing Head with Vise—(14″ Swing) (used).

### DRILLS

1—10″ Burke Sensitive, Bench Type (new).
1—15″ Rockford (used).
1—16″ Edlund, No. 2B, H.S. Sensitive (new).
1—20″ Silver, B.G., W. L. & P. Feed, Auto. Stop (new).
1—20″ "Champion," B.G., W. L. & P. Feed, Auto. Stop (new).
1—20″ Rockwell, B.G., W. L. & P. Feed, Auto. Stop (used).
1—20″ Sibley, B.G., W. L. & P. Feed, Auto. Stop (used).
1—3-Spindle Silver Gang Drill, 20″, Tapping Attachment (used).
4—4-Spindle W. & R. Sensitive, Cap. ½″ (used).
1—36″ C.M.C., Heavy Duty (used).
1—36″ Bertram, Heavy Duty (used).
3—National Acme Horizontal Drills (½″ Cap.) (used).

### BORING MACHINES

1—66″ Bement-Niles Vertical, 2 Heads, 24″ Under Rail (used).
1—Universal, No. 2½, Horizontal, Table 42″ x 22″ (used).
1—Bullard, "New Era," Vertical Turret, 36″, Complete Equipment (new).

### POWER HACK SAWS

1—No. 10 Racine, 8″ x 8″ Cap. (new).
1—No. 7 Watkins, 9″ Cap. (used).
1—No. 1 Racine, 6″ x 6″ (used).
1—Peerless, 6″ x 6″ (used).

### AIR COMPRESSORS

1—8″ x 8″ Sullivan, Class WG-3, Belt Driven (used).
1—8″ x 10″ x 8″ Bury, Steam Driven (used).
1—12″ x 18″ Ingersoll-Sargent, Belt Driven (used).
1—12″ x 12″ Can. Ingersoll-Rand, Belt Driven (used).
1—3″ x 1½″ x 3″ American, Motor Driven (used).

### GRINDING MACHINES

1—Landis No. 4 Universal (used).
1—Landis, Plain, Self-contained, 36″ x 12″ (used).
1—Landis, Plain, 42″ x 12″ (used).
1—Fitchburg Cylindrical, 8″ x 36″ (new).
1—Globe Universal Tool and Cutter Grinder (new).
1—Le Blond Universal Tool and Cutter Grinder (used).
1—Cincinnati Universal Tool and Cutter Grinder (used).
1—Gardner No. 12, Double Disc, 18″ Discs, with End Grinding Attachment (used).
1—Diamond Surface Grinder, Table 84″ x 30″, Cup Wheel 24″ Dia. (used).
1—Lafayette Universal Grinder.
Several Pedestal Emery Stands.

### PUNCHES, SHEARS AND PRESSES

1—Lennox Rotary Bevel Shear (1″ Cap.) (new).
1—Crowell Hydraulic Rocking Press, with Pump (used).
1—Greenerd No. 3½ Arbor Press, with Stand (used).
1—Greenerd No. 3½ Arbor Press, without Stand (new).
1—Ryerson Single End Punch (½″ Cap.) (new).
3—Ryerson Single End Punches (¼″ Cap.) (new).
1—No. 19 Inclinable Power Press (new).
1—Newell Foot Power Press.
1—68N Bliss Double Action (used).
1—No. 57½ Toledo (used).

### MISCELLANEOUS

2—No. 4 John Hall Pipe Machines (new and used).
1—High Speed Riveting Hammer, No. 3 "A" (used).
1—Beaudry "Champion" Power Hammer, No. 9 (used).
1—Grant Rivet Spinning Machine, Pedestal Type, No. 80A, 3-16″ Cap. (new).
1—Grant Rivet Spinning Machine, Bench Type, No. 80B, 3-16″ Cap. (used).
1—Leader Polishing Lathe, Motor Driven, Direct Current, 5 H.P., 115 Volt, 2,800 R.P.M. (used).
1—Roots No. 1 Low Pressure Blower.
1—Sheldon No. 2 Forge Blower.
1—Buffalo No. 3 Forge Blower (7″ opening).
1—Buffalo No. 3 Pressure Blower (4½″ opening).
1—Sturtevant 60″ Single Exhaust Fan.
1—Sturtevant 48″ Single Exhaust Fan.
1—Sturtevant 36″ Single Exhaust Fan.
1—Sturtevant 45″ Double Exhaust Fan.
1—Detroit No. 16 Single Exhaust Fan (16″ opening).
1—Herbert Morris Portable Crane, 1½ Ton, 10′ Lift.
1—Canton Portable Crane, 2 Ton, 5′ Lift.
1—Canton Portable Crane, 1 Ton, 8′ 6″ Lift.
1—West Magott Gas Furnace, 10″ x 8″ Opening (used).
1—Bellevue Double Chamber Oil Furnace, 9″ x 5″ openings (used).
Transmission Equipment, Pulleys, Belting, Shafting and Hangers.

### POWER EQUIPMENT

1—75 H.P. Bell High Speed Engine (used).
Several Motors (Various Sizes) (used).

### FRICTION SAWS

1—46″ Ryerson, with 52 H.P., 220 V., D.C. Motor (used).
1—22″ Ryerson, with 35 H.P., 550 V., 25 Cy. Motor (used).


# Garlock-Walker Machinery, Limited

**32 Front Street West, Toronto**

**567 Banning St., Winnipeg** *Warehouse:* **163 Dufferin Street** **334 St. James St., Montreal**


*If interested tear out this page and place with letters to be answered.*

IMMEDIATE SHIPMENT—TORONTO STOCK

# COLD ROLLED STRIP STEEL

10,800 lbs. .028″ x 2⅞″, soft, 6′ lengths.
2,000 lbs. .028″ x 4″ , dead soft, 8′ lengths.
7,000 lbs. .028″ x 6″ " " 8′ "
2,500 lbs. .032″ x 4″ " " 8′ "
5,100 lbs. .032″ x 8″ " " 8′ "
2,000 lbs. .035″ x 1⅛″, soft, coils.
2,200 lbs. .035″ x 6″ and 8″, dead soft, 8′ lengths.
3,500 lbs. .050″ x 1½″, hard, 8′ lengths.
2,000 lbs. .050″ x 1¾″, dead soft, 7′ lengths.
3,400 lbs. .050″ x 4″, dead soft, 8′ lengths
6,200 lbs. .050″ x 5¾″ " " 8′ "
2,800 lbs. .050″ x 6″ " " 8′ "
6,500 lbs. .062″ x 6″ " " 8′ "
3,800 lbs. .062″ x 8″ " " 8′ "
12,000 lbs. .062″ x13″ " " 104″ "
6,500 lbs. .065″ x 6″ " " 6′ "
700 lbs. .073″ x 6″ " " 8′ "
500 lbs. .083″ x 1¾″, half hard, 6′ "
1,600 lbs. .100″ x 4⅛″ " " 10′ "

*Write us for complete lists.*

**Auto Body Sheets—Black and Galvanized Sheets.**
**Tubing**
**Brass and Copper Bars and Sheets.**

*YOUR ENQUIRIES SOLICITED.*

# ONTARIO METAL PRODUCTS
## Co., Limited

**237 Dufferin Street -- -- Toronto, Canada**



# GOOD OPPORTUNITIES HERE

### STEEL PLANT EQUIPMENT

6—Heroult Electric Furnaces, 6 ton, tilting type, complete with transformers and auto regulators.
18—Williams Cut Off Machines, hollow spindle, taking up to 9½″ bar stock.
1—Allis Bulldozer, No. 12, jaw opening 54″ x 72″ deep, approximately 12″ stroke.
6—Deane Horizontal, double plunger Pumps, 4⅛″ x 18″, capacity 200 gallons at 1,500 lbs. working pressure, being motor driven and complete with motors.
1—Kennedy Billet Shears, double head, 14″ capacity.
1—Combined Punch and Shear, 10″ throat.
8—New, Pittsburgh Ladles, cast steel, bottom discharge, 15 ton.
4—Used, Pittsburgh Ladles, cast steel, bottom discharge, 12 ton.
2—Used, Steel Plate Ladles, bottom discharge, 9 ton.
1—Used, Tilting Type Ladle, capacity 6 ton.
1—Gordon & Maxwell, Duplex Hydraulic Pump, 20″ x 7⅜″ x 18″.
1—Gordon & Maxwell, Duplex Hydraulic Pump, 19″ x 6½″ x 18″.

### MACHINE TOOLS

#### Lathes

1—Bertram Engine Lathe, 20″ x 10′ bed
1—Sellers Engine Lathe, 18″ x 10′ bed
1—Pond Engine Lathe, 20″ x 8′ bed, taper attachment.
1—Herrington Engine Lathe, 24″ x 14′ bed
1—Ledge & Davis Engine Lathe, 14″ x 18′ bed.
1—Fay & Scott Engine Lathe, 40″ x 12′ bed.

#### Shapers

1—Norton, 20″, Table 20″ x 20″.
1—Pedrle Crank Shaper, 14″

#### Drills

1—New, Barnes, 22½″, 3 spindle, style "E."
1—Fosdick, Heavy Duty, Table 20″ x 20″.
1—Herrington, Heavy Duty, 42″ Type "C"

#### Steam Hammers

1—Sellers Steam Hammer, 400 lbs.
1—Brandts Power Hammer, No. 12, 500 lbs.
1—Fairbanks Power Hammer, 250 lbs.
1—Brandts Belt Drive, 3″ x 20″

#### Planers

1—Herrington, single head, Table 42″ x 8′.

#### Hack Saws

2—Racine, drawcut, capacity 11″
14—Racine, drawcut, capacity 5″.
2—Victor, drawcut, capacity 8″.

#### Gear Hobber

1—New, Barnes, No. 1 Gear Hobber.

### AIR COMPRESSORS

#### Belt Driven

2—Canadian Ingersoll-Rand, Cross compound, 16″ and 9″ x 16″, 780 cu. ft. at 100 lbs.
1—Canadian Ingersoll-Rand, two stage, 14″ and 9″ x 12″, 400 cu. ft. at 100 lbs.
1—Bury, 12″ x 12″, 340 cu. ft. at 100 lbs.
1—Bury, 10″ x 10″, 150 cu. ft. at 100 lbs.
1—Sullivan, 12″ x 12″, 345 cu. ft. at 100 lbs.

#### Steam Driven

1—Ingersoll-Rand, Corliss Type, cross compound, 2 stage, cylinders 20″, 36″, 30″ x 36″ stroke, 1,920 cu. ft. at 100 lbs.
1—Ingersoll Sargent, cross compound, 2 stage, 14″ and 22″ x 18″, 900 cu. ft. at 100 lbs.
1—Canadian Rand, straight line, 12″ and 12″ x 18″, 280 cu. ft. at 100 lbs.
1—Ingersoll-Rand, two-stage, 15″ and 25″ x 24″, 1,600 cu. ft. at 100 lbs., direct connected to 25 cycle Westinghouse Motor.
1—Canadian Rand, two-stage, cross compound, 12″ and 20″ x 18″, 18″ and 12″ x 18″, 775 cu. ft. at 100 lbs.

### PUMPS

1—No. 7 Cameron Sinking Pump.
3—No. 2 Cameron Removable Bushing Pattern Pumps.
1—Cameron Prospectors' Sinking Pump.
1—Swaby two-stage Centrifugal Pump, 3″ suction, 2½″ discharge, direct connected to 15 H.P. Motor.
1—Swaby two-stage Centrifugal Pump, 1½″ suction, 1½″ discharge, direct connected to 5 H.P. Motor.
1—Cameron, No. 2, four-stage Centrifugal, direct connected to 30 H.P. Motor, complete with auto float starter.
1—Worthington Boiler Feed Pump, 14″ x 8½″ x 12″.
2—Duplex Boiler Feed Pumps, 3″ x 2″ x 3″.
2—Edwards Triplex Pumps, 6″ x 8″.
2—Myers Geared Pumps, 2½″ suction, 2½″ discharge.
3—Fairbanks Oil Pumps, 4½″ x 3″ x 4″.
1—Pulsometer Pump, No. 2, 1½″ x 1½″.
1—Birdsboro Centrifugal Sand Pump, 24″, complete with base and sub-base for direct connection to Motor.

**WILSON-McGOVERN, Limited, Lumsden Building, Adelaide St. E.**
**TORONTO, ONTARIO**

**KIM-O** *The Boiler Compound That Has No Equal.*

**Oils, Soaps, Greases, Roofing Paint, Machinery.**

1—Belliss & Morcom Engine, 750 H.P.
1—Belliss & Morcom Engine, 135 H.P.
2—Wheelock Engines. Each 75 H.P. One with Heater and Pump attached.
1—30 x 6 Upright Boiler, complete.
1—42 x 7 Upright Boiler, complete.
Numerous other Boilers and Engines on hand.

**Write us your requirements. We can satisfy you. Boilers sold subject to inspection only.**

**THE BOILER & ENGINEERING EQUIPMENT CO., REG.**
**Office: 222 CRAIG ST. W., MONTREAL, P.Q.**

# Our Loss--Your Gain

Here are a few opportunities for you to save some money:

2—26 x 12 first-class used C.M.C. Lathes, $650 each.

2—No. 0 B. & S. used Automatics, $650 each.

2—No. 2 B. & S. used Automatics, $750 each.

These are a few. Write us about other new and used machines we are offering at reduced prices, such as Gap Lathes, Turret Lathes, Shapers, etc.

**Williams & Wilson, Limited**
**84 Inspector Street**
**MONTREAL**

## The Kaitting List Of Second-Hand Machinery

Two turret lathes, Warner & Swasey make.
One engine lathe, 21" x 12', McGregor-Gourlay make.
One Corton Disc Grinder, 20", with press.
One 30" band saw, manufactured by the Preston Machine Co.
One London engine lathe, 20" x 10'.
One three horsepower electric motor, Westinghouse.

**Geo. C. Kaitting & Son**
**54 & 56 Ainslie St. S.**
**Galt, Ontario**

# Machinery For Sale

## *LATHES*

| | |
|---|---|
| 20"x10'-0" Cisco Heavy Duty Engine Lathes, Q.C.G., D.B.G. | $1,000.00 |
| 19"x8'-0" Le Blond Heavy Duty Engine Lathes, Q.C.G., D.B.G. | 900.00 |
| 16"x10'-0" Cisco Engine Lathe, Q.C.G. | 800.00 |

## *DRILLS*

| | |
|---|---|
| Avery Sensitive Drill Press, Bench Type | $ 75.00 |
| 14" Single Spindle "Perfect" Pedestal Drill Press | 75.00 |
| Two Spindle Pedestal Drill Press | 75.00 |

## *MISCELLANEOUS*

| | |
|---|---|
| Pedestal Grinders ..... Each | $ 35.00 |
| "Modern Machine Co." Chaser Grinder. | 100.00 |
| No. 180 B & B Inclinable Punch Press | 250.00 |
| Heavy Duty Polishing Lathes ..... 40.00 | 60.00 |
| 2—50 Gal. "Pendrith" Candy Mixers Each | 85.00 |
| Robertson Power Hack Saw | 35.00 |
| "Chapman" Elevating Truck | 75.00 |
| 2—Garvin No. 1 Rapid Castellating Machines ..... Each | 25.00 |
| 1—No. 1 Acme Screw Slotting Machine. | 175.00 |
| 1—National Acme Centering Machine | 50.00 |
| 20" Silver Drill Press | 150.00 |
| No. 6 Brown & Sharpe Turret Lathe | 450.00 |
| 4'-0" "B. & B." Power Squaring Shear, Practically New | 1,000.00 |
| No. 18 Globe Co. Cleveland "Tumbling Barrel," New | 225.00 |

**Pulleys, Hangers, Shafting.**

**All Used Equipment Is Guaranteed in First-Class Running Order.**

# GENERAL MACHINERY COMPANY

***Telephone Main 2200***

**67-69 Frederick Street**
**Toronto**


*If interested tear out this page and place with letters to be answered.*

# Machinery and Equipment

## PUNCHES AND SHEARS

S. 22B 1—6″ throat, Hilles & Jones No. 1 Horizontal Punch.
S. 38B 1—Size T40, Henry Pels & Co., John's Patent Shears.
W. 5B 1—30″ Jumbo Punch, cam shaft drive off pulley shaft, 7 8″ hole and 7 16″ plate. Die block, slipper, belt drive.
W. 13B 1—56″ throat, American Ship Vertical Punch; capacity 1″ through 1″ ; belt drive, with T. & L. pulleys.
W. 40A 1—No. 5 60″ throat, Southwark Vertical Punch.
W. 6B 1—12″ throat, Hilles & Jones Bar Shear.
W. 49A 1—48″ throat, Southwark Plate Shear.
W. 31A 1—48″ throat, quick work Rotary Shear.
W. 17B 1—14″ throat, Coping Shear.
D. 87A 1—No. 252 Niagara Squaring Shear.
D 46B 1—No. 352 Niagara Squaring Shear; cuts and squares 14 gauge mild steel; has 16″ throat for trimming and splitting; T. & L. pulleys, 4½″ belt, cam and lever hold down.
D. 48B 1—**Foot Squaring Shear; 22″ knife; capacity to cut 24 gauge mild steel. Light machine.**
D. 43B 1—**2A 30″ throat, quick work Rotary Shear,** 4 speed changes; cuts curves of any radius and will cut minimum round hole 5½″ diameter. Capacity up to 5/32″ mild steel. Belt drive.
CL 4B 1—30″ gap, Globe Iron Works Double End Punch; one end 1″ hole and ½″ plate; other end 1″ hole and ¾″ plate. Belt drive.
CL 16B 1—36″ throat, American Ship Single Vertical Punch; belt drive; capacity 1″ through 1″.
B 9A 1—12″ throat, Southwark Horizontal Punch.
B 7A 2—84″ throat, Long & Alstetter Plate Punches.
B 27B 1—Size T-40 Henry Pels & Co., John's Patent Shears.
B 28B 1—42″ throat, Plate Shear; capacity to shear 1″ plate.
B 6A 1—84″ throat, Long & Alstetter No. 2 Single Plate Shears.
B 8A 1—No. 4B Quick Work Rotary Shear.
L 13B 1—36″ throat, Cleveland Ship Building Co..
L 21B 1—36″ throat, Cleveland Ship foot operated Single Punch.
L 14B 1—32″ throat, Cleveland Punch and Shear Manhole Punch.
L 24B 1—18″ throat, Channel Shear.

## Polishing Machines

D 57A, D 58A, D 81A 3—No. 5 Webster and Perks Double Spindle Polishing Machine.

## Drills

Ch. 25A 1—25″ Barnes upright Drill Press.
Ch. 32A 1—26″ Barnes back geared upright Drill.
Ch. 45A 1—30″ Putnam upright Drill.
L 2A 1—Aurora Upright Drill.
L 10A 1—48″ Morris Plain Radial Drill.
L 26A 1—48″ Reed Prentice Plain Radial Drill.
L 39A 1—6′ American Plain Radial Drill.
L 15B 1—16′ arm, Post Radial Drill, made by Cleveland Punch and Shear Works.
D 30A 1—Radial Reed Prentice 6′ Standard.
D 20A 1—5′ Arm Radial Drill, Niles-Bement-Pond semi-universal.
D 57B 1—12″ Burnham Sensitive Drill.
D 15B 1—20″ Barnes Upright Drill.
D 32B 1—Foote-Burt, 4 spindle, No. 2 Mud Ring and Flue Sheet Drill.
Ch. 33B 1—15′ arm, Post Radial with No. 3 Morse taper socket.
Ch. 29B 1—24″ Dallette Portable Radial Drill.

## Rolls

S 41B 1—Set Hilles & Jones Mangle Rolls, 6′ 10″ rolls, 8′ 2″ between housings, takes 7′ 6″ plate, hand adjustment.
D 54B 1—Set Forming Rolls, Peck, Stowe & Wilcox.
D 72B 1—Set 30″ Hand Power Forming Rolls.
B 53A 1—Set 16′ Hilles & Jones Bending Rolls, Pyramid Type, top roll 14″ diameter, bottom rolls 12″ diameter.

## Milling Machines

D 110A 1—Milling Machine, No. 3B Milwaukee Plain, Kearney and Trecker make.
D 116A 1—No. 3H LeBlond Heavy Duty Miller.
W 24B 1—No. 2 LeBlond Plain Miller.
D 40A 1—No. 5 Cincinnati Plain Milling Machine.
D 41A 1—No. 4C LeBlond Milling Machine.
D 80A 1—No. 5 Cincinnati Universal Milling Machine.
D 53A 1—24″ x 24″ x 12′ Ingersoll Milling Machine.
D 39A 1—No. 6 National Transit Plain Milling Machine.
D 84A 1 No. 2 Rockford Universal Milling Machine.
D 13B 1—No. 5 Brown & Sharpe Plain Milling Machine.

## Rivet and Bolt Headers

S. 29B 1½″ to 1¼″ Ajax Single Rivet Heading Machine.
S. 35A 1—Improved 1¼″ Ajax Steel Bed, continuous motion, hand feed Heading Machine.

## Riveters

S. 30B 1 Wm. Sellers Co., Upright Stationary Steam or Air Riveter.
CL. 25B 1—10″ gap, Morgan Horizontal Hydraulic Riveter.
Ch. 19A 1—Hanna 75″ gap Bull Riveter.

## Rivet Machine

B 46A 1 Acme A Rivet Machine.

## Rivet Forges

B 16A 2—Rivet Forges.

## Tables—Punch

W 41A 2—Lysolm Punch Tables, capacity 6 handle 25″ plate.

## BORING MILL

S 12A 1—7′x10′ Betts Vertical Boring Mill.
B 23A 1—48″ Niles Vertical Boring Mill.
Ch 1B 1—36″ Sellers Horizontal Boring Mill.
CL 25A 1—24″x24″x24″ Giddings and Lewis No. 0 Horizontal Boring Mill.
CL 36A 1—48″ Gisholt Vertical.
CL 29A 1—Sellers 84″ Vertical.
**D63A 1—60″ Derrick and Harvey Horizontal Boring, Drilling and Milling Machine.**
**D66A 1—60″ Gisholt Horizontal Boring Mill.**

## RIVET HEADERS

W 12A 1—National Rivet Header, Capacity up to 1¼″ diameter by 9″ long rivets.
Ch 51A 1—Acme size A, All steel open die Rivet Making Machine.
Ch 23B 1—½″ to 1½″ x 5″ Ajax Rivet and Bolt Making Machine.

## GANTRY CRANES

W 9A 1—15-ton Link-Belt steam operated variable Radius Gantry Crane, 90′ steel boom.
Ch 37B 1—Brown-Hoist Gantry Crane, 120′ boom.
Ch 26B 1—Gantry Crane, 172′ Boom, 49′ rail centers. Hook travel 149′. Clear lift 50′ 10″. Will be sold complete with 314′ long trestle. 30′ 10″ high. Crane capacity ten tons at end of boom. Equipped with three 220V. D.C. Motors.
Ch 14A 1—15 ton Link-Belt, 8-wheel single drum, steam operated Gantry Crane, mounted on Gantry sub-structure 30′ high. 90′ steel boom, 20′ rail centers, 54″ x 6′ boiler for 125 lbs. pressure.
Ch 14A 1—14-ton Link-Belt 8-wheel single drum, steam operated Gantry Crane, mounted on Gantry sub-structure 34′ high. 90′ steel boom, 20′ rail centers, 54″ x 6′ boiler for 125 lbs. pressure.
S 39B 1—Electric Drive Steel Gantry Crane, with 170′ boom. 55′ lift. Capacity 5 tons, 80′ from center, 18′ span. Will be sold with runway 580′ long.
S 2A, S20A 2—15-ton Link-Belt, fill revolving, steam operated.

## OVERHEAD CRANES

W10A 1—7½-ton Toledo, three motor Travelling Crane, 72′ 5″ span, 30′ lift.
W 11A 4—7½ ton Toledo three motor Travelling Cranes, 87′ 5″ span, 30′ lift.
Ch 24B 1—10-ton P. & H. overhead Travelling Crane.

## CRANES

B 10A 4—3-ton Sprague Electric Monorail Cranes, 15′ lift. Remote controlled. With trailing operator's cage. Complete with one 35 KW Generator set; 3 phase, 25 cycle, 220 V, on AC end; 220 V, DC on Generator end.
B 11A 1—10-ton Lakeside Electric Gantry Crane and trackage. Single line equipment. 67′ span. 60′ lift. Equipped with four 3 phase, 25 cycle, 220 V Motors.
B 59A 1—Hand Operated Overhead Traveling Crane, with 14′ 9″ rail centers, capacity 3 tons.
L 32A 1—20-ton Champion Electric Travelling Crane with 5-ton auxiliary hoist.
L 25B 12—Pedrick and Ayer Jib Cranes, 17′ 10″ arms.

## WALL CRANES

**Ch 32B 9—17 6″ arm Wall Cranes, with 4 wheel carriages.**

## Tanks---Oil Storage

CL 52A 2—Oil Storage Tanks, 8′ x 36′, equipped with ¾″ steam coils, two 3″ drains, 3″ vent, and 3″ pump inlet, 5-16″ plate; 13,500 gals. cap. each.
CL. 53A 1—Oil Storage Tank, 8′x26′ 6″ long, equipped with ¾″ steam coils, two 3″ drains, 3″ vent and 3″ pump inlet, 5-16″ plate, 9,950 gallons capacity.

## Shaper

L. 19A 1—24″ Gould & Eberhardt Shaper.

## Slotters

L 21A 1—18″ Newton Vertical Slotter.
CL. 40A 1—18″ Newton Vertical 48″ diameter table.

## Tube Bender

L 33A 1—Wonder Boiler Tube Bender.

## Plunging Press

CL 26B 1—75 ton Morgan Engineering Co. Plunging Press.

*If interested tear out this page and place with letters to be answered.*

# for Sale---Immediate Delivery

## LATHES

L 36A 1—16″ x 7′ Le Blond double friction back geared screw cutting Lathe.
L 5B 1—24″ x 16′ 0″ Pond back geared Lathe.
L 4B 1—18″ x 4′ 10″ Dietz-Schumaker & Boyce back geared rack and screw feed Lathe.
L 13A 1—42″ x 30′ 0″ Elyria roughing Lathe.
L 3A 1—42″ x 30′ Elyria roughing Lathe.
L 3B 1—26″ x 14′ 0″ Pond back geared Engine Lathe.
CL 15A 1—14″ x 8′ Champion Screw Cutting.
CL 28A 1—24″ x 14′ Boyce and Emmes double back geared Engine Lathe.
CL 46A 1—42″ x 28′ Pittsburgh; heavy duty; triple geared; face plates; steady and compound rests; driven by 20 HP, 230 V, 400-1200 RPM, D C Westinghouse type SK Motor.
Ch 10A 1—16″ x 8′ South Bend back geared Engine Lathe.
Ch 6B 1—21″ x 8′ bed, Bradford Lathe; back geared.
Ch 5B 1—26″ x 12′ Dietz-Schumaker & Boyce back geared Engine Lathe.
B 3B 1—32″ x 20′ New Haven Engine Lathe.
B 2B 1—34″ x 8′ Putnam back geared Engine Lathe.
L 29A 1—36″ x 22′ 0″ Putnam Lathe.
L 17A 1—27″ x 20′ American Lathe.
D 17A 1—20″ x 10′ 8″ Walcott Engine Lathe.
W 51A 1—18″ x 10′ Walcott Engine Lathe.
W 52A 1—19″ Sidney Engine Lathe.
W 53A 1—New Haven Pipe Facing Lathe.
D 34B 1—28″ x 16′ 4″ New Haven Single Back Geared Engine Lathe.
D 91A 1—26″ x 18′ 6″ Walcott Double Back Geared Engine Lathe.
D 23B 1—30″ x 23′ 11″ Pond Single Back Geared Engine Lathe.
D 35B 1—21″ x 10′ 5″ bed Hamilton Double Back Geared Engine Lathe.
D 51A 1—30″ x 37′ 6″ Wickes Double Back Geared Engine Lathe.
D 11A 1—26″ x 14′ 6″ Walcott Double Back Geared Engine Lathe.
D 90A 1—26″ x 16′ 5″ Walcott Double Back Geared Engine Lathe.
D 52A 1—No. 9 Empire Irregular Type Wood Turning Lathe.

## TURRET LATHES

D 5B 1—Bardons and Oliver Turret Lathe.
D 9B 1—Warner and Swasey Turret Lathe.
D 83B 1—Bardons and Oliver Turret Lathe.
W 27B 1—Foster Machine Company Turret Lathe.
D 16A 1—18″ x 8′ Walcott.
D 50A 1—Lathe, 24″ Gisholt Turret.
D 37A 5—2¼″ x 10″ Mulholland Turret Screw Machines.
D 68A 3—1⅝″ x 10″ Turret Lathe Screw Machine.

## Flanging Press

CL 18A 1—200-ton Southwark Hydraulic.
L 12B 1—Morgan Engineering Works 75-ton Hydraulic Flanging Press.

## Saws

S 27B 1—24″ Newton Cold Saw. Will cut up to 6″ square.
D 60A 1—No. 18 Lea Simplex Cold Metal Saw.
1—Saw Sharpening Machine for Lea Simplex Cold Saw.

## AIR RECEIVERS

S 48A 1 Ingersoll-Rand No. 7, Vertical Steel Air Receiver, 54″ x 12′, complete with all fittings.
B 14A 2—54″ x 12′ Chicago Pneumatic Vertical Air Receivers.
Ch 50A 1—42″ x 10′ Kewanee Vertical Air Receiver.
CL 49A 1—48″ x 9′ Kewanee Vertical 2 course Air Receiver.
L 1A 1—36″ x 9′ Vertical Two Course Air Receiver.
L 37A 1 48″ x 12′ Vertical Air Receiver.
L 37A 2—54″ x 12′ Kewanee Vertical Air Receivers.

## CARS

CL. 11A 1—Saddle Boiler Car, 32′, 4″ long overall; capacity 70 tons. Built to M C B requirements, all steel construction.
CL. 103A 2—Saddle Boiler Cars, M C B requirements, all steel construction, 32′ 4″ long overall; 30′ long, not including couplers.

## PIPE MACHINES

Ch. 33A 1—D Saunders Pipe Machine, capacity 1″ to 4″.
Ch. 46A 1—Crane Co. Pipe Machine, capacity 1″ to 4″, Eaton Cole and Burnham Type.
B 12A 1—Lovekin A Pipe Expanding and Flanging Machine, capacity, 2″ to 6″.

## Hoist—Electric

Ch. 54A 2—Thomas Double Drum Hoists, band friction type with reverse mechanism for slewing.

## Generators

B 25B 1—Fairbanks Morse 2½ K.W., 115 V, type T R, Generator.
CL. 37B 1—30 K W Card, 240 V, 775 R.P.M., belt drive.

## Bolt Cutters

S 19A 1—2½″ Acme Bolt Cutter.
S 50B 1—Acme Single Bolt Cutter, 1½″ to 2″ capacity.
CL. 26A 1—1½″ Merriman Single head.
CL. 47A 1—4″ Landis Single head.
D 82B 1—3½″ National Bolt Cutting Machine.
D 25B 1—1½″ Acme Bolt Cutting Machine.

## Nut Tapping Machine

D 42A 1—Nut Tapping Machine; 10 Spindle.

## Transformers

Ch. 49A 3—833 KVA General Electric Type, WC, form BDH, 60 cycle, transformers.

## Hammers

L 31A 1—2,000-lb. Bement Single Frame Steam Hammer.
L 31½A 1—2,400-lb. Bement Single Frame Steam Hammer.

## Planers

D 81B 1—24″ x 24″ x 6′ Pease Planer.
W 23B 1—36″ x 36″ x 10′ Pond Planer.
L 16A 1—72″x72″x20′ Standard Cincinnati closed side Planer.
L 27B 1—48′ x 48″ x 16′ Pond Planer.
CL. 50A 1—48″ x 48″ x 20′ Patch Planer.
B 24A 1—60″ x 60″ x 20′ Sellers closed Side Planer.

## Woodworking Machinery

B 23B 1—McKinnon Wood Cutting Jig Saw, with semi-universal head.
B 21B 1—15″ Fay & Egan Four side "Lightning" Planer and Matcher.

## Air Compressors

S. 17A 1—2,000 Cu. Ft. class P R E. Ingersoll Rand.
S. 48B 1—Franklin double stage Air Compressor.
W 39A 1—Laidlow 2 stage tandem compound horizontal steam driven Air Compressor.
Ch. 28B 1—150 Cubic Ft. Sullivan.
CL. 57B 1—Chicago Pneumatic 1,200 Cubic Feet steam driven cross compound, 2 stage.

## Air Compressor --- Electric

B 13B 1—1,100 Cubic Ft. Class WN, No. 3 Sullivan Angle Compound, 20″ and 12″ x 14″; direct connected to 225 H P., 2,200 V., 214 R P M., 3 phase, 25 cycle, Electric Machinery Synchronous Motor with exciter.

## STOCKS OF

**Contractors' and Builders' Supplies—Electrical Supplies—Plumbing Supplies—Ship Hardware and Supplies—Bolts, Nuts, Rivets and Washers—Steel Plates, Shapes, Bars, Etc.—Air and Water Hose—Pipe and Fittings.**

**Write or telegraph us for our catalogs, prices, and full particulars.**

THE

# American Ship Building Company

## Foot of West 54th St., N.W.

## CLEVELAND, OHIO, U.S.A.

## Grinders

Ch. 23A 2—12″ Willey double Emery Wheel Grinders.
D 100A 1—Drill and Cutter Grinder, Wilmarth and Morman Co. Mfrs. Serial No. 10,-602—JBX.
D. 19A 1—Combination Cutter and Grinders, Wilmarth and Morman Yankee.
D. 102A 1—Yankee Drill Grinder and Cutter.
D. 47A 1—Grinding Machine, No. 5 Ransome.
D. 49A 1—No. 8B Ransome Dry Tool Grinder.
D. 76B 1—Double Emery Grinder.

## Locomotives

L 12A 1—48-ton Schenectady Locomotive, 4 wheel type, 4′ drivers, 46½x16″ boilers, air brakes.
D 118A 1—Plymouth 6-ton Gasoline Locomotive

# LOOK OVER THIS LIST!

## Many Good Opportunities in Used Tools Here

### BORING MILLS

10′ to 16′ extension type, swings 11′ 2″-20′ 2″.
60″ x 5′ horizontal, back geared.
54″ x 10′ horizontal, back geared.
42″ x 12′ horizontal, back geared.
42″ vertical car wheel boring and facing machine.
34″ London, vertical.

### DRILLS

11′ Bertram, rail type, 6 spindle, adjustable heads.
Gardam, multiple, medium capacity, 6-spindle.
D-8 Colburn, heavy duty, B.G.
No. 16D "Hole Hog" multiple, 4-spindle.
D-4 Colburn, heavy duty.
No. 4 Colburn, heavy duty, B.G.
20″ Barnes, 3-spindle manufacturers.
20″ Colburn, 4-spindle, heavy duty, B.G.
18″ Sipp, 2-spindle, quick-change speed.
17½″ Allen, sensitive, 4, 5 or 6-spindles.
15″ Avey, 4-spindle, ball bearing, lever feed.
70—Upright drills of various makes, from 7″ to 40″ capacity.
25—Bench drills, from 6″ to 15″ capacity.
14—Post drills, from 12″ to 21″ capacity.
12′ and 14′ arm, wall radials.
8′ semi-universal radial.
5—Radials, from 30″ to 52″ capacity.

### GRINDERS

2—No. 106 Rivett, automatic internal.
No. 2½ Bath, duplex internal.
No. 205 Rivett, radial.
No. 3 Brown & Sharpe, universal with internal attachment.
No. 200 Heald, ring and surface, 8″ magnetic chuck.
No. 3 Gardner, disc, 14″ ring wheel chuck.
No. 2 Cincinnati, 12″ x 36″ plain.
2—10″ x 30″ Landis, plain.
2—12″ x 36″ Landis, plain.
18″ x 7′ Stringertype surface.
4—Twist drill grinders.
4—Plain surface grinders.
9—Universal tool and cutter.
7—Plain tool grinders.
30—Pedestal, various makes and sizes.
10—Bench, various makes and sizes.
2—Electric grinders.

### GEAR MACHINES

No. 6 Fellows gear shaper, 26″-36″ capacity.
36″ Fellows gear shaper.
No. 2 Barber-Coleman hobber, 3″ x 7″ capacity.
No. 1 Farwell gear hobber.
24″ Brown & Sharpe, automatic spiral gear cutter.
12″ Rochester, gear tooth rounder.

### POWER HAMMERS

1500-lb. Bement, steam driven.
700-lb. Bertram, steam driven.
350-lb. Sellers, steam driven.
800-lb. board lift, drop.
40-lb. Bradley, helve hammer.
2—No. 4-A High Speed riveting hammers.
Pettingell base plate.

### KEYSEATERS

No. 0 Chattanooga.
No. 1 Davis.

### TURRET LATHES

10—No. 6-A Potter & Johnston, automatic.
10—No. 4 Foster, friction head.
26—No. 4 Wood, friction head, tilted turret.
No. 4 Warner & Swasey, universal.
No. 3-A Warner & Swasey, hollow hexagon.
2—No. 3 Foster, plain head.
41—2¼″ Gridley, single spindle, automatic.
2¼″ Cleveland, automatic.
4—¾″ National, multiple spindle, automatic.
2—⅞″ x 2½″ Brown & Sharpe, automatic screw machine.
2—2″ x 24″ Jones & Lamson, flat turret.
2—27″ x 10′ C.M.C., heavy duty.
6—26″ x 10′ Steinle, geared head.
4—24″ x 9′ Gisholt, B.G., friction head.
50—Other turret lathes of various makes and sizes.

### ENGINE LATHES

130—Engine lathes of various makes and sizes from 8″ to 32″ swing.
24″ x 12′ Advance, D.B.G.
21″ x 12′ Sidney, D.B.G.
20″ x 12′ Lodge & Shipley, selective head.
2—18″ x 10′ Sidney, medium pattern, manufacturing.
18″ x 10′ 3″ Lodge & Shipley, D.B.G., 3-step cone.
16″ x 5′ Reed, automatic, single pulley drive.
3—16″ x 8′ Sidney, D.B.G.
16″ x 8′ South Bend, quick change gear.
14″ x 6′ Mulliner, tool room lathe, with pan, taper attachment, draw-in attachment.
14″ x 6′ Sidney, quick change gear.
No. 504 Rivett precision, bench type.
No. 505 Rivett precision, bench type.

### GAP LATHES

30″ x 44″ x 23′ London, B.G.
26″ x 44″ x 20′ Bertram, B.G.
24″ x 44″ x 16′ or 20′ bed, C.M.C.
22″ x 40″ x 14′ Rae, D.B.G.
18″ x 32″ x 10′ McDougall, D.B.G.
13″ x 20″ x 5′ back geared.

### MILLING MACHINES

N. 2 Cincinnati, vertical, high power.
No. 3 Brown & Sharpe, universal.
No. 3 Cincinnati, universal, cone type.
No. 2 Cincinnati, universal, cone type.
No. 2-M Cincinnati, universal.
No. 1½ Cincinnati, universal, cone type.
No. 2 Owen, universal.
No. 1-M Cincinnati universal.
No. 2 Lincoln type.
No. 1 Brown & Sharpe plain oil pan, pump and pipe.
2—18″ Cincinnati, plain, B.G.
2—No. 6 Whitney hand millers.
14—No. 1 Burke bench millers.
Nos. 3 & 4 Thurston die millers with die sinking attachment.
No. 3 Becker-Brainard vertical milling attachment.
14—Thread millers.

### IRON PLANERS

36″ x 36″ x 10′ x 12′ Belmer-Eames, 4 heads.
30′ x 12′ x 8½′ Smith & Tannant, 29′ x 8′ table.
60″ x 40″ x 10′ London, 2 heads.
40″ x 37″ x 12′ Fitchburg.
38″ x 38″ x 7½′ London.
36″ x 36″ x 10′ Gray, 2 heads.
32″ x 32″ x 10′ Gray, 2 heads.
30″ x 30″ x 8′ Gray.
26″ x 26″ x 8′ Putnam, 2 heads.
24″ x 24″ x 6′ London.
20″ x 20″ x 5′ London.

### PRESSES

5— No. 857 Toledo drawing presses.
No. 355 Toledo drawing press.
Zeh & Hahnemann, horizontal, B.G.
No. 2-C Consolidated, inclinable.
5—Brown-Boggs, power presses.
8—Bliss, power presses.
3—20-ton garage screw presses.
5—No. 0 Hercules, bench, power.

### PUNCHES AND SHEARS

Bertram double end punch and shear, 42″ throat, capacity of punch 1½″, shear 8″.
Edwards double end punch and shear, capacity of punch 2″ shear 6″ x 6″.
1″ Cleveland style "C", single end punch.
1″ Bertram, horizontal punch.
No. 5 Pels, universal, portable punch.
6″ x 6″ Bertram, double angle shear.
3/4″ Lennox, rotary plate bevelling shear.
No. 214 Stoll, rotary, circle and slitting shear.

### SHAPERS

2—24″ back geared with swivel vise.
7—16″ back geared.
10″ x 54″ traverse head.

### MISCELLANEOUS

18—Arbor presses.
3—Bolt Cutters and Threaders.
7—Pipe Machines.
8—Cutting-off Machines.
16—Hack Saws.
Williamson metal band saw.
Complete outfit for making metal fly screens.
Beatty self-propelling derrick car.
5—ton revolving crane, 25′ boom.

## Full Information Promptly Furnished

# H. W. PETRIE, LIMITED

**TORONTO and HAMILTON**

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# PETRIE

## *The House that Gives*
## IMMEDIATE SERVICE

### From our Immense Stocks we are Able to Ship the Tools You Need the Day Your Order is Received

Our stock is always so large and varied that you run but an extremely small risk of catching us without the tool you need. Whether you write, wire or 'phone your order it will receive immediate attention of a staff that is organized to give competent service. Send us your orders for:

Lathes, Planers
Millers, Grinders
Shapers, Drills
Boring Mills
Punches, Shears
Wood Planers
Wood Shapers



Saw Tables
Matchers
Engines, Boilers
Pumps
Electric Motors
Belting, Hangers, Shafting
Supplies, etc.

***Canada's Dependable Machinery and Supply House***

## H. W. PETRIE, LIMITED
**TORONTO and HAMILTON**

# MACHINERY AND SUPPLIES

*If interested tear out this page and place with letters to be answered.*

WE HAVE A FEW BARGAINS LEFT IN

## Machines and Machine Supplies

FROM THE LACHINE MANUFACTURING COMPANY PLANT

| | |
|---|---|
| 2—Lees-Bradner Type C Thread Millers; each | $300.00 |
| 3—Rahn & Larmon Lathes, 18″ x 4′ 6″; each | 200.00 |
| 1—McDougall Lathe, 22″ x 8′ | 250.00 |
| 1—D-3 Colburn Heavy Duty Drill | 350.00 |
| 2—No. 25 Foote-Burt Drills; each | 250.00 |
| 1—Reavell Quadruplex Air Compressor | 400.00 |
| 1—Air Receiver, 14′ x 2′, 3/16 plate | 90.00 |
| 60—Rolls 2½″ Emery Cloth; per roll | 1.50 |
| 1—730½ Brown-Boggs Press | 400.00 |
| 1—Worthington Upright Triplex Hydraulic Pump, 1¼ x 4 | 75.00 |
| 1—Goulds Upright Triplex Pump, 2½ x 4 | 100.00 |
| 2—Jenkins 6″ Gate Valves (new); each | 50.00 |

**Pulleys, Hangers, Pillow Blocks, Countershafts and Supplies at very low prices.**

ALL F.O.B. LACHINE, SUBJECT TO PRIOR SALE

Renewed steel and wrought iron pipe, fitted with new threads and couplings ready to connect, suitable for steam, air, water, etc., at prices considerably under new pipe. Let us have your inquiries.

**CONSUMERS METAL CO., LIMITED**

**Phone: Melrose 600 Lachine, Que. 20th Avenue**



## Good Used Tools Bargain Prices

30″ x 30″ x 9′ Ingersoll Miller, Side and Vertical Heads.
42″ x 29′ 6″ Niles Triple Geared Lathe, Raising Blocks to 68″, Belt Drive, Taper Attachment.
96″ x 1″ Morgan Plate Shear, 80,000 Lbs.
81″ x ¾″ Garrison Plate Shear, Motor Drive.
2500-lb. Chambersburg Double Leg Steam Hammer.
No. 4 Doelger & Kirsten Alligator Shear, Capacity 4¾″ Round.
48″ x 48″ x 22′ Pond Planer, 4 Heads.
72″ x 56″ x 12′ Betts Planer, 2 Heads.
24″ Bullard Rapid Production Mill, Serial No. 6042.
30″ Colburn Vertical Boring Mill, Turret Head.
42″ Bullard Vertical Boring Mill, 2 Swivel Heads.
60″ Niles Vertical Boring Mill, 2 Swivel Heads.
90″ Niles Vertical Boring Mill, 2 Swivel Heads.
24″ Stockbridge Back Geared Crank Shaper.
No. 3 Cincinnati Plain Miller.

***Many Other Bargains. Send Us Your Inquiries.***

**Reliance Machinery Sales Company**

**1407 Brighton Road Pittsburgh, Pa.**



## MACHINERY FOR SALE

### Lathes

1—26″ x 12′ Pond Lathe, S.B.G., C.R., P.C.F.
1—24″ x 12′ New Haven Lathe, D.B.G., S-Q.C.G., C.R.
1—24″ x 12′ Can. Mach. Lathe, S.B.G., C.R., P.C.F.
2—22″ x 10′ Davis Lathes, D.B.G., Q.C.G., C.R.
1—22″ x 10′ Rahn-Larmon Lathe, S.B.G., S-Q.C.R., C.R.
1—21″ x 10′ London Lathe, S.B.G., C.R., P.C.F.
4—20″ x 8′ C.M.C. Lathes, D.B.G., S-Q.C.G., C.R.
3—18″ x 8′ C.M.C. Lathes, D.B.G., Q.C.G., C.R.
1—18″ x 10′ Butler Lathe, D.B.G., Q.C.G., C.R.
1—18″ x 8′ London Lathe, S-Q.C.G., D.B.G., C.R.
1—16″ x 6′ McDougall Lathe, S.B.G., S-Q.C.G., C.R.
1—18″ x 8′ Mueller Lathe, D.B.G., Q.C.G. Turret on cross slide.
1—14″ x 6′ Flather Lathe, S.B.G., Q.C.G., C.R.

### Shapers

1—16″ Butler Shaper.
1—12″ Port Hope Shaper.

### Drills

1—No. D-1 H.D. Colburn Drill.
2—No. 24 H.D. Foote Burt Drills.
1—28″ Barnes Drill, B.G., P.F.
1—22″ Barnes Drill, B.G., P.F.
3—20″ McDougall Drills, W. & L.F.

### Miscellaneous

2—2″ x 26″ Pratt & Whitney Turrets.
1—No. 2 Gardner Disc Grinder.
1—3″ Acme Bolt Cutter.

**YEATES MACHINERY**

HALE STREET

LONDON, ONT.



## Machinery and Equipment For Sale At Bargain Prices

### Motors and Electrical Equipment

1—20 H.P. Westinghouse Motor, 25 Cy., 550 V., 710 R.P.M.
1—20 H.P. Westinghouse Motor, 25 Cy., 550 V., 1420 R.P.M.
Above complete with Pulley, Base and Starters.
2—5 H.P. Crocker-Wheeler Motors, 25 Cy., 550 V., 1500 R.P.M.
1—Dumore Tool Post Grinder, complete.
1—Pyrometer—Tycos Type Multiple Indicating.
1—Pyrometer—Tycos Type Recording Indicating.
1—Pyrometer—Tycos Type Portable.
1—Mephisto Arc Welder, 150 Amps.
1—Arnold Electric Portable Drill.

### Engine Lathes

2—Stevens—18″ x 8′, complete with Countershaft.
2—Bridgeford—26″ x 12′ Bed, Quick Change Gears, Double Back Gears and Countershaft.
1—Putman—18″ x 8′, complete with Countershaft.
1—Putman—26″ x 14′, complete with Countershaft.

### Turret Lathes

8—Wood Machine Co.—Tilted Turret Lathe, Size 4, complete with Wire Feed and Collet System. Power Feed to Turret and Countershafts.
2—Jones & Lamson's Turrets, 3″ x 36″, Hardness Flat Turret. Complete with Countershaft.
15—Blowers—all different sizes for Cupola, Ventilating and Exhaust Work.
We carry a full line of Transmission Machinery in stock at our Warehouse.
Let us know what you require, also write us what you have for sale.

**Tuerk & Martin**

**702 Excelsior Life Bldg.**

**TORONTO**

# GOOD OPPORTUNITIES IN USED MACHINERY

**Vertical Boring Mills**

2—30″ London Machine Tool.
1—42″ Bullard.
1—44″ Bertram.

**Horizontal Boring Mills.**

1—4″ Bar, Beaman & Smith. floor type.
2—4″ Bar, Bertram, elevating table.

**Bolt and Nut Machines.**

1—2-Spindle Nut Tapper, ½″.
1—½″ to 2″ Bolt Cutter.
1—¾″ National Nut Forging Machine.
1—2″ Acme Bolt Header.
1—4-Spindle Bertram Nut Tapper.
1—Blake & Johnson Thread Rolling Machine.
1—¼x½″ Pawtucket Cold Nut Press.

**Boring Bar.**

1—8″ x 7′ Canada Foundry.

**Blowers.**

1—No. 4 Roots Pressure Blower.
2 27-Cubic-foot Connersville.

**Drilling Machines.**

1—12″ Perfect Sensitive.
1—14″ Excelsior.
1—20″ Bertram, sliding head.
2—20″ MacGregor-Gourlay.
1—25″ W. F. & J. Barnes.
1—20″ Prentice.
1—3′ Gang Radial.
1—3½′ Stevens Hamilton Radial.
1—5′ Western Radial.
1—6′ Western Radial.
1—5′ Bickford Full Universal Radial.
1—4′ London Semi-Universal Radial.
1 6-Spindle Crosby Mud Ring.
2—12′ MacGregor-Gourlay Plate Radial.
1—3′ MacGregor-Gourlay Wall Radials.

**Grinders.**

18—Miscellaneous Pedestal Emery Grinders.
1—8″ Goddard Ring Grinder.
1—40″ Canada Foundry Piston Ring Grinder.

**Hydraulic.**

1—150-ton Hydraulic Wheel Press, 46″.
1—No. 2 W. H. Wood Joggling Machine.
12—Hydraulic Forging Presses, 200 to 350-ton.

**Plate Planer.**

1—18′ Niles.

**Rotary Planer.**

1—36″ Bertram on turntable.

**Lathes.**

2—16″ x 6′ Canedy-Otto.
1—16″ x 6′ MacGregor-Gourlay.
1—16″ x 8′ Cleveland.
3—14″ x 5′ Bertram.
2—16″ x 6′ London.
1—16″ x 8′ Lodge-Shipley.
1—15″ x 8′ LeBlond.
1—18″ x 12′ Bertram.
1—20″ x 8′ MacGregor-Gourlay.
1—20″ x 10′ London.
1—18″ x 6′ Bertram.
1—20″ x 10′ Boye & Emmes.
1—20″ x 10′ Bertram.
1—26″ x 16′ Bertram.
1—24″ x 20′ Stevens.
1—26″ x 12′ Fitchburg.
1—26″ x 18′ Bullard.
1—24″ x 12′ Schumacher & Boye.
1—40″ x 18′ London.
1—20″ x 34″ x 10′ London Gap.
1—18″ London Fox Turret.
3—No. 4 Bartons & Oliver Turrets.
8—6A Potter & Johnson.
6—1½″ Wood Turret Lathes.
5—16″ Bawden Single Purpose.
1—100″ Bertram Wheel Lathe.
1—Bertram Axle Lathe.

**Milling Machines.**

1—No. 13 Brainard Universal.
1 –No. 2 London Plain.
1—No. 3 Cincinnati Plain.
1—No. 3 Bertram Plain.
1—42″ Newton Vertical.
1—24″ Bertram Slab Miller.
1—40″ Bertram Slab Miller.
1—54″ Newton Slab Miller.

**Metal Planers.**

1 30 x 30 x 10′ London.
1—30 x 30 x 8′ Bertram.
1—40 x 40 x 10′ Bertram.
1 –87 x 60 x 16′ London.
1—48 x 48 x 14′ Stirk.
1—106 x 84 x 28′ Bertram.

**Plate Rolls.**

1—27′ Allis-Chalmers Plate Bending Rolls, 27″ diameter, top roll, capacity 1¼″ plate.
1—9′ 6″ Bertram Plate Straightening Rolls, 12″ diameter, rolls 1″ plate.
1—8′ Smith Bros. Plate Straightening Rolls, 10″ diameter, rolls 1″ plate.

**Bull Riveters.**

1—42″ Hanna.
1—36″ Hanna.
1—36″ Allan.
1—24″ Allan.
1—18″ Allan.
1— 9″ Allan.

**Iron Shapers.**

1—20″ Bertram.
1—20″ Hendey.
1—24″ Morton.
1—30″ Morton.
1—14″ Bertram Traverse.
1—16″ Hand Traverse.
1—16″ Broadbent Traverse.

**Slotting Machines.**

1—10″ Crosby with rotary table.
1—24″ Bertram, triple head for locomotive frame.

**Saws.**

10—Racine Saws, 6″ and 10″ cap.
1—No. 1 Newton Cold Saw.

**Woodworking Machinery.**

1—MacGregor-Gourlay Rip and Cross-cut Saw.
1—32″ Crescent Band Saw.
1—24″ MacGregor-Gourlay Planer and Matcher.
1—12″, 4-side MacGregor-Gourlay Moulder.
1—MacGregor-Gourlay 54″ Band Resaw.
1—MacGregor-Gourlay 4′ x 8′ Door Clamp.
1—MacGregor-Gourlay 42″ x 6′ Sash Clamp.
1—MacGregor-Gourlay 6″ 4-side Sticker.
1—MacGregor-Gourlay 48″ 3-drum Sander.
1—MacGregor-Gourlay Mortiser.
1—MacGregor-Gourlay Horizontal Borer.
1 MacGregor-Gourlay 5″ Tenoner.
1—MacGregor-Gourlay Railway Cut-off.
1—MacGregor-Gourlay, 2-Spindle Shaper.
1—MacGregor-Gourlay 20″ Wood Lathe.
1 MacGregor-Gourlay 16″ Buzz Planer.
1—Foy-Egan 12″ Buzz Planer.
1—MacGregor-Gourlay "Daniels" Timber Planer.

**Miscellaneous.**

23—Miscellaneous Toledo Presses.
2—2″ Pipe Machines.
2—4″ Pipe Machines.

**Punches and Shears.**

1—Cleveland Beam Punch and Coping Machine, 31″ throat, 24″ beams.
1—Bertram, double end, 1″ x 1″, 32″ throat.
1—Long & Allstatter Bending Machine, 15″ beams and channels.
1—1¼ x 1″ Cleveland Horizontal Punch.
1—8 x 8 Bertram Angle Shear.
1—Hillis & Jones Splitting Shear, capacity 1″.
1—Bertram Beam Coping Punch, 24″ beams.
1—Bertram Double End Punch and Shear, 1″ x ¾″, 30″ throat.
1—T-40 Pells Beam Shear, 15″ beams and channels.
1—Double End Corbett, ½ x ½ x 24″ throat.
1—Double End Long & Allstatter, ¾″ x 1, 18″ throat.
1—Double End Smith, 1″ x 1″, 30″ throat.
1—Single End C.M.C., 1″ x 1″, 30″ throat.
1—60″ C.M.C. Gate Shears, 1″ capacity.
1—¾″ Wagner Rotary Shear.

## CANADIAN ALLIS-CHALMERS, LIMITED

**King and Simcoe Sts., TORONTO, ONT.**

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# POWER EQUIPMENT

## *For Immediate Delivery*

## MOTOR GENERATOR SET

### 25 TO 60 CYCLE

350 K.V.A. 25 Cycle, 2200 Volt, 3 Phase Westinghouse Synchronous Motor, 500 R.P.M.

DIRECT CONNECTED TO

275 K.V.A. 60 Cycle, 2200 Volt, 3 Phase Generator with Exciter and Sw. Board. Also

**TRANSFORMERS AND MOTORS FOR SAME**

ALL IN NEW CONDITION

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110 KW. (150 H.P.) 25 Cycle, 2200 (or 550) Volt, 3 Phase Westinghouse Generator or Synchronous Motor, Complete with Exciter and Sw. Board.

LARGER SIZES QUOTED UPON APPLICATION.

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60 KW. 110 Volt Direct Current Generator. Direct Connected to High-Speed Engine.

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## MOTORS, GENERATORS and TRANSFORMERS

**NEW OR USED IN ALL SIZES**

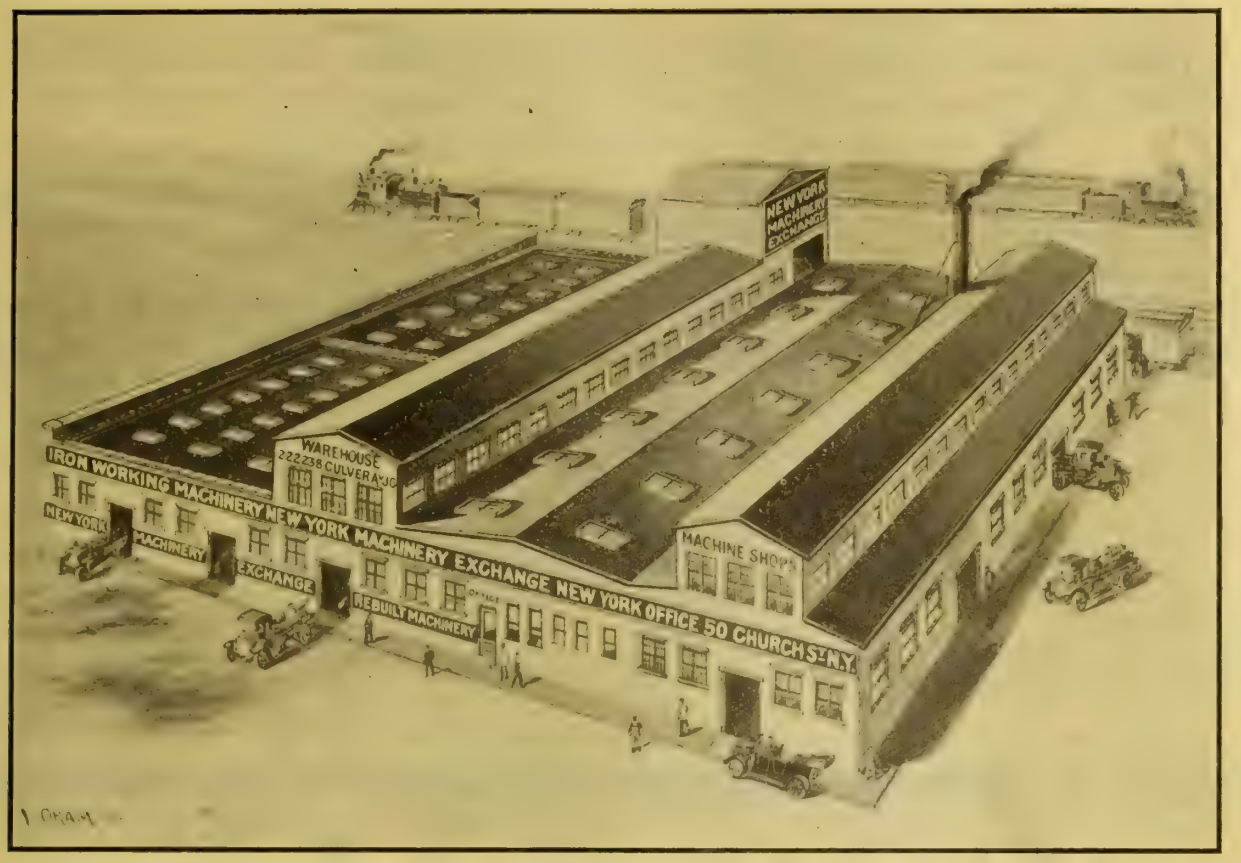
***Send List of Equipment for Disposal***

## The E. A. Lowry Power Equipment Company, Limited

**GUELPH** **CANADA**

# NEW YORK MACHINERY EXCHANGE

**50 Church Street, NEW YORK**




*Established 1908*

# The Largest Used Machine Tool Dealers in the World

***All Machines Tested in Our Shops***

Every Machine Guaranteed Complete and in Good Operating Condition.
Unusual Facilities for Export Shipment.

**WHY BUY EXPENSIVE NEW TOOLS?**
**OUR USED MACHINES GIVE SATISFACTION AT LOW COST**
***SAVE MONEY—GIVE US YOUR INQUIRIES***

**NEW YORK MACHINERY EXCHANGE, 50 Church Street, New York**

**Cable Address:** ***"Machused, New York"*** **Codes:** ***Liebers—Bentley***

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# THREE EXCEPTIONAL OFFERS

## One No. 1 Alfred Herbert Hexagon Turret Lathe

For Bar Work, complete with full tool equipment, capacity 1⅝" x 24".

## One Two-Spindle Alfred Herbert Ball Bearing Drill

With one geared spindle with automatic self-engaging, self-releasing feed and one plain lever feed spindle with pump and fittings.

The two machines offered above have been used for demonstration purposes in our showrooms, where they can be inspected under belt.

## One 20-in. Gould & Eberhardt Cone Drive Back Geared Shaper

This machine has hardly been used; it can be considered as equal to a new machine.

*Enquiries Solicited*

*Write for our stock list of new and used machine tools*

## ALFRED HERBERT, LTD.

Phone No. 4409 Adelaide

1-3 JARVIS STREET, TORONTO

*Head Office and Works:* Coventry, England

New York Office 54 Dey St.

Turret Lathes, Engine Lathes, Horizontal Boring Machines, Boring Mills, Planing Machines, Slotting Machines, Shaping Machines, Profiling Machines, Grinding Machines, Sawing Machines, Precision Machines, Chucks, Die Heads, Tool Room Equipment, Foundry Equipment, Drills, Milling Cutters and Small Tools.

# FOR SALE

## USED ELECTRICAL EQUIPMENT AND MACHINERY

One C.G.E. Type C/L, Class 6-45-975, 120-125-volt, 360 ampere, speed 975, direct current generator, mounted on sliding base with 12" x 12" iron drive pulley, listed at.$700.00

Gray Marble Panel Switchboard, one Panel 24 x 60 x 2", and one 12 x 60 x 2", with all the necessary mountings, listed at .....$250.00

One Bullock Electric Mfg. Co. 35 H.P., 208 ampere, 115-120-volt, 1,050 r.p.m., direct current motor, mounted on sliding base with 12" x 10" wood-faced pulley, listed at .....$550.00

One Bullock Electric Mfg. Co. 120-volt, 25 ampere, 1,250 R.P.M., direct current motor, mounted on sliding base with 10" x 8" paper face drive pulley, listed at .....$535.00

One Waterous Engine Co. McEwen Engine, 55 H.P., 9" x 10" stroke, high speed steam engine, automatic governor, listed at .....$700.00

One Goldie-McCulloch Jerome-Wheelock 13" x 33" Horizontal Steam Engine, in first-class condition.

One No. 389 Webster Feed Water Heater and Purifier, complete with all fittings.

One 8 x 10 x 10" Horizontal Simplex Steam Vacuum Pump, complete with Rochester automatic lubricator and Webster 1" diaphragm automatic vacuum pump governor, including two 5" vacuum gauges mounted on slate slab.

Any reasonable offer will be accepted for the last three items.

*IMMEDIATE DELIVERY*

## THE PEDLAR PEOPLE, LIMITED

*ESTABLISHED 1861*

MANUFACTURERS OF SHEET METAL PRODUCTS

Executive Office and Factories: - OSHAWA, ONT.

# Canadian Machinery BUYERS DIRECTORY

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Norton Co. of Can., Ltd., Hamilton, Ont.
Oakey & Sons, Ltd., John London S.E., Eng.

**Abrasive Materials**
Can. Hart Products, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Acetylene, Dissolved**
L'Air Liquide Society, Toronto, Ont.

**Accumulators, Hydraulic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Air Lifts**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Analyses, Chemical**
Toronto Testing Laboratory, Toronto, Ont.

**Angle Bars**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Anvils**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Columbia Hdwe. Division, Cleveland, O.
Petrie, Ltd., H. W., Toronto, Ont.

**Arbors**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Cleveland Twist Drill Co., Cleveland, O.
Ford-Smith Machine Co., Hamilton, Ont
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Jacobs Mfg. Co., Hartford, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.

**Axles, Car**
Dom. Foundries & Steel, Hamilton, Ont.

**Babbitt Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.

**Balls, Brass, Bronze and Steel**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian SKF Co., Toronto, Ont.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

**Barrels, Tumbling**
McDougall Co., Ltd., R., Galt, Ont.

**Bars, Boring**
Armstrong Bros. Tool Co., Chicago, Ill.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Madison Mfg. Co., Muskegon, Mich.

**Bars, Boring, Portable**
Underwood Corp., H. B., Philadelphia, Pa.

**Bars, Bronze Cored**
Moore & Son, Thos., Montreal, Que.

**Bars, Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Bars, Steel**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.

**Bearings, Ball**
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Railway Roller Bearing Co., Syracuse, N.Y.

**Bearings, Bronze**
Railway Roller Bearing Co., Syracuse, N.Y.

**Bearings, Die-Cast**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Tallman Brass & Metal Co., Hamilton, Ont.

**Bearings, Journal**
Fisher Motor Co., Ltd., Orillia, Ont.

**Bearings, Roller**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

**Belt Cement**
McLaren Belting Co., J. C., Montreal, Que.

**Belt Dressings and Fillers**
Aikenhead Hardware Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.

**Belt Fasteners**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

Can. Fairbanks-Morse Ltd., Montreal, Q.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Smith Belting Co., Toronto, Ont.
Sumner & Co., New York City.
Tullis & Son, Ltd., John, Glasgow, Scot.

**Belting, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.
Quaker City Rubber Co., Philadelphia, Pa.

**Belts, Abrasive**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.

**Bench Countershaft Standards**
Ford-Smith Machine Co., Hamilton, Ont.

**Benches, Work**
Aikenhead Hardware Ltd., Toronto, Ont.

**Bending Machines, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bertrams Ltd., Edinburgh, Scotland.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Bins, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Blocks**
Ford Chain Block Co., Philadelphia, Pa.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Chain (See Hoists, Hand)**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.

## For list of Dealers see the last page of This Buyers' Directory

**Belt Hooks**
Torrington Co., Ltd., Upper Bedford, Que.

**Belt Lacing**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

**Belt Lacing, Steel**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing, Hinged**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing, Flexible Steel**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing Machines**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
McLaren Belting Co., J. C., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Belt Joiners, Conveyor**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Tools**
Graton & Knight Mfg. Co., Worcester, Mass.

**Belting, Chain**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glasseo, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Belting, Fabric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
McLaren Belting Co., J. C., Montreal, Que.
Sumner & Co., New York City

**Belting, Leather**
Atkins & Co., Inc., E. C., Indianapolis, I.

Ford Chain Block Co., Philadelphia, Pa.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Die**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Blocks, Pillow**
Can. Link-Belt Co., Toronto, Ont.

**Blowers**
Can. Blower & Forge Co., Ltd., Kitchener
General Combustion Co. of Can., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Bolt and Nut Machinery**
Acme Machinery Co., Cleveland, Ohio
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Greenfield Tap & Die Corp., Galt, Ont
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Bolt and Nut Machinery, Automatic**
National Acme Co., Cleveland, Ohio.

**Bolts and Nuts**
London Bolt & Hinge Works, London, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio
N. S. Steel Co., Ltd., New Glasgow, N.S.
Petrie, Ltd., H. W., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Bolt Threading Die Heads**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa

**Boosters**
Sturtevant Co., B. F., Boston, Mass.

**Boring and Turning Mills, Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.

**Boring, Drilling and Milling Machines, Horizontal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa.

**Boring, Drilling and Milling Mach., Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Boring Heads**
Aikenhead Hardware Ltd., Toronto, Ont

**Boring Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill
Gisholt Machine Co., Madison, Wis.

**Brakes, Magnetic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Brass**
Brown's Copper & Brass Rolling Mills Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bricks, Fire**
Elk Firebrick Co. of Can., Ltd., Hamilton, Ont.

**Bridges**
Hamilton Bridge Works Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que

**Broaching Machines**
Bilton Machine Co., Bridgeport, Conn
Garlock-Walker Mchy. Co., Toronto, Ont

**Bronze**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bronze, Phosphor**
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bucket Carriers, Pivoted**
Can. Link-Belt Co., Toronto, Ont.

**Buffing or Polishing Machines (See Polishing and Buffing Machines)**
Blount Co., J. G., Everett, Mass.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Petrie, Ltd., H. W., Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O

**Bulldozers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont

**Burners, Oil and Gas**
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

**Bushings**
Fisher Motor Co., Ltd., Orillia, Ont
Morrow Screw & Nut Co., Ltd., John Ingersoll, Ont.

**Cabinets, Oil**
S. F. Bowser & Co., Ltd., Toronto, Ont

**Calipers**
Brown & Sharpe Mfg. Co., Providence, R.I
Starrett Co., L. S., Athol, Mass.

**Cams**
Canada Foundries & Forgings Co., Welland, Ont.

**Can-Making Machinery (See Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont
MacKinnon Steel Co., Sherbrooke, Que

# BUYERS' DIRECTORY

Union Carbide Co. of Can., Ltd., Welland, Ont.

**Cars, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Castings, Aluminum**
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Brass and Bronze**
Algoma Steel Corp., Ltd., Sault Ste Marie, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont
Electric Steel & Engineering Co., Welland, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Copper**
Can. Hanson & Van Winkle Co., Toronto, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Marine**
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Castings, Die Molded**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Ferro-Alloy**
Can. Steel Foundries, Montreal, Que.

**Castings, Iron**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Hyd. Press**
Can. Steel Foundries, Montreal, Que.

**Castings, Monel Metal**
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

**Castings, Naval Bronze**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Nichrome**
Can. Driver-Harris Co., Walkerville, Ont.

**Castings, Nickel**
Can. Hanson & Van Winkle Co., Toronto, Ont.

**Castings, Semi-Steel**
Davidson Mfg. Co., Thos., Montreal, Que.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

**Castings, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont

**Cements, Iron**
Smith Mfg. Co., Jersey City, N.J.

**Centering Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont
Garlock-Walker Mchy. Co., Toronto, Ont.

**Chains (See Sprockets and Chains)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal Que
Wright Mfg. Co., Lisbon, Ohio

**Chains, Driving**
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que
Wright Mfg. Co., Lisbon, Ohio

**Chasers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt
Landis Machine Co., Inc., Waynesboro, Pa
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chemists**
Toronto Testing Laboratory, Toronto, Ont.

**Chucking Machines**
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Chucks, Drill**
Jacobs Mfg. Co., Hartford, Conn.

**Chucks, Drill and Tap**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Lathe**
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Magnetic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**
Columbia Hdwe. Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

**Cleaners, Metal, Waste, General**
Oakley Chemical Co., New York, N.Y.

**Clocks, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Clutches, Friction**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**
Can. Link-Belt Co., Toronto, Ont.

**Collars, Shaft or Set**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

**Collets**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compressors, Air**
Curtis Pneumatic Machinery Co., St Louis, Mo

**Compressors, Air and Gas**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**
Ford-Smith Machine Co., Hamilton, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Conveyor Belt Joiners**
Flexible Steel Lacing Co., Chicago, Ill.

**Copper**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Cored Bronze Bars**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Cotter Pins**
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Counterbores**
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Countershafts**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Couplers, Car and Locomotive**
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Couplings, Flexible**
Holden Co., Ltd., Montreal, Que.

**Couplings, Rigid**
Bernard Industrial Co., A., Fortierville, Que.

**Couplings, Shaft**
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

**Cranes, Electric**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.

**Cranes, Hand (See Hoists, Hand)**
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

**Cranes, Locomotive**
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Cranes, Traveling**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Crank Pin Turning Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia, Pa.

**Cutters, Flue**
Holden Co., Ltd., Montreal, Que.

**Cutters, Gear**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd. Dundas, Ont.

**Cutters, Milling**
Armstrong-Whitworth of Canada, Ltd. Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence R.I.
Butterfield & Co., Inc., Rock Island, Que
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Milling Machine Co., Cleveland
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.

**Cutters, Stay Bolt**
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa
Pratt & Whitney Co., of Canada, Ltd. Dundas, Ont.

**Cutters, Thread**
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa

**Cutting-Off Machines**
Bertram & Son Co., Ltd., The John Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I
Garlock-Walker Mchy. Co., Toronto, Ont
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Cutting-Off Machines, Pipe (See Pipe Cutting and Threading Machines)**
Landis Machine Co., Inc., Waynesboro, Pa
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Cutting-Off Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill
Pilot Steel & Tool Co., Montreal, Que.

**Cutting Oil Filters (See Oil Filtering Systems)**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Cataract Refining Co., Toronto, Ont.

**Cutting, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont

**Cutting, Oxy-Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Dealers, Machinery (See Searchlight Section)**
Ford-Smith Machine Co., Hamilton, Ont
Petrie, Ltd., H. W., Toronto, Ont.

**Deckle Straps**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Diamonds, Black and Rough**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond, Carbon and Bortz**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Desmond-Stephan Co., Hamilton Ont.
Ford-Smith Machine Co., Hamilton, Ont
Wheel Trueing Tool Co., Detroit, Mich.

**Diamond Crossings**
Can. Steel Foundries, Montreal, Que.

**Die-Castings**
Tallman Brass & Metal, Ltd., Hamilton Ont.

**Dies, Pipe-Threading**
Jones & Lamson Machine Co., Springfield, Vt.

**Die Sinking Machines, Automatic**
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

**Die Sinkers**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Screw and Thread Cutting**
Ackworthie, Ltd., John, Birmingham, Eng
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa
Murchey Machine & Tool Co., Detroit Mich.
National Acme Co., Cleveland, Ohio.

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Toledo Machine & Tool Co., Toledo, Ohio.

# BUYERS' DIRECTORY

**Dies, Forging**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

**Dies, Hammer**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Self-Opening, Adjustable**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Dies, Threading-Opening**
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Disc Cement**
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Dividing Heads**
Ackworthie, Ltd., John, Birmingham, Eng.
Dickow, Fred. C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Dogs, Lathe and Milling Machine**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drafting Boards and Tables**
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Drafting Materials**
American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Dressers, Grinding Wheel**
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Drill Holders**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drill Rods**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Drill Speeders**
Canada Machinery Corp., Galt, Ont.

**Drilling Machine Heads**
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

**Drilling Machines, Automatic**
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

**Drilling Machines, Bench**
Beacon Engineering Co., Tipton, England.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Electric and Hand**
Atkenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Gang**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drilling Machines, Heavy Duty**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Multiple Spindle**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

**Drilling Machines, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Drilling Machines, Portable**
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Radial**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Drilling Machines, Sensitive**
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Turret**
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

**Drilling Machines, Vertical**
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng.
Steptinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Drills, Center**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drills, High Speed Twist**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Drills, Twist and Flat**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.

**Dust Handling Equipment**
Can. Blower & Forge Co., Ltd., Kitchener.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Electrical Instruments**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Electrical Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O

**Elevating Trucks (See Trucks)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Elevators and Conveyors**
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que
Mathews Gravity Carrier Co., Port Hope, Ont.

**Emery Wheels (See Grinding Wheels)**
Atkenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Hart Products, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Engines, Capstan**
Kennedy & Sons, Wm., Owen Sound, Ont

**Engineers, Mechanical**
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.

**Expanders, Tube**
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que
Jardine & Co., A. B., Hespeler, Ont
Petrie, Ltd., H. W., Toronto, Ont.

**Eyeglasses, Safety (See Goggles, Safety)**
Prest-O-Lite Co. of Can., Toronto, Ont.
Willson Goggles, Inc., Reading, Pa.

**Fans, Electric**
Can. Blower & Forge Co., Ltd., Kitchener
Can. Fairbanks-Morse Co., Ltd., Montreal
Northern Electric Co., Montreal, Que
Skinner Bros. Mfg. Co., Inc., St. Louis Mo
Sturtevant Co., B. F., Boston, Mass

**Fans, Exhaust**
Can. Blower & Forge Co., Ltd., Kitchener
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis Mo
Sturtevant Co., B. F., Boston, Mass.

**Fans, Ventilating**
Can. Blower & Forge Co., Ltd., Kitchener
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont
Skinner Bros. Mfg. Co., Inc., St. Louis Mo
Sturtevant Co., B. F., Boston, Mass

**Fibre**
Diamond State Fibre Co. of Can., Ltd Toronto, Ont.
Northern Electric Co., Montreal, Que

**File Handles**
Ingersoll File Co., Ltd., Ingersoll, Ont

**Files and Rasps**
Atkins & Co., Inc., E. C., Indianapolis, I
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont
Simonds Canada Saw Co., Montreal, Que

**Filing Machines**
Garlock-Walker Mchy. Co., Toronto, Ont
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Filler, Iron (See Cements, Iron)**
Smooth Mfg. Co., Jersey City, N.J.

**Fire Extinguishers**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Fittings, Pipe**
International Malleable Iron Co., Guelph, Ont.

**Flexible Shafts**
Aikenhead Hardware Ltd., Toronto, Ont.

**Flux, Galvanizing**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Fluxes, Welding**
L'Air Liquide Society, Toronto, Ont.

**Forging Machinery**
Acme Machinery Co., Cleveland, Ohio
Bertram & Son Co., Ltd., The John Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.

**Forgings, Drop**
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd Toronto, Ont.

**Forgings, Hammer**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Foundry Equipment**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Foundry Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Frogs, Spring or Rigid**
Can. Steel Foundries, Montreal, Que.

**Fuel Oil Burning System**
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Heat Treating Coal**
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Oil and Gas**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bellevue Industrial Furnace Co., Detroit.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces and Ovens, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd Hiram, Walkerville, Ont.

**Furnaces, Tempering and Annealing**
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furniture, Machine Shop**
Garlock-Walker Mchy. Co., Toronto, Ont.

**Gages, Comparator**
Jones & Lamson Machine Co., Springfield, Vt.
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont.
Perdue, W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass.

**Gages, Measuring (See Tool Work)**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Q.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont
Starrett Co., L. S., Athol, Mass.

**Gages, Recording**
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.

# BUYERS' DIRECTORY

**Gages, Snap, Thread and Cylindrical**
Ackworthie, Ltd., John, Birmingham, Eng
Brown & Sharpe Mfg. Co., Providence, R I
Can. Fairbanks-Morse Co., Ltd., Montreal
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Standard**
Armstrong Whitworth Co. of Can., Lt Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis,
Johansson Inc., C. E., Windsor, Ont

**Gages, Thread**
Ackworthie, Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Garnet, Emery and Flint Paper and Cloth**
Ritchey Supply Co., Toronto, Ont.

**Gas, Coal Compressed**
L'Air Liquide Society, Toronto, Ont.

**Gas, Compressed**
Prest-O-Lite Co. of Can., Toronto, Ont.

**Gaskets**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

**Gear Blanks**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear-Cutting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R I
Can. Fairbanks-Morse Co., Ltd., Montreal.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn

**Gear Testing Machines**
Brown & Sharpe Mfg. Co., Providence, R I.
Ford Smith Machine Co., Hamilton, Ont.

**Gears, Cast**
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

**Gears, Cut**
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hamilton Gear & Machine Co., Toronto, Ontario.
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Gears, Dressed**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Gears, Forged**
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Gears, Herringbone**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

**Gears, Machine Moulded**
Can. Steel Foundries, Montreal, Que

**Gears, Rawhide (See Gears, Cut)**
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa

**Gear, Silent Chain**
Gardner & Son, Robt., Montreal, Que
Morse Chain Co., Ithaca, N.Y.
Can. Link-Belt Co., Ltd., Toronto, Can
Hans Renold of Canada, Ltd., Montreal, Quebec

**Gears, Worm**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.

**Generators, Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Generators, Electric**
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Goggles, Safety**
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

**Grab Buckets**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Grease Cups, Pressed Steel and Brass**
Can. Winkley Co., Ltd., Windsor, Ont.

**Greases, Lubricating**
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

**Grinding Discs**
Ritchey Supply Co., Toronto, Ont.

**Grinding Machines**
Brown & Sharpe Mfg. Co., Providence, R I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**Grinding Machines, Abrasive Belt**
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Automatic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Bench**
Aikenhead Hardware Ltd., Toronto, Ont.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Grinding Machines, Center**
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines Chaser**
Jones & Lamson Machine Co., Springfield, Vt.

**Grinding Machines, Cutter and Reamer**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Cylindrical**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Die**
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

**Grinding Machines, Disc**
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Drill**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Face**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Floor and Tool**
Beacon Engineering Co., Tipton, England.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Grinding Machines, Internal**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Portable**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Power Oscillating Tool**
Herbert Ltd., Alfred, Toronto, Ont.

**Grinding Machines, Ring Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Snagging**
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Surface**
Garlock-Walker Mchy. Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machinery, Tool Post**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Universal**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.

**Grinding Wheels**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Guards, Emery Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Guards, Machinery and Window**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Guards, Electric Lamp**
Flexible Steel Lacing Co., Chicago, Ill.

**Gun-Barrel Machinery**
Steinle Turret Machine Co., Madison, Wis.

**Hack Saws, Power**
Ackworthie, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Hamilton, Canada.
Garlock-Walker Mchy. Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hammers, Chipping**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hammers, Drop**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

**Hammers, Electric**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Hammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Hammers, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hammers, Riveting**
Cleveland Pneumatic Tool Co., Toronto Ont.

**Hangers, Shafting**
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F Montreal, Que.
Terry & Co., John C., Birmingham, Eng
Williams Machinery & Supply Co., A. R Montreal, Que.

**Hardening, Case-Hardening and Tempering**
Hamilton Gear & Machine Co., Toronto Ont.

**Hardness Testing Apparatus**
Shore Instrument Co., Jamaica, N.Y.

**Heating**
Skinner Bros. Mfg. Co., Inc., St. Louis Mo.

**Hobbing Machines**
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hobs**
Armstrong-Whitworth of Canada, Ltd Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R.
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.

**Hoists, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrook Que.
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montrea
Garlock-Walker Mchy. Co., Toronto, On
Morris Crane & Hoist Co., Ltd., Niaga Falls, Ont.
Northern Crane Works, Walkerville, On
Shepard Electric Crane & Hoist Co Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

**Hoists, Hand**
Lyman Tube & Supply Co., Montreal, Qu
Morris Crane & Hoist Co., Ltd., Niaga Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Hoists, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrook Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, On
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, I
Morris Crane & Hoist Co., Ltd., Niaga Falls, Ont.
Northern Crane Works, Walkerville, On

**Holders-On, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrook Que.
Cleveland Pneumatic Tool Co., Toront Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, I

**Hose, Flexible Steel**
Can. Fairbanks-Morse Co., Ltd., Montrea
Ontario Metal Products Co., Ltd., To onto, Ont.

**Hose, Industrial**
Dunlop Tire & Rubber Goods Co., Ltd Toronto, Ont.
Goodyear Tire & Rubber Co. of Can Ltd., Toronto, Ont.

**Hose, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Foamite Firefoam Co., Hamilto Ont.

**Hydraulic Leather**
Graton & Knight Mfg. Co., Worcest Mass.

**Hydraulic Machinery**
Bertram & Son Co., Ltd., The Joh Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrook Que.
Garlock-Walker Mchy. Co., Toronto, On
Stewart & Co., Duncan, Glasgow, Sc

**Hydrogen**
National Electro Products, Ltd., Toront Ont.

**Index Centers**
Dickow, Fred. C., Machinery Co., Ch cago, Ill.

**Igniters, Gas Engine**
Canada Foundries & Forgings Co., W land, Ont.

**Indicators, Speed and Test**
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis,
Brown & Sharpe Mfg. Co., Providence, R

**Insulation**
Diamond State Fibre Co. of Can., Lt Toronto, Ont.

**Jacks, Hydraulic**
Norton, A. O., Boston, Mass.

**Jacks, Planer**
Armstrong Bros. Tool Co., Chicago, I
Starrett Co., L. S., Athol, Mass.

Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que
Crescent Machine Co., Ltd., Montreal,

# BUYERS' DIRECTORY

**Jigs and Fixtures (See Tool Work)**
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Keyseating Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Keys, Machine**
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

**Knives, Machine**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Simonds Canada Saw Co., Montreal, Que.

**Knurl Holders**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lacing Leather**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

**Lamps, Electric**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**Lathe Attachments**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ort.

**Lathe Pans, Portable**
Canada Machinery Corp., Galt, Ont.

**Lathe Tools**
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

**Lathes, Automatic and Semi-Automatic**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Bench**
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lathes, Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
McDougall Co., Ltd., R., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Engine**
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Sidney Machine Tool Co., Sidney, Ohio.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Extension and Gap**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Lathes, Heavy Duty Projectile Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blaskill Wire Machy. Co., Ltd., Montreal.
Sidney Machine Tool Co., Sidney, Ohio.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio.
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Polishing (See Polishing and Buffing Machines)**
Ford-Smith Machine Co., Hamilton, Ont.

**Lathes, Relieving**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Lathe, Universal Hand**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Lathes, Screw-Cutting**
Jones & Lamson Machine Co., Springfield, Vt.

**Lathe, Speed and Hand**
Blount Co., J. G., Everett, Mass.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Lathes, Spinning**
Terry & Co., John C., Birmingham, Eng.

**Lathes, Threading**
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

**Lathes, Vertical Turret**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

**Lathes, Wood Turning**
Blount Co., J. G., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Lead Pipe**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Lighting Fixtures**
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont

**Linoleum Mill Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Liquid Air Plants**
L'Air Liquide Society, Toronto, Ont.

**Lockers, Clothes**
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

**Lubricants**
Cateract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Lubricating Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Machinists' Small Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal Q
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Mandrels, Expanding**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Mandrels, Solid**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Measuring Machines**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Metals, Alloy**
British Smelting & Refining Co., Ltd. Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Tallman Brass & Metal, Ltd., Hamilton, Ontario.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Metalite Cloth**
Ritchey Supply Co., Toronto, Ont.

**Micrometer Calipers**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Milling Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Milling Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**Milling Machines, Automatic**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Bench**
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Hand**
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

**Milling Machines, Horizontal and Planer Type**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Milling Machines, Plain**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Milling Machines, Universal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Milling Machines, Vertical**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

**Monel Metal**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Motors, Electric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Moulded Rubber Goods**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Nail Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Nails and Staples**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Nickel, Bars, Sheets, Wire, Etc.**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Nickel Plating Outfits**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Nickel Silver**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Nitrogen**
L'Air Liquide Society, Toronto, Ont.

**Nut Tappers (See Bolt and Nut Machinery)**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

**Nuts, Finished and Semi-finished**
Galt Machine Screw Co., Galt, Ont.

**Nuts, Machine Screw**
Torrington Company, Ltd., Upper Bedford, Que.

**Nuts, S.A.E., Plain and Castellated**
Galt Machine Screw Co., Galt, Ont.

**Oil Filtering and Storage Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oil Storage Engineers**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oils**
Canadian Oil Companies, Ltd., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Hole Covers**
Can. Winkley Co., Ltd., Windsor, Ont.

**Oils, Soluble**
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oxygen**
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

**Oxy-Acetylene Apparatus**
L'Air Liquide Society, Toronto, Ont.

**Packing, Hydraulic**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

**Packing, Steam**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

**Paper Mill Conveyors**
Bertrams Ltd., Edinburgh, Scotland.

**Patents**
Fetherstonhaugh & Co., Ottawa, Ont.
Marion & Marion, Montreal, Que

**Pans, Wet and Dry**
Frost Mfg. Co., Chicago, Ill.

**Pattern-Shop Machinery (See Woodworking Machinery)**
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Patterns, Wood and Metal**
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Wraggis Pattern Works, Galt, Ont.

**Penstocks, Steel**
MacKinnon Steel Co., Sherbrooke, Que

# BUYERS' DIRECTORY

**Phosphor Tin**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Photographic Duplicating Machines**
Commercial Camera Co., Providence, R.I.

**Pig Iron**
Steel Co of Canada, Ltd., Hamilton, Ont.

**Pipe Bending Machines**
American Pipe Bending Machine Co., Boston, Mass
Can. Fairbanks-Morse Co., Ltd., Montreal
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

**Pipe Couplings**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Cutting and Threading Machines**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**
Landis Machine Co., Inc., Waynesboro, Pa.

**Pipe Fitters' Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa

**Piston-Ring Machines**
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Planers, Parallels**
L. & P. Mfg. Co., Niagara Falls, Ont.

**Planing Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Planing Machines, Rotary**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Pneumatic Tools**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Bissett Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Pots, Steel**
Sarnia Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Pressed Steel Parts**
Ackworthie, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich.
Can. Fairbanks-Morse Co., Ltd., Montreal
L. & P. Manufacturing Company, Ltd., Niagara Falls, Ont.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Stenhouse Co of Can., Ltd., Chas. A., Windsor, Ont.

**Presses, Drop and Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Toledo Machine & Tool Co., Toledo, Ohio

**Presses, Foot and Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

**Presses, Forcing**
Atlas Press Co., Kalamazoo, Mich.
Stewart & Co., Duncan, Glasgow, Scot.

**Presses, Hydraulic**
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot
Williams Machinery Co., A. R., Toronto, Ont.

**Presses, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Protractors**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Propellers**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Pulleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal and Fibre**
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Pulp and Paper Mill Equipment**
MacKinnon Steel Co., Sherbrooke, Que.

**Pumps, Automobile Tire**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Pumps, Barrel and Boiler-feed**
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coalant**
Trahern Pump Co., Rockford, Ill.

**Pumps, Geared and Hand**
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

**Pumps, Lubricant and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Jardine & Co., A. B., Hespeler, Ont.

**Punches, Power**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo, Ohio

**Punching Machines, Horizontal**
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Racks, Cut**
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**
Holden Co., Ltd., Montreal, Que

**Reamer Holders**
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

**Reamers, Expanding**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Reamers, Solid**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Reamers, Taper**
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Recorders, Temperature**
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Recorders, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Rheostats**
Northern Electric Co., Montreal, Que.

**Resistance Materials**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Respirators**
Willson Goggles, Inc., Reading, Pa.

**Rivets**
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

**Rivet Heaters**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.

**Riveting Machines**
Bilton Machine Co., Bridgeport, Conn.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill
Keller Pneumatic Tool Co., Grand Haven, Mich
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**
Stewart & Co., Duncan, Glasgow, Scot.

**Rolls (Rubber Covered)**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rudder Frames, Steel**
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Rubber Goods, Mechanical**
Quaker City Rubber Co., Philadelphia, Pa.

**Rules, Steel**
Chesterman & Co., Ltd., J., Sheffield, Eng

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R.I

**Rust Preventatives**
Oakley Chemical Co., New York, N.Y.

**Sand Equipment**
Can. Link-Belt Co., Toronto, Ont.

**Sand Mills**
Frost Mfg. Co. Chicago, Ill.

**Sanding Machinery**
Oliver Machy. Co., Grand Rapids, Mich.

**Sand Rammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Saw Frames and Blades, Hack**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que

**Sawing Machines, Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Sawing Machines, Power Hack**
Ackworthie, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Saw Sharpening Machines**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saw Tables, Universal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Hot and Cold**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Saws, High Speed Steel**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Metal Band**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saws, Metal, Power**
Clemson Bros., Inc., Hamilton, Ont.

**Saws, Metal Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

**Saws, Milling**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Saws, Screw Slotting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Swing Cut-off**
Oliver Machinery Co., Grand Rapids, Mich.

**Scales**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal, Q

**Screens**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Screw Drivers, Optical, Jewelry and Novelty**
Torrington Co., Ltd., Upper Bedford, Que.

**Screw Driving Machine**
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill

**Screw Extractors**
Cleveland Twist Drill Co., Cleveland, O

**Screw Machine Work**
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
Tallman Brass & Metal Co., Hamilton, Ont.

# BUYERS' DIRECTORY

**Screw Machinery, Wood and Lag**
Cook Co., Asa S., Hartford, Conn.

**Screw Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Screw Machines, Automatic**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

**Screw Machines, Plain or Hand**
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio.

**Screw Machine Products**
Torrington Company, Ltd., Upper Bedford, Que.

**Screw Plates**
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

**Screws, Cap and Set**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Lock Cap**
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Machine**
Barnes Co., Wallace, Bristol, Conn.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Safety Set**
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Screws, Side Knob**
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Thumb**
Torrington Company, Ltd., Upper Bedford, Que.

**Second-Hand Machinery**
**(See Searchlight Section)**
Petrie, Ltd., H. W., Toronto, Ont.

**Separators, Moisture and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Separators, Oil and Waste**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Shafting**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Shapes, Cold-Drawn Special Steel**
Union Drawn Steel Co., Hamilton, Ont.

**Shaping Machines**
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Walcott Lathe Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Shapers, Wood**
Oliver Machinery Co., Grand Rapids, Mich.

**Shears, Hand**
Can. Blower & Forge Co., Ltd., Kitchener.

**Shears, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., Duncan, Glasgow, Scot.
Toledo Machine & Tool Co., Toledo, Ohio
Williams Machinery Co., A. R., Toronto, Ont.

**Shearing Machines, Angle, Iron Bar and Gate**
Bertrams Ltd., Edinburgh, Scotland.

**Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio.

**Sheets, Nickel, Resist, Alloy**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Sheets, Nickel, Monel and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Side Frames, Locomotive**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Slotting Attachments**
Ford-Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

**Slotting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

**Solders**
British Smelting & Refining Co., Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Canada.

**Snap Flasks**
Oliver Machy. Co., Grand Rapids, Mich.

**Special Machinery and Tools**
Brown Engineering Corp., Ltd., Toronto.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Specialties, Swaged and Headed Work**
Torrington Company, Ltd., Upper Bedford, Que.

**Spectacles, Industrial**
Willson Goggles, Inc., Reading, Pa.

**Springs**
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

**Spring-making Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Sprockets and Chains**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Squares**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Stamping, Metal**
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Stamps, Steel**
Diamond Saw & Stamping Works, Buffalo, N.Y.

**Stairways, Wrought Iron**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Steam Specialties**
Crane Ltd., Montreal, Que.

**Steel Plate**
Dom. Foundries & Steel, Hamilton, Ont.

**Steels, Tool**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel Blooms and Billets**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steel, Cold-Rolled Strip**
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Steel Castings**
Dom. Foundries & Steel, Hamilton, Ont.

**Steel Forgings**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Steel, Shafting and Free Cutting Screw**
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

**Steel, Sheet**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

**Steel, Tanks**
Can. John Wood Mfg. Co., Toronto, Ont.

**Steel, Stainless**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel Wire Rods**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steels, Alloy, Open Hearth and Electric**
United Alloy Steel Corp., Canton, Ohio.

**Steels, Alloy and Carbon**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steels, High-Speed**
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel, Magnet**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel, Structural**
MacKinnon Steel Co., Sherbrooke, Que.

**Steel Tubing, Close Joint and Welded**
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

**Stern Frames, Cast Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Straightening Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Studs**
Galt Machine Screw Co., Galt, Ont.

**Surface Plates**
Bilton Machine Co., Bridgeport, Conn.

**Swaging Machines**
Atkins & Co., Inc., E. C., Indianapolis, I.

**Switches, Railway**
Can. Steel Foundries, Montreal, Que.

**Switches and Switchboards**
Northern Electric Co., Montreal, Que.

**Tablets, Bronze, Memorial**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Tachometers**
Aikenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

**Tanks, Steel**
MacKinnon Steel Co., Sherbrooke, Que.

**Tanks and Pumps, Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

**Taper Cutting Dies**
Jones & Lamson Machine Co., Springfield, Vt.

**Tap Holders**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taper Pins**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Tapes, Measuring**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass.

**Tapping Machines and Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Taps and Dies**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks Morse Co., Ltd., Montreal
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
International Machinery & Supply Co., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taps, Collapsing**
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio
Victor Tool Co., Waynesboro, Pa.

**Teeth, Dredge Bucket**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Testing Metals and Materials**
Toronto Testing Laboratory, Toronto, Ont.

**Thermometers**
Bristol Co., Waterbury, Conn.

**Thread-Cutting Tools**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Thread Cutting Machines**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa.

**Threaded Wires**
Torrington Company, Ltd., Upper Bedford, Que.

**Threading Machines**
Acme Machinery Co., Cleveland, Ohio.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Thread Lead Testing Machines**
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Thread-Rolling Machines**
Bliss Co., E. W., Brooklyn, N.Y.

**Tongs**
Hepburn Ltd., John T., Toronto, Ont.

**Tool Cases**
Rice Lewis & Son, Ltd., Toronto, Ont.

**Tool Holders**
Armstrong Bros. Tool Co., Chicago, Ill.
Bilton Machine Co., Bridgeport, Conn
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Markers, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Tool Posts, Lathe**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Steels for all Purposes**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Tools, Small (See Machinists' Small Tools)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Bertrams Ltd., Edinburgh, Scotland.
Burgess & Marchand, Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Chesterman & Co., Ltd., J., Sheffield, Eng.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.
National Machine Tool Co., Racine, Wis
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Tool Work**
Brown Engineering Corp., Ltd., Toronto
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont

# BUYERS' DIRECTORY

**Torches, Blow**
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Trackwork, Railway**
Can. Steel Foundries, Montreal, Que.

**Trackwork, Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Transformers**
Northern Electric Co., Montreal, Que.

**Transmission Machinery**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Toronto, Ont.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Transportation Systems (See Trucks)**
Mathews Gravity Carrier Co., Port Hope, Ont.

**Treated Bits**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Trolleys and Tramways**
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Trucks**
Can. Fairbanks-Morse Ltd., Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Maple Leaf Mfg. Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Trucks, Industrial Motor**
Maple Leaf Mfg. Co., Montreal, Que.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Tube, Products**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Electric Welded or Oxy-Acetylene Welded**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Flexible**
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Tubing, Seamless Steel**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Seamless Steel, Brass and Copper and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Steel Products Co., Brantford, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Tubing, Welded**
International Nickel Co. of Can., Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Tubing, Welded Steel**
Tube Co. of Canada, Toronto, Ont.

**Turbines, Water**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Turret Heads**
Ackworthie, Ltd., John, Birmingham, Eng.
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Turret Machines (See Lathes, Horizontal Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Cook Co., Asa S., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Turrets, Tool Post**
Gisholt Machine Co., Madison, Wis.

**Unions, Pipe**
Crane Ltd., Montreal, Que.

**Universal Joints**
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Valves**
Can. Fairbanks-Morse Ltd., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Crane Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Vises, Drilling Machine**
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.

**Vises, Metal Workers'**
Aikenhead Hardware, Ltd., Toronto, Ont.
Columbia Hdwe. Division, Cleveland, O.

**Vises, Milling Machine**
Brown & Sharpe Mfg. Co., Providence, R.I.
Crescent Machine Co., Ltd., Montreal, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Victor Tool Co., Waynesboro, Pa.
Parmenter & Bulloch Co., Gananoque, Ont.

**Voltmeters**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Wagon Loaders**
Can. Link-Belt Co., Toronto, Ont.

**Washers**
Barnes Co., Wallace, Bristol, Conn.
Diamond State Fibre Co., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

## DIRECTORY OF DEALERS

THE Buyers' Directory of CANADIAN MACHINERY was originally intended to contain information regarding lines actually manufactured by our advertisers. We now carry the advertising of leading machinery dealers, some of whom represent scores of manufacturers in addition to being manufacturers themselves in some cases. This necessarily widened the scope of our Directory, but it would be impracticable to list all the lines handled by all the dealers. We recommend, therefore, if our subscribers cannot find what they want in our Directory that they communicate with the dealers whose names appear herewith.

### MACHINE TOOLS AND METAL WORKING EQUIPMENT

Chas. P. Archibald & Co., Montreal, Que.
The Canadian Fairbanks-Morse Co., Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
H. W. Petrie Limited, Toronto, Ont.
The Standard Equipment & Tool Co., Montreal, Que.
Chas. A. Strelinger Co. of Canada, Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Wilson-McGovern Limited, Toronto Ont.
Yeates Machinery Co., London, Ont.

### MACHINE SHOP AND FACTORY SUPPLIES

Chas. P. Archibald & Co., Montreal, Que.
The Canadian Fairbanks-Morse Co., Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
H. W. Petrie Limited, Toronto, Ont.
The Standard Equipment & Tool Co., Montreal, Que.
Chas. A. Strelinger Co. of Canada, Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Wilson-McGovern Limited, Toronto, Ont.
Yeates Machinery Co., London, Ont.

### POWER EQUIPMENT AND SUPPLIES

The Canadian Fairbanks-Morse Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
H. W. Petrie Limited, Toronto, Ont.
The Standard Equipment & Tool Co., Montreal, Que.
Wilson-McGovern Limited, Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.

### WOODWORKING MACHINERY

Chas. P. Archibald & Co., Montreal, Que.
The Canadian Fairbanks-Morse Co., Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
H. W. Petrie Limited, Toronto, Ont.
Chas. A. Strelinger Co. of Canada, Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Yeates Machinery Co., London, Ont.

**Vises, Pipe**
Columbia Hdwe. Division, Cleveland, O.
Greenfield Tap & Die Corp., Galt, Ont.

**Vises, Planer and Shaper**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Superior Machine Co., London, Ont.

**Vises, Wood Workers'**
Columbia Hdwe. Division, Cleveland, O.
Egan Machinery & Supply Co., Geo. F., Montreal, Que.
Oliver Machy. Co., Grand Rapids, Mich.

**Washers, Rubber**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Welding Apparatus, Oxy-Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Welding, Electric**
All-Weld Company, Toronto, Ont.
Carter Welding Co., Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.

**Welding Filler Rods**
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

**Welding Machines, Oxy-Acetylene**
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

**Welding, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Prest-O-Lite Co. of Can., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

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Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Canada, Ltd., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

**Wheels, Cast, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Wheels, Industrial**
American Pulley Co., Philadelphia, Pa.
Hull Iron & Steel Foundries, Hull, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.

**Winches, Electric**
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

**Winches, Headgate**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Winches, Stoplog**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Wire**
Barnes Co., Wallace, Bristol, Conn.
Canada Metal Co., Ltd., Toronto, Ont.
Dennis Wire & Iron Works, London, Ont.
Greening Wire Co., B., Hamilton, Ont.
Northern Electric Co., Montreal, Que.

**Wire Cloth**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Wire Coiling Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Wire Rope**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Wire Straightening and Cutting Machinery**
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Schuster Co., F. B., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

**Wire, Welding**
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Wires, Special**
Dennis Wire & Iron Works, London, Ont.
Greening Wire Co., B., Hamilton, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Woodworking Machinery**
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Wrenches, Drop Forged**
Armstrong Bros. Tool Co., Chicago, Ill.
Canada Foundries & Forgings Co., Welland, Ont.

**Wrenches, Machinists'**
Armstrong Bros. Tool Co., Chicago, Ill.
Canada Foundries & Forgings Co., Welland, Ont.

**Wrenches, Pipe**
Canada Foundries & Forgings Co., Welland, Ont.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.

**Wrenches, Tap**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.

**Wrought Iron Pipe**
Steel Co. of Canada, Ltd., Hamilton, Ont.


## CANADIAN MACHINERY AND MANUFACTURING NEWS

143 UNIVERSITY AVE., TORONTO, CANADA

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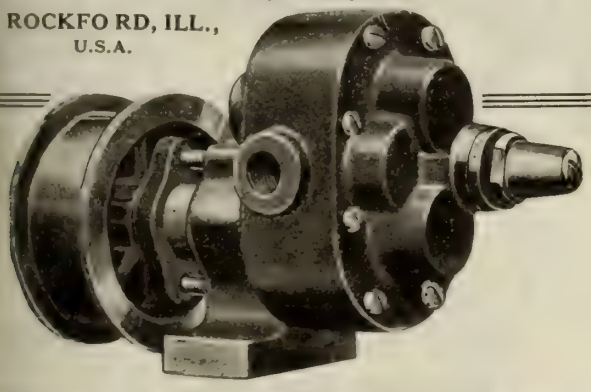
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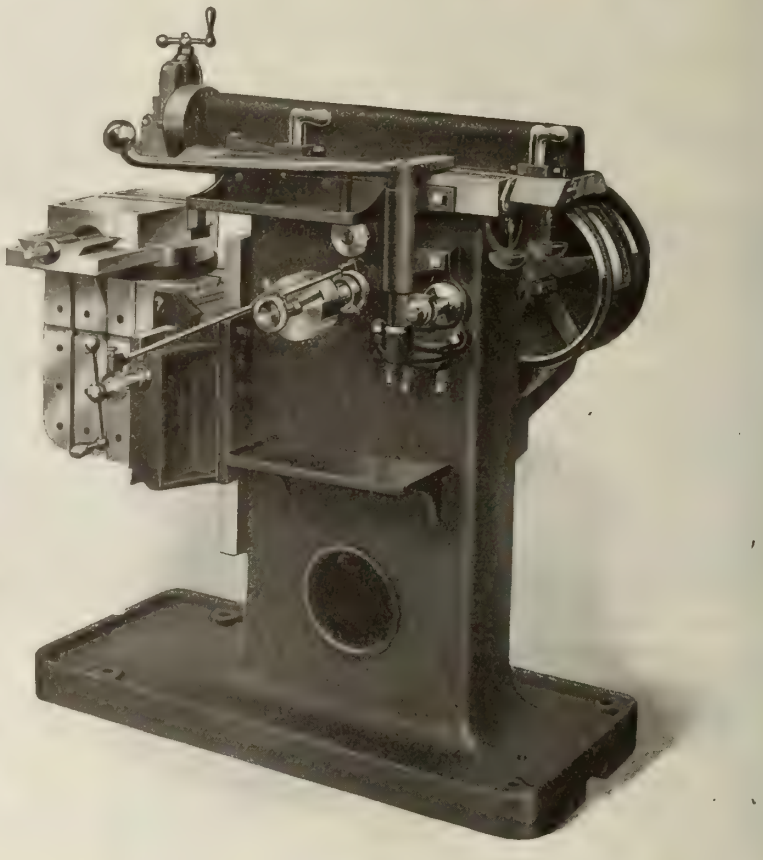
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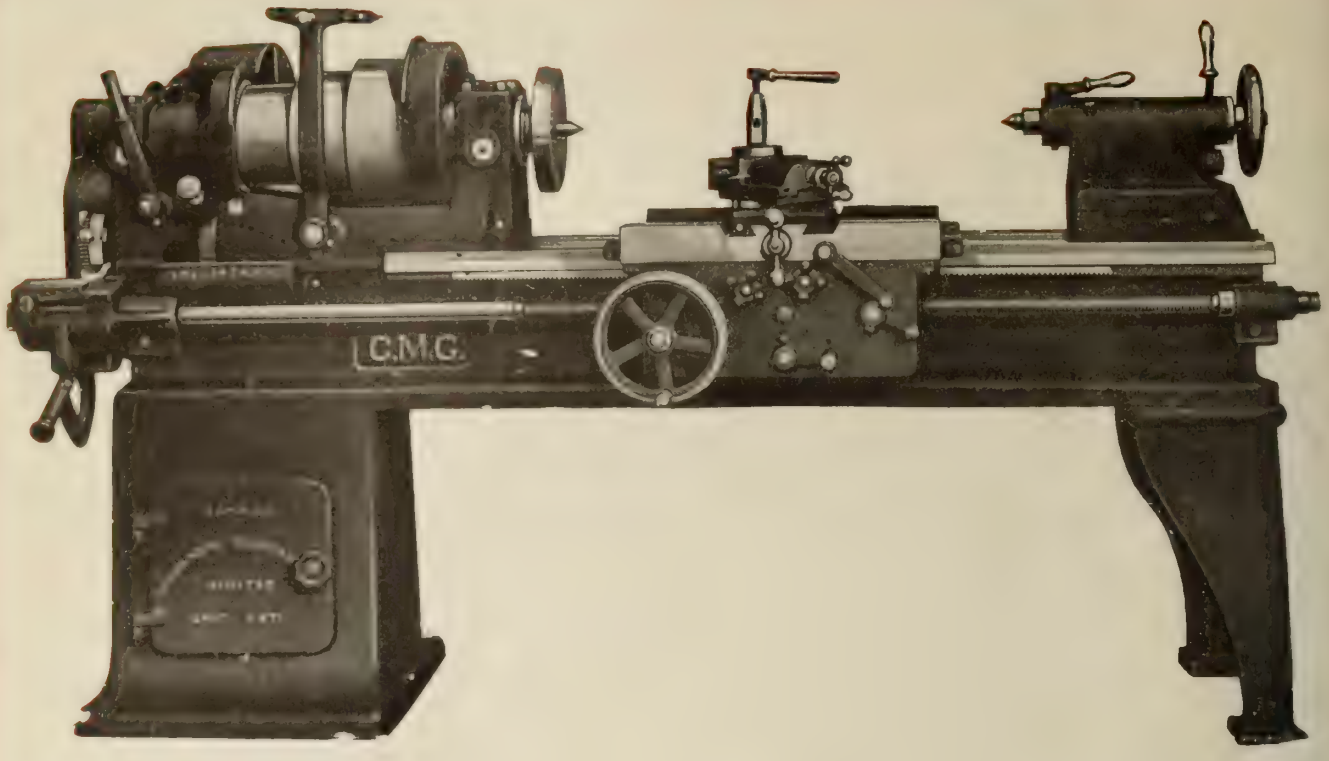
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1205 McArthur Bldg.

WINDSOR
Davis Building

VANCOUVER
B.C. Equipment Co.

HALIFAX
Roy Building



**PRATT AND WHITNEY**

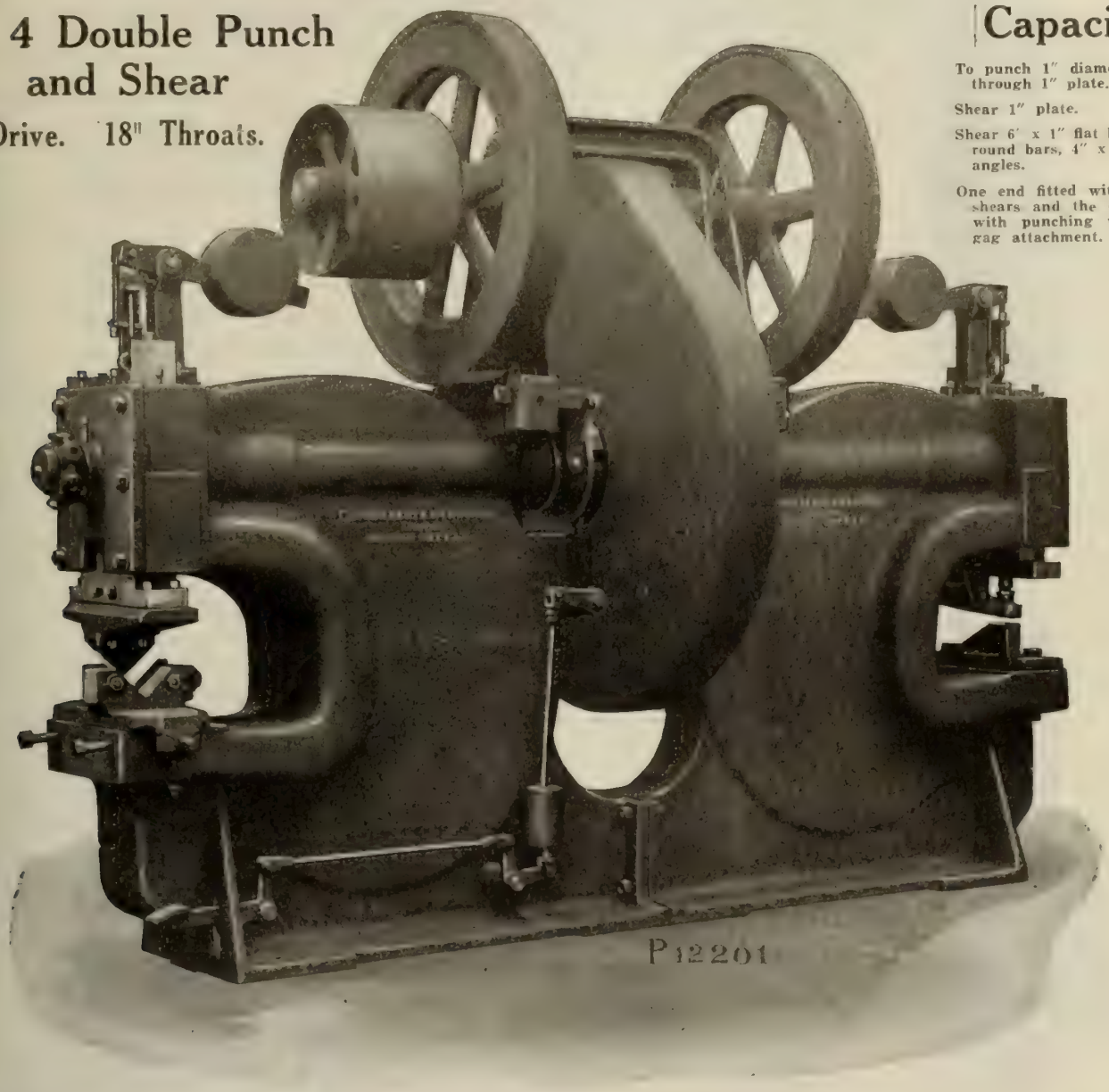
# The BERTRAM Page

## MACHINE TOOLS

JB&SCo

## No. 4 Double Punch and Shear

Belt Drive. 18" Throats.




## Capacity

To punch 1" diameter holes through 1" plate.

Shear 1" plate.

Shear 6' x 1" flat bars, 1¾" round bars, 4" x 4" x ⅜" angles.

One end fitted with Angle-shears and the other end with punching tools and gag attachment.

# The John Bertram & Sons Co., Limited

DUNDAS. ONTARIO. CANADA.

| MONTREAL | TORONTO | VANCOUVER | WINDSOR | WINNIPEG | HALIFAX |
|---|---|---|---|---|---|
| 723 Drummond Bldg. | 1002 C.P.R. Bldg. | 609 Bank of Ottawa Bldg. | Davis Bldg. | 1205 McArthur Bldg. | Roy Bldg. |



# The New Canadian-Detroit Double-D Rolled Drill

***Made in Canada***

PRODUCTION requirements in an ever-increasing number of plants necessitate the use of a strong, accurate drill, specially designed for hard drop forgings, steel castings, and other alloy steels equally tough and difficult to drill.

For this service we have developed a hot rolled process drill known as the Canadian-Detroit Double-D (DD) Rolled Drill. It combines the strength of the forged type drill with the accuracy and uniformity of the milled type.

The flute of the DD is formed straight from the bar stock by successive passes through specially built and patented rolls at a temperature of 1850° F. This mechanical rolling of the flutes produces a refinement and uniformity in the grain of the steel and gives additional density at the centre and at the outer edge. Each drill is rolled separately, and the rolls are so designed and operated as to produce the same uniform increase in web thickness as is obtained in high-grade drills of the milled type.

The fluted drill is reheated and twisted in a specially designed automatic machine. The twisting process is held absolutely uniform, giving the same increase in helix angle from shank to point, 27° to 32°. This standard has been adopted on our milled drills and has been proven by exhaustive experiments to be the most efficient.

The DD has increased production and cut drilling costs in many of the finest plants in Canada. A fair test will convince you.

Manufactured and carried in stock at Walkerville in all sizes from ½ inch to 1½ inches.

We also manufacture and carry in stock all sizes and types of high speed and carbon milled drills.

## CANADIAN-DETROIT TWIST DRILL COMPANY, LIMITED

**Walkerville, Ontario**

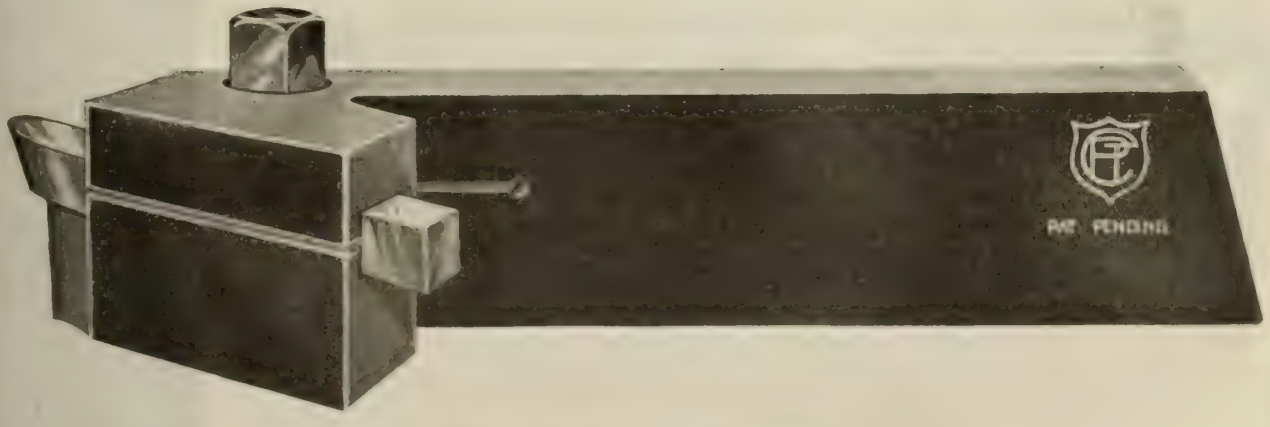
# CANADIAN PRODUCTION TOOL COMPANY LIMITED
## WALKERVILLE, ONTARIO, CANADA

Manufacturers of High Grade

# Tool Holders

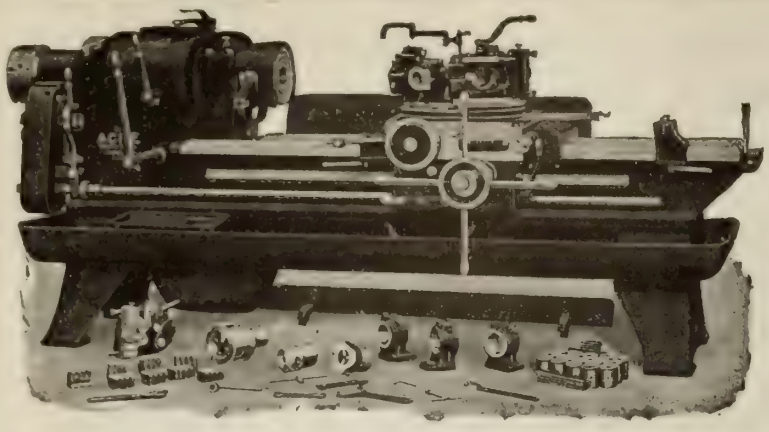
*Write for Catalogue*

**Left Hand Square Turning Tool Holders**




Made of Tool Steel and Tempered

*If interested tear out this page and place with letters to be answered.*



# Cincinnati Acme

Cincinnati Acme Turret Lathes are adapted to both bar and chucking work. We offer a full line for your every requirement.

## *Don't Merely Ask for Efficiency—Get It!*

Have you often wondered why production sometimes falls a little behind on certain jobs? Perhaps it's your lathes.

Cincinnati Acme Turret Machinery will give fast, accurate and economical production. Once installed in your shop you will find that their double purpose features and sturdy, rigid construction save power and get your work out ahead of schedule.

Writing us a postcard may be your first step toward increased production and greater lathe economy.

## The Acme Machine Tool Company

**CINCINNATI, OHIO, U.S.A.**

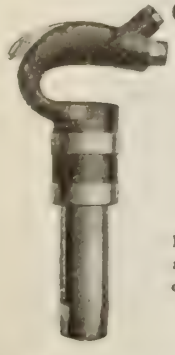
***Canadian Agents: Rudel-Belnap Machinery Co. of Toronto and Montreal***

# Cleveland Sand Rammers

## FOR FLOOR, BENCH, PEIN AND FLASK RAMMING

Cleveland Sand Rammers are made in several sizes and weights, and are adapted for all kinds of Foundry Ramming.

The Piston Rods are packed with a resilient packing which prevents any dirt from entering piston chamber and working parts—They are fitted with either Round or Flat Rod as required. Cleveland Rammers are light in weight, have high speed and practically no vibration, making them ideal foundry tools.



## CLEVELAND CHIPPING HAMMERS

For Foundry Work. Are furnished in any required size or weight for grey iron or steel castings; they have high speed, and are adapted for fast chipping now required by piece-workers.

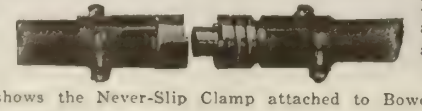


## CLECO PRESSURE-SEATED AIR VALVES AND BOWES AIR HOSE COUPLINGS

**Are Standard Equipment Everywhere**

***Both Valves and Couplings are pressure tight.***

Bowes Couplings are instantly connected or disconnected.



Bowes Couplings are absolutely air tight under all pressures.

Above cut shows the Never-Slip Clamp attached to Bowes Coupling.

IN STOCK:—RIVETING HAMMERS, DRILLS, REAMING, TAPPING AND FLUE-ROLLING MACHINES, CORNER DRILLS, PORTABLE AND BENCH GRINDERS, PRESSURE-SEATED AIR VALVES, ETC.

**Write for Bulletins 44-46-48 and 49.**



***ADDRESS ALL INQUIRIES TO:***

## CLEVELAND PNEUMATIC TOOL CO. OF CANADA, LIMITED

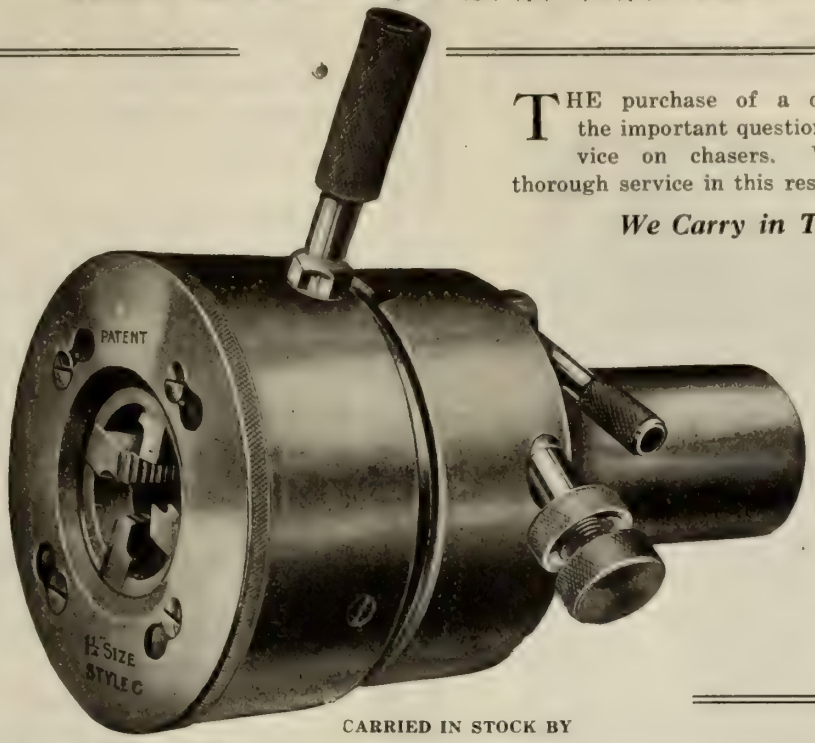
**84 CHESTNUT STREET, TORONTO, ONT.** **337 CRAIG ST. W., MONTREAL, QUE**

# The Coventry Patent Self-Opening Diehead

MADE IN SEVEN SIZES—5/16", ½", ¾", 1", 1¼", 2" and 3"

THE Coventry Diehead produces clean smooth threads, accurate in form and pitch.

The Coventry chaser grinding system ensures exceptional life to the chasers and the greatest ease in grinding, all chasers are ground together on any type of surface grinder.




THE purchase of a diehead involves the important question of prompt service on chasers. We offer very thorough service in this respect.

***We Carry in Toronto Stock***

Chasers With
U.S. Standard Thread
Briggs Pipe Thread
A.S.M.E. Thread
S.A.E. Thread
Whitworth Thread

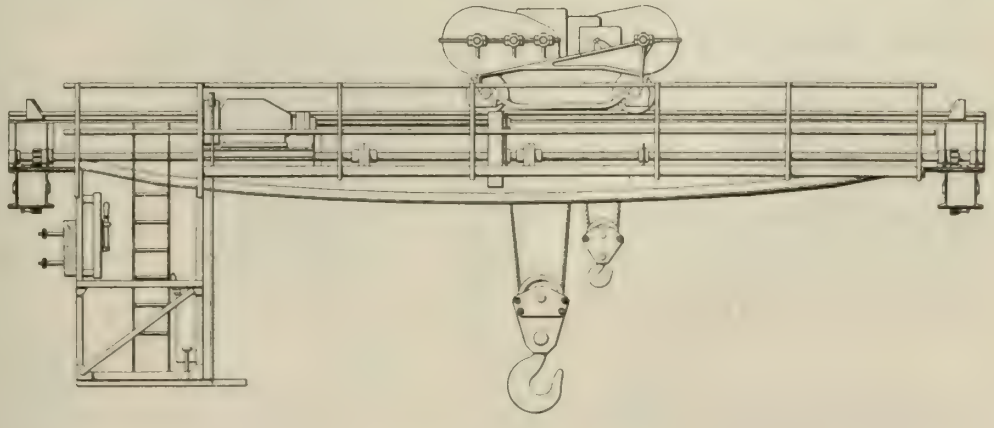
*Section H. describes our Diehead and Chaser Grinding System in Detail. A copy will be sent on request.*

CARRIED IN STOCK BY

ALFRED HERBERT LIMITED 1-3 JARVIS STREET, TORONTO

# CRANES

## ELECTRIC AND HAND OPERATED

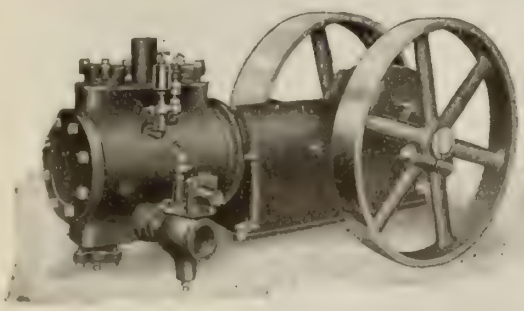


## DOMINION BRIDGE COMPANY LIMITED

HEAD OFFICE & WORKS: MONTREAL BRANCHES:-OTTAWA, TORONTO, WINNIPEG


*If interested tear out this page and place with letters to be answered.*

# For Your Shop Air Supply



Class "EL-1" Single Stage, Straight Line, Power Driven Compressor has a higher capacity for weight and floor space than other machines of its type on the market and is characterized by such worthwhile features as entirely enclosed dust-proof frames, automatic lubrication at all speeds, silent leaf valves, etc. Specially adapted to short belt motor drives. An ideal unit for the small shop or as an auxiliary in larger plants. Smaller sizes shipped from stock. Fully described in Bulletin K-300-C.

An unfailing supply of compressed air is a manufacturing necessity in these days of keen competition and close buying.

The installation of a Canadian Ingersoll-Rand Compressor is the simplest and best means of establishing a satisfactory air service in your plant.

Made in a score or more sizes and styles, there is one for every air compressing need and for every type of drive.

Perfected design, modern production methods and high manufacturing standards gained through years of specialization in this field, ensure satisfaction from the standpoints of prompt shipment, moderate first cost and high operating economy.

Whenever you are planning on the provision or extension of air power in your shop you will want our catalogues at hand for consultation. Better send for them now.

## CANADIAN INGERSOLL-RAND COMPANY, LIMITED

Sydney Sherbrooke Montreal Toronto
Cobalt Winnipeg Nelson Vancouver

# GENUINE EMERY

**Sizes 180, 160, 140, 120, 110, 100, 90, 80, 70, 60, 54, 46, 40, 36, 30, 24, 20, 18, 16, 14, 12, 10, 9, 8, hole.**

**EMERY FLOUR AND WASHED FLOUR**

**Emery, Glass, Flint, Garnet, Corundum, Carborundum** — **Paper and Cloth** — **In Sheets, Rolls, Discs, Bands, Strips and Tapes, &c.**

## JOHN OAKEY & SONS

LIMITED
WELLINGTON MILLS
LONDON, S.E. 1, ENGLAND

AGENTS:
F. Manley, 343 Garry St.
Winnipeg, Man.
Sankey & Mason
839 Beatty St., Vancouver

MAPLELEAF

# MOTOR TRUCKS

## On a Steep Hill With a Heavy Load

THE driver has got to shift gears in a hurry. That is the time he is glad the truck has a Mapleleaf transmission in it.

For Mapleleaf transmissions have ample multiplying power. The 5 ton model, for example, multiplies 6 times on lowest speed and gives two other changes between that and high. Enough to overcome any hauling problem you will run up against, isn't it!

All changes are made simply and easily. The gears change quietly and effectively. The whole transmission system is of the most rugged type imaginable.

Let us show you a Mapleleaf truck winning an argument with a wicked hill. You will know we haven't said all we might about the merits of its transmission.

## MAPLELEAF MFG. CO., LIMITED

MONTREAL, CANADA

# GREY IRON CASTINGS

*Also*

## Brass, Bronze, Aluminum, Copper, Zinc and Nickel Castings

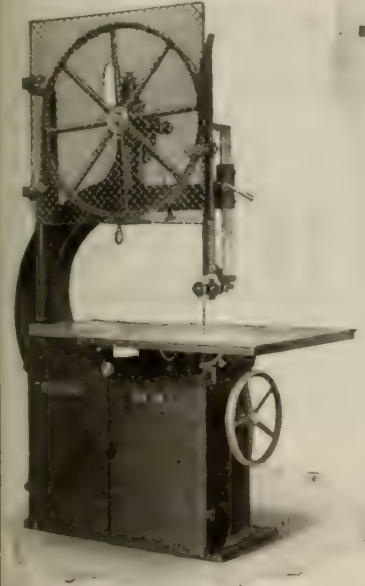
QUALITY!
SERVICE!

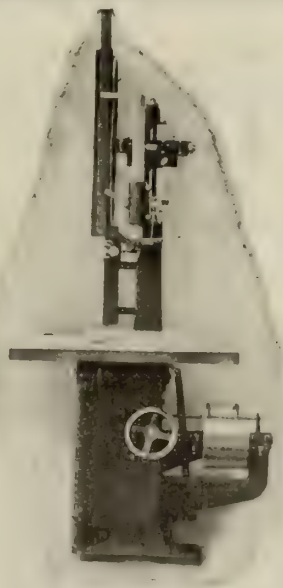
**Canadian Hanson and Van Winkle Co., Limited**

Toronto - - - Canada

# "Oliver" Quality

Pattern Shop Equipment
Woodworking Machinery
Engine Lathes





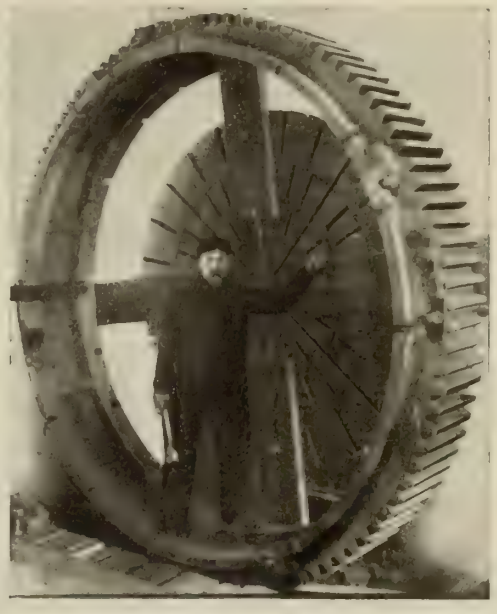
Oliver No. 15 Band Saw

**Oliver Machinery Co.**

Grand Rapids, Mich.

# Hull Iron and Steel Foundries, Limited

## HULL, QUEBEC



# Specify "HISCO" *Regd.* Products

Steel, Chrome, Manganese and Nickel

## STEEL CASTINGS

**Annealed and Unannealed**

Cement Mill and Mining Machinery, Castings, Stamp Mills, Crushing Plants, Excavating Outfits, Steel Car Wheels, Locomotive Driving Wheels and Frames, etc.

## Machine-Moulded GEARS

"HISCO" machine-moulded gears, while requiring no pattern, insure accuracy, dependability, quality, and the price is minus the cost of patterns—which in these days of high prices of lumber and labor is something to be considered.


*If interested tear out this page and place with letters to be answered.*

# THE JOHNSON FRICTION CLUTCH

## The Case Against the Countershaft

The old familiar countershaft drive, through cross belts and tight and loose pulleys, stands accused of the following offences against efficiency.

In that it—

1. Involves needless equipment.
2. Costs too much to set up.
3. Prevents economical and systematic use of space.
4. Operates sluggishly.
5. Multiplies belt troubles and the resultant cost of upkeep.

Modern practice has discarded the antiquated countershaft for the simplicity and efficiency of the clutch drive direct from lineshaft.

**Adopt the Johnston Lineshaft Drive**

The economical, efficient and durable method of power transmission through friction control.

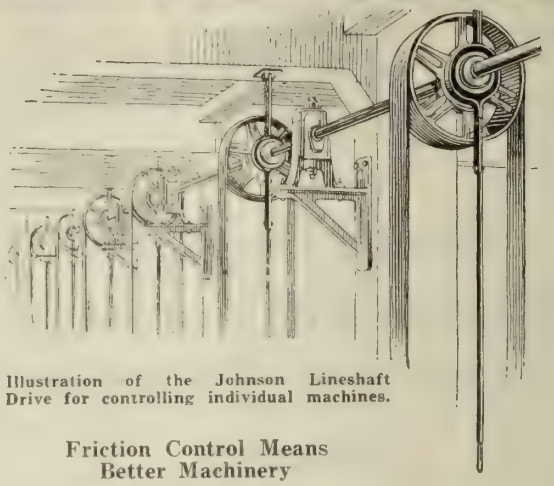
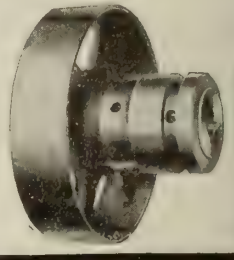


Illustration of the Johnson Lineshaft Drive for controlling individual machines.

**Friction Control Means Better Machinery**

Whether it is applied overhead or in the machine itself.

**Write for our Booklet "Clutches as Applied to Machine Building" and our Yellow Catalog.**



CANADIAN AGENTS:

WILLIAMS & WILSON, LTD., 84 Inspector Street, Montreal
CANADIAN FAIRBANKS-MORSE CO., LTD., Montreal, Toronto, Winnipeg

**THE CARLYLE JOHNSON MACHINE CO. MANCHESTER, CONN.**

# Quality

**Is the Characteristic which makes**



# "MORSE" DRILLS POPULAR

MORSE TWIST DRILL & MCH. CO.
NEW BEDFORD, MASS., U.S.A.

# CANADIAN STEEL FOUNDRIES LIMITED

## AMONG OUR PRODUCTS

**O. H. STEEL**
- Bolsters
- Couplers
- Draft Arms
- Locomotive Side Frames
- Machinery Castings
- Marine Castings
- Rolling Mill Rolls
- Wheel Centres

**FERRO-ALLOYS**

**MANGANESE-STEEL**
- Bucket Lips
- Crusher Jaws
- Dipper Teeth
- Mixer Teeth
- Special Trackwork

**OTHER ALLOYS**
- Crank Pins
- Crank Shafts
- Locomotive Frames
- Rolls
- Roll Shells

**TRACKWORK**
- Diamond Crossings
- Crosses
- Frogs
- Mates
- Switches
- Rail Braces
- Guard Rail Clamps
- Complete Intersection

This list is merely an indication

General Offices:
Transportation Building, Montreal

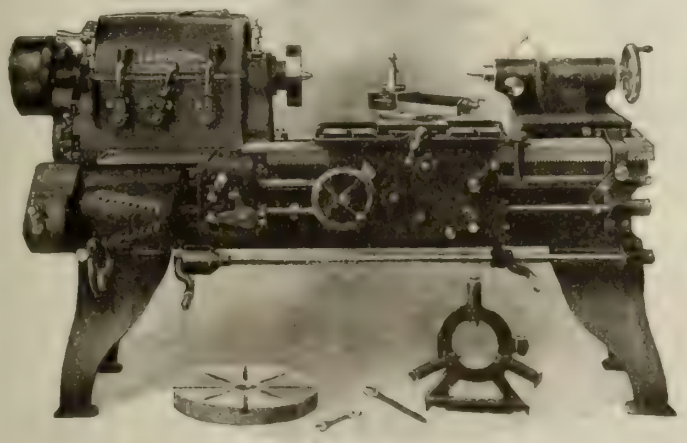


# The "Lehmann" Improved Selective Head Lathes

**(Patents Pending)**

**SIZES—14" to 24" SWING**

On account of its simplicity of construction, great driving power and rigidity, ample range of speeds, moderate tooth travel of its gears, compact and shapely appearance, the "LEHMANN" Selective Head Engine Lathe stands to-day in a class *ahead* and *alone*. Some of the features of construction are:



Sixteen Spindle Speeds in correct geometrical progression obtained with the use of only ten gears.

Improved Friction Clutches (Patents Pending) running in oil, requiring no adjustment and giving forward and reverse control to spindle.

Heat-treated or Hardened Steel gears.

All Shafts, except spindle, running on ball bearings.

Spindle of alloy steel, hardened and ground at the bearings and running in phosphor bronze boxes.

Head Casting forms oil-tight case enclosing all running parts.

In addition these lathes embody all features such as the patent quick change mechanism, the tailstock spindle locking device, the rod and screw shift, etc., forming part of the "LEHMANN" Cone Head Lathes which have acquired an enviable reputation for accuracy and production.

*Let us describe more fully this Exceptional Lathe and its Distinctive Advantages*

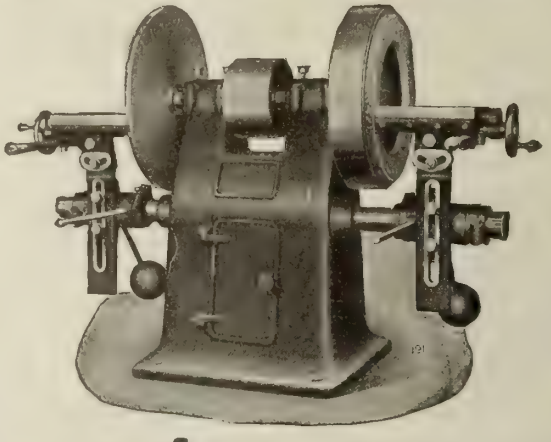
## Lehmann Machine Company - St. Louis, U.S.A.

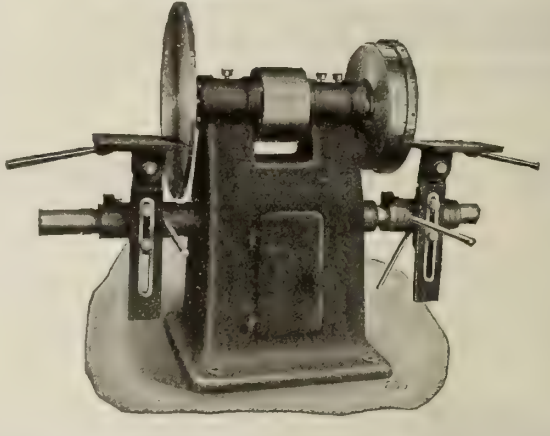
**Chouteau Avenue at Grand**


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# FORD-SMITH DISC Grinders

## High-Class Made-in-Canada Machines





MACHINES which bear a reputation for doing quicker, better work, and whose upkeep expenses are practically nil, merit investigation.

Such machines are Ford-Smith Disc Grinders; every model of the Ford-Smith line—and there's a model for practically every purpose—is designed to give *quality* production as well as *quantity*.

Before leaving the factory all Ford-Smith Grinding Machines are subjected to a series of exacting tests, covering every detail of their construction. These tests *prove* that the machine is capable of filling all our claims.

Many manufacturing operations show possibilities of exceptional economies by the use of suitable grinding processes. Have one of our engineers call and see just what saving grinders would effect on your work.

***Any information with regard to Ford-Smith Grinders will gladly be furnished.***

*Send for our latest Disc Grinder Bulletin.*

## THE FORD-SMITH MACHINE COMPANY, LIMITED

HAMILTON, CANADA

*Foreign Agents:*

W. E. Storey, London, England McLeod & Co., Calcutta, India

# BROWN-BOGGS

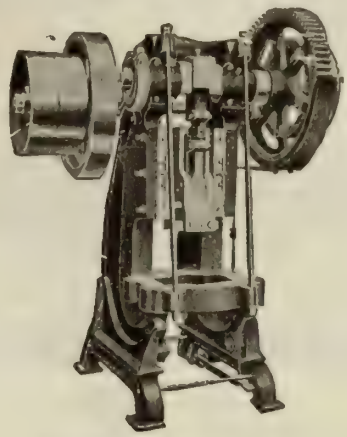
B B

# *RELIABLE*

## in every sense of the word

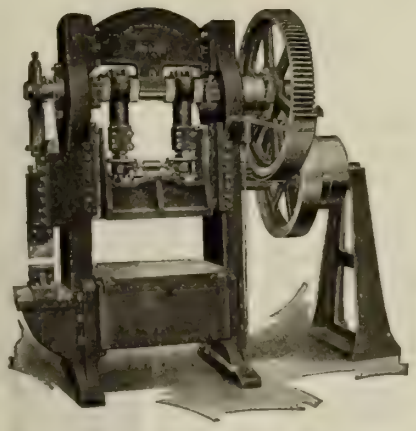
A machine which is always on the job—always willing—is really worth far more than it is usually credited with.

Steady, consistent effort is the only true builder of volume production—effort which utilizes every minute—effort such as you get from all Brown-Boggs machines.

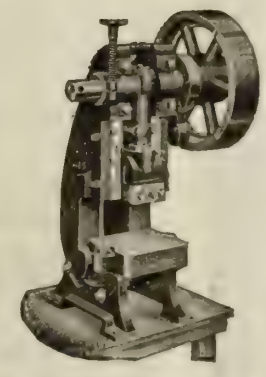


No. 215—Power Press

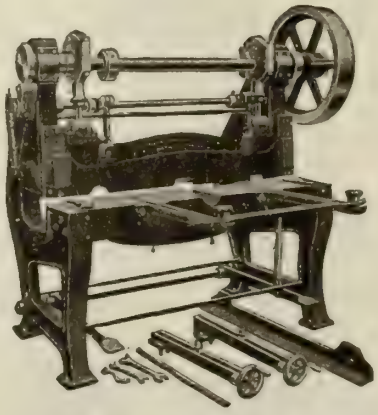
The "B-B" line consists of machines and tools for sheet metal; tinsmiths' tools and machines; presses; dies; shears; punches; drop hammers; canners' processing machinery; evaporating machines and special machinery. We shall be pleased to send you our catalogs containing full particulars of the machines in which you are interested.



No. 140—Double Crank Trimming Press



No. 10—Bench Press



No. 449—Shear

B B

# THE BROWN-BOGGS CO. LIMITED

## HAMILTON, CANADA.


*If interested tear out this page and place with letters to be answered.*

CANADIAN MADE

CANADIAN MADE

# Electric and Hand Traveling Cranes

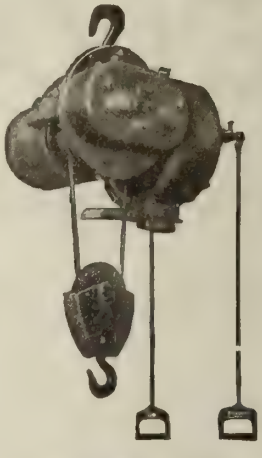


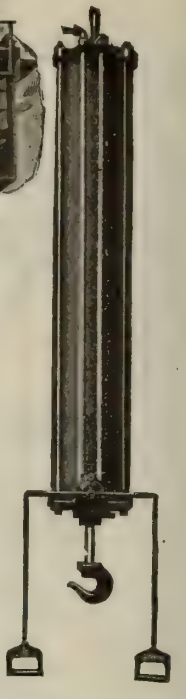
Type E—3-Motor Electric Traveling Crane, 2 Tons to 100 Tons.

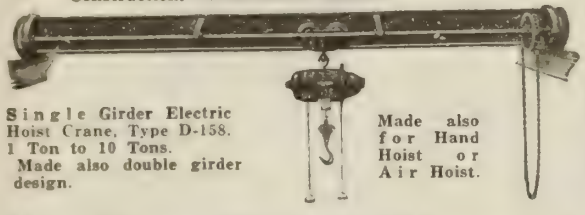


Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada.

We make a wide range of CRANE and HOIST designs. All sizes and capacities, 1 ton to 100 tons.







Single Girder Electric Hoist Crane, Type D-158. 1 Ton to 10 Tons. Made also double girder design.

Made also for Hand Hoist or Air Hoist.

Get our prices and specifications before you buy.

In asking prices, state SERVICE CAPACITY, SIZE OR SPAN POWER, and, if electric, KIND OF CURRENT.

Catalogs free.

Type D Electric Hoists—½ to 10 Tons.

Air Hoists, Trolleys and Tracks

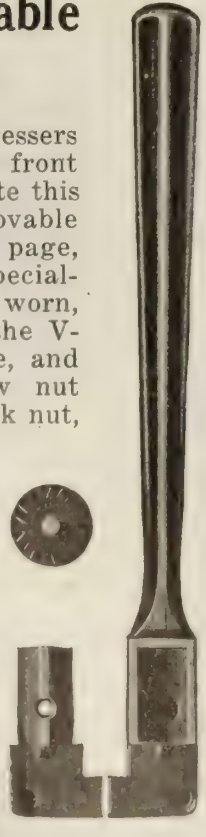
Type No. 20 Air Hoists.

## Northern Crane Works, Limited

Walkerville, Ontario, Canada

## Desmond Removable Jaw Dresser

The wear on Huntington Dressers is at the "nose," directly in front of the bushings. To obviate this trouble the Desmond Removable Jaw Holder, shown on this page, was designed. When the specially hardened jaws become worn, a new set is adjusted in the V-shaped sides of the handle, and held in place with a jaw nut placed over the countersunk nut, thus renewing the dresser.



**Write for catalog of our complete line of dressers and accessories.**

The Can. Desmond-Stephan Mfg. Company, Limited

Hamilton, Ontario

## 1/3 to 1/2 Reduction in Milling Cost

This will be the result of taking small milling jobs from your big millers and putting them up to

## The U.S. MILLER

*The Miller for Small Work*



A small machine takes up less space, requires less power, is easier to operate and is more accurate.

**The Paramount Miller of its size.** Drop us a line for full details.

United States Machine Tool Company

Cincinnati, Ohio, U.S.A.




FORD TRIBLOCS, from ¼ to 20 tons, and more; worm and differential hoists, trolleys—you have room for several? Let us quote you prices.

FORD TRIBLOC

# *Dog tired? No!*

Their burden is carried by a FORD TRIBLOC.

These men do not work with the blind force of a gang of ignorant hunkies. They're strong men, but their strength is directed—their efforts are centered in **placing** the loads.

Men are fond of the TRIBLOC. They work under it, over it, relying on it with perfect confidence. They know it will not fail. They work it from any angle, at high speed, for they find that the hand chain will not "gag" or override the hand wheel flange. Familiarity has bred **respect.**

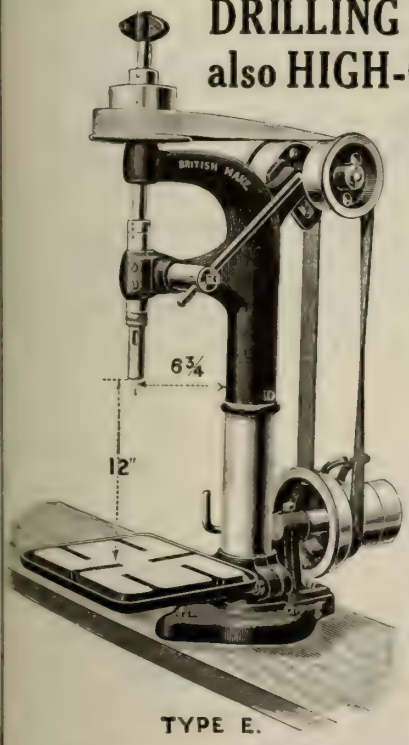
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2ND & DIAMOND STREETS PHILADELPHIA, PA.

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TEN DIFFERENT TYPES, ALL FROM STOCK

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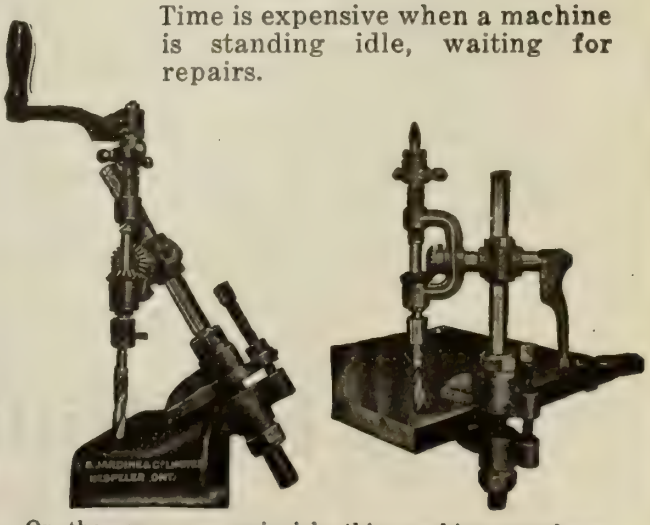
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**Beacon Engineering Co.**
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## Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.

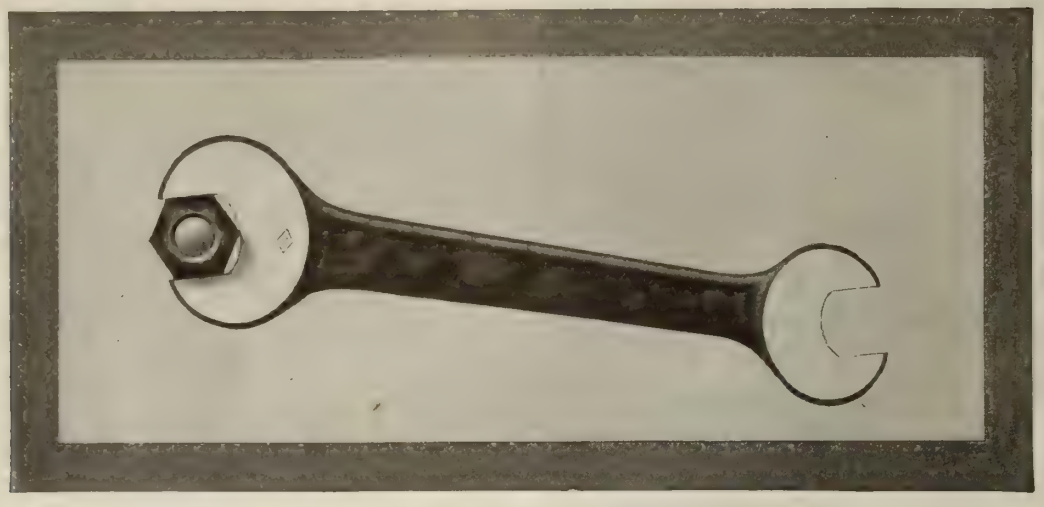


On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

**Weight, 40 lbs. Price, $26.50 net.**
**Sold by all Machinery and Supply Houses.**

**A. B. JARDINE & CO., Limited**
**HESPELER, ONTARIO**

*If interested tear out this page and place with letters to be answered.*



# Williams' Superior Drop-Forged Wrenches

It's great to be able to "lean" on your wrench and give a husky, full-arm swing, secure in the knowledge that it will stand any strain that may be applied. It's confidence that the wrench is dependable that makes the work a pleasure and the tightening-up job real play.

Williams' Superior Drop-Forged Wrenches are regular "he" wrenches; they do a man's work in a man's way; they take the hard with the easy jobs, as they come; they do not round and batter the corners of nuts and cap-screws, because they fit; neither do they slip, for the same reason.

There's a Williams' Wrench for every purpose—40 Standard patterns in nearly 1,000 sizes with openings from 3-16 to 7 5-8 inches. Also Screw Wrenches, Adjustable Wrenches, Stillson Wrenches, "Bull Dog" Wrenches, Auto Wrenches, Chain Pipe Wrenches, etc., etc. Ask your dealer.

Wrench Book on request.

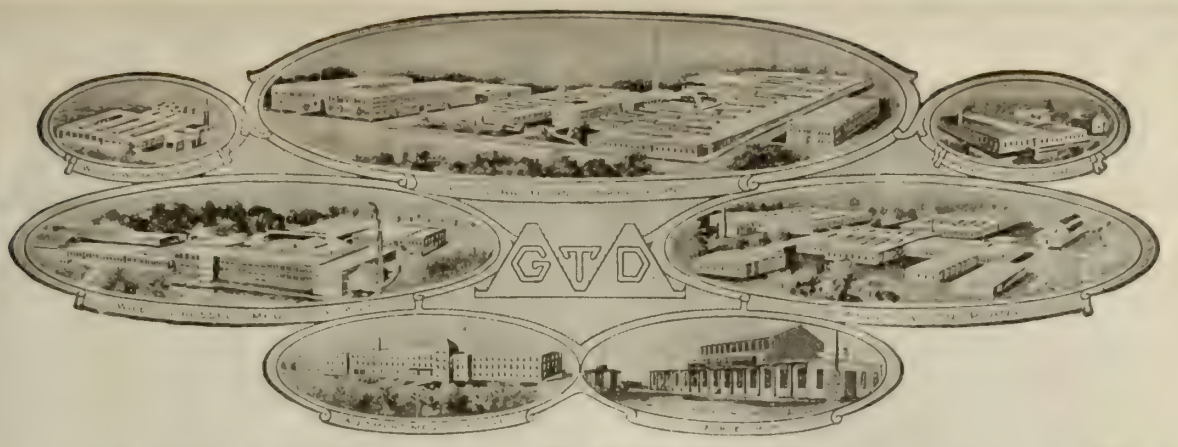
## J. H. Williams & Co.

**LIMITED**

*"The Wrench People"*

FORMERLY CANADIAN DIVISION OF
THE WHITMAN & BARNES MFG. CO.

**45 Thorold Road, ST. CATHARINES, Ontario**




# Why should I buy GTD Taps and Dies?

AS you turn the pages of the magazines and note the many advertising announcements—you must often have asked this question:

"Are all taps and dies alike?"

If they are, then your decision is influenced mainly by the attitude of the people who make them—their friendliness, their understanding of your needs, and their aggressiveness in urging you to buy their product instead of some other.

If taps and dies are *not* alike, how do they differ?

Take the matter of metal buying—or heat treatment, or uniformity in production. Some products excel over others in each case. Or consider accuracy, rapidly becoming a first consideration in buying taps and dies. Or such elements as adaptibility or application!

Consider GTD with these fundamental differences in mind. Think of the tap and die specialties now so universally used which are ours and were first made by us:

The Button Die
The Round Adjustable Split Die
The *"Little Giant"* Die
The *"Acorn"* Die
The *"Gun"* Tap
The *"Maxi-Staybolt"* Tap, etc.,

In all of these tools there are *differences* which distinguish them from taps and dies so often thought of as "all alike."

Back of these differences is the pioneer work in screw-cutting tool manufacture, of Wiley & Russell, Reese, Wells Brothers—names that have stood and still stand for the painstaking effort that only real genius gives to its task.

No, taps and dies are not all alike. There are differences that most observers can detect. And these differences which make it worth any tool-user's while to look for the GTD trademark and *insist on it*—are the things on which our advertising and our salesmanship put the emphasis.

## *Screw Thread Text Books Free*

*Our catalogs and descriptive booklets on GTD threading tools are really text books on the subjects they cover and as such are valuable to any shop worker or executive. Let us mail them to you without cost. Use the coupon and indicate whether you are using production or repair tools or both.*

GTD
GREENFIELD TAP AND DIE CORPORATION
OF CANADA, LIMITED GALT, ONTARIO

Successors to Wells Bros. Co. of Canada, Ltd., Galt, Ontario

GTD Screw Plates, Taps, Dies, Reamers, Gages, Pipe Wrenches

GTD
Corporation of Canada, Ltd.
Galt, Ontario

Send your threading tool catalogs and booklets giving information about

☐ Production Threading Tools
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# BUTTERFIELD




## TAPS, DIES, DRILLS, REAMERS and MILLING CUTTERS

*BUTTERFIELD — "The Tools You Buy Again"*

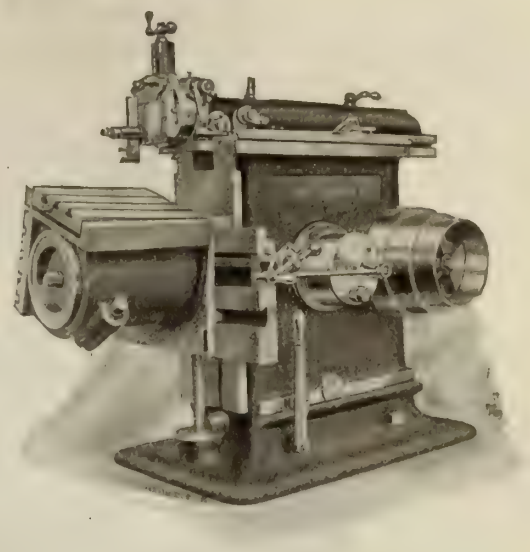
The quality and reliability of our product is assured and guaranteed by our long experience. We have been manufacturing Cutting Tools for forty years and during that time have built up a reputation, not only in Canada but throughout the industrial world for high quality tools—tools you buy again.

**BUTTERFIELD & CO. Division**
Union Twist Drill Co.
**ROCK ISLAND, QUE., CANADA**

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131 St. Paul Street West, Montreal.
AGENTS—D. Phillip, 138 Portage Ave., Winnipeg, Man.
The Triangle Co., Standard Bank Bldgs., Vancouver, B.C.

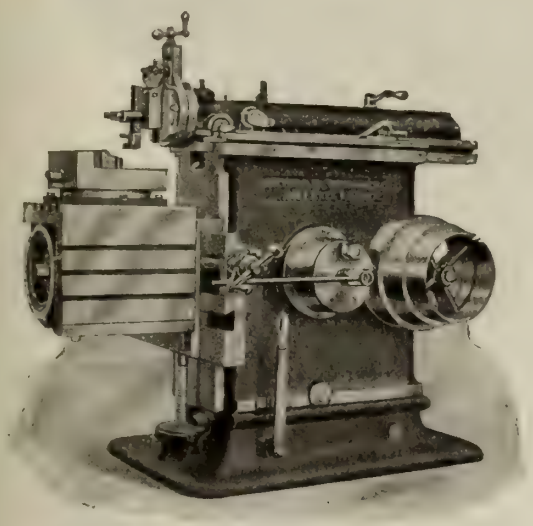
FOREIGN REPRESENTATIVES: Great Britain, Geo. H. Alexander, 83-84 Coleshill St., Birmingham, England; France, Italy, Belgium, and Switzerland, Fenwick Freres, 9 Rue de Rocroy, Paris; Sweden, Norway, and Denmark, Ab. Sigfr. Anderson & Co., Malmo; Spai. Casamitjana Hermanos, Barcelona; Japan, Abe-Kobei & Co., Yokohama; Greece, Stephen C. Stephanson, 11 Lycourgan St., Athens; Netherlands, Wynmalen & Hausman, Rotterdam; Australia, H. R. America, Charles Dreyfus, B. Mitre 785, Buenos Aires, R.A.; South Africa, H. Parker Wood, Cape Town, Durban and Johannesburg.

# UNIVERSAL SHAPING MACHINES



No special vises or fixtures needed; the Universal features of these machines take care of everything, making them particularly adapted to—

Die Work, Tool Making and General Manufacturing.



Machines regularly furnished with—

Swivelling Graduated Table,

Auxiliary Tilting Side for Compound Angles,

Power Down Feed on any angle, with any variation of feed,

Automatic Feed Stop,

Graduated Collars on Tool Head Feed Screw and Table Feed Screw,

Swivel Vise and Graduated Base,

Table raised and lowered by power on 24-in. size.

**We carry large stocks of our 15-inch and 24-inch shapers in our Toronto show rooms—all ready for immediate shipment.**

*Canadian Offices:* POTTER & JOHNSTON MACHINE CO.

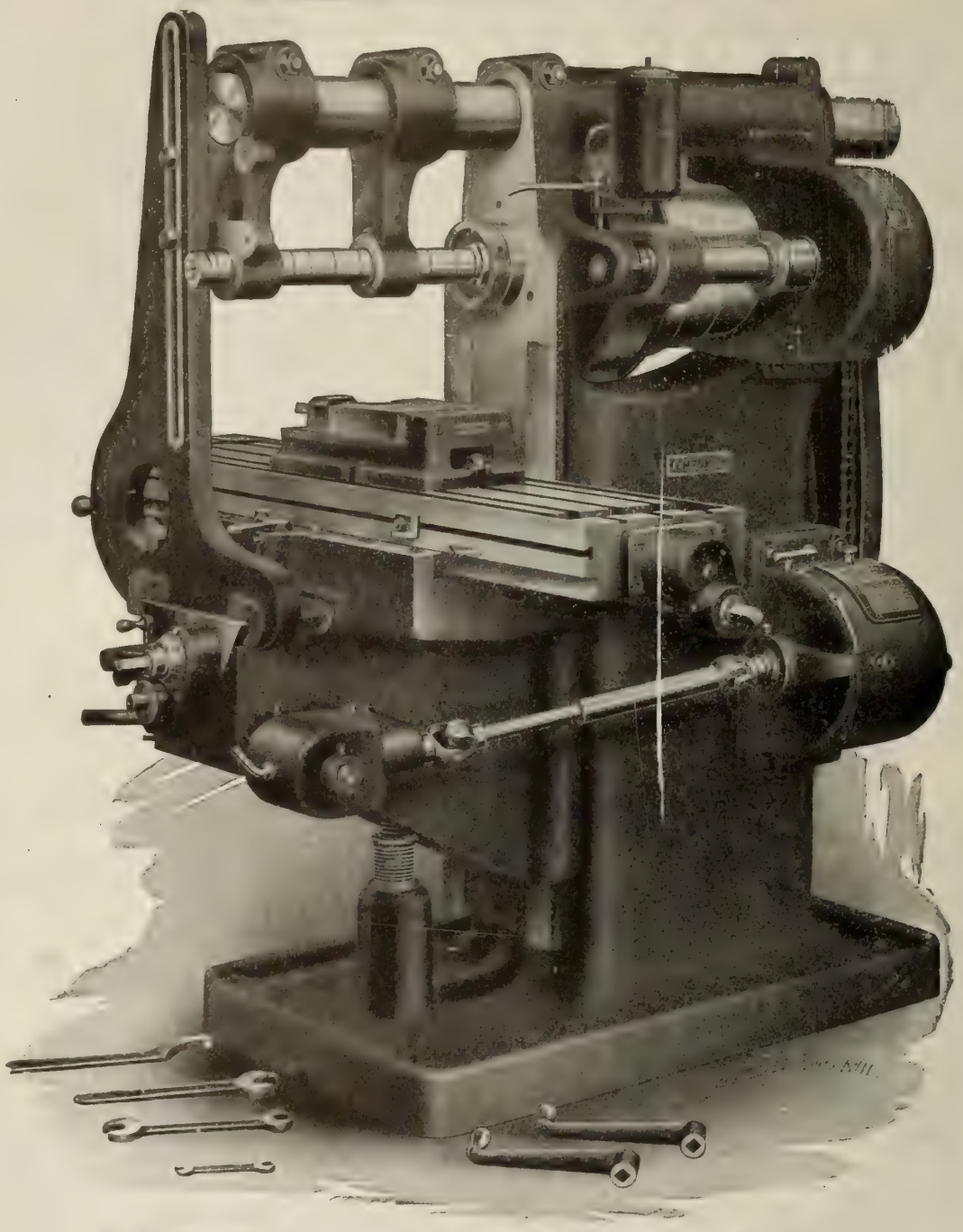
## ROELOFSON MACHINE & TOOL CO., Limited

*Head Office and Showrooms:*

11 Wellington Street East, Toronto, Canada

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# KEMPSMITH



## KEMPSMITH No. 3 Plain Milling Machine

Double Back Geared

A heavy, powerful tool with double back gears and wide driving belt running on a three-step cone of large diameter. Our catalogue "B" describes and illustrates many notable features of the Kempsmith Miller. Write for a copy to-day.

## THE KEMPSMITH MANUFACTURING CO.

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# Canadian Hart Wheels




## *Choosing the RIGHT Wheel!*

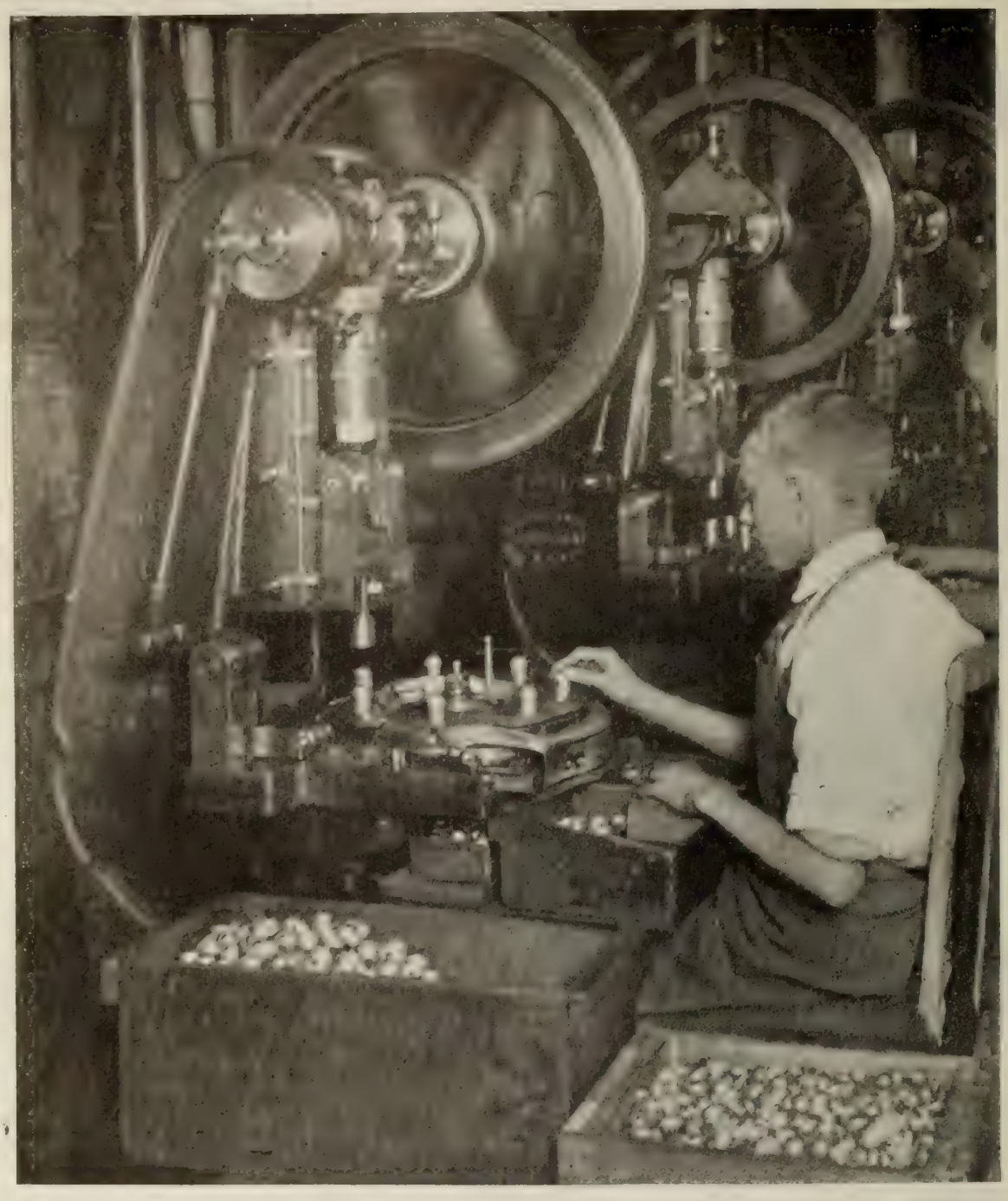
By using the right wheel for the job it is possible to save a good deal of time and expense in your grinding operations. It takes a lot of experience and practice to choose the wheel of correct grade and grain. Tell us the class of work and we'll tell you the wheel you should use.

## Canadian Hart Products Limited

**Hamilton, Canada**




*Made In Canada*



A BOY, operating this "BLISS" No. 19 Inclinable Press for THE KIRBY MANUFACTURING CO., "TOYS WITH BELLS," MIDDLETOWN, CONNECTICUT, is able, regularly, to close 15,000 two-piece, cold-rolled steel sleigh bells per 10-hour day.

The dial feed arrangement makes practicable this extremely rapid production. This press has been operating 10 hours per day since 1906 without the replacement of any part.

BLISS 1857

# E. W. Bliss Company

BLISS 1921

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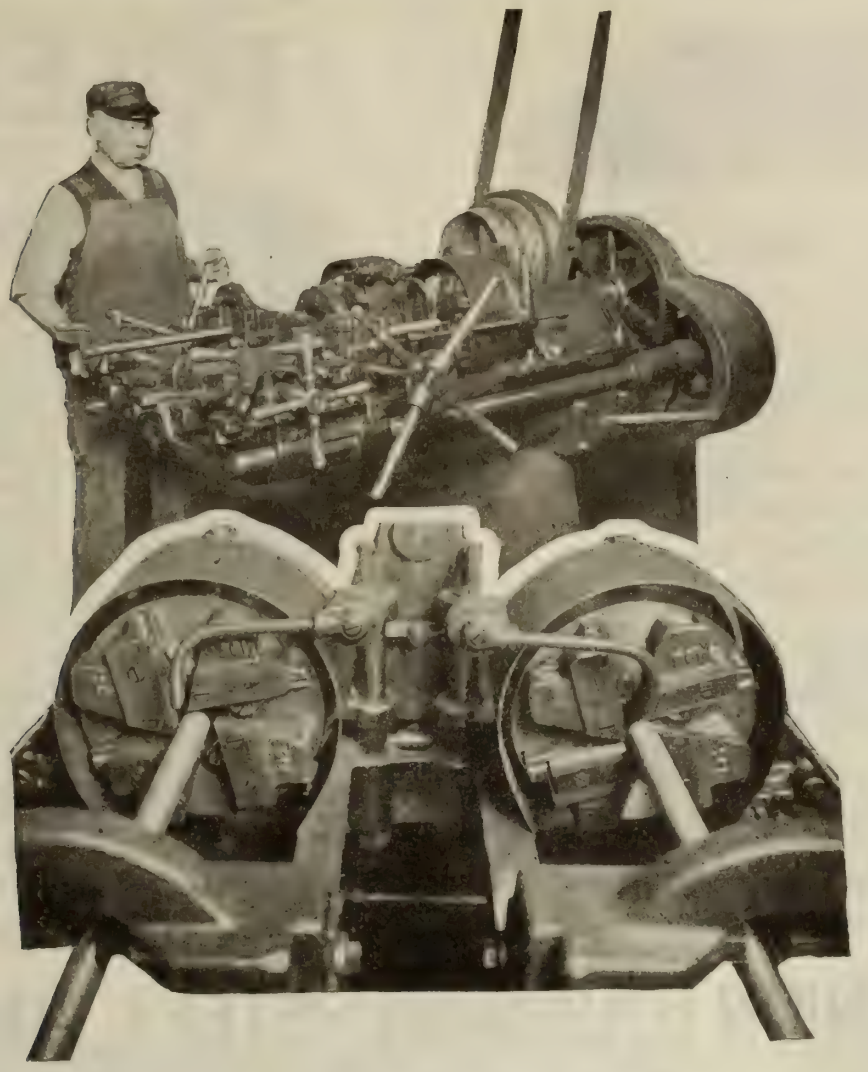
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No. 87



# THE LANDIS
## Ideal for Staybolt Threading

The above Landis Threading Machine photographed at the plant of the Bigelow Company, New Haven, Conn., has been in operation for three years, during which time it has seen steady service, threading 1⅛-in. stock for staybolts.

At no time have they been forced to cease operation on this machine owing to repairs, etc. The use of Landis Threading Machines, with their sturdy construction and superior type die head, has proven that "Landis" means more threads per hour, more hours of threading, and the consequent "more threads per dollar."

Be guided by "Landis" performance of "More threads per dollar."

***Write for information***

## Landis Machine Co., Waynesboro, Pa., U.S.A.

**Exclusive Canadian Agents: Canadian Fairbanks-Morse Co., Limited**

*If interested tear out this page and place with letters to be answered.*

NOVO-SUPERIOR

HIGH SPEED STEEL
INTRA STEEL GIBRALTAR STEEL
Tool Steel for Every Purpose
Swedish Lancashire Iron

Twist Drills, Taps, Hack Saw Blades, Milling Cutters, Files, Etc.; Music Wire for Springs, Steel Balls, Cold Rolled Tool Steel in Strips and Sheets, Circular Saws, Machine Knives.

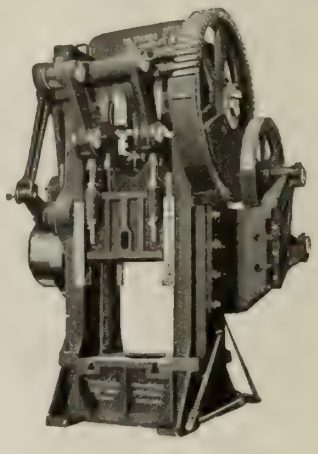
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The "TOLEDO"



Toggle Drawing PRESSES

The steady reliability of these presses is responsible for the noticeably increased production which they make possible. This fact and their low cost of upkeep has made them a success to every user. The patented toggle mechanism is simple and effective.

This is but one of our presses; altogether we make presses for every use. Shall we send you full particulars of those designs in which you are interested?

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TOLEDO, OHIO

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HAMILTON, ONTARIO

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## Has an Advantage Over Other Grinders

There is some outstanding feature of all La Salle Grinding Machines that lends it exceptional productive ability.
The American Drill Grinder is especially adaptable for grinding twist, flat and three-lipped drills, because it has automatic lip rest and caliper jaw device, which assures proper clearance on all sizes of drills automatically. Send for descriptive matter covering our entire line of grinding machinery.



American Drill Grinder
For Wet or Dry Drill Grinding 1/8" to 2¼". Also 1/8" to 3½" dia.

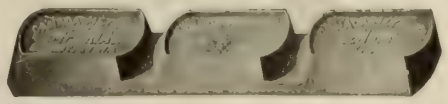
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La Salle, Illinois, U.S.A.

Represented in Canada by

## A. R. Williams Machinery Co., Ltd.
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## IMPERIAL GENUINE




For Heavy Engines and Extraordinary Hard Work

## HARRIS HEAVY PRESSURE

THE COPPER COATED CAKE

For Donkey Engines, Saw Carriages, Small Motors, Transmission Line Shafting and all steady heavy pressure duty.

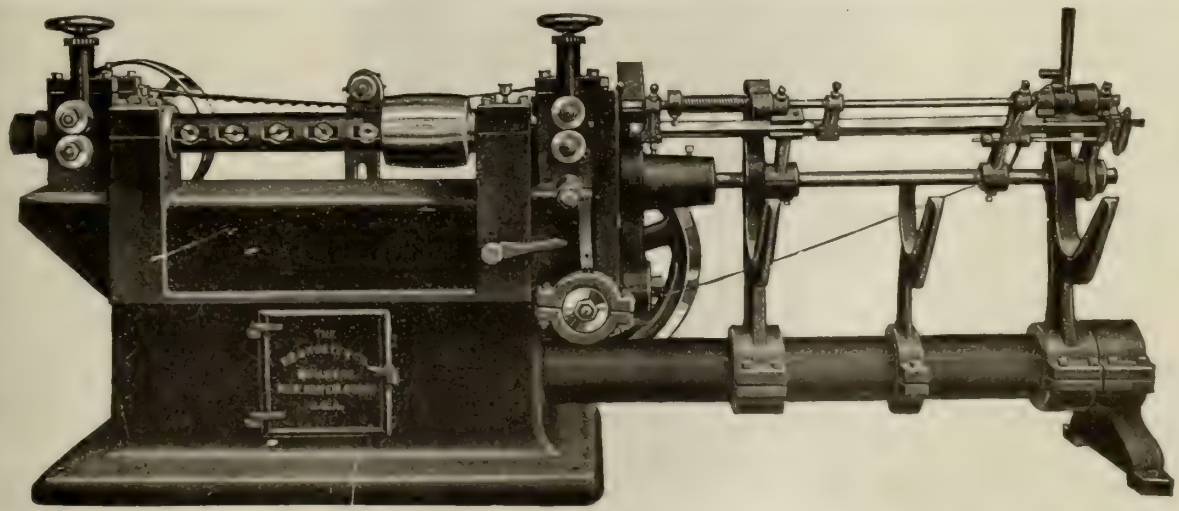


## Matchless

Suitable For Slow-Moving Bearings

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## THE CANADA METAL CO., LIMITED
TORONTO HAMILTON MONTREAL
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## Perfect Wire Straightening Quickly and Profitably Done on Our

# Automatic Wire Straightening and Cutting Machine

Just put your coil of wire on the reel, adjust the rolls and dies, and set the gauge for the length you want. The machine does the rest—thousands of feet per day, perfectly straight and cut to accurate lengths.

**Catalogue tells more about them, and we will be glad to send you a copy.**

# THE F. B. SHUSTER CO., New Haven, Conn.

FORMERLY JOHN ADT & SON ESTABLISHED 1886

*ALSO MAKERS OF STRAIGHTENERS FOR SQUARES, HEXAGONS, FLATS, ETC.*


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# Gear Cutting With the "IFS" Left Out

## The Gear Shaper Way

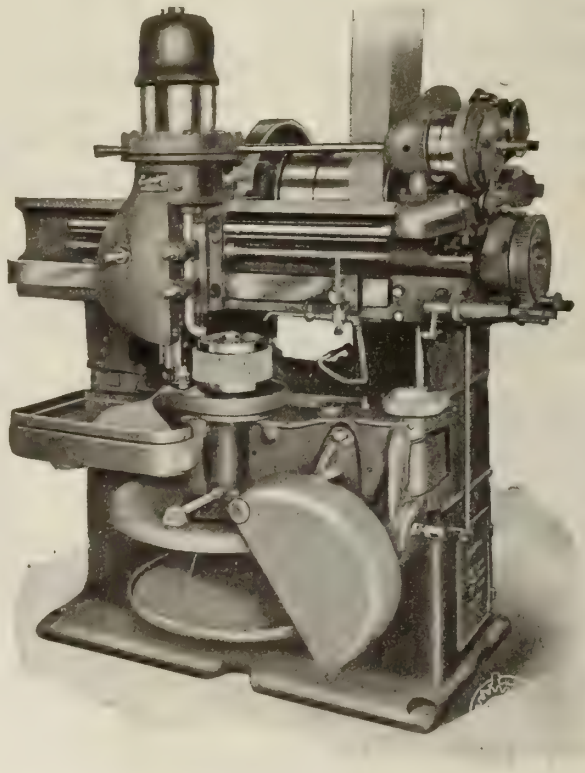
A production manufacturer knows that he will secure good gears IF he has an accurate cutter, an accurate machine and a machine working on the correct principle. The whole question of good gears is resolved in this one little word "IF."

When the Gear Shaper was originally designed, the question of "IF" was taken into consideration and every possible means known to mechanical engineering was employed to eliminate the "IFS" from gear cutting.

That we have been successful in solving the problem is evidenced by the fact that each ensuing year sees a larger number of manufacturers adopting the Gear Shaper method.

How the Gear Shaper has accomplished this is clearly explained in our general catalog "Commercial Gear Cutting," which is a treatise on the subject of:—
Gear Cutting with the "IFS" Left Out.

**Send for your copy to-day.**



The Fellows Gear Shaper—the machine which has taken the "IFS" out of gear cutting.

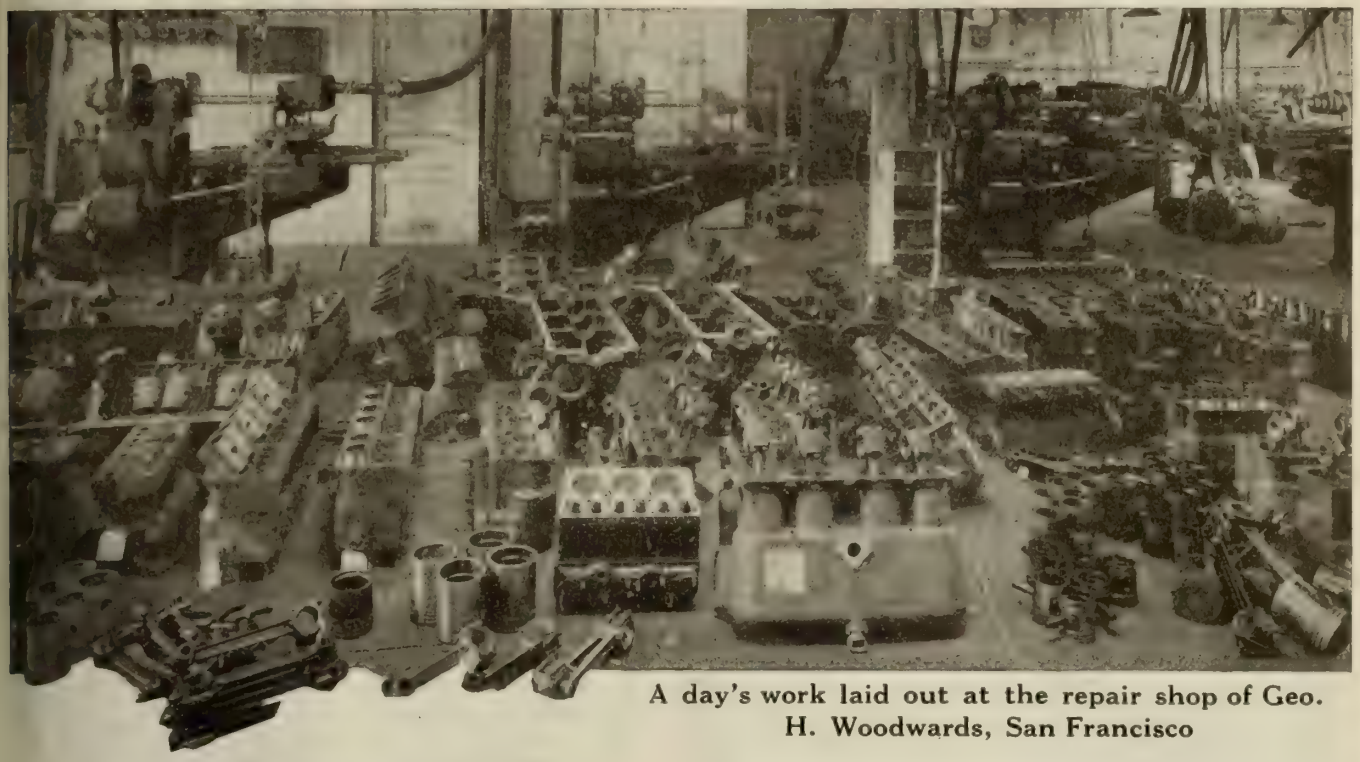
# The Fellows Gear Shaper Company

## Springfield, Vermont, U.S.A.

FOREIGN AGENTS: Alfred Herbert, Limited, Coventry, England; Societe Anonyme Alfred Herbert, Paris, France; Societa Anonima Italiana Alfred Herbert, Milan, Italy; Alfred Herbert, Limited, Yokohama, Japan; Societe Anonyme Alfred Herbert, Barcelona, Spain; Societe Anonyme Belge Alfred Herbert, Brussels, Belgium; Alfred Herbert (India), Limited, Calcutta, India.

# Small Machine Shops, Auto Repair Shops Welding Companies

# *Do you want a business like this?*



A day's work laid out at the repair shop of Geo. H. Woodwards, San Francisco

### Opportune Time

There is no business to-day that has the possibilities and which fits so nicely into a small machine shop, automobile repair shop, or a concern doing welding, as the regrinding of worn or scored cylinders.

Many companies would have had to close their doors this Spring but for the business obtained through regrinding. It does not require skilled mechanics for operators, and the profit received on the capital invested is unusually large.

### The Field for Regrinding

There were over 9,000,000 commercial and pleasure cars registered during last year. Truck and tractor cylinders require attention once a year. Passenger cars should be looked over at least once every two or three years. Figure out for yourself what your chances are with only approximately 350 concerns properly equipped for such work. Consider also the fact that three 4-cylinder blocks a day will bring profitable returns.

### Advantages to the Automobile Owner

Reground cylinders fitted with new pistons and rings will give the motor as much, if not more, power and pep than when it was new. It cuts the oil and gas consumption in two and stops all excessive smoking.

### Necessary Equipment

Eighty-four per cent. of all pleasure cars, and ninety-one per cent. of all commercial motors manufactured are ground, and Heald Machines are used exclusively. The Style No. 55 is built expressly for regrinding work. It is simple, moderately priced, self-contained, and has a very large capacity and range, easily taking care of singles, doubles, four and six en bloc cylinders.

In addition, to handle the work satisfactorily, one should have a small lathe and drill press, bench and hand tools. A small external grinder would be convenient for finishing pistons, thus enabling the shop to purchase semi-finished pistons and grind them to the oversize required.

**Now is the logical time to get started. If you want figures, in addition to the above facts, write, wire or 'phone**

## The Heald Machine Company

**51 New Bond Street** **Worcester, Mass.**

**Branches at New York, Philadelphia, Buffalo, Cleveland, Detroit, Chicago, Cincinnati**

*If interested tear out this page and place with letters to be answered.*

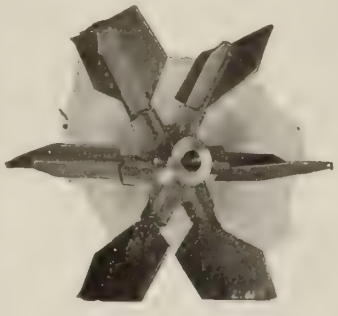
# Canadian

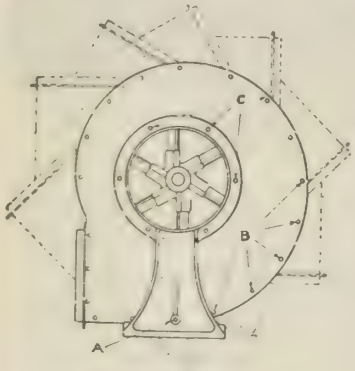
The Canadian Standard Reversible Mill Exhauster will keep your shop clean, remove sawdust, shavings, fumes, gas or any loose materials and disagreeable odors.

Insurance rates can be reduced; floors and machines covered with sawdust, chips or shavings, increase the fire risk.

Insurance companies reduce the premiums where adequate precautions have been taken to prevent fires.

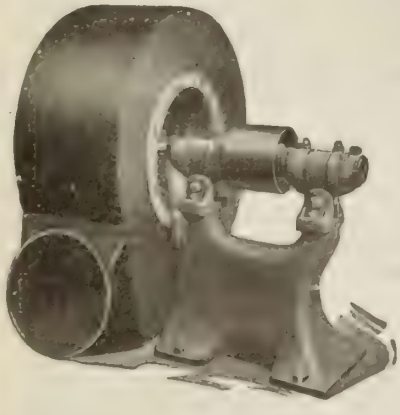
Blast Wheel — This wheel is so constructed that it will handle any kind of stringy material efficiently, such as sawdust, shavings, cotton lint. Will also handle gases, fumes, smoke, etc.






The Canadian Standard Planing Mill Exhausters have reversible housings so that the outlet can be adjusted instantly to any angle desired.

This eliminates necessity of crossed belts. Simplifies changes on alterations in piping or building.



The housing is of heavy rolled steel plate securely bolted together with angle irons. Round cast iron outlet bolted to the housing. Blast wheel mounted on heavy cast iron spider.

Every fan carefully tested by running test at speeds in excess of that required.

*Write for Catalog 16.*

## Canadian Blower & Forge Co.

Kitchener - Ontario



# VENUS PENCILS

*The largest selling quality pencil in the world.*

Engineers everywhere use the perfect VENUS knowing that none other gives the same supreme service and satisfaction.

With VENUS the fine, clean lines of working drawings are put in with ease and accuracy; the shadows and high lights of sketches take form with amazing results.

The exactness and uniformity of VENUS grading is your safeguard; it insures pencil efficiency and pencil comfort.

**17 Black Degrees—3 Copying**

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Plain ends, per doz., $1.50
Rubber ends, per doz., $1.75

*At stationers and stores throughout the world*

**American Lead Pencil Co.**
238 Fifth Ave.
New York

*Factory: Hoboken, U.S.A.*

*Factory: Sondon, Eng.*




*The world's most famous pencil*

# AMERICAN STEEL SPLIT PULLEYS

## *Pulleys Should Transmit Power, Not Consume It*

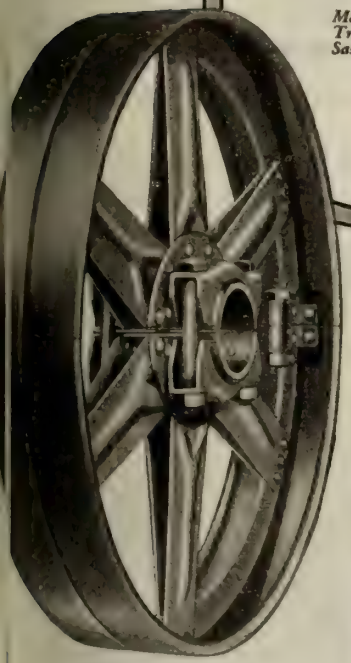
THE pulley that is strongest by test in actual operation—the pulley that is lightest—and at the same time has the minimum of belt slip is named "American."

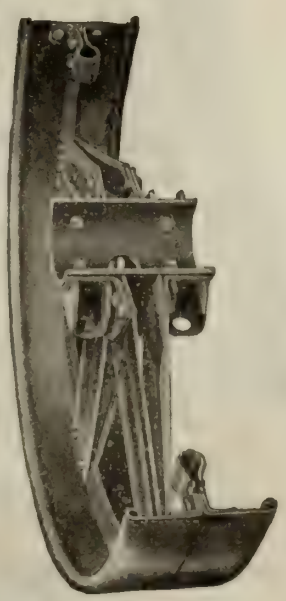
There are between five and six million in constant use, proving these claims all the time.

Our book, "Getting Maximum Pulley Efficiency," tells how. Yours for the asking.

**The American Pulley Co.**
**Philadelphia, Pa.**

*Manufacturers of Steel Split Transmission Pulleys, Steel Sash Pulleys and Pressed Steel Shapes*





of the large plants where American eel Split Pulleys are helping to conserve power

nternational Harvester Co.
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# Cut Costs

by using keen cutting files and keen cutting files only. When files cease to cut keenly discard them.

A dull file wastes money.

The following brands are made to cut keenly and are hardened to maintain their keen cutting edge:

**KEARNEY & FOOT**
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# Files and Rasps

Made in Canada by

## Nicholson File Company

PORT HOPE, ONTARIO


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# Cut Gears — Quantity Production



## Write for Quotations on any kind of Gear Work

## Hamilton Gear & Machine Co.

**Van Horne St.** TORONTO

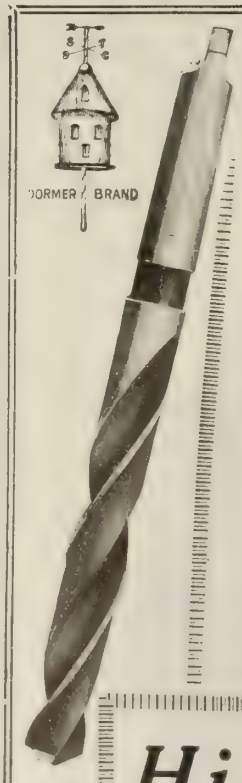
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**Made in Canada**

## L-XX HIGH-SPEED ATLAS TOOL STEELS ATLAS ALLOY STEELS

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Works: WELLAND, ONT.
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Works: Summerfield Street, Sheffield.

To **PROMOTE TRADE** within the **EMPIRE, CANADIAN MANUFACTURERS** will find that **"DORMER BRAND DRILLS"** meet all requirements. **QUALITY DRILLS** for quick drilling—USE **"DORMER."**

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Limited,
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## *High Speed Twist Drills*

DORMER BRAND


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*QUALITY GUARANTEED*

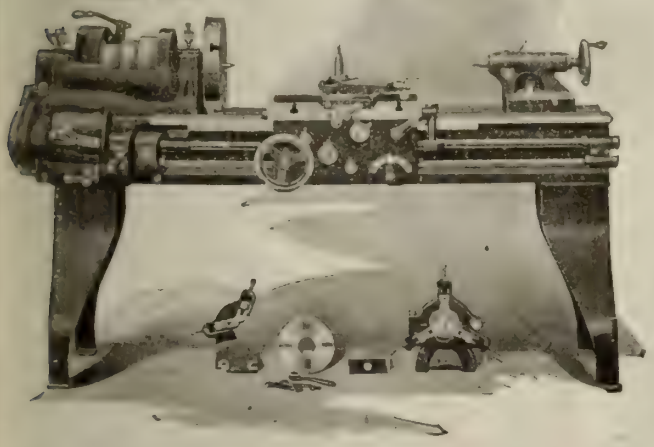
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**OWEN SOUND, ONTARIO**
ESTABLISHED 1860

*The*
# ROCKFORD ECONOMY

This small, back geared, quick-change engine lathe is a wonder for big production. Its extreme accuracy makes it particularly adapted to the tool room of the modern manufacturing plant. Made in 12", 14", 18", and 22" swing.

Write for full particulars of the small, heavy duty Rockford "Economy" without delay.



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Rockford, Illinois, U.S.A.



Franklin Die-Castings for Aeroplane onstruction

# Rapid Strides in Communication

Remember the old Pony Express? It averaged about eight miles an hour. Now fast mail coaches and mail-service aeroplanes travel *eighty* miles an hour.

This progress in communication has come about only within the last few decades. Franklin Die-Castings have aided this development by their use both in mail-coach equipment and in aero engines.

In 1892 we originated the Die-Casting Process. For nearly thirty years we have been reducing the cost and simplifying the output in many fields of industry. The addition of the standard No. 12 Aluminum to the Tin, Lead and Zinc base alloys already in use has enabled us to meet a still wider range of individual needs.

*We quote from samples or blueprints. Write for booklet, "Franklin Die-Castings in Many Fields."*

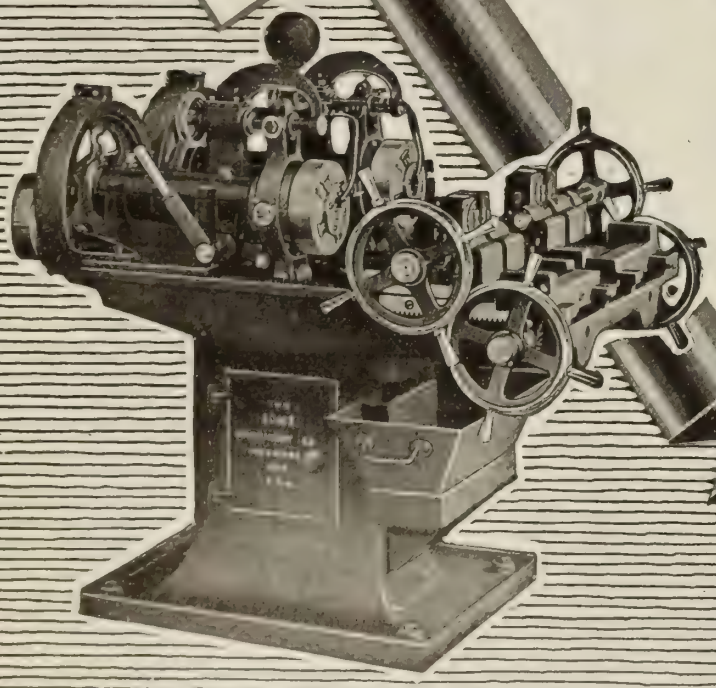
**FRANKLIN**
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**Gifford and Magnolia Sts., Syracuse, N.Y.**

**FRANKLIN DIE-CASTINGS**


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# BOLTS

## SQUARE HEXAGON TEE-HEAD



### Cut Them In Your Own Plant

*and Save Money on Cost and Delay in Deliveries*

### ACME BOLT CUTTERS

are made in various sizes for cutting bolts from ¼ to 1 in. diameter. Their heads allow micrometer adjustments while they are in motion. The dies can be changed from one size to another in less than one minute and produce clean, accurate, highly-finished threads.

**May we send catalog**

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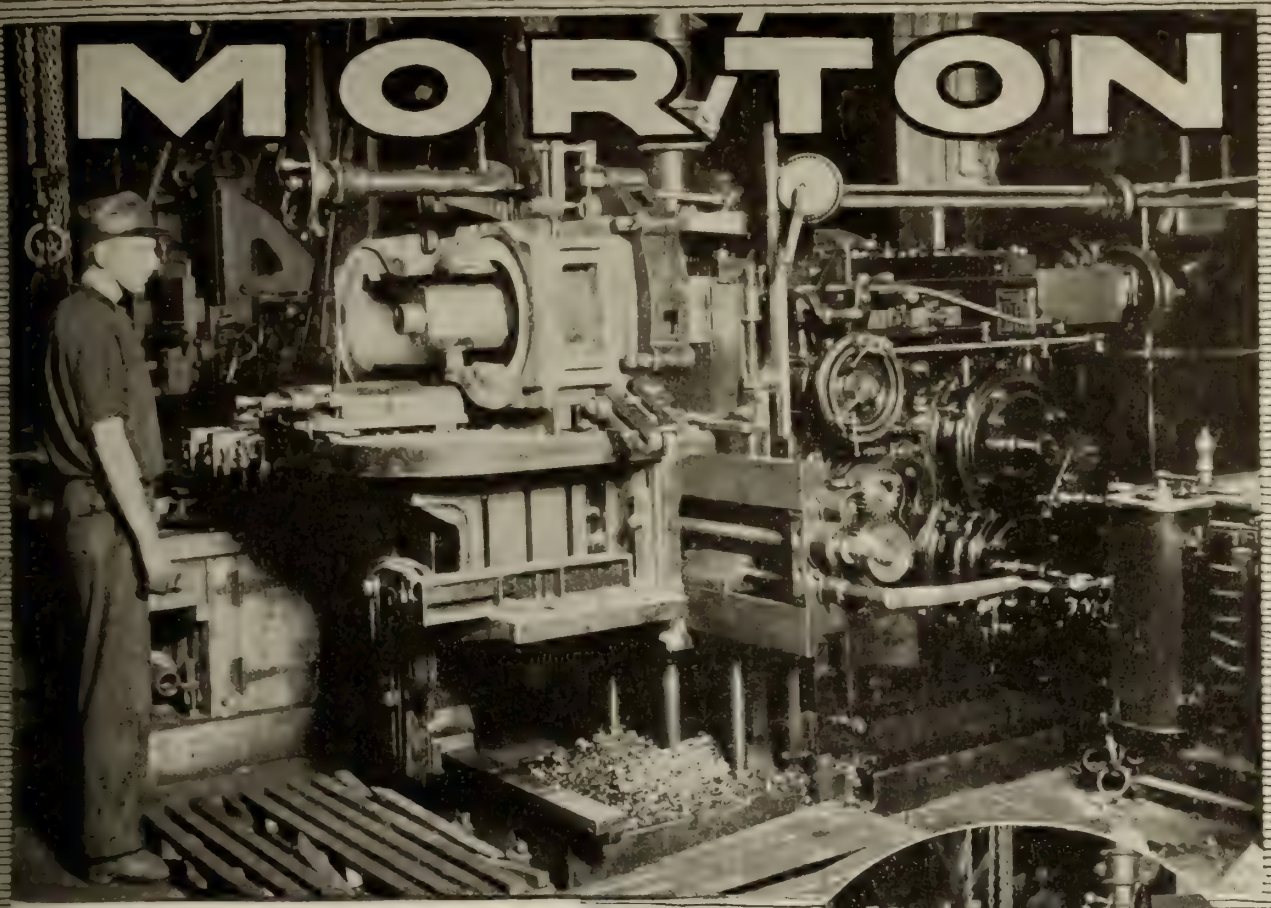
**4530 St. Clair Ave. Cleveland, Ohio**

We make a complete line of Bolts, Rivet, Heading, Upsetting and Forging Machines, Bolt Cutters, Hot Pressed Nut Machines, Hammer Heads, Bolt Pointers, Nut Tappers.

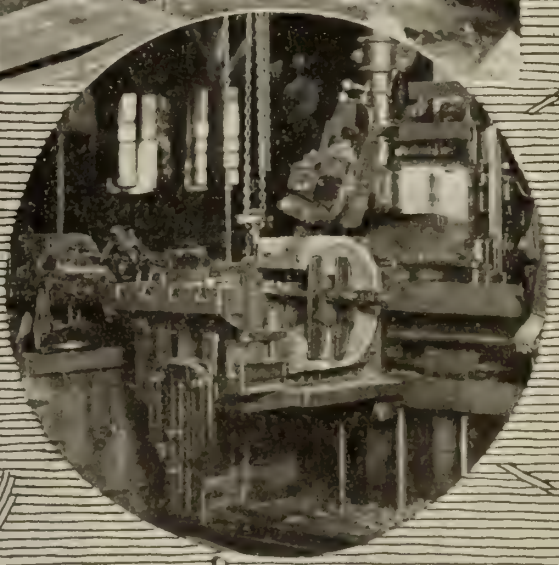
**Representatives for Canada:**
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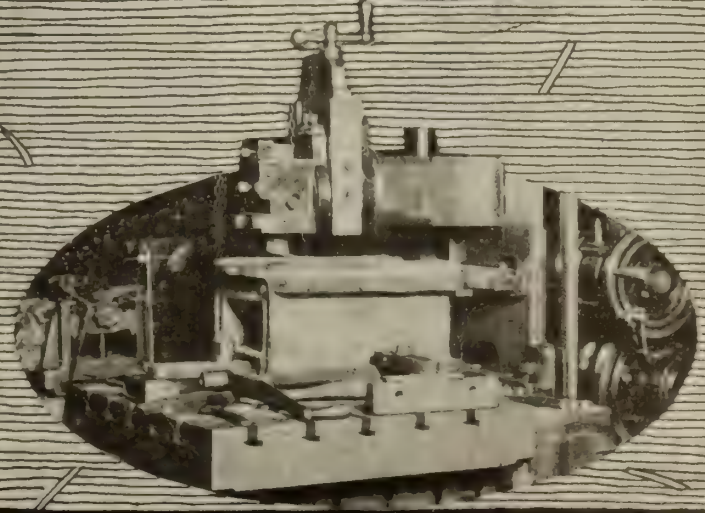
# ACME BOLT CUTTERS

MORTON



# Increased Driving Box Repairs Forced the Purchase of this Morton Draw Cut Shaper





Delays to output were traced direct to driving box repairs in this busy shop. Time element and shortage of man power were considered and the installation of this "Morton" reflects the good judgment of these thoughtful officials to install machines of guaranteed production power.

This Morton handles all the machine work on driving boxes—planing to thickness, planing shoe and wedge faces and crowning for bearing brass. It simplifies handling and reduces machine time.

May we send Bulletin A-6 explaining numerous points of merit?

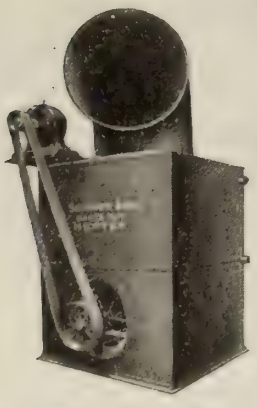
**MORTON MFG. CO.**

Muskegon Heights - Michigan




## "That Is All There Is to the Skinner Bros. (Baetz Patent) Heater—*No Pipes or Ducts*"

"As you see, it consists of a series of steam coils compactly nested over a powerful fan-wheel, and enclosed in a sheet steel casing. Cold air at the floor level (or from outside) is drawn into the heater by the fan, and forced up through and around the steam coils—after it is thus warmed, it is gently diffused through the directing elbow out into the open building space."



Steam coil type SC. Where steam is not available we supply type DF, burning coal, coke or wood. Fired like an ordinary furnace.

### Economical to Install and Operate

Skinner Bros. (Baetz Patent) Heaters are guaranteed to heat all of the open space in any large factory, foundry or plant interior. They cost 15% to 50% less to install than any other system—operating cost is equally low. They are strictly portable and require no special foundations. Use live or exhaust steam—where steam is not available, we furnish our direct-fired type DF, which burns coal, coke or wood.

Find out more about this wonderful heater—if you wish, we will send you names of users so you can investigate for yourself.

**Skinner Bros. Mfg. Co., Inc.**

**1438 S. Vandeventer Ave. St. Louis, Mo.**

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Buffalo.....706 Morgan Bldg.
Cleveland.....616 Marshall Bldg.
Chicago.....1508 Fisher Bldg.
Indianapolis.....330 Occidental Bldg.
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# Skinner Bros.
## Baetz Patent HEATING SYSTEM

Skinner Bros. Mfg. Co., Inc.
1438 S. Vandeventer Avenue, St. Louis, Mo.

Please send complete details on Skinner Bros. (Baetz Patent) Heaters to

Firm .....

Address .....

Building used for.....

We can / cannot use steam.

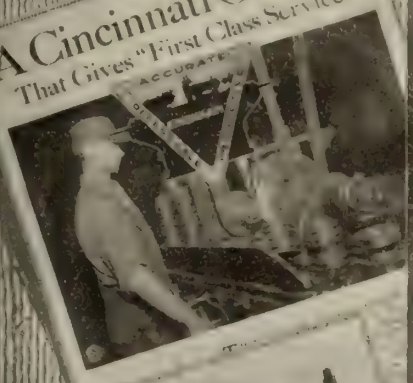
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A Cincinnati Grinder
That Gives "First Class Service"



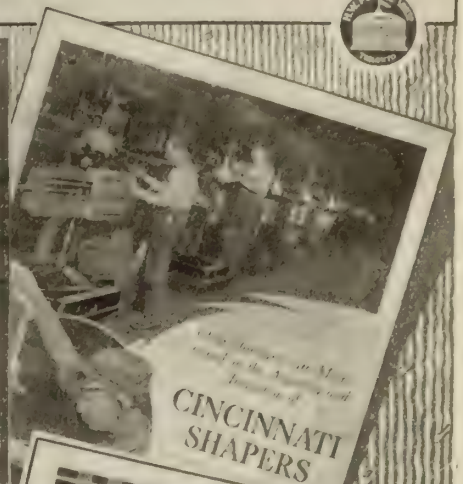
"DALTON SIX"
Type B-4 Actual Swing 7⅛ Inches
The Small Lathe for the Big Job



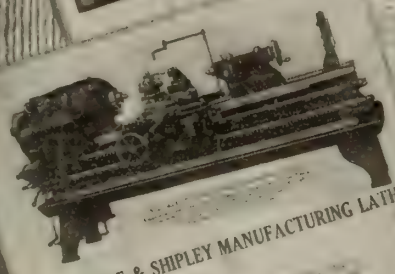
WHY order a large Lathe when so much of your work could be done on a "DALTON SIX" Type B-4

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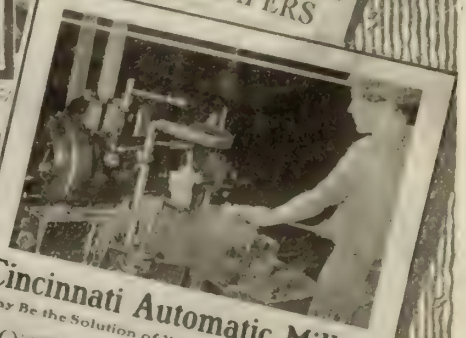


CINCINNATI SHAPERS



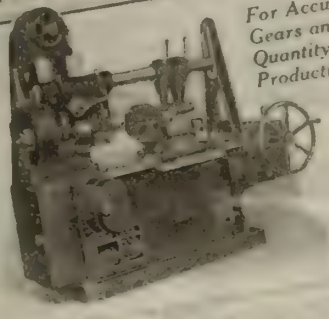
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The KEYSTONE to Satisfactory Service is Found in the Use of These Machine Tools ~ Sold by H.W. PETRIE Limited



Cincinnati Automatic Millers
May Be the Solution of Your Production Problems

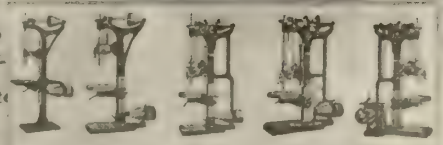
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16-INCH GEAR HOBBERS

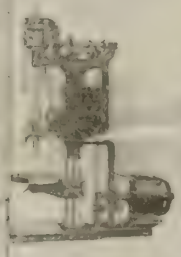


For Accurate Gears and Quantity Production

The Cincinnati Gear Cutting Machine

CINCINNATI



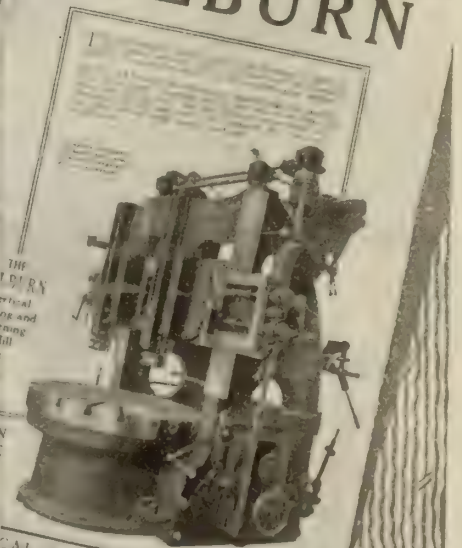


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24- to 42-inch High Speed Shaft Driven Upright Drilling Machine

The Cincinnati Bickford Tool Co.



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GIVE BETTER SERVICE

Trade Mark

Skinner Drill Chucks eliminate most of the trouble of accurate drilling operations, simply because they are built right to hold the drill or tap accurately and rigidly on center. The hardened jaws are ground true.

They are easy to handle, too, as there are no exposed gears to pinch the fingers.

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**These Drill Chucks are all described in our catalogue, which will be sent to you with prices upon request.**

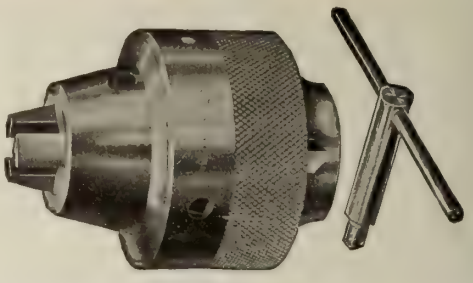
THE SKINNER CHUCK COMPANY

NEW BRITAIN, CONN. U.S.A.

Established 1887

New York Office: 94 Reade Street. San Francisco Office: Rialto Building. Chicago Office: 552 West Washington Blvd.

London Office: 139 Queen Victoria St., E.C. 4

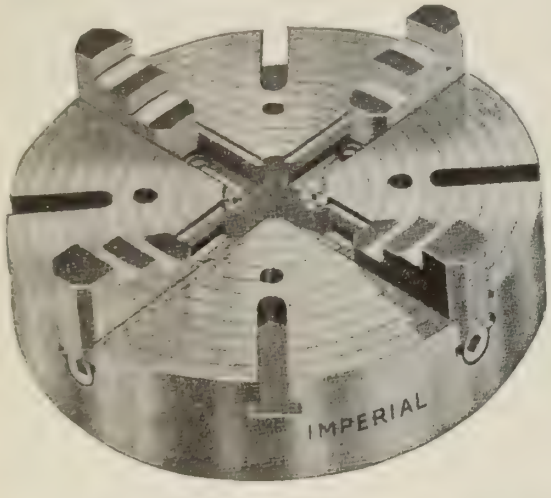


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Specify them in your next order.

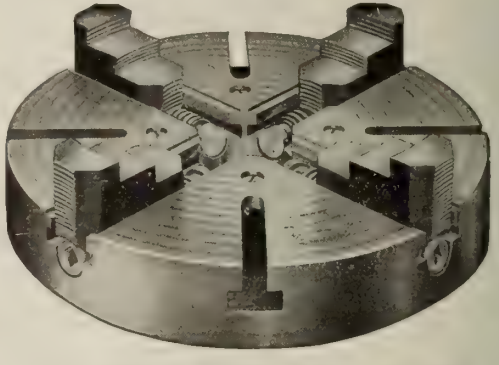



**Ker & Goodwin Machinery Co.**
BRANTFORD, Ont. LIMITED

ALL STEEL

## INDEPENDENT CHUCKS

are not an experiment — they have come to stay. They are a necessity with the modern machinery and high-speed steel cutting tools.



THE UNION STEEL BODY CHUCKS

are well designed and have all the elements of strength and durability for which they are designed. We make other types in steel also, including the Geared Scroll Chucks and the Geared Scroll Combination—all designed for heavy work and hard usage.

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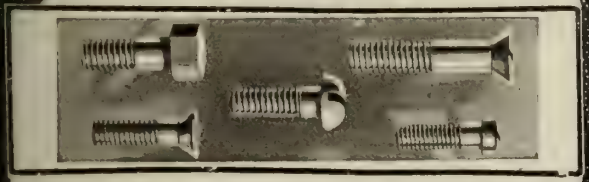
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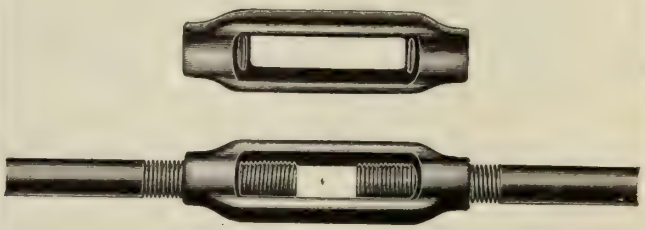
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EVERY man was his own shoemaker and tailor, the articles he made served his purpose after a fashion, but they would not be regarded as "efficient" to-day.

Many users of Industrial Furnaces are going back to the Stone Age when they undertake to build their own furnaces.

Is it not reasonable to suppose that Engineers who have devoted the best part of their lives to the science of designing and building of better furnaces should know more about it than you do?

Many of the greatest industrial corporations in the country, who maintain large staffs of Engineers, have found it good practice to have us design and build their furnaces —such as Canadian Pacific Railway; Canadian National Railways; Steel Company of Canada, Ltd.; Canadian Tube & Iron Company, Ltd.; Crane Limited; Page Hersey Tubes Ltd.; Canada Grip Nut Co., Ltd.; B. J. Coghlin Co., Ltd.; Baldwins Canadian Steel Corporation, Ltd., etc., etc.

Ask your Competitors what we have done to help them reduce their operating costs.

Our Engineers are Experts—let us design and build your industrial Furnaces.

***Oil Fired Coal Fired Gas Fired Electric***

## GENERAL COMBUSTION COMPANY of CANADA LIMITED

**NEW BIRKS BLDG. - - MONTREAL**

***"Made in Canada" Industrial Furnaces***


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**Plain Grinding Machines**
**Universal Grinding Machines**
**Self-Opening Die Heads**
**"Magic" Quick Change Chucks**

"Modern" Tools have an established reputation for superiority. They are made to a standard that insures the maximum service. Every "Modern" product is fully guaranteed. The advantages of Modern Tools are many. All over this great country Modern Machines and Tools are daily proving their superiority.

## Find Out Now What MODERN Can Do For You

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## MODERN TOOL CO., ERIE, PA.

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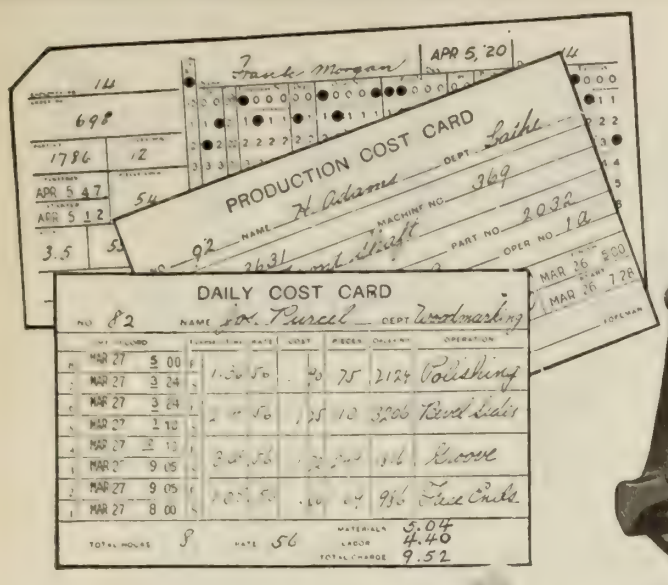
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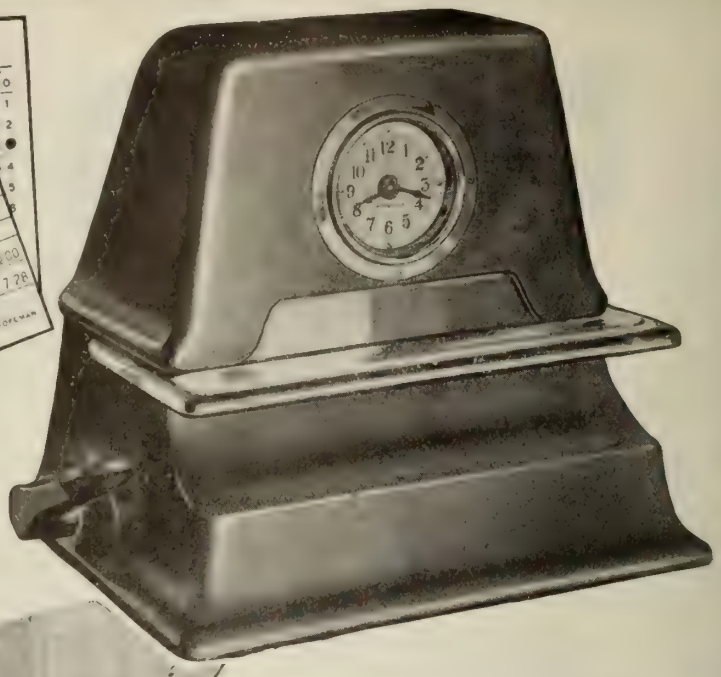
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YOU can check with relative ease the materials you use in any product.

Time—which is more costly and more precious than the materials—is elusive and cannot be checked accurately or quickly by a manual system.

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give you an accounting of the time spent by every employee on every job—an accurate record of all **Productive** and **Non-Productive** Time. They are employed in all lines of industry, supplying data which cannot be obtained accurately or economically in any other way.

*We frequently have for sale a good line of second-hand Time Recorders from $60 upward. By buying an International you have the assurance—not merely the promise—of CONTINUED SERVICE.*

## International Business Machines Co., Limited

FRANK E. MUTTON, *Vice-President and General Manager*

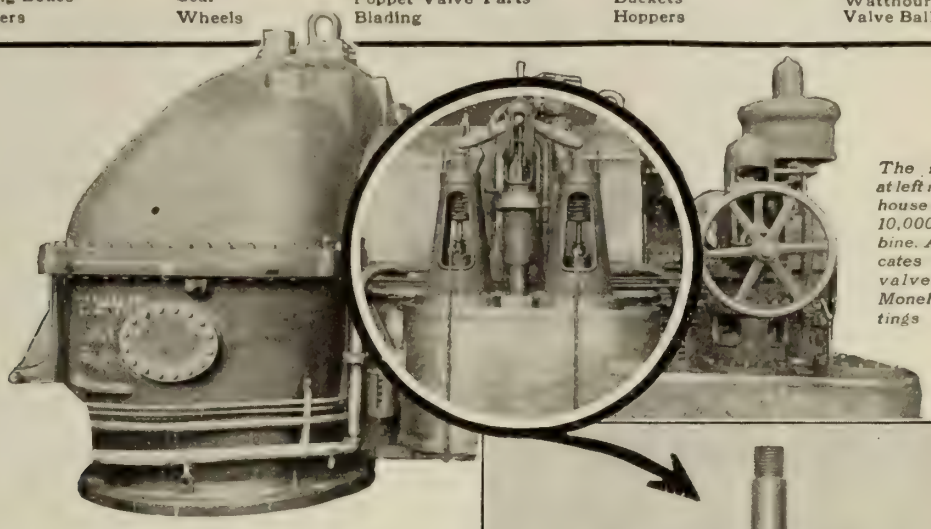
**Head Office and Factory: 300-350 Campbell Ave., Toronto, Ont.**

For your convenience we have Service and Sales Offices in Vancouver, Winnipeg, Walkerville, London, Hamilton, Toronto, Ottawa, Montreal, Quebec, Halifax, St. John's, Nfld.

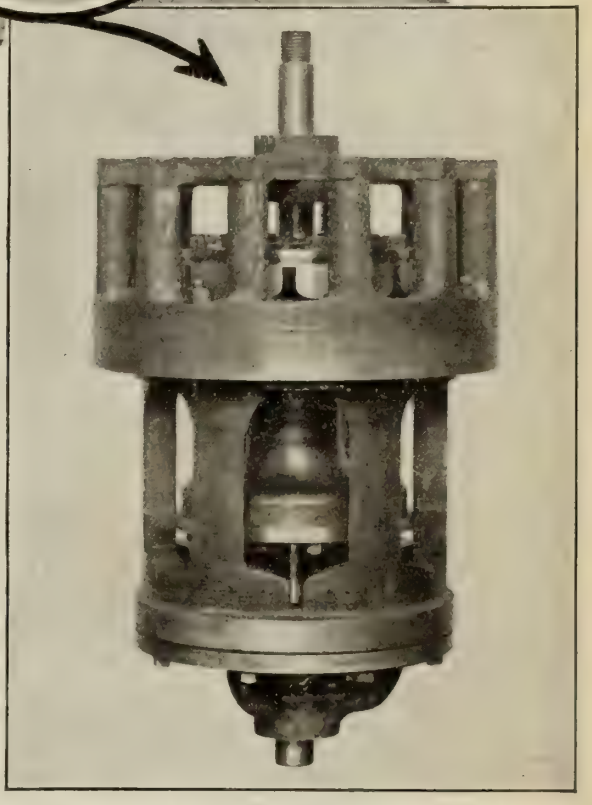
***Also Manufacturers of International Dayton Scales and International Electric Tabulators and Sorters.***

## A FEW MONEL USES

| *Valves* | *Pumps* | *Meters* | *Gas and Oil Engines* | *Gauges* | *Air Compressors* |
|---|---|---|---|---|---|
| Seats | Pump Liners | Cylinders | Valves | Pins | Valves |
| Rings | Runners | Bushings | Ignition Chambers | Pivots | *Blowers, Fans* |
| Guide Stems | Valve Seats | Valves | Ignition Tubes | Diaphragms | Blading |
| Clappers | Trim | Valve Parts | Fuel Filters | | *Thermometers* |
| Wedges | Hand Hole Covers | Spindles | Scavenger Valves | *Conveying and Handling Apparatus* | Bulbs |
| Spindles | Plunger Rods | Screws | | Chains | *Special Apparatus* |
| Dash Pots | Stuffing Boxes | Gear | *Turbines* | Buckets | $CO_2$ Recorders |
| Pistons | Plungers | Wheels | Poppet Valve Parts | Hoppers | Watchman Recorders |
| | | | Blading | | Watthour Recorders |
| | | | | | Valve Balls |



*The illustration at left is Westinghouse 128 C.W. 10,000 K.W. turbine. Arrow indicates detail of valve in which Monel metal fittings are used.*



# Monel metal
## insures continuous machine service

WESTINGHOUSE uses Monel Metal in steam turbines as poppet valve parts and as blading because it resists corrosion and steam wear—withstands high heats—has the strength and approximately the co-efficient of expansion of steel.

These characteristics, plus the ability to resist most chemical attacks, make Monel Metal most valuable to engineers, managers and superintendents of manufacturing plants.

As indicated by the uses listed at the head of the page, Monel finds its work in special as well as in standard apparatus. It is the recognized metal for parts of valves that must handle high pressure or superheated steam, acid and alkaline solutions. It has become part of the standard specifications of the largest engineering organizations for duties where other metals have been tried but failed.

The name Monel identifies the natural nickel alloy—67% nickel, 28% copper and 5% other metals—produced by The International Nickel Company. Monel products include Monel blocks, Monel rods, Monel castings, Monel sheet, Monel wire, Monel strip stock, etc.

**THE INTERNATIONAL NICKEL COMPANY OF CANADA, LIMITED**

Harbor Commission Building, Toronto, Ontario

MONEL METAL — NICKEL

**THE INTERNATIONAL NICKEL COMPANY**

*Producers of* METALLIC NICKEL *in the forms of* Ingot, Shot, Electrolytic Cathodes-99⅞% Malleable Nickel.
NICKEL SALTS. Oxides, Carbonates, Sulphates, Sulphides, Acetates, Formates - MONEL METAL, Ingot, Shot, Blocks.

*If interested tear out this page and place with letters to be answered.*

THERE is as much difference in the various makes of High Speed Steel as there is in men—

The practice and methods of manufacturers differ widely in every mill and anyone who is at all familiar with the manufacture of High Speed Steel thoroughly understands this

"Red Cut Superior"

*The Nationally Known—First Quality*

HIGH SPEED STEEL

is the best for all Machine Work

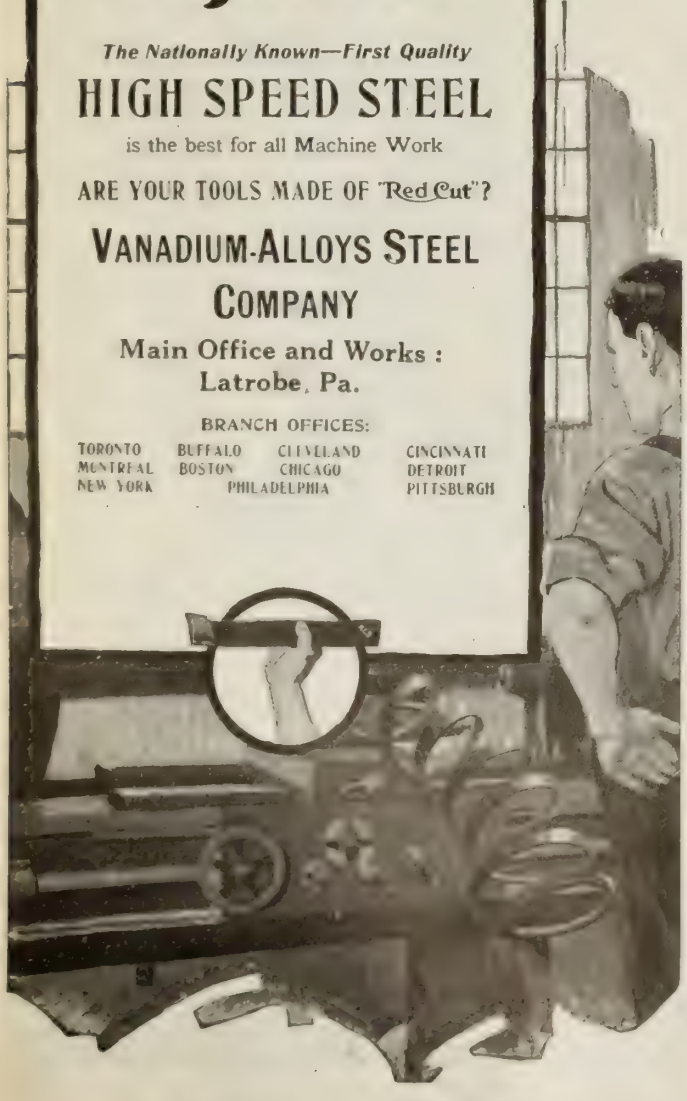
ARE YOUR TOOLS MADE OF "Red Cut"?

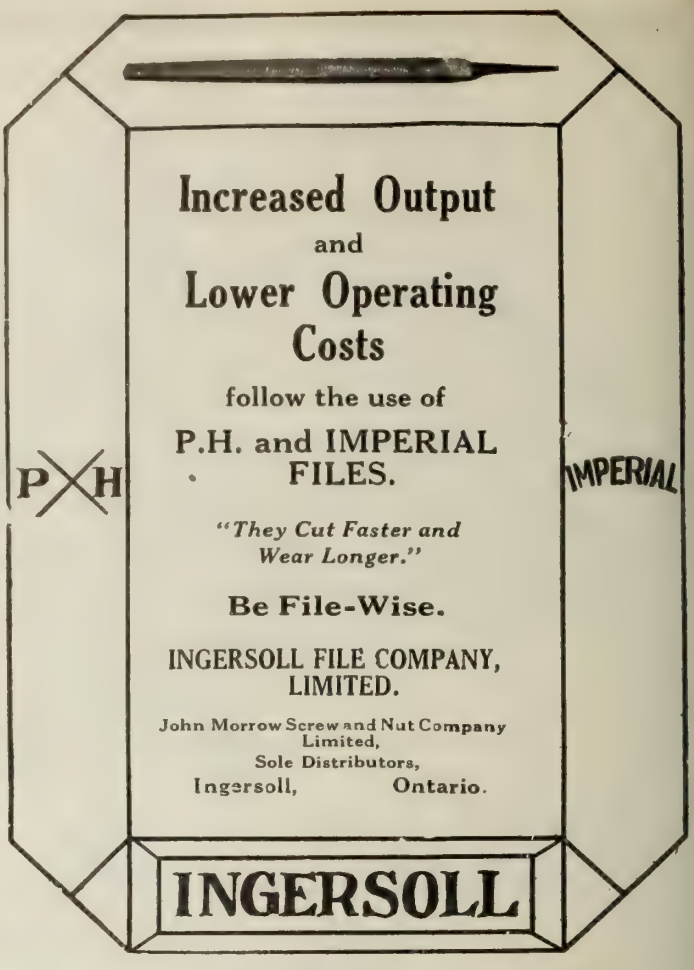
VANADIUM-ALLOYS STEEL COMPANY

Main Office and Works :
Latrobe, Pa.

BRANCH OFFICES:

TORONTO BUFFALO CLEVELAND CINCINNATI
MONTREAL BOSTON CHICAGO DETROIT
NEW YORK PHILADELPHIA PITTSBURGH

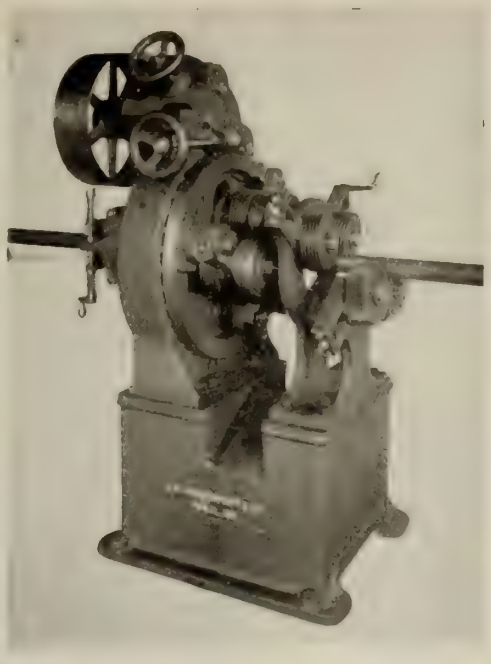







Underwood Rotary Flue Cleaning Machine

*Built in Two Sizes*



For removing scale or crust from boiler flues this strong, easily operated machine is unequalled. It requires very little power and will clean from eight to ten feet per minute—completely removing all scale without injury to the flue.

Full particulars of this and other Underwood Machines upon request.

**H. B. UNDERWOOD CORPORATION**

**1025 Hamilton St. Philadelphia, Pa., U.S.A.**



# Buried in the Work and Broke!



Next time a tap breaks below the surface of a large casting, don't let some makeshift method of removing it injure the thread and waste half an hour of valuable production time. Instead—



## Walton it Out in a Jiffy

And save the casting.

Special analysis steel fingers of the Walton Extractor drop into the flutes of the broken tap—and grip. Then a few turns of a wrench applied to the squared end of the Extractor backs out the buried tap.

**Sixty-day trial offer** proves the Walton Extractor pays for itself.

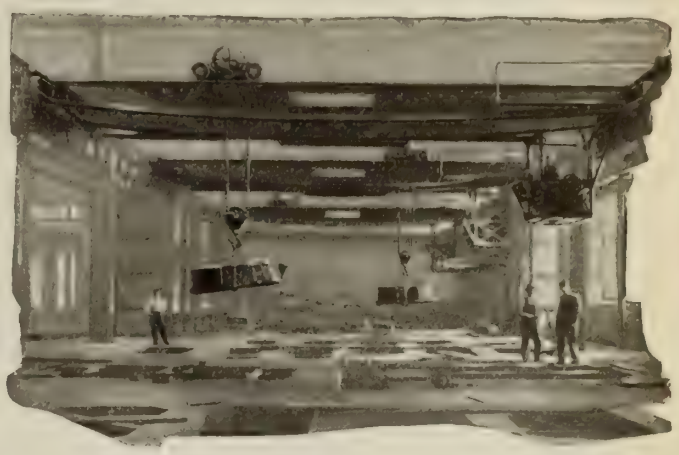
Write.

**The Walton Co.**

**Hartford, Conn.**



SHEPARD
ELECTRIC CRANES & HOISTS



# For faster foundry work

High speed production schedules are easily maintained in many foundries throughout the country by Shepard equipment.

Shepard Electric Traveling Cranes are rugged of design and built for everyday, year in, year out service — and deliver it. Operative parts, both electrical and mechanical, are contained within tight metal housings and are fully protected from dirt, dust, dampness, and fumes. Thorough lubrication is maintained by oil baths.

The wide experience of Shepard engineers in planning lifting and transfer equipment for foundries should prove helpful in laying out a system for your foundry. This service is freely extended.

*"Shepard" makes Electric Traveling Cranes, Transfer Cranes, Jib Cranes, Electric Monorail Hoists, Electric Winches and Cargo Handling Equipment for Docks and Ships.*

**Shepard Electric Crane & Hoist Co.**

**426 Schuyler Ave., Montour Falls, N.Y.**

New York, Boston, Detroit, Philadelphia, Baltimore, Melbourne, Chicago, Cleveland, Montreal, Pittsburgh, San Francisco, London

**Canadian Representatives: RUDEL-BELNAP, Montreal**

*Member Electric Hoist Manufacturers' Assn.* 2168-S


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# A FOLDING STEEL TRIPOD

Fitted with a Morris Triple Gear or Worm Gear Chain-block and used for setting machinery and making the occasional difficult lifts around your plant, will soon pay for itself and will occupy but little space when not in use.

## THE HERBERT MORRIS CRANE & HOIST CO., LIMITED

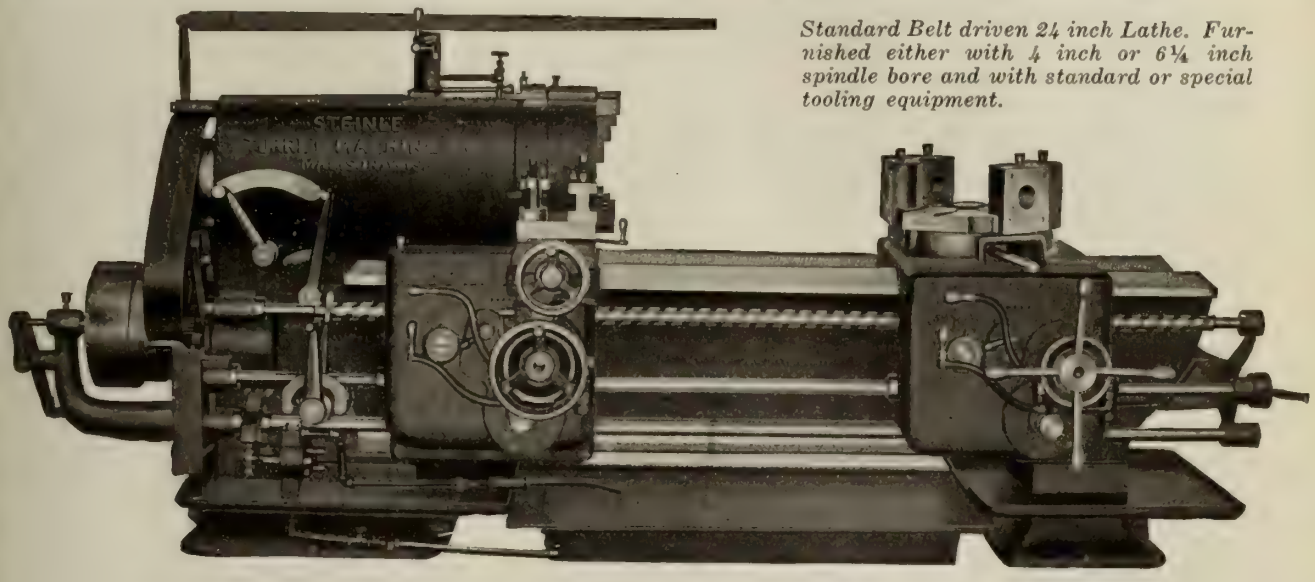
HEAD OFFICE and WORKS
NIAGARA FALLS, CANADA

Specialists in the design, manufacture and application of lifting machinery and material handling equipment.

# HERBERT MORRIS
## Cranes and Chain Blocks

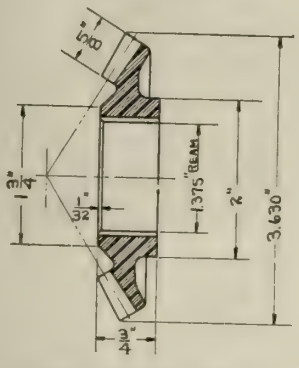
# STEINLE

## Full Swing Side Carriage Turret Lathes




*Standard Belt driven 24 inch Lathe. Furnished either with 4 inch or 6¼ inch spindle bore and with standard or special tooling equipment.*

## *Bar Problems for STEINLE Solution*




**Material 3½% Nickel Steel**
**Finish All Over**
**Time 12 Minutes**

An Eastern gear and machine manufacturer operating a battery of STEINLES is now turning out from bar stock an order of 20,000 bevel gears as illustrated opposite.

In the first operation a 3¾ inch bar of 3½ per cent. nickel steel is chucked so as to permit a production of five gears before rechucking. The gears are drilled, rough and finish bored, formed and cut off, then rechucked and the opposite side of the hub faced and turned.

Time twelve minutes complete, both operations included.

***Send us drawings of your work so that our Engineering Department can estimate STEINLE production, or ask to have a qualified representative call upon you to determine what work can be produced to advantage on our machines.***

## Steinle Turret Machine Company

*Originators of the Full Swing Side Carriage Turret Lathe*

**Madison, Wis., U.S.A.**

AGENTS—Machine Tool Engineering Company, Singer Building, New York City; Cadillac Tool Company, Dodge Power Building, Detroit, Michigan; L. G. Henes, 75 Fremont Street, San Francisco, California, and Title Insurance Building, Los Angeles, California. FOREIGN—Leo. C. Steinle, 53 Victoria Street, London, England.

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The Sign of Efficiency

The Sign of Durability

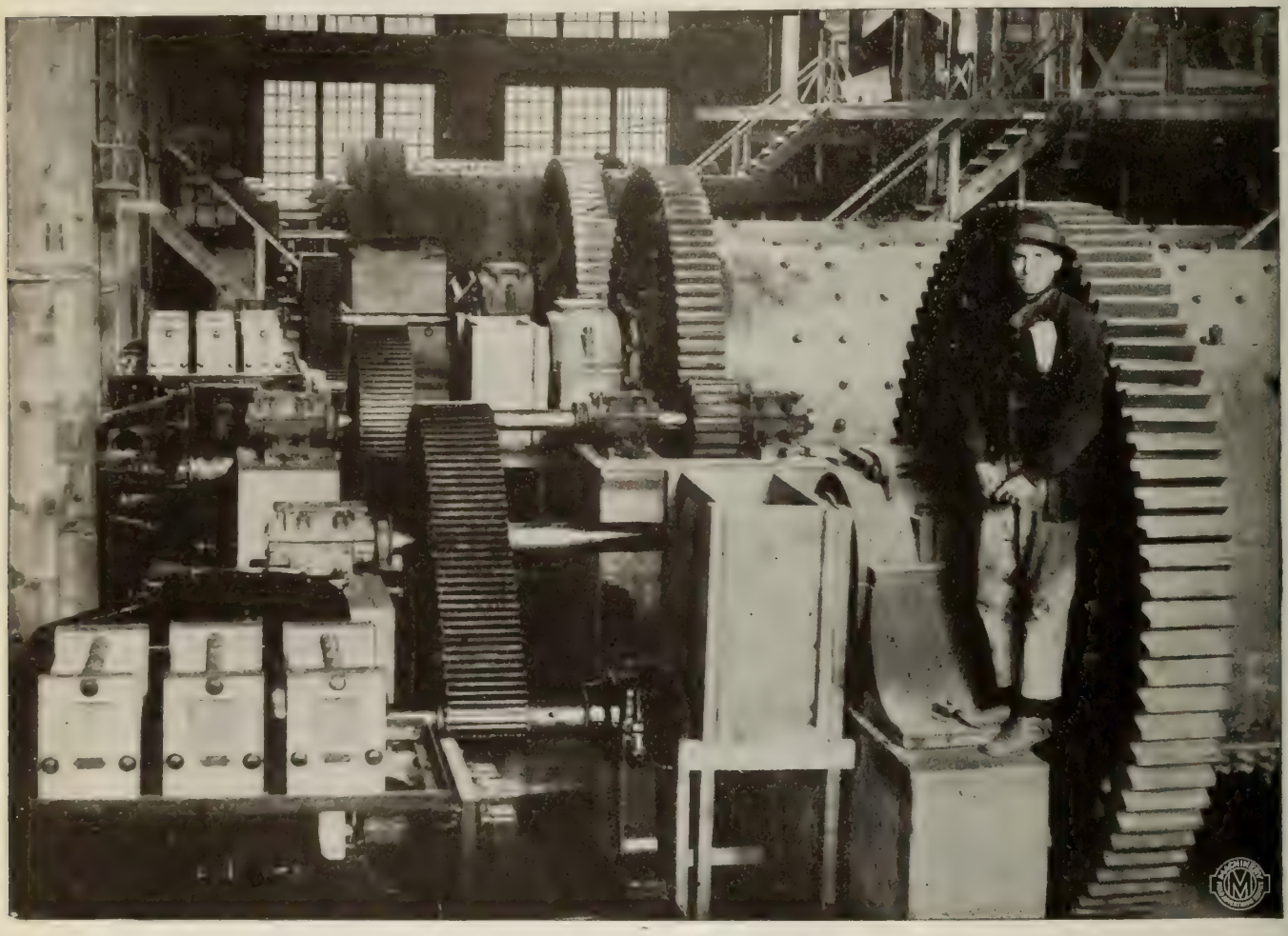
# MORSE DRIVES

THE MORSE "ROCKER JOINT"

Positive as Gears

Flexible as a Belt

Longer Life



## Six in Sight—More on Another Floor

MORSE Rocker Joint Silent Chain Drives installed about a year ago in plant of Canada Copper Corporation Ltd., Allenby, British Columbia, in severe service, transmitting 99% efficiency from 100 H. P. motors to 5′ x 20′ Tube Mills.

Have you troublesome drives in Hard Service in Dust, Gases or Steam? Let us show you how to save fuel, increase production, lower maintenance costs and bring out the profits lost through slipping belts.

Our Sales Engineers are Power Transmission Experts, who make it their business to secure results, that are the best available for your Power Problem.

Consult us on heavy, difficult or expensive drives.

**MORSE CHAIN CO.,** LARGEST MANUFACTURERS OF SILENT CHAINS IN THE WORLD **ITHACA, N. Y.**

*Morse Engineering Service* *Assistance Without Obligation*

*Write for Booklet*

*Address Nearest Office*

| | |
|---|---|
| ATLANTA, GA. | MINNEAPOLIS, MINN. 413 3rd St. S. ..... Strong-Scott Mfg. Co. |
| BALTIMORE, MD. | CANADA ..... Jones & Glasco, Regis'd |
| BOSTON, MASS. | MONTREAL, St. Nicholas Bldg. ..... Toronto, Bank of Hamilton Bldg. |
| CHARLOTTE, N. C. | NEW YORK CITY ..... 50 Church St. |
| CHICAGO, ILL. | PHILADELPHIA, PA. ..... 302 Harrison Bldg. |
| CLEVELAND, OHIO | PITTSBURGH, PA. ..... Westinghouse Bldg. |
| DETROIT, MICH. | SAN FRANCISCO, CAL. ..... Monadnock Bldg. |
| KANSAS CITY, MO. | ST. LOUIS, MO., Chemical Bldg. ..... Morse Engineering Co. |

**"Morse" is the Guarantee Always Behind the Efficiency, Durability and Service**

# For Permanent Replacement

*Replace the Old Roof permanently.* When you reinvest in the old building do it with a permanent material that will not need constant painting and repairs—do it with a protected metal that will *not need replacement* in a few years—do it with Robertson Process Metal.

The fact that your old roofs need replacing in so short a time proves the need for a better material. It shows how unprofitable the unprotected metal has been—how its maintenance and upkeep costs have piled up and how in the long run the investment has not been profitable.

Comparative tests between unprotected metal and Robertson Process Metal are no longer necessary. The greater value in Robertson Process Metal has been demonstrated thousands of times—by actual usage. Hundreds of times it has out-lived unprotected metal by such a wide margin that roof costs over a period of years have been more than cut in half. Hundreds of times Robertson Process Metal has replaced old roofs and siding of all kinds and put an end to wasteful corrosion losses and repair costs.

This result is to be expected when you realize how the Robertson Process scientifically protects the metal and how each sheet is completely encased, with both surfaces and edges fully protected.

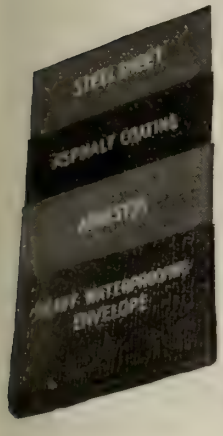
In the Banker's eyes the permanent substantial building represents an equally permanent and safe investment. The quick depreciation of ordinary steel sheets in comparison with long-lived protected metal is a point not to be overlooked by bankers, investors and business men generally. They invest in "building life" and because Robertson Process Metal has a *sure future* it has found its greatest opportunity for service *in new construction.*

Besides the savings in maintenance costs, in the cost of paint and repairs, the original cost of Robertson Process Metal is less than that of any other material of equal permanency. It makes possible the employment of lighter steel frame work and more economical foundations. By its speedy construction it effects still further savings.

You will find evidence of these facts in the experience of the users listed below. The purchasing agents, the factory superintendents, the officials of these companies do not buy with their eyes shut. They are scientific buyers of building materials. Their orders give assurance that Robertson Process Metal has earned its reputation by actual tests.

Let Robertson Engineers study your building and replacement needs. Estimates together with detailed information will be gladly furnished upon request.

## *The* PRODUCT



Three impervious coatings (1) Asphalt (2) Asbestos (3) Waterproofing, stand between the metal and its many enemies. Each coat protects the other and together they perfectly shield the specially annealed steel within.

Refined Robertson asphalt forms an air-tight moisture casing first. To this protective coating a thick layer of asbestos felt is firmly bonded by powerful machinery. Because of the fibrous-rock character of asbestos it is indestructible. It cannot rot or decay. Acids and alkalies cannot affect it. The entire sheet is then enveloped and fully sealed by a thick weather-resisting coat. All metal parts of Robertson Skylights are made of R. P. M.

R. P. M. is made in corrugated, flat, beaded and mansard sheets for roofing and siding. It is also built into trim, flashing, gutters, downspouts and ventilators. Made in maroon and black.

The illustration opposite shows each step in the Robertson Process. A process sample will be gladly sent upon request—also practical literature.

## *The* EVIDENCE

This partial list of users is significant because of the prominence of the various corporations and because *all of them have used Robertson Process Metal* after careful study or because of their experience with it on previous installations.

Abitibi Power & Paper Company, Ltd.
W. D. Beath & Son, Limited.
Brown Boggs Company, Ltd.
Canadian Electro Products.
Canada Furnace Company, Ltd.
Coke Oven Company of Canada, Ltd.
Dept. of Railways and Canals—Ottawa, Ont.
Dominion Glass Company, Ltd.
Dominion Iron & Steel Corporation, Ltd.
Dominion Sugar Company, Ltd.
Grasselli Chemical Company, Ltd.
Imperial Oil, Ltd.
Montreal Harbor Commissioners.
Moirs, Ltd.
Montreal Locomotive Works, Ltd.
Nova Scotia Tramways & Power Company, Ltd.
Oneida Community Company Ltd.
Page Hersey Tubes, Ltd.
Sarnia Bridge Company, Ltd.
Department of Works, City of Toronto.

H. H. ROBERTSON COMPANY, Limited, Sarnia, Ontario

*General Sales Office:* Drummond Building, Montreal. *Branch Office:* Kent Building, Toronto.

*Agencies:* Canadian Asbestos Company, Montreal and Toronto; Jamieson Engineering Company, Ltd., London Building, Vancouver; R. Y. Kilvert & Co., Builders Exchange Building, Winnipeg; Gandy & Allison, No. 3 North Wharf, St. John, N. B.; General Sales & Engineering Co., Metropole Building, Halifax, N. S.

# ROBERTSON PROCESS METAL

TRADE MARK REG. U.S. PAT. OFF.

## FOR PERMANENT ROOFS. SIDING AND TRIM

*If interested tear out this page and place with letters to be answered.*

HOYT

BABBITTS—METALS—SOLDERS

HOYT METAL COMPANY

MONTREAL TORONTO WINNIPEG

# Heat Under Accurate Control

Here is an important factor in the heat treatment of metals. An intense heat, rapidly developed, and always under accurate control of the operator, is a feature that distinguishes

## BELLEVUE FURNACES

These tool forges are particularly adapted for the requirements of the small machine shop for annealing and tempering dies, cutters, reamers, etc.

Combustion is perfect and no flames come in contact with material. Built to stand the highest temperature. Doors are properly counterbalanced. In every way BELLEVUE FURNACES meet with the demand for durability, efficiency and convenience.

**Let us advise you about your heat-treating problems**

**Bellevue Industrial Furnace Company**

**Julius C. Hinz, President**

**703 Bellevue Ave. - Detroit, Mich.**

***Representative in Canada: H. W. PETRIE, LIMITED, Toronto, Canada***



**For General Tool Work**

**Oil or Gas**

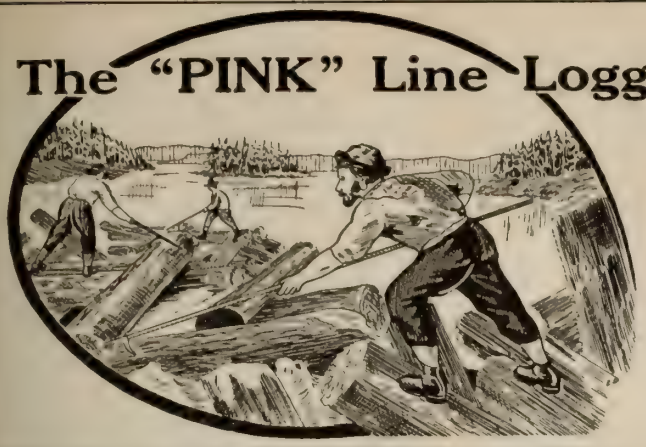
Are *YOU* Represented ?

*The next issue is dated May twelfth. It will be especially interesting to all. Send in your classified advertisements now.*

CANADIAN MACHINERY, *143 University Ave.*
*TORONTO, CANADA*

*If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.*

# The "PINK" Line Logging Tools and Handles



**MADE-IN-CANADA Products---Headquarters for British Empire for all Lumbering Tools**

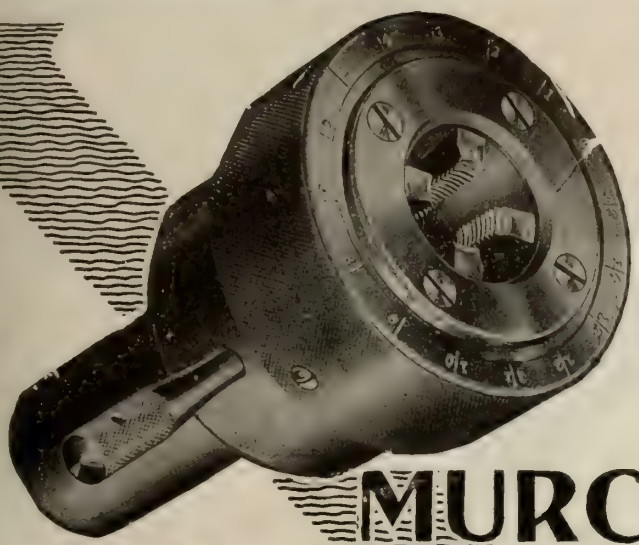
In every lumber camp in Canada you'll find PINK'S famous lumbering tools. They are the favorites there and have won the esteem of all woodsmen through their superior merit. They are world-renowned and are extensively used in Australia, New Zealand and other countries where the lumbering industry thrives.

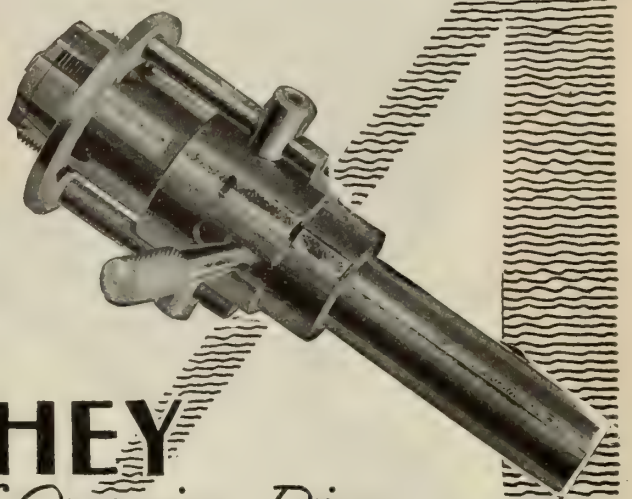
**EXPORTERS TO EUROPE**

We export the same good quality of lumbering tools that have made PINK'S TOOLS a by-word in the matter of good tools in all Canadian lumber camps. Enquiries cordially solicited.

**Thomas Pink Co., Limited**

PEMBROKE, ONT., CANADA





# MURCHEY

## *Collapsing Taps & Self-Opening Dies*

There are two all-important reasons why your Taps and Dies should be Murcheys. In the first place Murchey design cuts operating time in half and gives you better work. Secondly — you get prompt shipment on all Murchey Chasers.

Murchey Taps and Dies are built with long, hard service. The fine materials and workmanship used, their extremely simple design and rugged construction leave nothing to be wished for in the service they give their owners.

**Send for a Murchey Tap and Die on Approval.**

**Murchey Machine & Tool Co., 75 Porter St., Detroit, Mich.**

The Coats Machine Tool Company Ltd., 14 Palmer St., Westminster, London, S. W., England Fenwick Freres & Company, 8 Rue de Rocroy, Paris, France

# THE MORSE CHAIN CO.

are the

**Largest Manufacturers in the world**

of

**High Speed Silent Chains**

**Why?**

Morse Chain possesses the exclusive

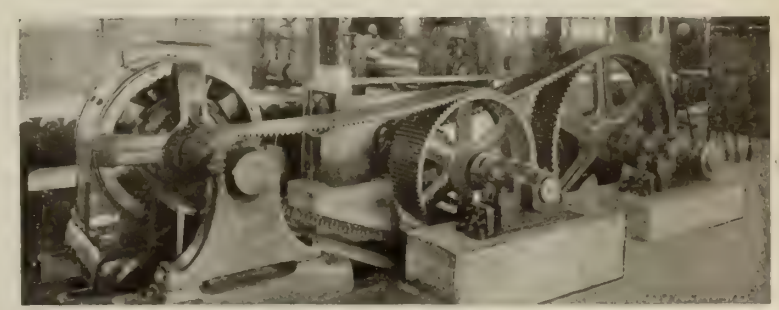
**Rocker Joint**

Frictionless—Requires no Oilbath.

**Jones & Glassco** (Reg'd.)

Canadian Agents

**Montreal - - Toronto**



80 H.P. Morse Drive to Rolls, reverses direction every 45 seconds


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The New
Jacobs
Super
Chuck
CAP.
Jacobs

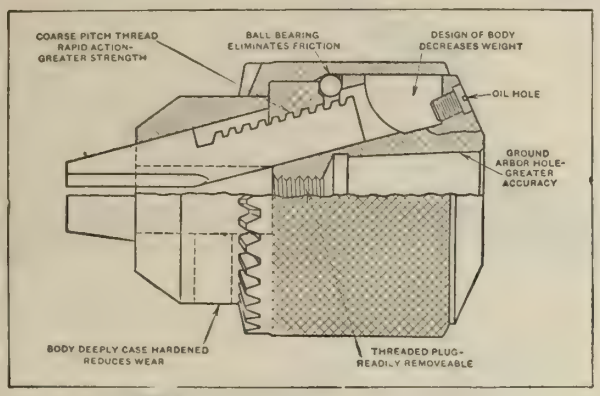
# *Announcement*

# The New Jacobs Super Chuck

Patented 1909-1915. Other Patents Pending

We present The New Jacobs Super Drill Chuck—our contribution to greater drilling efficiency—a better chuck even than the Jacobs Drill Chuck you have known and used for the past eighteen years. The New Super Chuck is fitted with ball bearings, is better proportioned, quicker in action, more durable—from all standpoints the best chuck experience has been able to produce, that money can buy.

THE JACOBS MANUFACTURING COMPANY
Hartford, Connecticut, U. S. A.




***We predict great things for this Super Chuck.***

***You can expect great things from it.***





SPRINGS, WIRE & STEEL
EST.
"BARNES-MADE" PRODUCTS
1857
SCREW MACHINE PRODUCTS

*"Barnes-Made"*

# Flat Springs

All "Barnes-made" Products are made to customers' specifications. Small flat springs in endless variety have been supplied for every conceivable trade. This means an accumulation of engineering resources and manufacturing facilities allowing speedy and accurate quantity production of springs, stampings and washers. However exacting your requirements—they will be met. The success of your product is bound to be upheld by the "Barnes-made" product which goes into it.

***Ask us to estimate***

## The Wallace Barnes Company

*"Spring Makers for Three Generations*

**Main Office and Works - Bristol, Conn.**

**Western Office: Book Bldg., Detroit**

BY INVITATION
MEMBER OF
NEW YORK, U.S.A.

# IMCO TOOLS

## Rushed to the Limit!

Every now and then your drilling, reaming and milling *must* be rushed to the limit. So, excessive power and strength is built into every "Imco" —thus every tool is prepared for those times.

**Catalog of 3 and 4-lip drills, reamers and milling cutters upon request.**

***Eastern Representatives:***
WATT MACHINERY & EQUIPMENT CO., 344 St. James St., Montreal, Que.

**Ingersoll Machine & Tool Co., Ltd.**
Ingersoll, Ontario.
Toronto Office — 80 Bay St. Phone Adelaide 7227.
Chas. A. Strelinger Co. Ltd. Windsor, Ont.

*If interested tear out this page and place with letters to be answered.*

# Open a Bank Account in Canada

The present abnormal exchange situation between Canada and the United States is affecting trade relations between the two countries. Exporters in the United States can meet this by opening Bank Accounts in Canada.

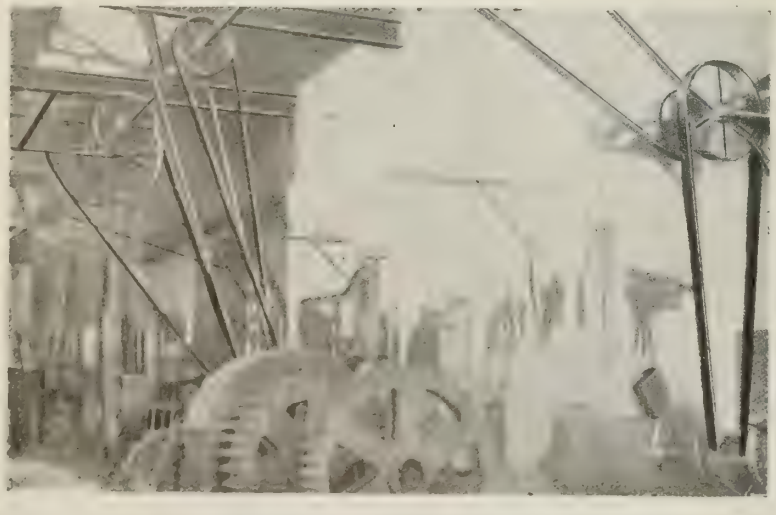
**This Bank has 730 Branches, of which 626 are located in Canada from the Atlantic to the Pacific Coast. Write for a complete list of Branches and for terms respecting a Canadian account.**

# THE ROYAL BANK OF CANADA

**Capital and Reserves $40,000,000** **Total Resources $544,000,000**

***Head Office:*** MONTREAL

# Solid Woven Belting



Solid Woven Hair Belting
Driving Heavy Machine Tools

## Solid Woven Cotton Hair Twintex

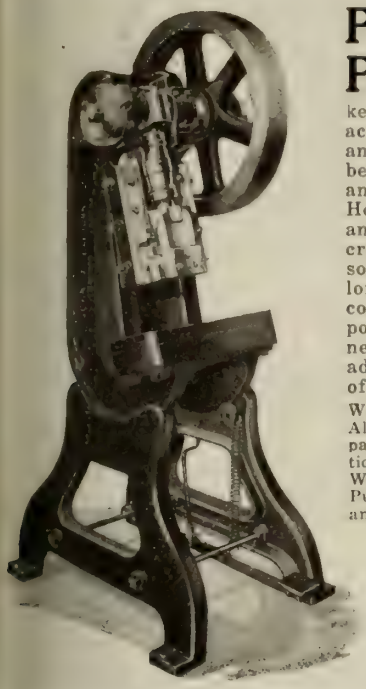
*These beltings will solve your driving problems and save you money.*

**SUMNER & CO.**
**108 WORTH ST.**
**NEW YORK**

Representative for Eastern Canada
GEORGE F. SHEPPARD
702 Southam Bldg., Montreal

You Gain in Length of Service

# HEPBURN



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keep on turning out accurate work long after an ordinary press has to be scrapped. Why? The answer is simple. Every Hepburn Press is strong and well built. The cranks are made from solid forgings and give long strokes. The entire construction is so proportioned that weaknesses never occur. Quick adjustability a feature of every press.

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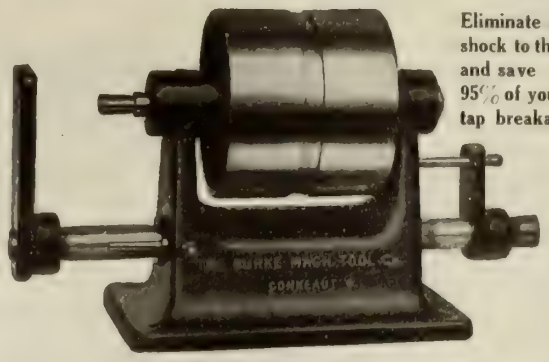
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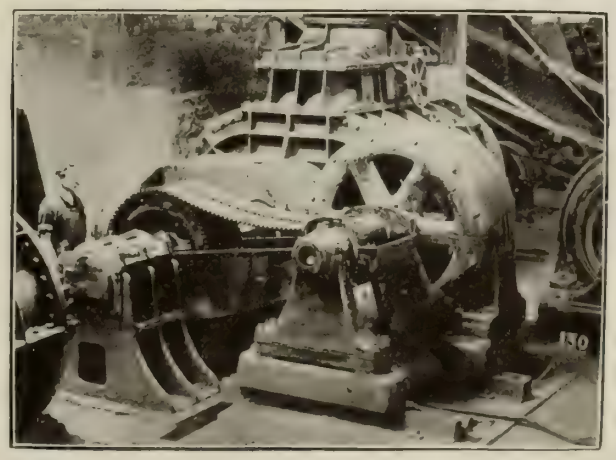
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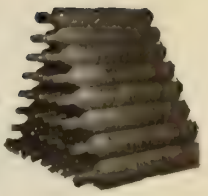
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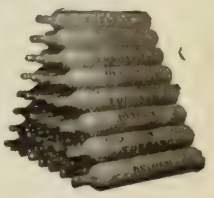
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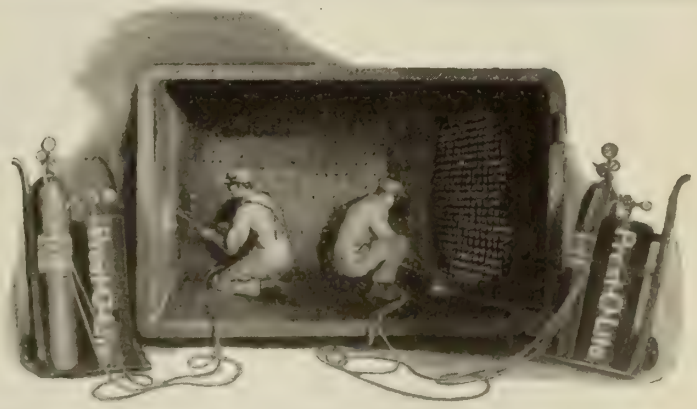
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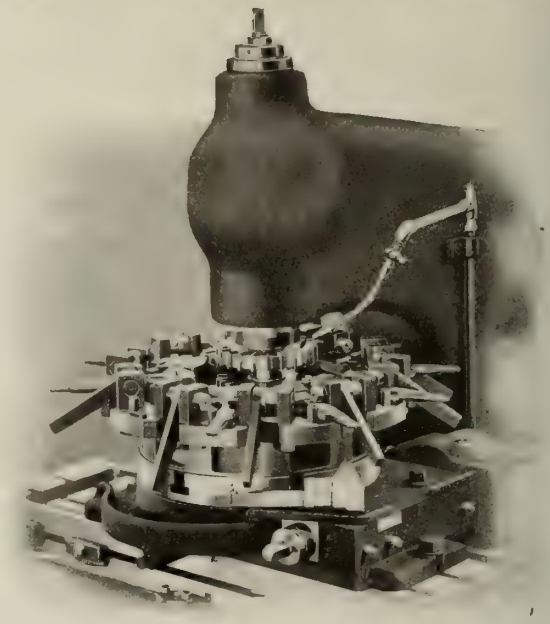
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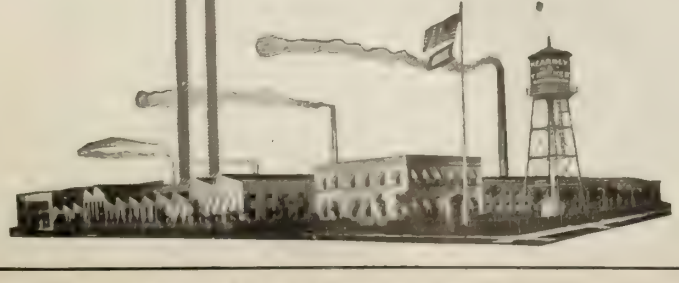
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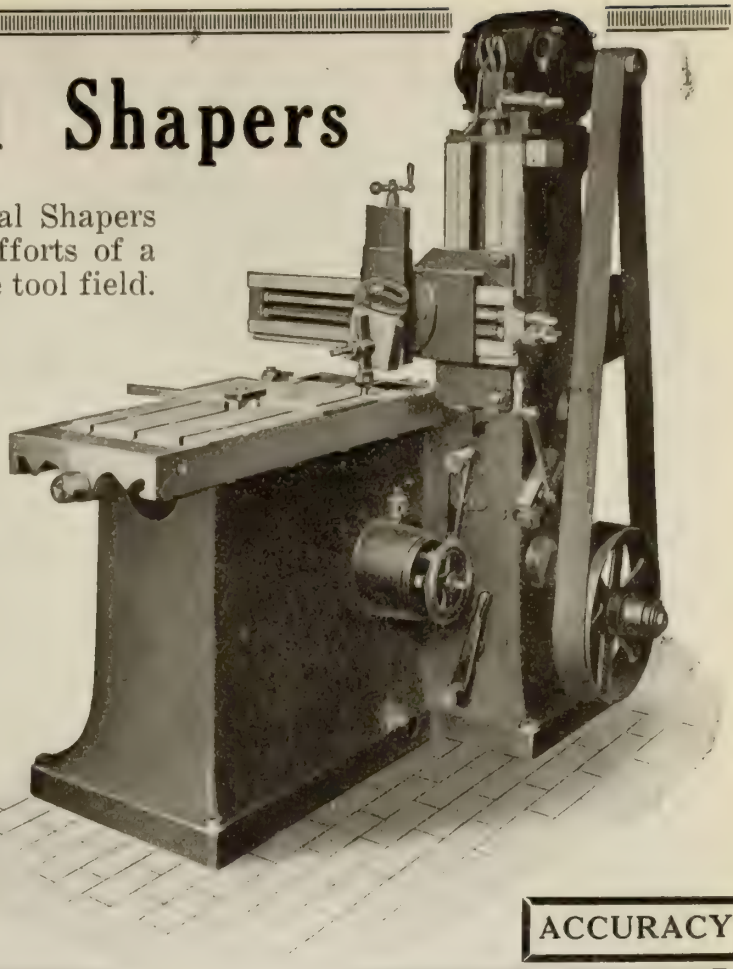
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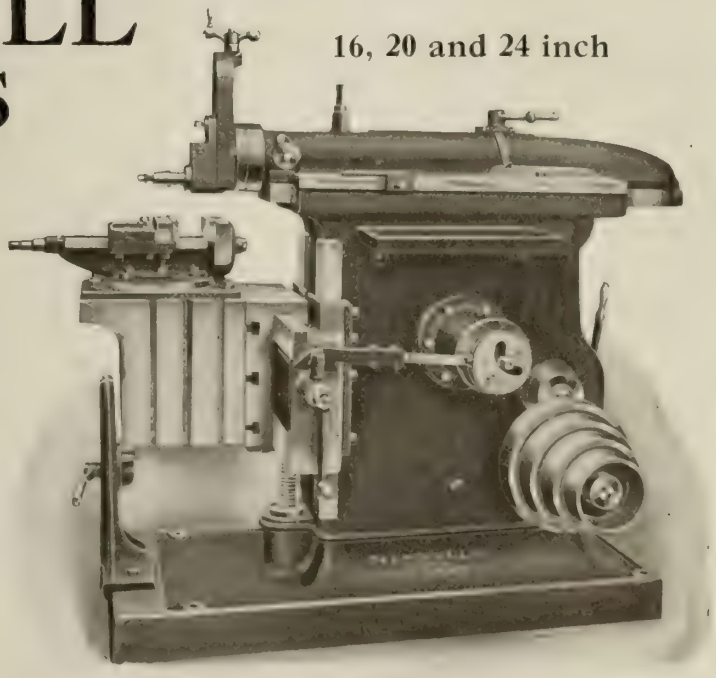
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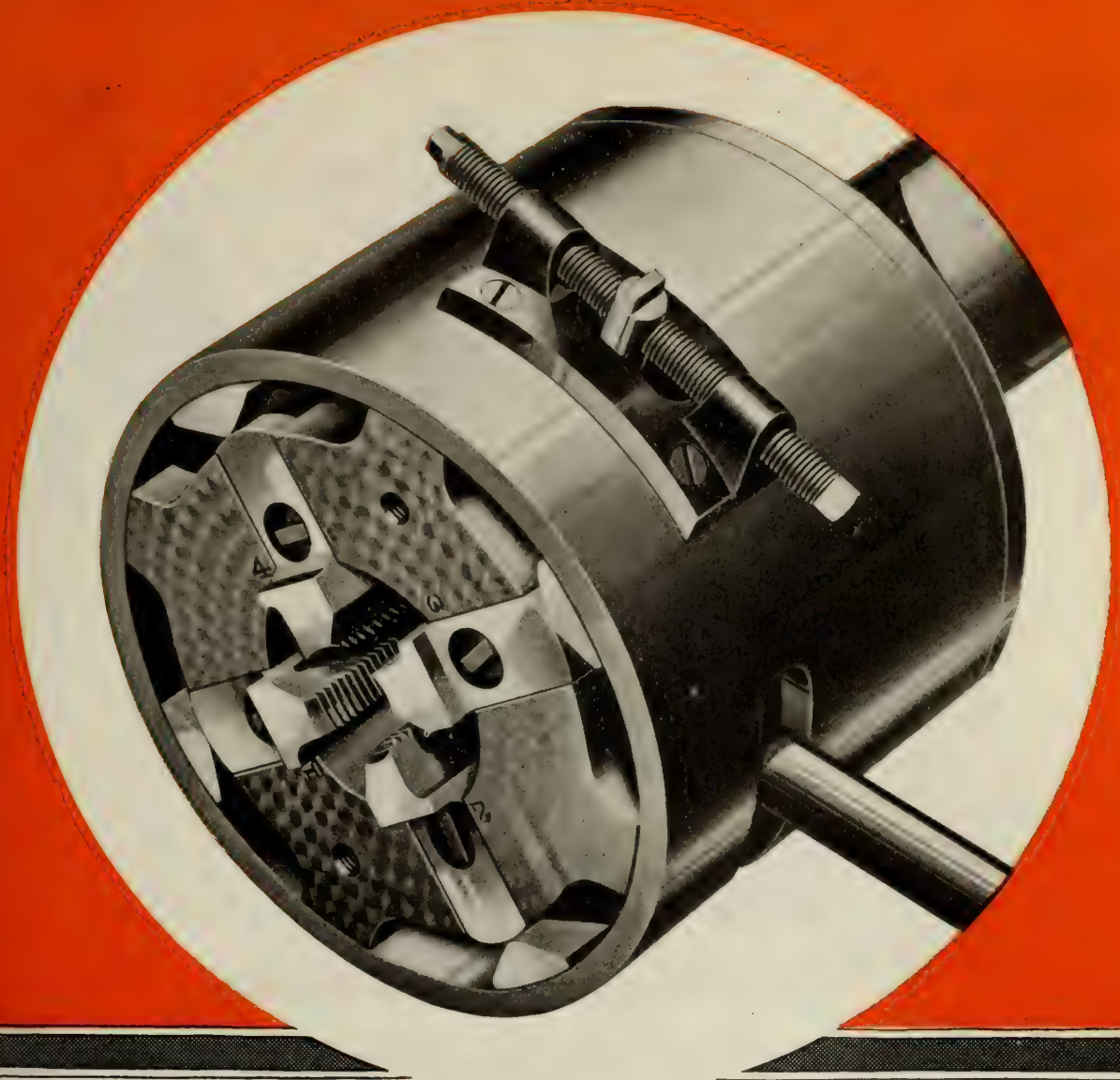
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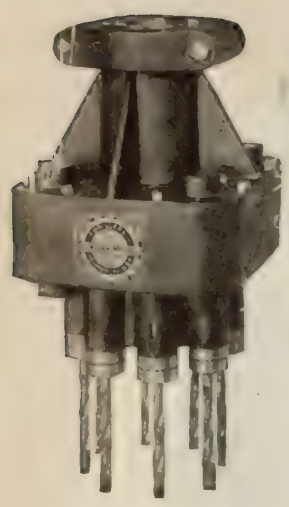
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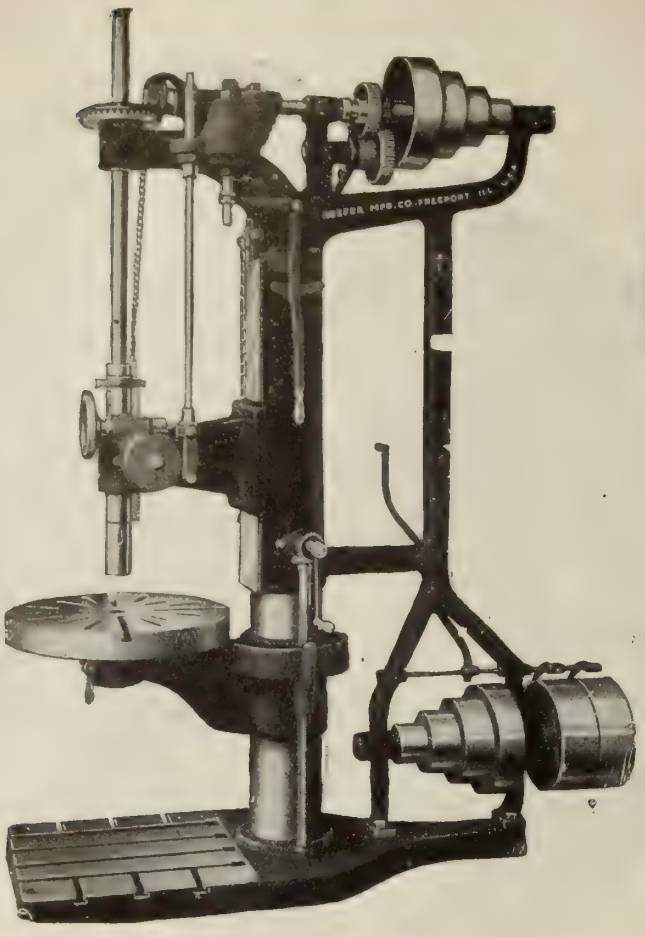
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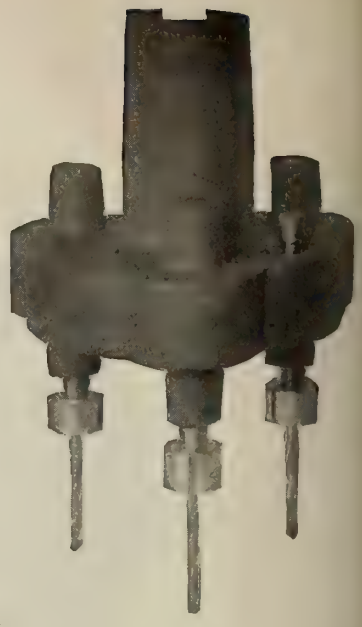
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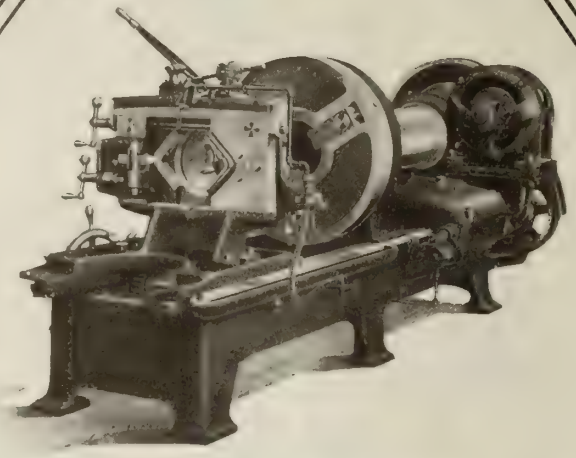
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VOL. XXV. No. 18. May 5, 1921

# Surface Grinding 700 Ball Races Every Hour

## Magnetic Chucks—Their Relation to Surface Grinding—Grinding Steel Forgings, Gear Blanks, Cylinder Castings, Locomotive Crank Pin Washers, Dies, Push Rods and Connecting Rods

By J. H. MOORE

BEFORE entering into the subject of surface grinding, let us first consider the system of holding the work for such style of grinding. It is a readily conceded fact that surface grinding would never have reached its present point of efficiency but for the development of the magnetic chuck; and yet, there are quite a few mechanics who still look at you in a puzzled manner the moment you ask them, "Why don't you use a magnetic chuck?"

Of course the field of usefulness of such chucks is not confined to grinding, for they are freely used in the shop, on planer and milling operations, but as we are especially interested in the grinding field (so far as this article is concerned), let us concentrate on this particular style of work.

Luckily, the magnetic chuck has been developed to such a point that it has literally forced itself upon industry in general. Its usefulness has been proven beyond a doubt, and results obtained have been so satisfactory that many industries could hardly get along without them. In spite of this, the chuck itself still remains to the men who use it daily a tool of mysterious holding power. Many tool makers, who ought to know better, still persist in the belief that such a chuck can hold flat pieces only, but for irregular shaped parts,—well to put it bluntly, they revert back to the vise. This is hardly fair to the chuck itself, or the principles involved, so without going too far into detail, let us ask the question, "What is a magnetic chuck?"

First of all, it is a device that will hold magnetically various shapes of work while machining operations are being performed. It is a labor and time saving factor that is rapidly proving its wide field of usefulness, and is being used not only in the tool room and machine shops, but in manufacturing trades in general.

These chucks were originally designed to hold only flat pieces on which very light operations were performed. At that time they were considered merely as time saving factors in the tool room, and truth to state, were looked upon as rather risky factors at that. Development is a great thing, however, and now, when we speak of magnetic chucks, we refer to devices that will hold pieces of magnetic metal of almost any shape, this including even rough castings and forgings. We also know that the modern magnetic chuck is a device magnetically strong enough to hold pieces securely against the heavy strains that are brought to bear upon them by our modern production methods.

Such chucks are no longer accessories, they are essentials, and a surface grinder, especially if used for production work, has a magnetic chuck as part of its equipment.

Of course, if such a chuck is used in manufacturing work, a sufficient number of duplicate pieces have to be passing through the shop to warrant the expense of special holding fixtures, that is, if the parts are of irregular shape. As surface grinders are to a large extent used on such work, the first cost of the holding fixture is nothing compared to the saving which results through its use.

To go into the various styles of chucks on the market would take a volume in itself. We are not so interested in the various makes, however, as we are in the

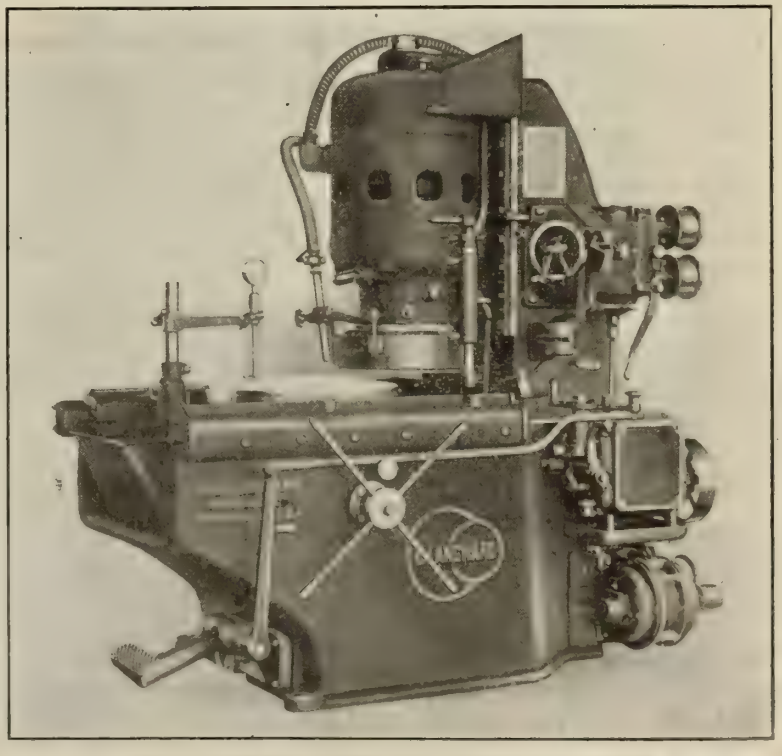


FIG. 1—GENERAL VIEW OF A SURFACE GRINDER.



FIG. 2—A MISCELLANEOUS ASSORTMENT OF PARTS FINISHED BY SURFACE GRINDING.

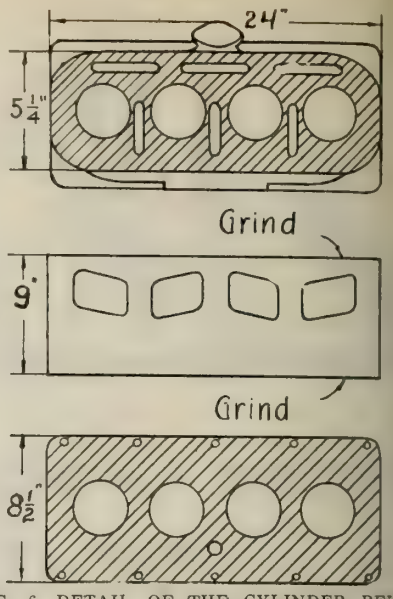



FIG. 6—DETAIL OF THE CYLINDER BEING GROUND AT FIG. 5.

work that they can accomplish, so feeling sure the shop superintendent, and mechanics in general, do not care to delve into the principles of magnetism, we will simply show how magnetic chucks have helped the cause of surface grinding.

Before proceeding to examples of work performed, let us discuss in a brief manner the term "surface grinding." This term in the minds of many shop men means finish-grinding, or grinding preliminary to lapping such work as dies, tools, gauges, small hardened parts, etc. This conception of the term was at one time quite correct, for the first style of surface grinder was intended for such work. These machines were used for the removal of a small amount of stock, usually hardened steel, and some of the machines were adapted for dry grinding only.

Times have changed, and now when we speak of surface grinding, we refer to the removal of stock at a high production rate. Grinding machines have of course been developed to a high point of efficiency to handle such work, and through the courtesy of the Blanchard Machine Co., Cambridge, Mass., we are able to present various examples of work produced by their practice. These examples are picked at random, and illustrate in a general way the wide field of usefulness of this style of grinding. A word about the machine itself.

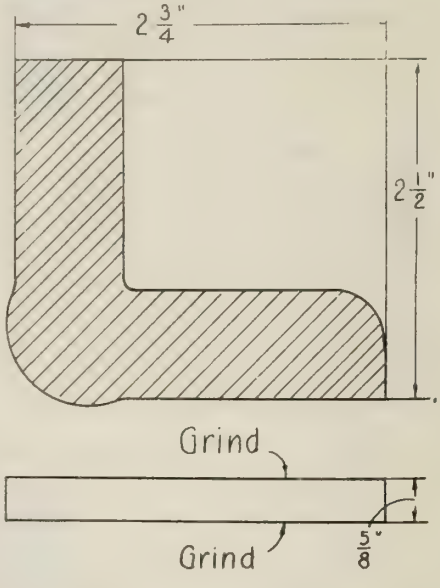



FIG. 4—DETAIL OF THE FORGING BEING GROUND AT FIG. 3.

Fig. 1 depicts a No. 16 Blanchard vertical surface grinder with a direct motor drive. Without going into the constructional details, enough to say that the machine consists of a spindle, a suitable mounting for the spindle, a wheel, a table with a magnetic chuck, and various gear changes necessary to obtain the different speeds. Our chief reason for confining the details to this brief space is that anyone interested can write for further information, while by holding down the constructional details in this manner we can proceed with the work accomplished which, after all, is the foreman's chief consideration.

### Method of Procedure

The work to be ground is laid on the rotary magnetic chuck, and the switch closed. The entire table, comprising the chuck and the sliding carriage in which it and its driving mechanism are mounted is then moved by hand horizontally on the base to bring the center of the chuck just under the face of the cylinder wheel. In this position the chuck is rotated continuously. The water to inside of wheel is turned on, after which the wheel head is gradually fed downward, usually .001 inch to .002 inch per revolution of the work, until the desired size of work is reached. The wheel head is then raised enough so that the wheel will clear

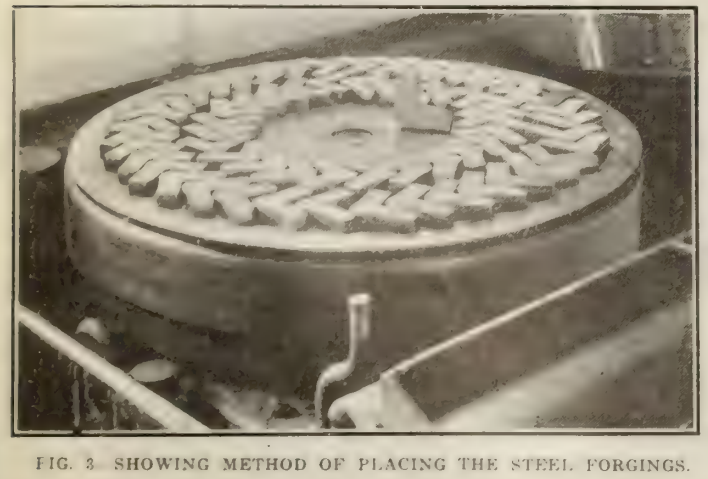


FIG. 3—SHOWING METHOD OF PLACING THE STEEL FORGINGS.



FIG. 5—GRINDING CYLINDER CASTINGS IN AUTOMOBILE PLA

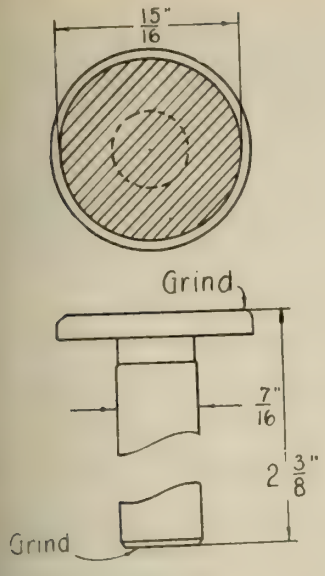



FIG. 8—DETAIL OF THE PUSH ROD.

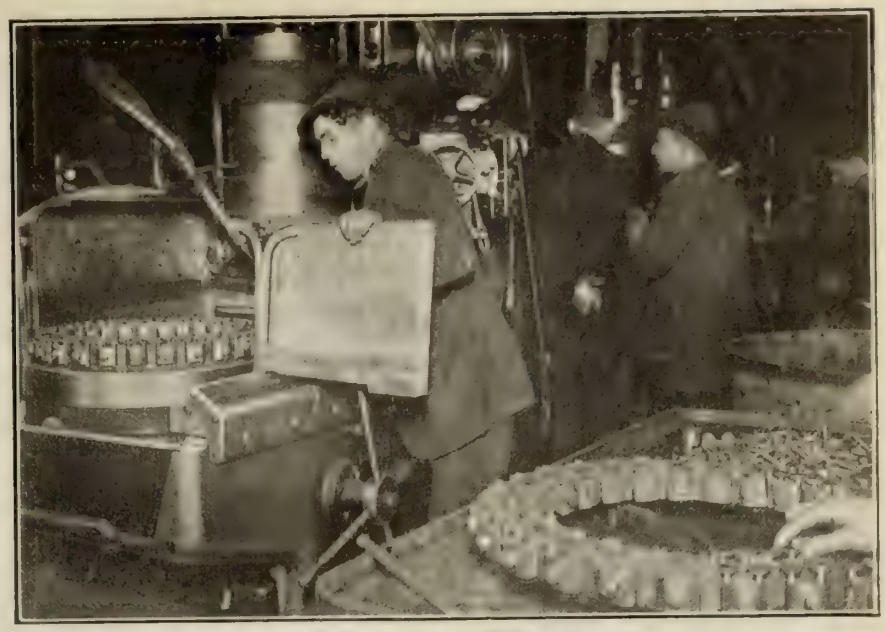


FIG. 7—GRINDING AUTOMOBILE PUSH RODS.

ext load of rough pieces, the chuck ro- ation is stopped, the chuck is moved orizontally out from under the wheel, nd the finished work removed. Should he pieces have to be ground on both ides, they are reloaded the other side p, and again ground in similar manner. Should the parts be ground on one side nly, the pieces are removed and fresh arts placed on the fixture or chuck. This, briefly, is the procedure adopted.

The wheels used differ in grade de- ending upon the nature of the work, but n every case, irrespective of the parts eing ground, the wheel is a plain hollow ing of abrasive, mounted in a cast iron ing. It is left in this ring until worn ut. We do not wish to take up further pace on the machine itself, so leave eaders to study Fig. 1 at their leisure.

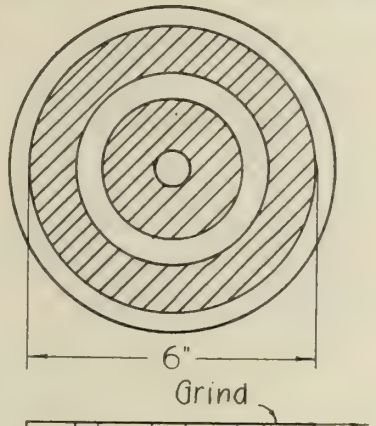



FIG. 10—DETAIL OF ARMATURE DIE.

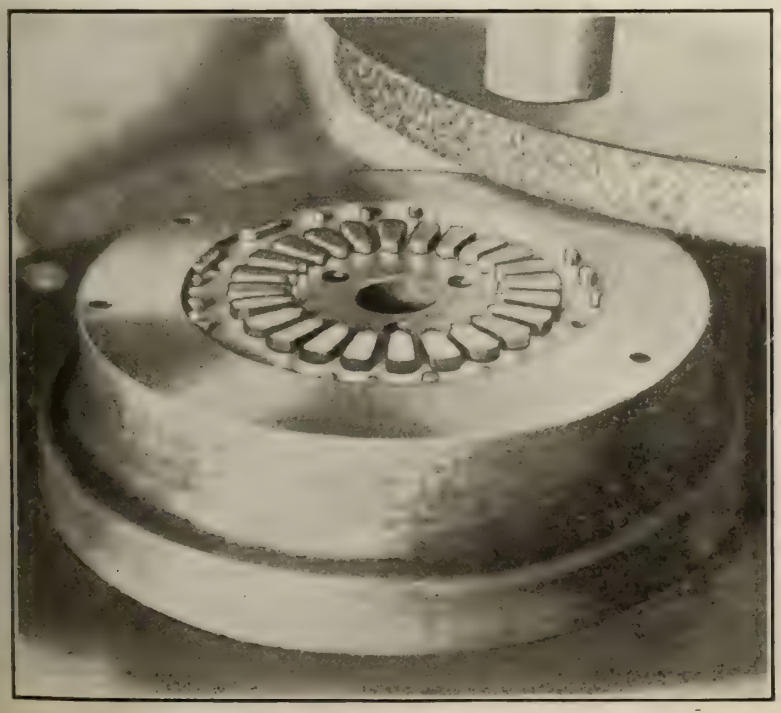


FIG. 9—GRINDING AN ARMATURE DIE.

In the meantime let us consider examples of work produced.

### Examples of Work

Referring to Fig. 2, we see a miscellaneous group of parts machined by surface grinding. There is no need to speak on the variety of work shown in the photograph for it speaks for itself. Our main reason in showing such a group is to bring up the question, "What field is covered by surface grinding?" The extreme range of work possible to machine by this process makes it difficult to define the field, but generally speaking it is a process that will machine almost any flat surface unobstructed by projections. As the boosters of the method put it, "A process that obtains a finish and accuracy somewhat better than would result from a roughing cut made simply to remove metal." The field is constantly growing, new uses and applications being discovered daily.

Figs. 3 and 4 depict both the photographic and diagrammatic views of a steel forging, this piece being ground on a machine of the same size shown at Fig. 1; a 26 inch magnetic chuck being used. The stock removed per side is 1-16 inch, and the work is held to limits of plus or minus .0005 inch. As can be noted, the piece is ground on both sides, and the production on this forging is 326 surfaces, or 163 pieces per hour. This production was obtained without any special equipment, and proved to be a great saving on the previous method employed.

Figs. 5 and 6 depict the grinding of cylinder castings in a certain automotive plant. The same equipment, stated above, is used, and the piece itself, made from cast iron, weighs 90 pounds. The stock removed per side is from .015 inch to .020 inch, and the limits are plus and minus .003 inch. Two sides are ground, and the production is 32 surfaces or 16 pieces per hour. This figure is of course for one machine. These parts are rough

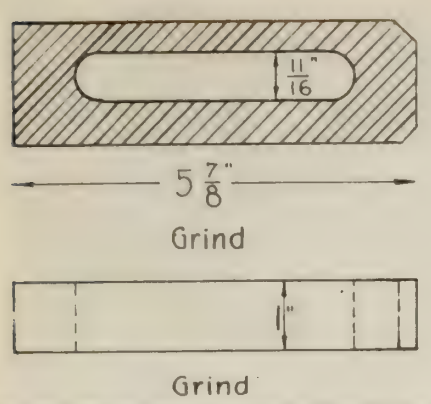



FIG. 12—DETAIL OF THE STEADY REST JAW.

milled before grinding, and the object of thus grinding is to give the part proper finish, accurate height, and at the same time making it easy to secure tight joints without using thick gaskets.

Figs. 7 and 8 illustrate the grinding of automobile push rods. The material is hardened steel, and the stock removed per side .015 inch. The limits are held to plus or minus .001 inch, and two sides are ground. The production is some 1,600 surfaces or over 800 pieces per hour. These rods have to be ground on both ends, to length, square with the shank. Fixtures are used which hold 104 rods each, the rods being clamped in V grooves, one bolt gripping four rods, two on the outside, and two on the inside. Three machines, six fixtures, and six men produce 2,500 rods per hour. This is not the highest possible figure, but is taken from an average production day.

Figs. 9 and 10 depict the grinding of an armature die. The material is of course hardened steel, .015 inch of stock per side being removed. No limits are necessary, the main stipulation being to clean up. The complete grinding of such a die occupies only four minutes.

### Further Examples

Figs. 11 and 12 illustrate the grinding of some steady rest jaws, these being made of cast iron. The stock removed is 1-32 inch per side, and the work is held to plus or minus .0015 inch. Four sides are ground, and the production time is 100 surfaces or 25 jaws per hour. These

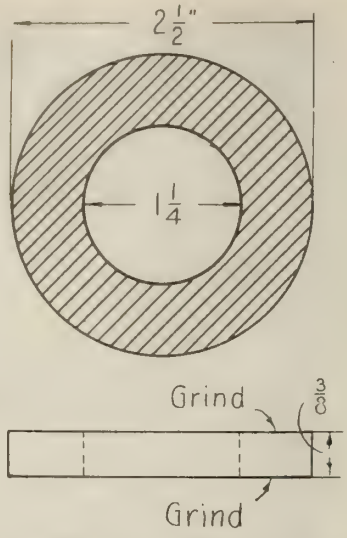



FIG. 14—DETAIL OF THE PACKING RING.

jaws must be parallel and square and are finished from the rough. The two parallel sides, viz., the operation shown

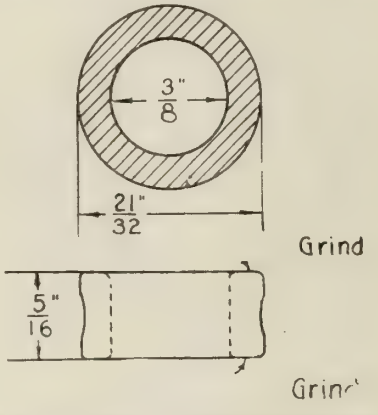



FIG. 18.—DETAIL OF THE BALL RACE.

in photograph, is done at the rate of 120 surfaces per hour. The pieces are then packed between square bars, or clamped

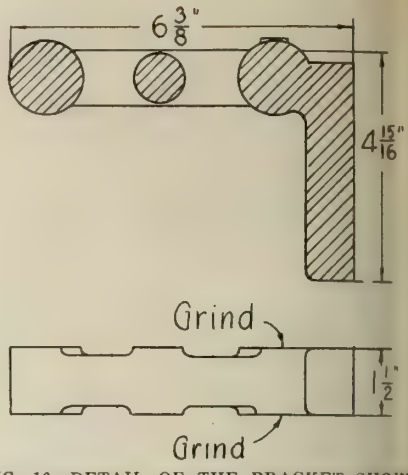



FIG. 16—DETAIL OF THE BRACKET SHOW AT FIG. 15.

against vertical surfaces of a block, ar one edge ground square with the tw parallel sides. They are last of all place with this squared edge on the chuck, ar the second edge ground parallel to it.

Figs. 13 and 14 depict the grinding some cast iron packing rings, the stoc per side removed being 1-64 inch wi limits of plus or minus .001 inch. Tw sides are ground, the production beir 270 surfaces or 135 rings per hour. Th work is done on a smaller sized machi than those previous.

At Figs. 15 and 16 is shown the m chining of cast iron brackets, the stoc per side removed being 1-16 inch. Tl limits are held to plus or minus .001 inc and two sides are ground. The produ tion is 90 surfaces or 45 parts per hou

A very interesting example of sma work is shown at Figs. 17 and 18. The parts are hardened steel ball races a .007 inch stock per side is removed. T pieces are held to limits of plus or min .005 inch, and two sides are ground. T production is 1,400 surfaces, or 7

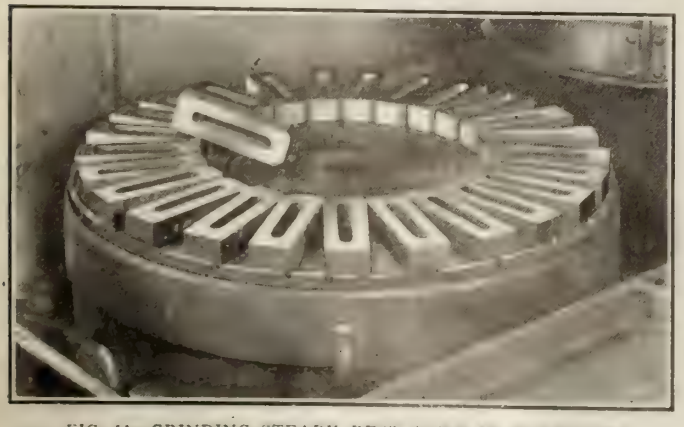


FIG. 11—GRINDING STEADY REST JAWS IN QUANTITY.

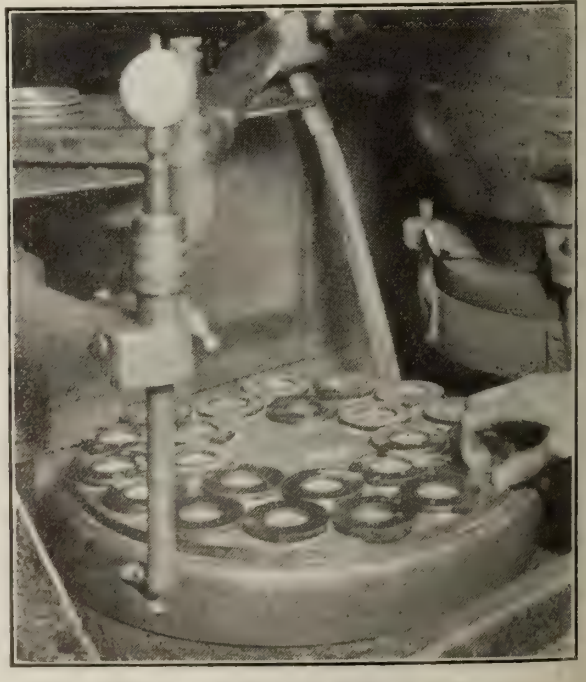


FIG. 13—GRINDING PACKING RINGS.

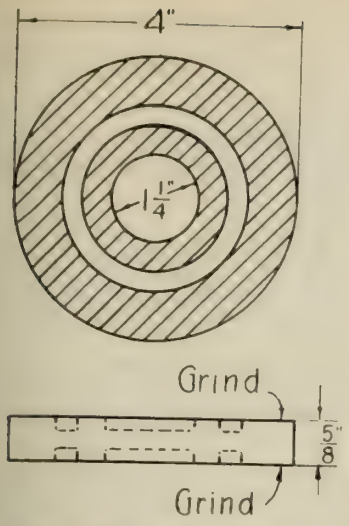



FIG. 19 - DETAIL OF A GEAR BLANK GROUND.

races per hour. This production is for one man only operating the machine. A man with a helper operating the machine and using plates for loading and a rapid washing device (the helper loading the plate while the machine is grinding) produces 3,600 pieces per hour. In the illustration the work is retained by inner and outer rings, this being the standard method of chucking small pieces.

### Diagrammatic Views

The remaining illustrations will be confined to drawings only. Fig. 29 depicts a gear blank made from soft alloy steel, 1-16 inch stock per side being removed. The work is held to limits of plus or minus .001 inch, and the blanks must be parallel to within .005 inch; 150 per hour is the production figure.

Fig. 20 depicts a locomotive crank pin washer 7¾ inches outside diameter made from hardened steel. Both sides of this washer are ground, .032 inch being removed from each side. The work is held to limits of plus or minus .005 inch, and 180 surfaces, or 90 complete washers are completed per hour. This is only one example of locomotive work, but such parts as slide valves, piston rings, link plates, ball couplings, link blocks, main links, radius rods, guide liners, wedges, main rod keys, etc., have been machined by this process with splendid success.

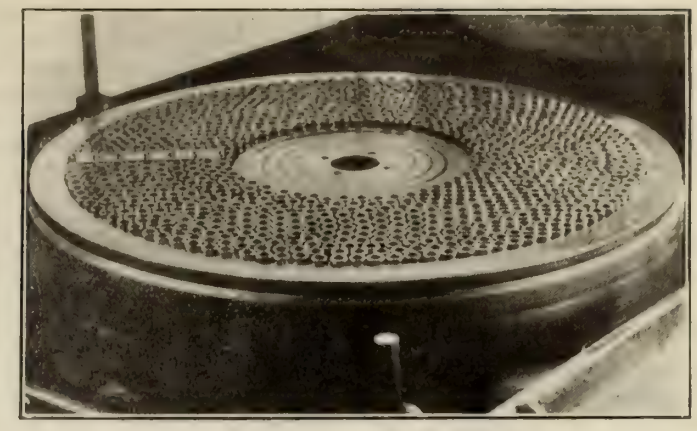


FIG. 17—GRINDING BALL RACES.

Fig. 21 shows a rather good example of die grinding, this being a crankshaft forging die. The material is hardened steel, and .012 inch is removed. The die has merely to be cleared up and the grinding takes only 10 minutes.

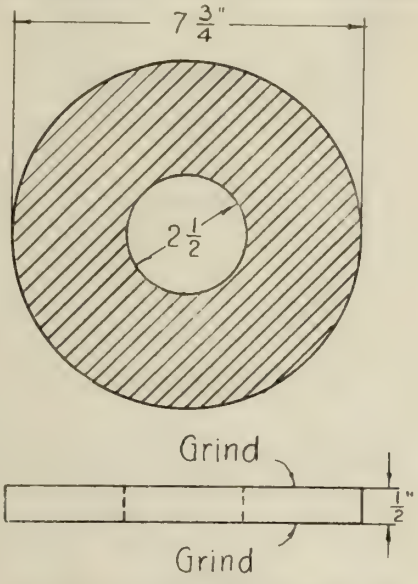



FIG. 20—A LOCOMOTIVE CRANK PIN WASHER THAT IS GROUND.

The gear box shown at Fig. 22 is made of cast iron, ⅛ inch of stock being removed. No limits are given, the work being merely cleaned up. Of course, a special fixture is necessary, but the design is lighter and the cost less in this case than it would be for a milling or planing fixture. The parts need not be clamped, unless there is a tendency to tip, and then only a very light form of clamping is necessary. Six pieces per hour is the production figure on this particular work.

Fig. 23 shows a connecting rod made from a steel forging that lends itself nicely to grinding. The points ground are shown in sketch, .050 inch stock being removed per side. The work is held to plus or minus .001 inch, and the production per hour is 216 surfaces, or 54 rods per hour.

As the surfaces of the large and small ends of these rods are not at the same level, they are chucked in approximately radial position with the thick ends toward the center of the chuck. After grinding these ends, the chuck is moved out until they clear the wheel, when the wheel is then brought down to grind the thin, small ends. Of course the same procedure is adopted when the rods are turned over in the fixture.

The last example, that at Fig. 24, depicts a reamer blade ground on a No. 10 grinder, using a 16 inch chuck. The material is hardened steel, the stock removed per side being .020 inch. The work is held to limits of plus or minus .0005 inch and, as can be noted, two sides are ground; 660 surfaces, or 330 blades per hour are produced.

We could go on indefinitely illustrating examples of work completed by surface grinding, but sufficient has been shown to not only prove the effectiveness of the process, but its wide scope.

Before leaving the subject, however, let us dwell on a few points of general interest. Speaking on this method of grinding, the Blanchard Co. have the following to say:

It is obvious that to obtain a succession of light cuts economically it is necessary to have a high work speed. This is readily obtained on a rotary chuck type of surface grinder, because the chuck revolves continuously in one direc-

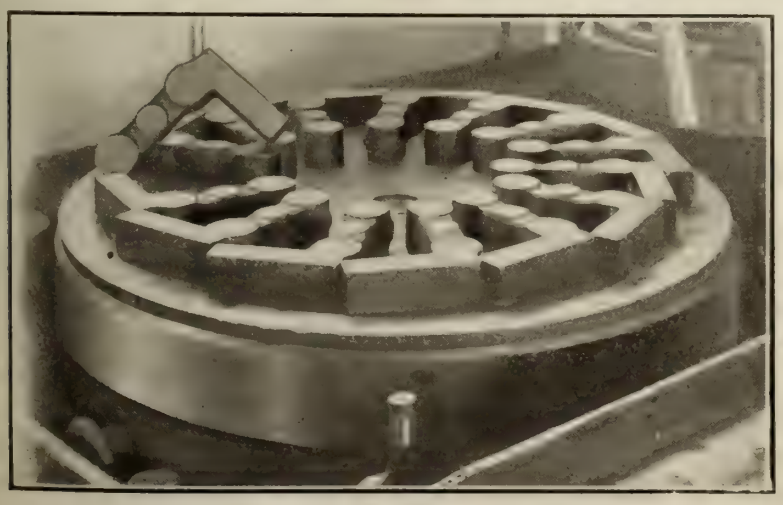


FIG. 15—GRINDING SOME CAST IRON BRACKETS.

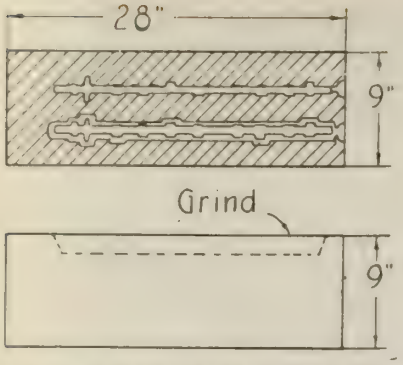



FIG. 21 A CAMSHAFT FORGING DIE, GROUND WITH SUCCESS.

tion and there is no need for any reversing mechanism such as is used on planer type machines. To rotate the chuck say at 28 r.p.m. (which corresponds to 140 feet per minute) requires no elaborate mechanism, and the action of the wheel when fed .001 inch 28 times a minute is much better than when it is fed .005 inch five times a minute. Furthermore, a high work speed greatly facilitates keeping the work cool, for it reduces the time that any particular point on the work remains under the wheel. When a broad surface is being ground, the work under the wheel is difficult to reach with any large volume of coolant, while that out of contact with the wheel is readily supplied.

### Coolant System

For accuracy on any work, and to permit rapid grinding of hardened material, the work must be kept cool at all times. If work is ground dry, the grinding must be done slowly so that the heat generated may be carried away by the parts of the machine and the surrounding air. Therefore on our system all grinding of metal is done wet. This means more than merely flooding the work with water after it comes out from under the wheel, for to heat the work and then suddenly cool it is perhaps worse than letting it remain hot. The water system applies the water where the heat is generated—between the wheel and the work—and absorbs it before the work can become heated. Water is supplied by a one-inch pipe to a passage in the wheel head from which it enters the faceplate carrying the wheel. In the passages of this faceplate it is whirled at the full speed of the wheel and issues from under the cutting face of the wheel with force sufficient to carry it between the wheel and the work in considerable volume. To increase the cooling available on broad surfaces, an auxiliary nozzle is used which floods the work clear of the wheel. The base of the machine serves as the tank for the water and holds 65 gallons. The water passes from this main tank through a removable gate that holds back both the mud at the bottom and any floating dirt into the pump tank at the rear. There a submerged centrifugal pump forces the water to the wheel head and to the outside nozzle. It is interesting to note that the most satisfactory results have been obtained by the use of a solution of seven pounds of soda ash in fifty gallons of water. To this, when grinding steel, one or two quarts of cutting oil may be added, but on cast iron it is advisable to use only the soda and water. Numerous grinding compounds have been tried, but have been unsatisfactory for one or more of the following reasons:

1. They foam so as to overflow the tank. 2. Are opaque and prevent operator from seeing work. 3. They prevent good wheel action on hardened steel. 4. They mix with cast iron chips and form a paste. It should be remembered in this connection that the wheel contact on a surface grinder is very high, being sometimes as great as 25 square inches.

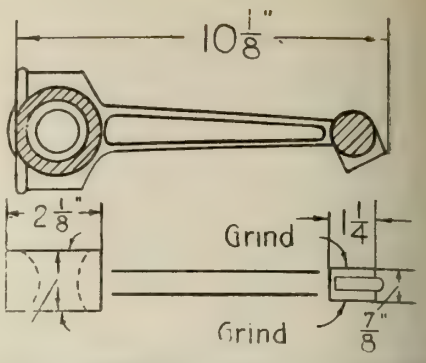



FIG. 23—CONNECTING RODS CAN BE GROUND VERY READILY, AS CAN BE NOTED FROM THIS SKETCH.

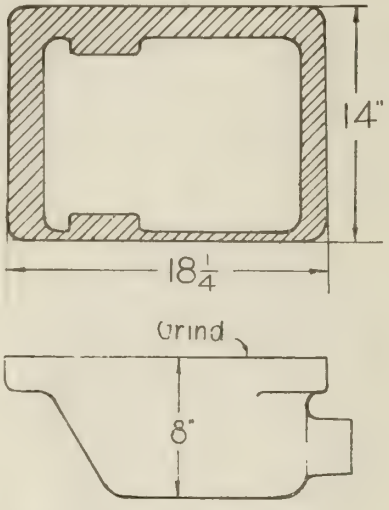



FIG. 22—A GEAR BOX GROUND BY THE SURFACE METHOD.

### The Chuck

Next to the spindle, the chuck is probably the most vital part of a surface

| Material | Width of Surface | Finish and Narrower Surfaces | Best Wheel for Average Work | Faster Cutting and Broader Surfaces | Finer Finish and Narrower Surfaces | Best Wheel for Average Work | Faster Cutting and Broader Surfaces |
|---|---|---|---|---|---|---|---|
| | | Norton Crystolon | | | American Carbolite | | |
| Cast Iron | Narrow | 30-H | 20-I | | 30-H | 20-I | |
| | Medium | 30-G | 20-H | 14-H | | 20-H | 14-I |
| | Broad | | 14-H | | 30-G | 14-H | |
| Chilled Iron | Narrow | | 20-I | | | 20-I | |
| | Medium | | 20-H | | | 20-H | |
| | Broad | | 14-H | | 30-G | 14-H | |
| Bronze | Narrow | | 20-I | 14-I | | 20-I | 14-I |
| | Medium | | 20-H | | | 20-H | 14-H |
| | Broad | | 14-H | | 30-G | 14-H | |
| Aluminum | Narrow | | | | | 20-I | |
| | Medium | | | | | 20-H | |
| | Broad | | | | | 14-H | |
| | | Norton Silicate No. 18 Aluminum | | | American Silicate Corundum | | |
| Malleable Iron | Narrow | | 24-I | | 30-I | 24-1¾ | |
| | Medium | | 24-H | | 30-H | 24-I | |
| | Broad | 30-G | 24-H | | 30-G | 24-I | |
| Cast Steel | Narrow | 30-I | 24-I | | 30-I | 24-1¾ | |
| | Medium | 30-H | 24-H | 14-I | 30-H | 24-I | 14-1¾ |
| | Broad | 24-H | 14-I | | 30-G | 24-I | |
| Steel Castings | Narrow | | 24-I | | 46-I | 24-1¾ | |
| | Medium | | 24-H | 14-I | | 24-I | |
| | Broad | 30-G | | | | 24-I | |
| Hardened Carbon Steel | Narrow | 36-G-H | 30-G-H | | | 30-I | 24-I |
| | Medium | | 30-G-G | 14-H | | 30-H | |
| | Broad | | 30-G-G | | | 30-G | |
| Hardened High speed Steel | Narrow | | 30-G-H | | | 30-I | |
| | Medium | | 30-G-G | | | 30-H | |
| | Broad | | 30-G-G | | | 30-G | |

TABLE NO. 1—WHEELS WHICH HAVE BEEN USED WITH GOOD SUCCESS.

### THE ECONOMY OF USING SOFT, FREE-CUTTING WHEELS

| Data:— | Hard Wheel | Soft Wheel |
|---|---|---|
| Production per hour | 150 pcs. | 200 pcs. |
| Life of wheel | 75 hrs. | 50 hrs. |
| No. of pieces ground by one wheel | 11250 pcs. | 10000 pcs. |
| Example 1—Taking labor at 55c, burden 100% or 55c | | |
| | Costs per 1,000 pieces ground | |
| Wheel cost at $20 per wheel | $1.78 | $2.00 |
| Labor one man at 55c per hour | 3.66 | 2.75 |
| Burden at 55c per hour | 3.66 | 2.75 |
| Total, per 1,000 pieces | $9.10 | $7.50 |
| Saving, by using soft wheel | $1.60 per 1,000 pcs. | |
| | $2.88 per day, 9 hrs. | |
| | $864.00 per year, one shift. | |
| Example 2—Taking labor at 75c, burden 166% or $1.25 | | |
| | Costs per 1,000 pieces ground | |
| Wheel cost at $20 per wheel | $1.78 | $2.00 |
| Labor one man at 75c per hour | 5.00 | 3.75 |
| Burden at $1.25 per hour | 8.34 | 6.25 |
| Total, per 1,000 pieces | $15.12 | $12.00 |
| Saving, by using soft wheel | $3.12 per 1,000 pcs. | |
| | $5.62 per day, 9 hours. | |
| | $1,686.00 per year, one shift. | |

TABLE NO. 2—SHOWING THE SAVING EFFECTED BY USING SOFT, FREE-CUTTING WHEELS.

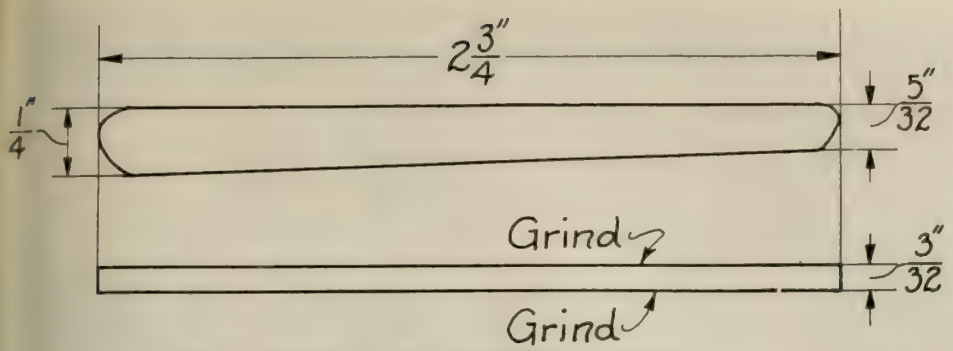



FIG. 24—REAMER BLADE SUCCESSFULLY GROUND.

grinder. The chuck bodies on our machines are made from a solid disc of forged steel in which are machined on one side large concentric grooves to receive the coils, and on the other side numerous small grooves which are later filled with hard brass strip. This leaves a continuous layer of steel extending under the entire face of the chuck, making leakage of water into the coils an absolute impossibility. The coils are form wound, vacuum impregnated, and are sealed in place with an insulating compound, making the completed chuck solid, with no air spaces. This eliminates trouble from sweating and does away with the need for ventilation of the chuck.

The working face is composed of steel and brass in alternate rings. So close is the spacing of the steel poles that a piece of work as small as a 25-cent piece will touch two or more poles, no matter where placed. The chuck will hold large or small pieces equally well, and once ground true will remain much longer in this condition than chucks having cast-iron and soft metal in the face. Also the annoyance due to grit charging the soft metal and making bad scratches on the work cannot occur when the chuck is of the construction spoken of. Owing to the close spacing of poles, it is not necessary to provide perforated plates for locating any but the smallest work.

### Wheels Used

Little has been said up to the present concerning the grinding wheels used, beyond indicating that the soft, free-cutting wheel is the most satisfactory. Not only is a soft wheel satisfactory from the viewpoint of the production manager but it is the most economical wheel when studied from the desk of the cost accountant. The first reason for satisfaction with a soft wheel may be explained in this manner:

Any one grain of abrasive in the grinding wheel should cut until it loses its cutting edge, and then it should either fracture and present a new edge, or be torn from the wheel by the increased friction due to its dull edge. If the bond of the wheel is so strong that the grain must get exceedingly dull before it is dislodged (i.e., if the wheel is hard) much power is absorbed in useless friction, for the grain rubs but does not cut. These dull grains not only waste power but their presence reduces the number of effective grains in the wheel face, and so reduces the rate at which metal can be removed from the work.

Considering this same subject from the cost standpoint, let us show some figures in table No. 1 gathered from an actual machine operation to prove the point.

It should be remembered that this is not the most striking case of the economy of free-cutting wheels, but is an average example, also that in a wheel which is altogether too soft the grains are torn out before they become dull and are thus wasted. At table No. 2 is shown a tabulated list of the grains and grades of the wheels which we have found satisfactory on certain work.

### ORGANIZED MOTORING

As an example of the degree to which motoring in Great Britain has been organized—wholly by private enterprise—the "sentry boxes" instituted at various points along the main country roads by the automobile association are very striking. The sentries on duty at these boxes provide information on routes, road conditions, hotels, and so on, to motorists, and they are also available to assist in repairing breakdowns or in securing relief cars with the utmost promptitude. The boxes are provided with telephones. A short time ago the members of the association were provided with keys to enable them to open the boxes and use the telephones during the hours when the sentries were not on duty. The latest development is to illuminate each box so that its position may be readily discovered after dark.

In a certain plant, where polishing is a major operation, a special work bench of grated construction is used. Not only is the polishing completed on this bench, but the dust is immediately drawn down through the grating. The air is perfectly clear, thus the bench serves a double purpose.

# *Sheet Metal Work*

## *Development of Funnel and Spout*

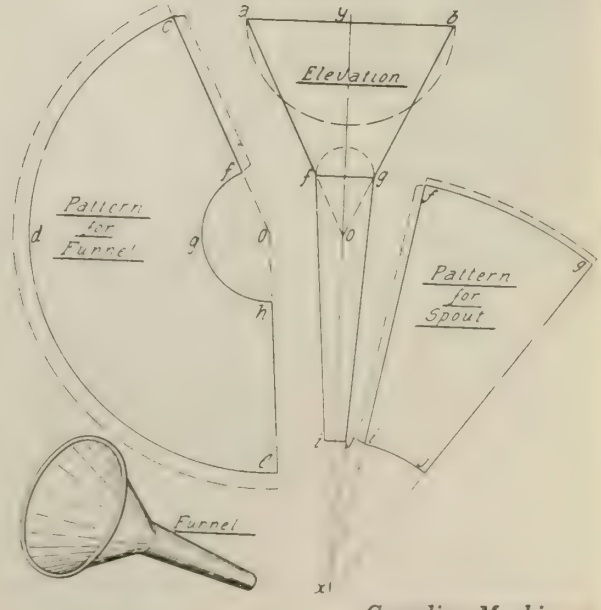
Sketch shows elevation (centre) and the developed patterns for the funnel (left) and the spout (right).

The elevation, giving the necessary dimensions is first drawn, using the centre line X Y as a base. The sides are prolonged until they cut the centre line at O and X. With O as a centre and radius O A, describe the arc C D E, also the arc F G H, the latter with a radius F G. Make the arc C D E equal to the circumference of the mouth of the funnel and complete the pattern by drawing the necessary radii at each end.

The spout pattern is developed in the same way, using X as a centre with the radii as shown.

For wiring and seaming purposes additional metal is added, as indicated by the dotted lines.

If dies are to be made for punching out the blanks, it is well to make a few samples by hand before deciding on the final shape.




*Canadian Machinery*

# Manufacturing a Lightning Mixer and Beater

## Production Methods Must Be As Low As Possible—Various Dies Used Including Blanking and Forming—Depressing and Trimming, Also Piercing and Marking—Effective Twisting Fixture

By ROBERT MAWSON

IT is a well-known fact that to make a household necessity a success the price must be as low as possible. This in turn means that the production methods must be as economical as pos sible for otherwise the price could not be kept down.

The article to follow describes the operations followed out in manufacturing a certain kitchen convenience, known as the Roberts lightning mixer and beater. According to the maker's claims, it can be used to beat eggs, whip cream, mix mayonnaise, churn butter and other such tasks. However, we are not so much interested in its qualities as we are in the method of its manufacture. In order, however, that readers can form some idea of its general appearance we show the device at Fig. 2.

### Actual Operations

Fig. 2 depicts the punch and die employed to blank and form the cover. The punch B is made with a similar contour to that of the cover and is held by means of a shank in the ram of the punch press. The die is held rigidly on the table of the machine with two bolts fitting in the slots of the base. The strip steel is fed between the punch and die and, as the former descends, the material is blanked out. The outside diameter of the punch is a good sliding fit inside the steel ring of the die B, this accounting for the operation. As the punch continues to descend, the blank is formed between the hollow portion of the punch and the sliding plunger D of the die.

This plunger has a shank which passes through the base of the die and is held so that it cannot come out with nuts. Between these nuts and the large diameter of the plunger are placed a series of rubber discs. As the punch is fed down, the blank is formed, the rubber discs being compressed, but as the punch returns these discs resume their original thickness and raise the plunger D. This in turn forces the blanked and formed cover out of the die so that it can be easily removed by the operator. One of the covers after the operation described is illustrated at E.

The cover is then placed on the die, Fig. 3, being located by means of the four stops A, and the next operation of forming depression and trimming is performed.

The punch B is held in the ram of press in the usual manner, and, as it is fed down, it first trims off the outside edge. The machine in which this operation is performed is of the double acting type, and the second stroke forces down the ram or former C, thus making the depression in the cover.

The punch is also provided with a cutting tool D, which slits the portion of the cover trimmed off, and as these slit sections build up on the punch they automatically fall away from the tool, or, if need be, can be easily removed by the operator.

The illustration, Fig. 4, shows the tools for piercing the centre hole and marking. The cover A is placed on the die after it has been fastened securely on the table of the press, and the punch attached in the machine ram. The punch is then fed down and the hole pierced and the letters formed on the cover as shown by the sample A. This completes the operations on the cover.

The first operation when making the dasher is blanking and punching the holes, and the tools employed are illustrated in Fig. 5. The strip is fed over the die A, which is held in a bolster on the punch-press table. It will be noticed that the various piercing tools used are




FIG. 1—COMPLETED ARTICLE

FIG. 8—FIXTURE FOR TWISTING THE STEM.

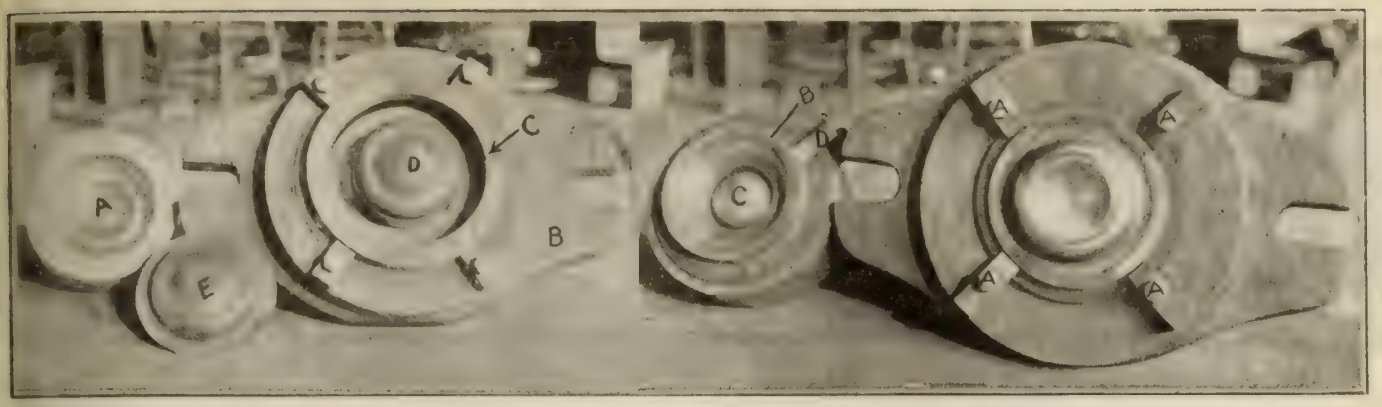



FIG. 2.—BLANKING AND FORMING COVER.




FIG. 3.—FORMING DEPRESSION AND TRIMMING.

arried in the die, the cross-shaped sec-on being made a sliding fit in the die nd operated by rubber pads as pre-iously described.

The punch is then fed down and it rst blanks out the dasher, and, as this pushed down with the continued troke, the holes are then punched out y means of stationary tools in the die. he stripper plate C is held between the unch and die and removes the part as he punch is drawn back with the ma-pression shown in the centre of the dasher C. The tools are held in the machine in a similar manner to that already described.

When making the stem the material is purchased in a rectangular form of the proper dimensions and is fed into the die shown at Fig. 7 against the stop B, which is made adjustable so that this tool may be used for making stems for both the pint and quart sizes.

The punch C is then fed down with However, the duty that it has to perform is only light and it answers the purpose very well.

The dasher is first riveted on to the stem, using a standard machine for the work. This is then placed into the fixture with the dasher resting against the end A. The headless set screw B is next tightened to hold the stem rigidly.

The free end of the stem sets into a slotted portion of the chuck C, the handle D is then given two and a half




FIG. 4—PUNCHING HOLE AND STAMPING.

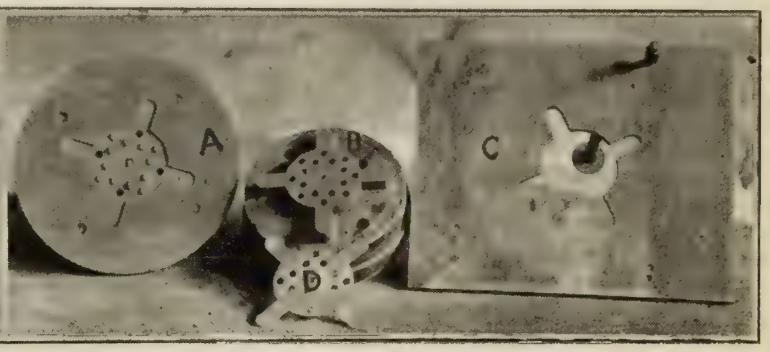



FIG. 5—BLANKING AND PIERCING DASHER.

ne. One of the dashers after going rough these operations is shown at D.

**Forming Depression**

The part is now ready for the next peration, which is bending prongs and rming depression, and the tools used e shown in Fig. 6. The blank is laced in die A and the punch B fed own with the press. This action first ends back the prongs, and the con-nuation of the stroke makes the de-the press and the strip stock is cut and one end blanked with a short cut away portion as D and the strip which has been cut to length made with a long portion as E. By this method the punch forms the beginning of one stem and completes another stem in one operation.

A somewhat crude tool is used for the next operation, which is twisting the stem, and is illustrated in Fig. 8. revolutions, and, as the handle comes in contact with the driver E, the stem is twisted to the shape shown by the sample F.

The twisted stem is next placed through the slot in the cover and a porcelain knob riveted on. The various parts now assume the condition of the finished work and only require placing on to one of the glass containers when the device is ready for service.

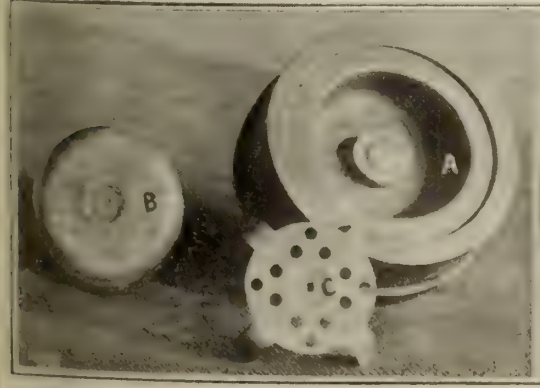



FIG. 6—BENDING AND FORMING DEPRESSION.

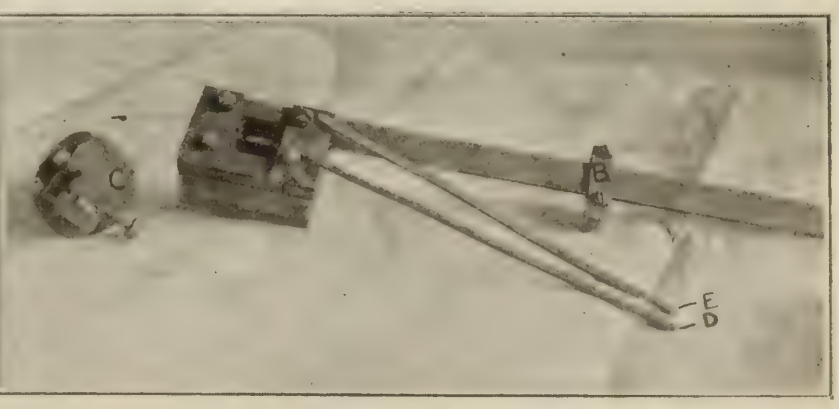



FIG. 7—BLANKING NOTCHES IN STEM.



# WHAT OUR READERS THINK AND DO



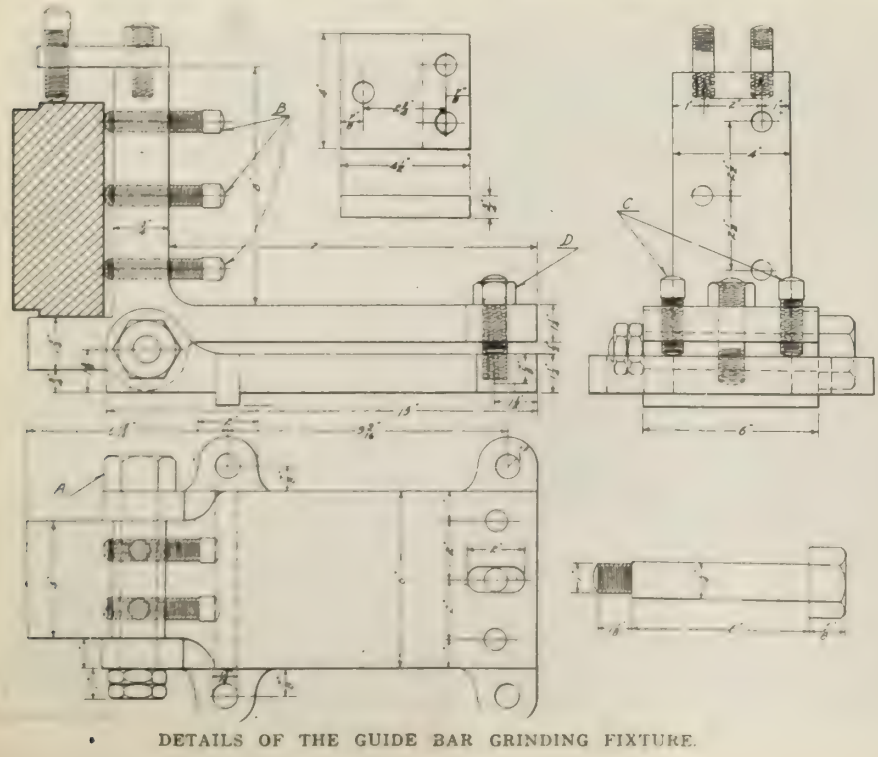
## GRINDING LOCOMOTIVE GUIDE BARS.

By F. C. H.

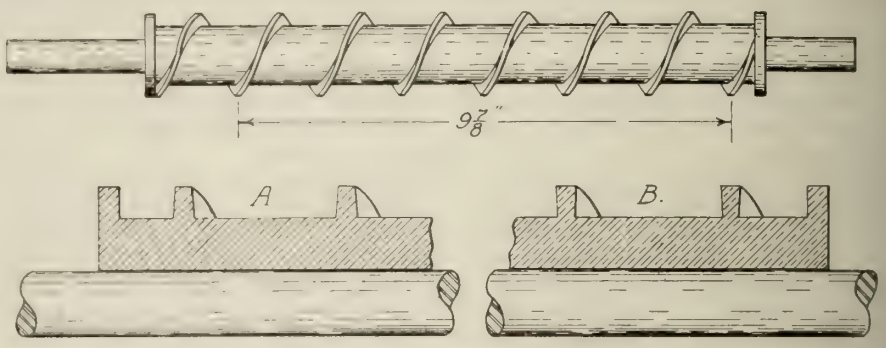
The jig as shown was designed to facilitate the grinding of locomotive repair guide bars. It is the practice, at least it is our practice, to remove as little as possible from the wearing face of the bar. To accomplish this it is often necessary to throw the bar out of line, or out of square, with the other machined surfaces of the guide bar, to square the wearing face with the grinding wheel.

These guide bars were previously secured to table with ordinary clamps, bolts and packing, and to make the necessary adjustment to square wearing face of bar to wheel it necessitated the slacking off of bolts and clamps at each adjustment, often requiring several trials before final adjustment was made. With the aid of these jigs, of which there are two, each being composed of a base secured to machine table, the one which holds the bar being attached to the base by knuckle pin A, the time required to set bars was reduced considerably.

The guide bar is placed in jigs as shown, set pins B allow the guide bar to be moved towards wheel at either end to bring same in alignment with wheel, while set pins C allow guide bar to be set over or tilted to square the wearing face of bar with the wheel. The nut on stud D is tightened after each adjustment.




DETAILS OF THE GUIDE BAR GRINDING FIXTURE.




WE DESIRE AS MANY REPLIES AS POSSIBLE ON THIS SCREW CUTTING QUERY.

## SCREW CUTTING QUERY

By J. H. R.

The sketch herewith shows a brass roll cast upon a steel shaft. These rolls were intended for use on a corn husker, and it was required to insert a strip of rubber between the helical rib throughout the entire length. As the casting came from the foundry the rib had a slight draft as shown at (A), but in order to provide a better grip for the rubber, it was decided to under cut the rib as at (B).

After measuring up the pitch of the rough casting it was found that this was approximately six turns in 9⅞ inches. This was a pitch of 1.6458 inches. On a lathe with a four thread lead screw, and a range of change gears from 20 to 80 (advancing by 5), including one of 69 teeth, what gears would be best suited for facing off the sides of the rib? If a new gear had to be made, what number of teeth would give the greatest accuracy?

Replies from readers on the solution of this problem—or any of similar character—would be appreciated.—Editor.

### COLOR VERSUS HARDNESS

Quite often a workman spends considerable time in carefully drawing the temper of a piece of carbon steel, only to find to his dismay that it is soft, while yet the color is real light brown! It upsets his ideas of steel and hardening. Really, the trouble is that the piece was not hard when taken from the water. Either it was not hot enough to harden when dipped, or else it was removed from the bath too soon and drew itself before the black was polished off. Test the piece as soon as taken out of the hardening bath—it is quite apt to prove soft. Remember that the same colors can be produced on a piece of mild steel but they do not indicate a state of hardness.

## GRINDING AUTOMOBILE DRIVE GEARS

By A. J. QUINLAN

The drawing herewith illustrates a neat method of setting and holding a drive gear in a Heald, or other internal grinding machine, when grinding the bore. The finished bore must be concentric with the pitch circumference of the teeth, and as the teeth are cut with the blank held on an arbor cloely fitting the bore in the "green" size, it is evident that the gear is located from the same bore for grinding the final size, and this will bring the bore concentric, provided that the heat treatment has not disturbed the relation of the pitch circumference to the bore, or warped the gear out of round. When the heat treating is properly done the percentage of gears so distorted is very small.

The grinding fixture shown is made from a standard magnetic chuck. A hole was bored through the center and a brass bushing (3) pressed in. Inside this is pressed a hardened steel bushing which is ground dead true after the chuck is in place on the machine spindle. The brass bushing obstructs the magnetic lines. The steel bushing forms the bearing for the locating gauge composed of the shank (2) and the plate (1).

On the face of the chuck are fastened 18 steel blocks, which are really extensions of the small magnets embedded in the face of the chuck. These blocks hold the gear one inch out from the face of the chuck, allowing grinding wheel clearance after the gauge plate has been pulled back against the face of the chuck, by the draw bar operating through the spindle of the machine. These blocks are pack hardened machinery steel and the faces in contact with the chuck magnets have the "case" ground off to expose the soft core directly to the magnetic lines. A ring of babbitt is poured around the blocks, covering all but the working faces, to prevent the accumulation of chips. The face is ground off smooth and flush. The gauge plate (1) is ground cone-shaped and has three locating spots on which the gear is centered. The switch is then thrown in and the gauge plate pulled back to the face of the chuck, leaving the gear ready for grinding. This outfit is very fast, the operation being measured in seconds. The fixture is adaptable to different sizes of gears by simply changing the gauge plate (1) to the size of the piece to be ground.

## FORCING HOME A PISTON HEAD

A nut that came off inside the cylinder brought us the job of making a new rod and piston. We made a splendid fit of these but we had no good way of getting the head clear up to the shoulder on the rod. There was no press within fifty miles and we knew that we would injure something if we used the 24-lb. sledge as a "persuader."

Finally we jarred the head on. It was already within an inch of the shoulder and we turned the assembly, head in the air, resting the cross head end of the rod on a piece of 3" x 12" maple plank. A length of rope to the roof truss prevented it from toppling and acted as a safety. A foot of 4" pipe secured to the plank guided the lower end. Then four good men lifted the job about 6" at a time and let it drop, soon getting the desired position with this 200-lb. head.

## CLEANING BURRS FROM THREADS

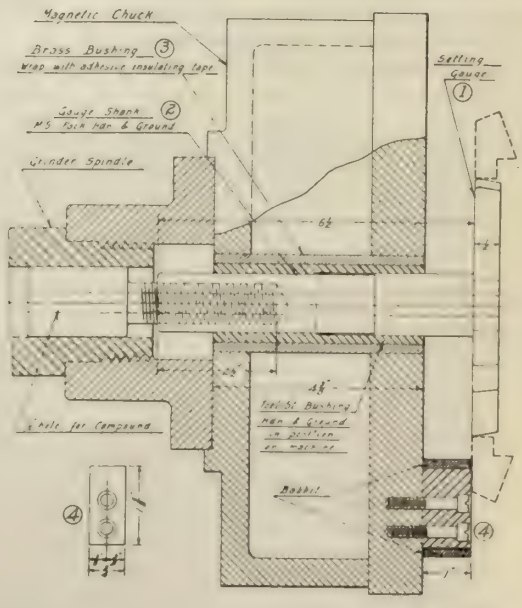
We had a screw used in our manufacturing that was milled flat across the end after it came from the automatics. The amount removed varied from 1/16 to 1/8, which was necessary to bring the starting of the thread in relation to other parts. After milling, the burr had to be entirely removed from the last thread to facilitate assembling. This was a slow, laborious job as accomplished with a file. The thread was a special 29 degree type.

The head of the department hit upon a scheme for removing these burrs that is worthy of wider use. We had sectional wire brushes, eight inches in diameter, that were used to clean up discolored drawn brass and steel parts and were discarded when worn within half an inch of the flanges which retained the bristles. A section of such a worn brush lying around served as the germ of the idea that proved so successful. One of these mounted on an emery stand became instantly a flexible, revolving file. With the screws resting in a V rest just at one side of the brush, they were revolved by hand against the wire brush and every particle of burr cleaned from the thread in an instant. The little burr thrown up, or left, on the end of the screw was unimportant. Ninety-five per cent. of the former time was saved and a better grade of work performed.

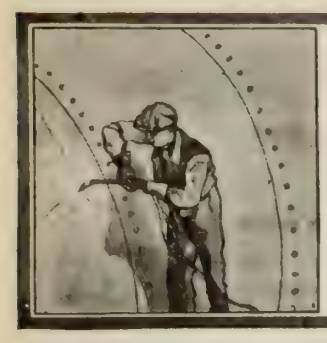
The city of Hamilton is being urged by the local Hydro department to build a city hall annex at an estimated cost of $225,000.

# *Grinding Automobile Drive Gears*

Sketch shows the arrangement of a magnetic chuck for the grinding of automobile drive gears. The chuck is bored to receive the brass bush (3) which is covered with insulating tape to break the magnetic lines. The steel bushing is pressed in and afterwards ground in position to a push fit for the gauge shank (2), on the front of which is secured the gauge plate (1). This plate has three locating spots to set the gear concentric. Eighteen small hardened blocks (4) are fastened to the chuck face. These blocks are completely enclosed in babbitt to eliminate the possibility of adhesion of chips. The gauge shank is threaded to the draw rod so that the gauge plate (1) can be drawn back after the gear has been placed in position and the switch thrown in. This device provides both accurate and rapid setting of the work. Gauge plates of different sizes may be made if desired.




*Canadian Machinery*



# WELDING AND CUTTING



# Welding Irregular Shaped Fresh Water Tanks

## Range and Application of Electric Arc Welding Constantly Growing Wider—Repairing Air Compressor Cylinder by Studding Process—Welding Small Vertical Engine Frame

By R. E. SMYTHIES*

THIS article deals with autogenous welding by the electric arc process as distinct from electric butt and spot welding. In passing, it may be mentioned that butt welding is an unfortunate expression, by which we mean that it is misleading and ambiguous. It is used promiscuously to designate the joining of two pieces of bar stock by the resistance-welding process, and the joining of the butting edges of two steel plates, for instance, by the electric arc process. It is a pity that we ever got away from the technically correct term resistance-welding to the popular but confusing application of the term butt welding to the resistance process.

Arc welding may be described as a welding process which is in many ways similar to the oxy-acetylene process in both range and method of application, the welding heat being produced by the flame of the electric arc instead of by the combustion of gases in a specially designed torch. The temperature of the electric arc is higher than that of the gas flame, being over 6,000 degrees F., and the heat is more concentrated.

The question is often asked, "Which is the better process?" It is impossible to return a direct answer to this question. At the present stage of development it is only safe to say that some jobs can be done better by the one process and some by the other, while some can be done just as well by either. Also, each process can be used for certain applications which it is not practicable to carry out with the other.

In my opinion it is safe to say that any job that can be done by either process can be done at a much lower cost by the electric arc, especially where current is as cheap as it is in Canada. The first cost of a good direct current welder complete with equipment necessary for all ordinary jobs of welding, will be from $1,200 up, which is much higher than the cost of a gas welding outfit. The cost for current to run a 150 ampere welder, however, would be about $10 per month in most parts of Canada, and this is the only expense apart from rent and other purely overhead expenses which are common to both systems.

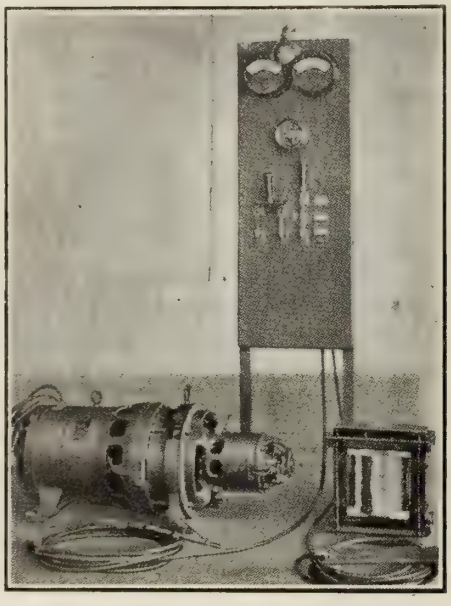


FIG. 1—LINCOLN ARC WELDER USED WHEN THE SHOP SUPPLY IS ALTERNATING CURRENT.

There is no constant handling of gas cylinders in and out, no risk of explosion and practically none of fire. With a well-designed direct current welder there is no risk of shock, on account of the very low voltage of the welding circuit, which is usually 20-30 volts. The electric welder shown in Fig. 1 is designed for use where the power supply is alternating current. It consists of a compact, three-bearing motor-generator-set, with switchboard, stabilizer and other accessories. The motor is suitable for operation on the supply current available, and the welding current is furnished by the specially designed D.C. generator which is of the variable voltage type with separate, direct coupled exciter.

A knowledge of electricity is not necessary to the making of a good electric welder, though it is necessary to a complete grasp of the design and workings

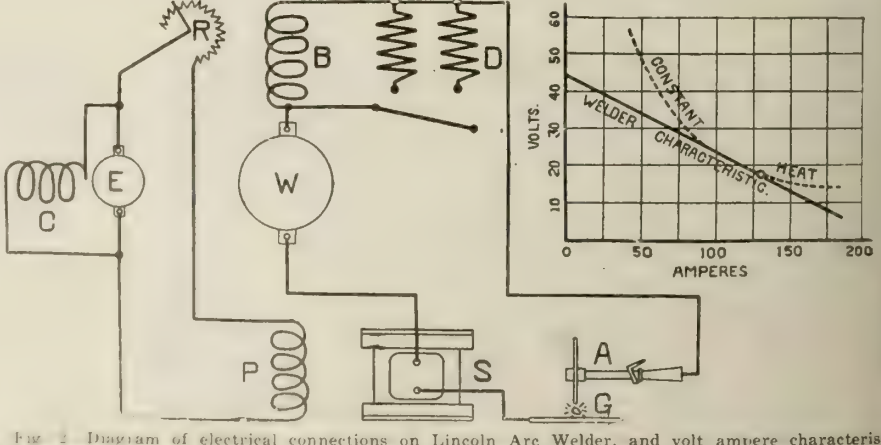



Fig. 2—Diagram of electrical connections on Lincoln Arc Welder, and volt ampere characteristic. "A" represents electrode holder; "B" series field (differential connection); "C" exciter shunt field; "D" diverter resistance; "E" exciter; "G" ground plate; "P" separately excited field; "R" rheostat; "S" stabilizer; "W" welding generator.

*The author is chief engineer for the Lincoln Electric Co., Toronto, Canada, and is an authority on the electric arc process. His chief object in preparing this material is to bring before Canadian manufacturers the possibilities of this process of welding.

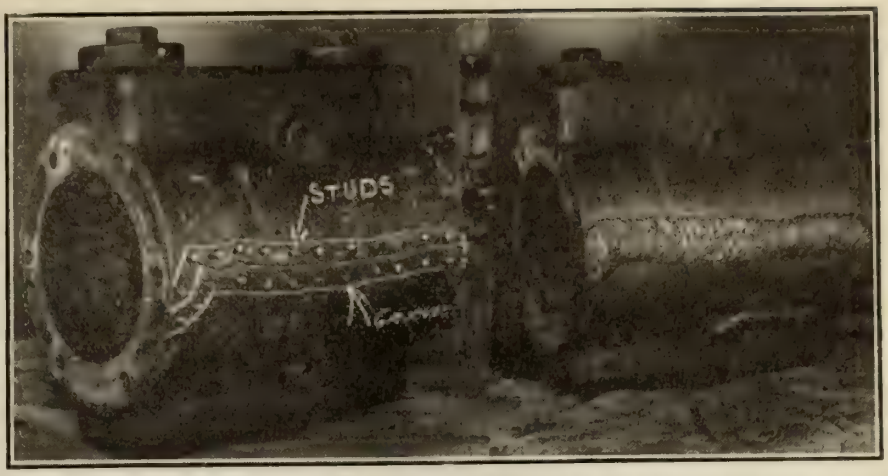
of the machine. For the benefit of the man who has had electrical experience, it is sufficient to state that the welding generator is a specially designed, separately excited generator with a differential compound winding, and that an inductive ballast is used in the arc circuit.

The diagram shown at Fig. 2 depicts the volt-ampere characteristic and wiring diagram of the welding generator.

The secret of the successful application of arc welding to every-day commercial uses lies in the design of the generator. There have been many attempts to use ordinary D. C. generators for welding purposes, with but indifferent success so far as our experience goes. It is extravagant at the best, owing to the fact that more current is wasted than used, and a much higher degree of skill in the operator is necessary, as the arc is harder to hold. With a specially designed generator the arc is steady and easy to hold, commutation troubles are unknown, and the overall efficiency of the machine is very high.

The range of application of electric arc welding is very wide and constantly growing wider. In this connection it may be said that Canada is behind other countries in the use and application of the process. She is considerably behind the United States, and Great Britain is ahead of both. In England, steel structures are actually being erected in which electric welding takes the place of riveting, and, further than this, a high pressure marine boiler has been built without a rivet in it, and has now been in use for some time.

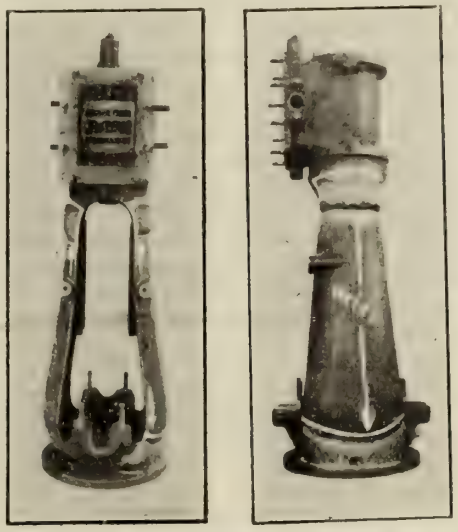
Unquestionably Canadians should wake up to the possibilities of the process. With our cheap and plentiful electric power it should have a most important bearing on the immediate future development of many branches of the engineering industries. It might even go a long way towards putting shipbuilding on a practical commercial basis in Canada. Experimental sea-going vessels have been built entirely by electric welding, at a great reduction in cost over




FIGS. 4 AND 5—AIR COMPRESSOR CYLINDER THAT WAS REPAIRED BY THE ELECTRIC ARC PROCESS.

riveted construction, even in England, where electric power is far from cheap.

The tanks shown in Fig. 3 illustrate this point. They are ship's fresh water



FIGS. 6 AND 7—SHOWING HOW VERTICAL ENGINE FRAME WAS REPAIRED.

tanks, irregular in shape, made of quarter-inch steel and tested to 20 pounds pressure when finished. On fourteen such tanks there was a total of 2,000 linear feet of welding. The work was done by one man using the metal electrode process, in nineteen days of nine hours each, which is equal to an average rate of 11.7 feet per hour. The total cost of welding was 40 per cent. of the cost of riveting the same job. In this connection it may be noted that under certain conditions very much higher welding speeds may be obtained on this class of work, using a carbon electrode.

One difficulty, against which advocates of electric welding have to labor constantly, is the popular delusion that welding of any kind is essentially a process for repairing broken or defective parts. Repair work is a minor, though useful application. The big field for future development is in the application of arc welding to manufacturing processes in all branches of the iron and steel industry. The metals that are most commonly welded by the electric arc are steel, steel castings and cast iron. Malleable castings can be welded, and it is quite practicable to join malleable iron to steel. Copper can be welded to steel, and certain applications have been made in welding brass and bronze. Mild steel is probably the easiest metal to weld and the best for a beginner to start on. Any man of average intelli-

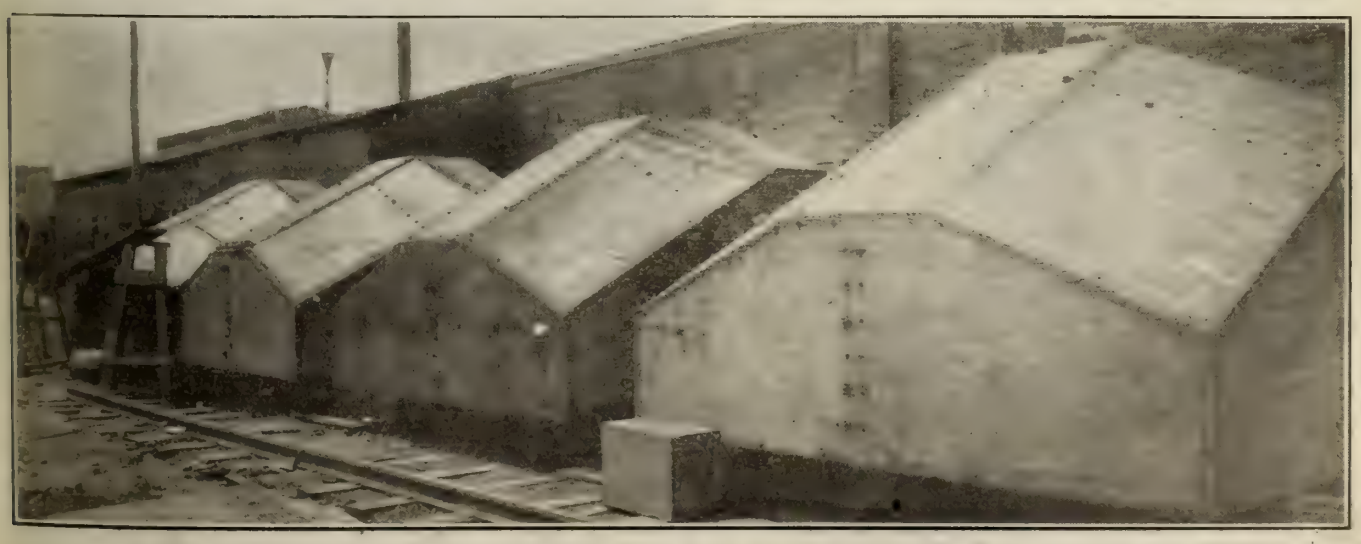


FIG. 3 THIS SHOWS SOME OF THE TANKS THAT WERE WELDED BY THE ELECTRIC ARC PROCESS.

gence can be taught to do straightforward welding such as the construction of steel storage or low-pressure tanks, in two or three weeks. High welding speed and the ability to turn out a good smooth job come with practice. Cast steel is also easy to work. It can be welded electrically without pre-heating and with the certainty of getting a good strong weld capable of standing high pressure and tremendous bending, twisting and tensile stresses.

With regard to cast iron, it is better not to make sweeping statements. Every cast iron job is a problem by itself and must be approached as such, and with due respect for the text-books which declare that cast iron cannot be welded. Recent developments have tended to furnish grounds for some revision of the text-books in this respect.

It has been found that by using certain special electrodes, what appears to be practically perfect fusion can be obtained in a cast iron weld. It is possible to fill up a hole in an iron casting and then drill a hole, half in the original casting and half in the added metal, the line of fusion not being discernible. Such welds will also have considerable tensile strength.

When speaking of welding cast iron, we mean welding without pre-heating the castings. It is considered that experimental and research work should be conducted along these lines, because, broadly speaking, pre-heating presents so many difficulties and drawbacks that any welding process which depends on it for a reasonable measure of success is necessarily subject to serious limitations on that score. The cost of pre-heating small castings is often more than they are worth, while apparatus for heating large castings is costly and bulky. Castings of complicated pattern and thin section such as automobile cylinder blocks are frequently warped or cracked in the pre-heating or subsequent cooling process.

Small castings such as handles, levers, etc., can be electrically welded very quickly and successfully by what is known as the carbon arc process. This consists of using a carbon pencil with which to strike the arc and holding a cast iron filler rod in the flame to melt and form the added metal. This method makes a very strong, smooth-looking weld and is strongly advocated for all such jobs.

The carbon electrode process is not suitable where consideration has to be given to expansion and contraction strains due to local heating and cooling of certain parts of a complicated casting such as a cylinder, press frame or any box section casting. These must be done by one or other of the various suitable metal electrodes or by what is known as the studding process.

The accompanying views at Fig. 4 and 5 depict an air compressor cylinder which was repaired by the studding process, and these illustrate the method more clearly than any number of descriptive paragraphs could ever do. Holes are drilled and tapped on each side of the crack, studs screwed in tight and left protruding about one-half inch from the cast iron. A metal electrode is then used to lace the studs together, the finished weld having the appearance of a rough steel plaster over the crack. As the weld cools there is usually just enough contraction to draw the crack tight. A weld made by this process is surprisingly strong. A great number have been made to the writer's knowledge on punch press frames and similar castings, subject to heavy working stresses, without a single known case of failure.

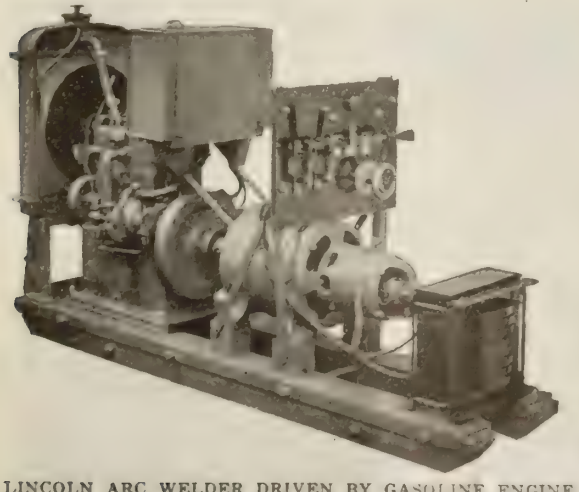
Figs. 6 and 7 show a small vertical steam engine that, to my mind, is one of the most remarkable pieces of "surgery" ever carried out by a job-welding shop. The frame of this engine was completely broken in three pieces, not merely cracked. When welded by dint of much patience and the studding process, it was perfectly true and as strong as ever!

Last August the same process was used in what was probably one of the most important marine repair jobs ever carried out on the Great Lakes. The steamer Chippewa suddenly developed a 40-inch crack in her main engine cylinder, which is 5 feet 6 inches in diameter by 11-ft. stroke. It took only twenty-six hours straight work to weld that crack up, so the well-known Niagara boat was not out of commission very long. So far as we know, the only alternative was to lay her up for the rest of the season.

Fig. 8 illustrates a piece of salvage which was well worth while. A broken tooth in this steel gear out of an English made automobile was built up by the electric arc. A special steel electrode was used to produce a hardened surface. This work can be done without softening the adjacent teeth. The replacement cost in this case would have been thirty times the actual charge made for welding.

A few weeks ago a remarkable repair job was carried out on a 1,000 k. w. motor generator set in a station of the Toronto and Niagara power company. A revolving cast steel spider about eight feet in diameter, having field coils on the periphery was found to have three adjacent spokes cracked clean through. Replacement would have cost many hundreds, possibly two or three thousand dollars, as well as tying a badly needed machine up for many weeks. The electric welder repaired the damage in two days, without removing or disturbing any part of the machine.

In an article of this nature it is, of course, only possible to give the barest outline of arc welding, its present applications and future possibilities. To the engineer who has looked into the matter to any extent, the possibilities seem unlimited. It is to be hoped sincerely that Canadian engineers and manufacturers will wake up shortly to some more of these possibilities. At present their English and American confreres and competitors are ahead of them, on arc welding at any rate!



LINCOLN ARC WELDER DRIVEN BY GASOLINE ENGINE. THIS TYPE OF WELDER CAN BE MOUNTED IN ANY STYLE DESIRED, AND CAN BE TAKEN TO WHATEVER PLACE THE WORK IS BEING DONE.

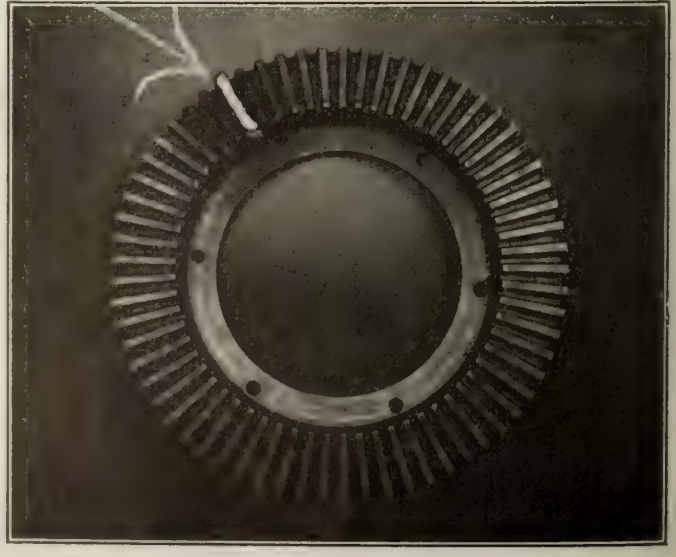
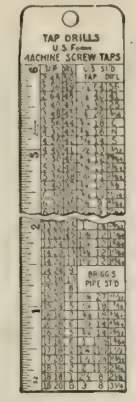


FIG. 8—THE TOOTH ON THIS GEAR WAS BUILT UP BY THE ARC WELDER USING A STEEL ELECTRODE TO PRODUCE A HARDENED SURFACE.

# Improve Your Powers of Perception—Try This Contest

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.




The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

## What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

B. Back, Hamilton, Ont., is the prize winner for April 14th contest. Chas. E. Mars, Brantford and J. A. Scarsbrook, Winnipeg, had correct lists, but lost out in the regular elimination test. One of the contestants asks this question: "Can the same advertisement be allotted to two different questions." Our answer to this is "No." We always use one question to one advertisement.

**CONTEST FOR MAY 5TH ISSUE**

**Contestants are required to write us, stating to which advertisements we refer in this number.**

1—Something that is elusive

2—How to save fuel, increase production, and lower maintenance costs.

3—How to save a good deal of time and expense.

4—Something that arrives at the tool under 80 lbs. pressure.

5—A chance to do a great favor.

6—Something that is made at customers' specifications.

7—A machine that has been in operation for three years.

8—Something that is said to encircle the globe.

9—How to get your work out ahead of schedule.

10—Something that deserves consideration.

11—A certain line that differs.

12—A product that takes heat away from the tool.

**These are Correct Answers for List from April 14th Issue:**

1—Fairbanks-Morse Co.

2—John Bertram & Sons Co., Ltd.

3—Hendey Machine Co.

4—Butterfield & Co.

5—Crane Ltd.

6—John T. Hepburn, Ltd.

7—W. S. Rockwell Co.

8—Bristol Co.

9—Geometric Tool Co.

10—Nicholson File Co.

11—Pratt & Whitney Co.

12—Brown & Sharpe Co.

## Closing Date for This Contest is May 26th

# A.W.
## Their Reputation Encircles the Entire Globe

# ENGINEERS' SMALL

## Gear Cutters
## Reamers

The **High Speed Steel and Carbon Steels** u[sed] in our tools are the result of many years af **actu[al] manufacture and careful research in our o[wn] mills.** Therefore the quality is assured.

*Our Nam[e]*

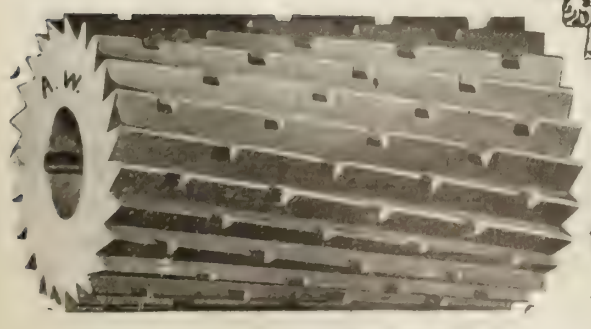
ARMSTRON[G]

**Works:**
**Longueuil, Que.**

**CANAI[DA]**

Messrs. Sir W. G. Armstrong Whi[tworth] & Co., E[ngland]

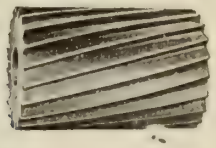
Messrs. Armstrong & Main Ltd., Constructional Engineers, G[lasgow]




WHI[TWORTH]

# ARMSTRONG

TRADE MARK



## TOOLS

## Milling Cutters
## Drills, etc., etc.

We combine **scientific methods** with an **intimate knowledge of working conditions.** Result—**Accuracy and Endurance,** which have led machinists to insist on **"A.W." Tools.**

*Ask for Every Tool*

## WHITWORTH *of* Canada Limited

Head Office:
29 St. James St., Montreal

Branches:
Toronto, Winnipeg

REPRESENTATIVES FOR

Messrs. Crompton & Co. Ltd.,
Electrical Engineers, London.

Messrs. Armstrong Siddeley
Motor Cars, Coventry.

Messrs. Partington Iron & Steel
Works, Manchester.

Messrs. Pearson & Knowles Ltd.,
Steel & Iron Manufacturers,
Warrington.



WORTH



# A Heavy Duty Railroad Shaper of New Desig

## This Machine Uses the Draw Cut—Claims Are Made for This Principle — Details of Construction — Examples of Work Produced, and Other Features, Dealing With Points in Design

A SPECIAL heavy-duty railroad shaper has been placed on the market by the Morton Manufacturing Co., Muskegon Heights, Mich. This company has concentrated its efforts in developing the application of the "draw-cut" principle to shapers, vertical and horizontal travelling head planers and keyway cutting machines. They have made a study of the methods of production in railroad shops, and the shaper described has been developed to fill the demand for increased production of driving boxes, crown brasses, shoes and wedges, and connecting rod brasses. While we shall describe the standard style, it is to be understood that these machines can be adapted to any special requirements.

Speaking on the draw cut principle this concern make the following claims: Owing to the ram being in tension, rather than compression, the tool adjusts itself to inequalities in the surface of work as it is being drawn through, thus allowing deeper and heavier cuts to be taken. Vibration is practically eliminated, smoother work is obtainable, and special forming tools can be used to advantage. Cutting strains to the various bearings are eliminated, and tools can be used with greater clearance angles, this reducing the cutting friction, at the same time increasing the life of the tool. Shaping to lines can be easily and accurately accomplished, as the lines are always in full view and are not broken until the tool cuts them out. It is also claimed that this style shaper is a multi-duty machine, as well as a specialized railroad tool, and that the changing of machine from one class of work to another is rapidly accomplished.

### Details of Construction

The column is a heavy box section casting provided with square rail bearings. All running bearings are fitted into accurately bored holes and held in position by bolts. This makes the use of dowel pins unnecessary, and maintains the alignment and rigidity of the journals. The cross-rail moves on square bearings at the front of the column. It is raised and lowered by nuts and screws and can be clamped quickly in any position. It is provided with gibs adjustable for wear. A counterbalance for the cross-rail is furnished on account of the weight of the special attachments. The saddle is fitted to square rail bearings on the cross-rail. Angular gibs provide the adjustment for wear.

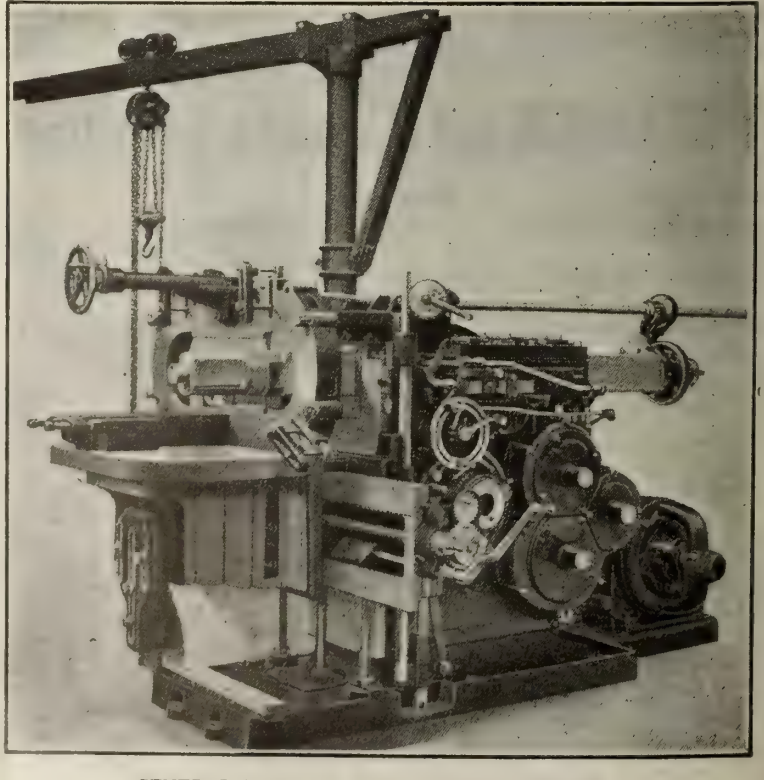
The table is a rigid box section casting. Two sides are "T" slotted. The upper one forms the bolting surface for the vise, top table and attachments. An angular extension bolts to the other "T" slotted surface to facilitate the rapid and positive binding of driving boxes when machining the shoe and wedge fit. The "T" slotted top table provides a large bolting surface for work.

The vise is so constructed that the tendency of the work to raise or buckle when placed on parallels is largely overcome. Ordinarily the entire cutting strain is taken by the vise jaws, and excessive clamping is necessary to secure the work. The results are spring and distortion. The cutting strains in this particular machine are said to be transferred through the solid vise jaw to the back-bearing and column. Only comparatively light clamping is necessary. When planing parallel to the jaws, the adjustable backbearing forms a stop for the work. The body of the vise is of steel. The sliding jaw is of special metal with a steel facing. Two screws control its motion. The stationary jaw has parallel planed ends which can be set snugly against the adjustable backbearing, with a consequent reduction in the strains to which the vise is subjected when a cut is taken. Its base is graduated through 180 degrees.

The adjustable backbearing is mounted on a post bolted to the cross-rail. It can be moved vertically to the desired position or swung to one side out of t way when using special attachments. transfers the thrust of the cut direct to the column of the machine. This r lieves the strains on work holding fi tures and the table bolts, lessening t danger of deforming the work by bi ing it too tightly. An auxiliary bac bearing is bolted to the top of the m chine for transferring the thrust of t cut to the column when using the dr ing box attachment. It swings out the way when not in use. The ram steel and is cast hollow. The scale the inner walls adds greatly to strength and stiffness. The ram has bearing surface on all four si throughout the length of the column, cept for a small oil space in the cent where the rack is lubricated. The ra teeth are machine cut. A bronze str inserted centrally in the rack, suppl a continuous bearing surface for the b tom side of ram. Wear can be taken at the sides by adjusting taper gi and at the top by lowering the ram c which is adjustable by means of t screws. The ram is bored at each e to receive an arbor.

### Other Features

The rotating arbor is a hollow st forging. It has close fitting journals each end and revolves in the ram, giv



GENERAL VIEW OF THE RAILROAD SHAPER.

the circular feed to the rotating head for cutting the crown fit in driving boxes. The front end is bored tapering to receive the rotary head. The shaper head is of steel, carefully fitted to the threaded end of the ram. It is graduated and can be held at any angle by a suitable clamping device. The sliding part of the head is made with the usual "V" joint, but has also adjustable side clamps with square rail bearings, which insures rigidity of the head. The swivel or tool block is threaded and fitted into the slide. It is held in position by a clamping device. The tool can be set at any desired angle. The reciprocating motion of the ram is obtained by the use of compound disc friction clutches, running inside the column in a bath of oil. Sliding collars and forged compression levers, adjustable for wear, give the necessary pressure. This design eliminates close fitting periphery surfaces which lose their size, causing trouble and necessitating new parts. The flat discs can be refilled at small expense. The material used will not injure the metallic surfaces of the clutches. A simple shifting bar and revolving cam reverse the clutches for the return stroke of the ram. The machine can be started and stopped by a clutch, independent of the driving motor. The ram may be moved as little as 1-16 inch at a time if desired.

The main driving pinion is a steel forging with teeth cut from the solid. All gearing is liberally proportioned, and the shafts are ground cylindrically true and straight. The stroke is adjusted by tappets on a circular disc, and can be changed while the machine is in operation. The adjustments are said to be so fine that the machine will take a cut and reverse close to a line. The reverse may be controlled by a lever at the will of the operator, for short stroking. A rapid power traverse for raising and lowering the cross rail and moving the saddle sideways in either direction is provided. The feed is relieved automatically. Any horizontal or vertical feed within a wide range is obtained quickly by moving tappets on a disc. The feed screws have a coarse pitch acme thread.

Rotary feed for the arbor is obtained from the regular automatic feed by means of a gear and ratchet working in connection with a vertical rack. The rotary motion is transmitted through a spline shaft and gears to the arbor which may be fed automatically in either direction.

A splash system of oiling is used for the clutches and all shaft bearings which are subjected to heavy strains. When the machine is running, oil is pumped from a tank in the column to the ram. The belt driven machine is furnished with a two speed countershaft. Two cutting speeds are obtained by the use of an additional pulley. The countershaft furnished hangs from the ceiling. A single belt transmits the power to the machine. Motor drive for either d.c. or a.c. can be installed, but a d.c. variable speed motor with automatic push button control is recommended. A controller guard is supplied with motor driven machines. The crane and hoist are used for handling the vise, attachments, and work too heavy to be moved by hand. A two-speed chain hoist is used. The control of this machine is entirely from the right-hand side, and all levers are said to be within easy reach of the operator.

The double chuck for driving boxes, as illustrated, forms a portion of the regular equipment. It is made in the form of an angle plate, which bolts securely to the knee of the machine, and is lined at right angles to the ram. It is provided with a suitable opening for the ram and special rotating head to pass through. Adjustable stops and binders secure the various sized driving boxes to the chuck. A special rotating head for crowning driving boxes forms another part of the equipment.

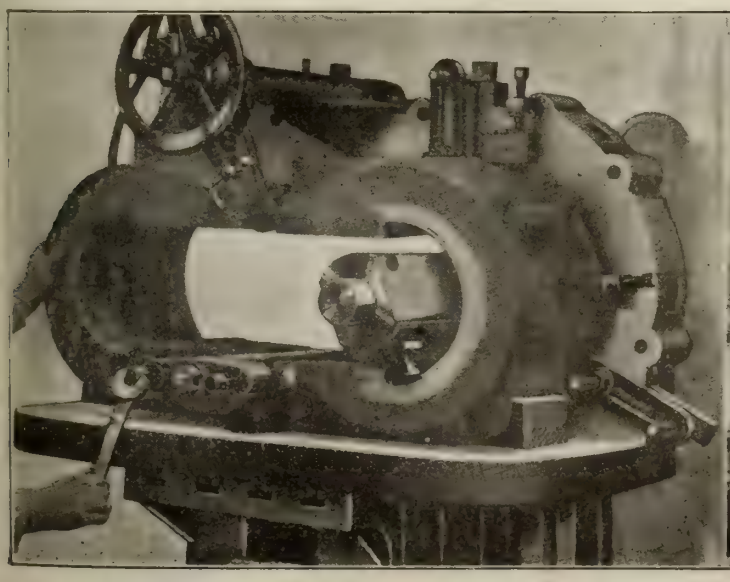
Special attachments, such as driving box shell planing attachment, shoe and wedge fixture, rod brass attachment, etc., etc., are available if required.

## AN AMBULANCE AEROPLANE

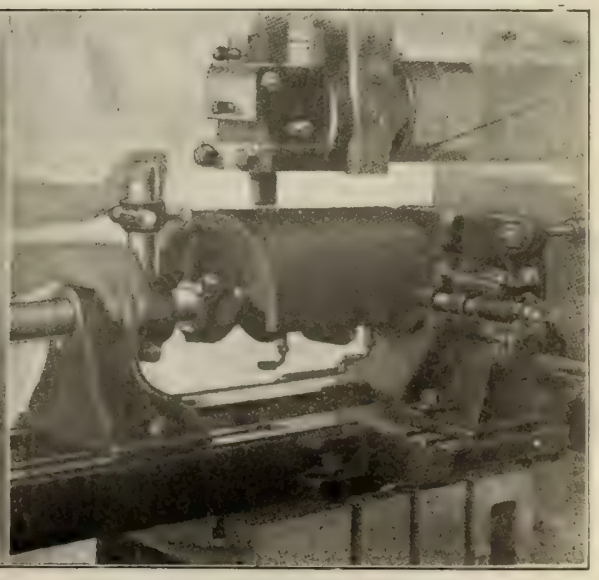
The latest innovation in air craft is the "ambulance aeroplane." A British firm has completed the first machine of this type. It is an adaptation of the firm's regular commercial model for passenger service. The forward part of the fuselage is arranged to accommodate four stretcher cases as well as a doctor, nurse, pilot and mechanic. If the patients are able to sit up, eight of them can be carried. The cabin to which the stretcher cases are admitted is provided with lavatory accommodation and with special cooling arrangements for use in tropical climates. The machine can climb to 6,500 feet in ten minutes and at that height it can be driven at a speed of over 100 miles an hour. Enough oil and petrol are carried for a five hours' journey at full speed. The machine, which is fitted with wireless telegraph apparatus, will be used in operations remote from a hospital base.

## AN ADAPTABLE WRENCH

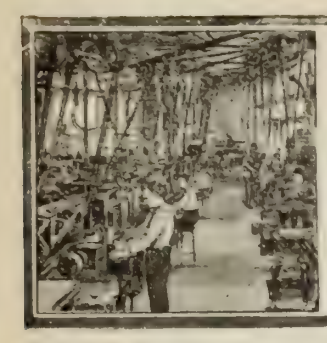
The Universal Wrench Co., Detroit, Mich., have opened a factory and office in Windsor, where they will manufacture their universal adjustable wrench. This wrench differs from the usual type of adjustable wrench by the addition of a lever mechanism which permits of pressure being applied to the jaws. A heavy duty spring opens the jaws to the determined position, when the lever is released. Among other advantages claimed is the non-slip feature—as it is said that the wrench cannot slip off the nut. It is also adaptable to smaller space as the handle need not be swung from flat to flat, but only far enough to permit the grooved jaw to grip on the nut angle. These wrenches are made of special material and are turned out in sizes from 4 to 18 inches.



SHOWING HOW TO SET THE SECOND BOX WHILE PLANING THE FIRST ONE.



ILLUSTRATING THE USE OF THE MICROMETER SCRIBER.



# DEVELOPMENTS IN SHOP EQUIPMENT



## INDEX CENTRES

Miller and Crowningshield, Greenfield, Mass., have placed on the market a multiple-spindle index centre as shown in the illustration. These centres are designed to permit the rapid fluting and squaring of taps, reamers, etc. The device is made with one, three, four, five, six or eight spindles, all of which rotate in the same direction. The spindles are spaced closely, so that the several pieces of work will be held in as small a space as possible, and they are connected by equalizing levers that allow a variation of about 3/16 inch in the length of the work being milled. The spindles have tapered holes, and a drift is furnished to interchange centres. All spindles are tightened simultaneously by operating a single handle.

Any number of flutes from one to twenty can be machined on work mounted on these centres, the proper indexing being obtainable by changing a spur gear. The indexing of all the different spindles is accomplished by turning a handle. In squaring and fluting work with only four flutes, no gearing is required, as one revolution of the index handle turns the spindles a quarter of a revolution. The tail block is separate from the head block and it is made in two styles, one solid, and the other having a separate vertical adjustment for each centre. Both types have the same interchangeable tail-centres, which can be readily replaced if they become broken or worn out.

## KEYWAY SET

The Velco Mfg. Co., Inc., Greenfield, Mass., have placed on the market a broach keyway set as shown. These broaches are equipped with patented staggered tooth cutter bars, and are said to cut smooth finished keyways with the use of the ordinary arbor press. The idea is this:

The work is slipped on to an accurately sized bushing, the tool steel cutter is inserted, the work is placed under an arbor press, and the tool is pressed through similar to any ordinary arbor. Should more than one keyway be desired in the same piece, the work is turned around to the required angle and the operation repeated.

The set is said to be particularly useful when cutting keyways in pulley hubs, couplings, milling cutters, etc., and where necessary half-round special broaches can be made. The complete set weighs only seven pounds and will cut ¼-inch keyways in work up to 1⅝ inches long, 3-16-inch keyways up to 1½ inches long and ⅛-inch keyways up to 1¼ inches long. Bushings from ½ inch to 1½ inches are included.

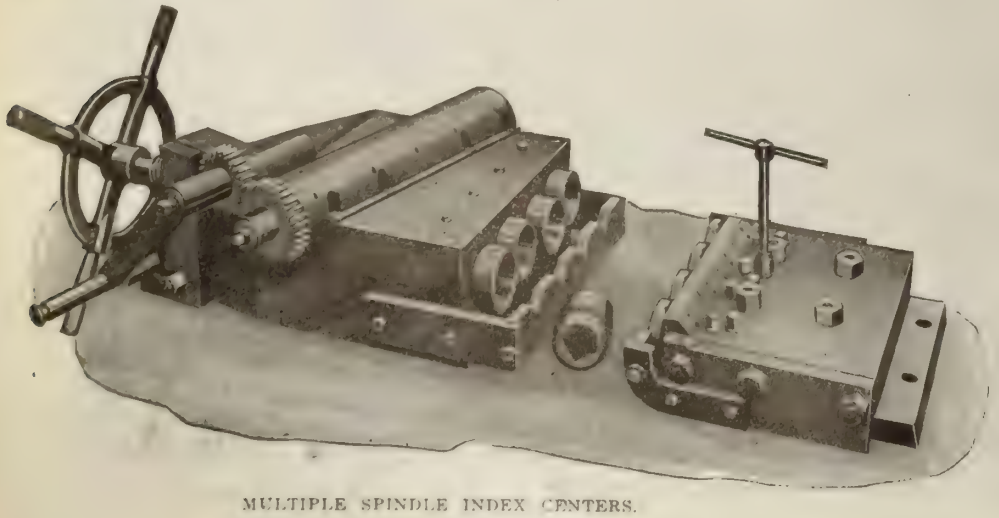


VIEW SHOWING THE KEYWAY SET.

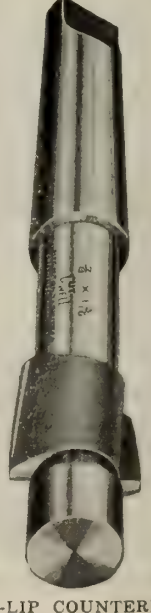
## TWO LIP COUNTERBORE

The Bickford-Switzer Co., Greenfield Mass., have placed on the market a counterbore of new design. This is shown in the illustration. This tool has been designed for counterboring on a production basis, and has two lips. It is said to have ample clearance, and with the spiral flutes will cut faster and even longer than the regular style counterbore.

Chattering is said to be eliminated and special provision has been made for sharpening. The body is circular between the cutters, in this way maintaining a pilot until the tool is worn out.



MULTIPLE SPINDLE INDEX CENTERS.



TWO-LIP COUNTERBORE.

### SELF-LOADING WAREHOUSE TRUCK

The Lewis-Shapard Co., of Boston, ass., are now making a self-loading rehouse truck, built in two sizes, one ving a capacity of 800 pounds, and the er capable of handling a load of 1,200 unds. The truck is of all metal con-uction and fitted with Hyatt roller arings. The grab hook may be placed 38 different positions, 10 vertically d 28 horizontally. The respective eights are 72 and 76 pounds.

### MOTOR DRIVE FOR MILLING MACHINES

The Clark-Mesker Co., of Cleveland, hio, is now making a special bracket r attachment to the Cleveland milling achines for direct motor drive. Pro-sion is made for a friction clutch be-ween the lower sprocket and the main ive shaft. This drive may be fitted to xisting belt driven machines by simply olting the bracket to the column in lace of the single-pulley belt-drive hous-ig. The motor speed is approximately 200 r.p.m. and drive from the motor to ie machine shaft is by means of a lorse chain.

### NEW SCOOP CAR TRAILER

A new scoop car trailer which is quipped with flat tread, instead of nar-ow gage track wheels, and which it is aid can be pulled around anywhere and easily handled by one man, is being ffered to the trade by the Easton Car Construction Co., 50 Church Street, ew York. It is designed for a variety f work ranging from the handling of teel chips, small forgings and castings, nd other material in machine shops, to he handling of coal, coke and cinders in nd around boiler houses and foundries. ts capacity is 27 cubic feet and it is uilt low to facilitate hand loading. The ody is mounted on a structural turn-able and can be turned around in any irection and dumped from any one of he four sides. The front axle is of the wivel type, equipped with a machined ast-iron ball-bearing turntable, permit-ing the car to be turned in practically s own length. The wheels are of the ide-in-the-hub type. A study of the illustration herewith will allow readers to form a general mind picture of this trailer.

### ROTARY-TABLE FOR MILLING MACHINES

The Cleveland milling machines can now be fitted with rotary tables made by the Clark-Mesker Co., of Cleveland. A table is made for each size of milling machine. When power feed is used, six-teen changes are possible, and these are controlled by the same lever that oper-ated the feeds for the sliding table. Telescopic sleeves connect the worm shaft, the worm running in oil. The worm wheel below the table is of large diameter. The table rests in taper bear-ings and an automatic trip is provided for release at any desired point. By us-ing a crank and index plate the attach-ment can be adapted to the cutting of large gears.

### PATTERN MILLING MACHINE

The Oliver Machinery Co., Grand Rapids, Mich., have placed on the mar-ket a pattern milling machine known as the Oliver No. 75. This machine has been used for some time with success in milling wood patterns, but the illus-tration shown is that of milling an aluminum pattern. Soft metal patterns of any description can be milled, and we have information to the effect that a very high percentage of saving was ob-tained in one pattern works alone through the use of this machine.

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Grinding Steel Forgings—Gear Blanks—Cylinder Cast-ings—Locomotive Crank Pin Washers—Dies—Push Rods—Gear Boxes—Connecting Rods—Brackets, and Steady Rest Jaws.

A Problem in Sheet Metal Work ..... 71

The Development of Funnel and Spout—This Panel Shows the Elevation, and the Developed Patterns. Method of Drawing is Shown, Also Allowance to Make For Wiring and Seaming.

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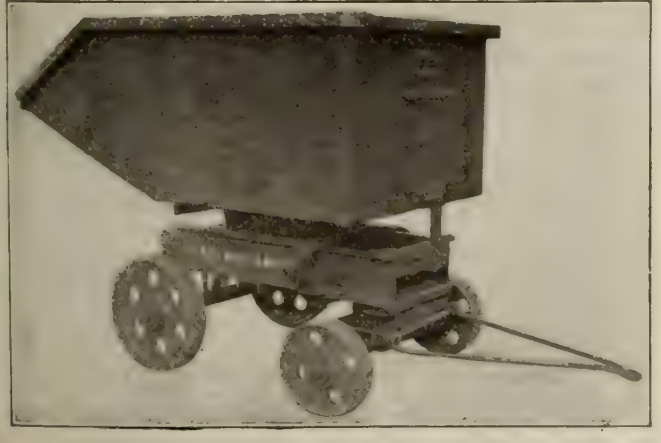
Describing Range and Application of Electric Arc Welding — Repairing Air Compressor Cylinder by Studding Process—Welding Small Vertical Engine Frame, and Building Up a Broken Tooth in a Steel Gear.

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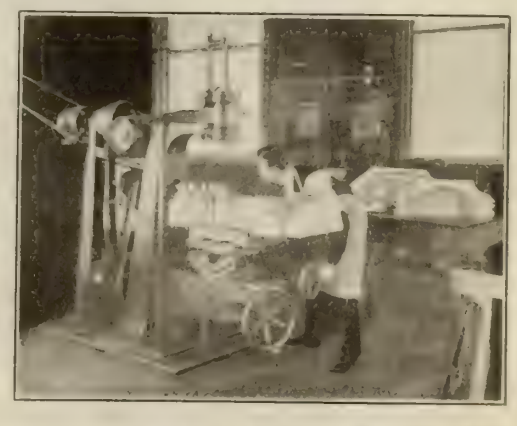
Interest in This Contest Still Continues to Grow—Have You Tried It So Far? If Not, Have a Go at It—You'll Find It Interesting and Instructive—On Top of That We Give a Scale Each Week to the Reader Sending in a Correct List of Answers.

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Multiple Spindle Index Centers—Keyway Set—Two-lip Counterbore—Scoop Car Trailer—Pattern Milling Machine—Self-loading Truck.

THIS SHOWS THE SCOOP CAR TRAILER.



VIEW OF PATTERN MILLING MACHINE.

# CANADIAN MACHINERY
## AND MANUFACTURING NEWS

Published in the Interests of the Machinery, Manufacturing, Iron, Steel, and Metal Working Industries.

Member of the A.B.C. Associated Business Papers and Can. Nat. Newspapers and Periodicals Association

B. G. NEWTON, Manager
A. R. KENNEDY, Managing Editor
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## Business Papers at Washington

SECRETARY of Commerce Hon. Herbert Hoover has arranged to meet with business paper editors at Washington at regular intervals for the purpose of discussing in what way these papers can best serve the interests of the nation.

Mr. Hoover recognizes that these papers have a real field and that they are performing a real service. It is the part of good politics for him to take advantage of their columns.

The plan of meeting with these editors gives the latter a new and vital interest in affairs at Washington and they are far more likely to give intelligent assistance to a government department that is ready to meet with them and give them the facts than with one that leaves them to dig for what they can find.

The fact that Hon. Herbert Hoover considers it worth while to confer with business paper editors shows the standing the business press has attained in United states.

When the Secretary of Commerce at Washington links up with the 500 business papers of the States and through them gets to the millions of people that these papers reach in the business world, he has placed his department in line with a force that is going to be of real assistance to him.

## There's a Real Point Here

MANUFACTURERS in general are faced with the problem of keeping their establishments going and making the best showing possible in a period such as we are going through. There are plenty to give advice, but much of it is not practicable because it comes from men who have no intimate, every-day connection with the machine shop, the foundry or the office.

A Toronto manufacturer made a worth while point in discussing this matter with Canadian Machinery a few days ago.

"There are many things people can do in going through a period such as we have been in for the past six months, but the trouble is that the plan I may try at my shop may not be much use any place else.

"But remember this, there are certain foundations that one can never allow to be broken down. These must be kept up if you are going to stay in business at all. There is the danger of cutting your business movement too fine. There is the danger of cutting the wages of your men, particularly your foremen and superintendents to the point where it takes the conceit and the pride out of them. When this is reached it is better to turn the key in the door and quit until things turn for the better.

"It is possible to run your business like a man trying to save fuel in his boiler. He starts to bank the fires and he starts to use clinkers instead of good coal. After a time he finds there is a call for steam some day and he is not able to produce it because his fire has gone too low. That may be a homely way of stating the case, but it has the real point, viz., that there are well-defined limits in the way of curtailment and it is not safe to go beyond them."

This same warning is capable of very general application. Some firms find it necessary to curtail their publicity. Quite right. Others cut it to the point where they are banking the fires where they are depending on the clinkers of past services and connections to keep up the fires of business accounts.

Some day there is going to be a call for real, live steam—for action, and the firm that is ready is going to move out in advance, while others are shovelling out ashes and clinkers and tearing down the banking they have put on their fires.

## None Working — No Strike

ONE of the most remarkable statements made in connection with the May Day strikes, or rather the lack of them, was by one union official who stated that owing to the large number of their men who were out of work there would be no strike.

In other words, had things been going on as usual and had their members been making a decent living, instead of nothing at all, they would have staged a strike.

But now that they had very few members at work, the strike had been passed up for this year.

It would seem, then, that the proper way to avoid strikes is to have plenty of unemployment.

## Canadian Trade Worth While

The New York Herald says editorially: "Deflation and its consequent check on international commerce have placed in bold relief no more satisfying development than the consistent growth and stability of the Dominion of Canada's foreign trade. Especially gratifying has been the steady enlargement, through prosperity and adversity, of the commercial and also the purely financial relations between the Dominion and the United States. Not only does this country occupy first place in Canadian trade, but our money investments in Canada far exceed what might have been anticipated only a short while ago.

"Here is consistency in trade which it would be hard to surpass. Canada's trade strategy has been that of her tutor, England. With three-fourths of her territory still to be developed, her commercial wisdom already has built for her an enviable place in the commerce of the world.

"Ill-conceived restrictions may deflect the currents and benefits of her commerce, but she has hit her stride in the path of progress and there will be no stopping her. Canadian trade with the United States is of the kind that will repay the most sympathetic and intensive cultivation."

## WE ARE NOT TURNING OUT APPRENTICES NOW

**F. W. Bawden Believes That as a Result There Is a Better Opening Now Than Ever Before**

"I venture to say you can put on the fingers of your hand the number of apprentices to the machine shop or iron molding shops that have been finished in the past year." That is the estimate that F. M. Bawden, of the Bawden Machinery Co., Toronto, puts on the present apprenticeship system.

"I can't see any way out until we get a class of boys who will take some interest in their work. It seems to be little use trying to get manufacturers to stop stealing boys from each other. The very fact that so few boys are going all the way through these two trades, the machine shop and the iron foundry, makes it all the more desirable that there should be some to make the start, for there are good openings for the men who finish thoroughly.

"The production methods of some of the shops make it very easy for them to take a boy who has had a year or two good training and give him a figure to do production work that makes the boy dizzy. I can recall being in one of the American centres about a year or so ago, when they had such a demand for production in the automobile shops. Several boys were apprentices in a shop where they build a very fine line of machine tools. These chaps, as lathe hands, were good and their general knowledge, as far as they had gone, was excellent. They were on the way to turning out to be good foremen or superintendents. The automobile shop had men on the lookout for just such boys and they baited them with wages of $6 a day, which, of course, looked a whole lot to the boys who were then making about $7 per week. Most of those who were approached in this way fell for the big money and as mechanics they stopped right there and then. They went in as production men in the auto shop and as long as things were going well they made the better money, but they ceased to develop. The man who took those lads out of the shop where they were learning to be real machine tool builders, and perhaps later designers, did them a mighty poor turn.

"We are not turning out mechanics in Canada, neither are they coming to us from other countries," continued Mr. Bawden. "As I said before, the molding shops are not getting them, neither are the machine shops. We need boys who at sixteen are neither cigarette fiends nor running around at nights. Out of these chaps we can make mechanics. I would almost venture to say that as a result of the system, or the lack of it, in regard to apprentices, we will be paying more eighteen months from now for machinists and molders than we were during the years of the war. If there is any other way out I can't see it."

## Using the Booster Engine

DESPATCHES from Kingston, Ont., state that several locomotives being completed by the Canadian Locomotive Co. are fitted with the booster engine, the first to be used on Canadian-made engines.

The auxiliary tractor idea is not a new one, although as it stands at present it is a great improvement over the first attempts in this direction.

It is in reality a small engine, two-cylinder, geared to the trailer axle of the locomotive. Steam is furnished direct from the boiler. The advantage is in starting from points at rest, or in furnishing additional power on grades. When the load can be just as well handled by the locomotive, then the booster is shut off.

Tests made out of Kingston on a trial run were apparently quite satisfactory and the little auxiliary power plant responded splendidly when the call was made for more power. A number of other engines that are being built at Kingston now are having the same device attached.

When the idea was first covered by patents as far back as 1889, the idea apparently was to have these auxiliaries attached to several cars, as the wording of the patent says:

> "The equipment being such as described, it will be seen that each motor will receive live steam from the boiler independently, and will exert its power upon the particular car to which it is attached. If each motor, for example, be of six horse, a one hundred horse power boiler will supply eighteen motors and propel a train of that number of loaded cars up heavy grades with ease and speed."

It is not known if that idea was ever put into practical use. The difficulties of supplying steam to a string of cars for the purposes of driving various engines are apparent and the upkeep of these numerous small engines would be no small consideration.

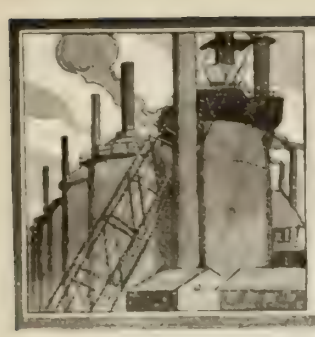
A writer in a technical paper, after reviewing the uses of the various types, sums up by saying that (first), that an appliance whereby a temporary increase of the tractive power of a locomotive may be afforded will be found to be of substantial practical value; (second), that the weight and cost of construction and maintenance of such an appliance should be reduced to the minimum; and, (third), that its design should not contemplate increased power for hauling tonnage after the locomotive has got the train in motion, but should be confined to means for enabling the engine to start the maximum tonnage that it is adapted to handle, from points of rest at which the train could only be started by backing up to more favorable position for a start.

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Some idea of the force of the explosion of a flywheel is furnished from an incident in Richmond, Kentucky. A flywheel burst at the plant of the Utilities Company. Wrecking the engine beyond hope of repair, part of the wheel ripped through the roof and buried itself in the ground half a mile away. In its flight it crashed through a house, entering by the roof, passing through and leaving by the side. As it did so it struck and instantly killed a child and injured a young woman. Investigation has given no cause or reason for the explosion.




**We can't travel with one wheel on the high road and one on the low road.**



# MARKET DEVELOPMENTS



## Prices Seem Steady at Present in all the Markets

### Effect of Pittsburgh Price Seems to Have Done Away With Much Of the Price Cutting—Passing of May Day Helps to Remove Cause of More Trouble—U. S. Export Trade Falls Off

MARKET conditions are not undergoing any marked changes, either in iron, steel or machine tools. Managers of many warehouses are kept in an anxious state of mind between reducing stocks in order to clear out high-priced material, and, on the other hand, keeping the stock sufficiently well assorted to give the service to the customers that they must give in order to hold their place in the trade.

Manufacturers in the iron and steel lines are in the same position. They must, of necessity, cut their overhead severely and at the same time keep up the nucleus of an efficient and effective organization for the time when the turn in business comes.

Most of the buyers of iron and steel seem satisfied that the present quotations on these lines are reasonable and should be the ruling figures of the market for some time to come. But that is not causing an increase of buying to any marked extent and the dealers state very frankly that they do not expect this increase until the buyers find it necessary to buy for some definite manufacturing programme.

But there are some concerns that report business as being very fair. They are securing some satisfactory orders and although the volume is not as great as a year ago by any means, they are satisfied with their progress.

Prices remain much the same in the steel trade locally and it is hardly to be expected that there will be changes for some time. There are variations in prices, but these come from dealers who still house more high-priced stock than they care to swing and they are letting certain tonnages pass out at a favorable figure to the buyer.

The scrap metal markets show no change. Dealers could probably secure contracts at to-day's figures, but they will not take them as they know it would be very difficult for them to go out and buy the material necessary to fill them at to-day's prices. Those having scrap prefer to hold it than sacrifice at the figures of this market.

## MONTREAL WAREHOUSES NAME NEW PRICES ON BAR MILL MATERIALS

Special to CANADIAN MACHINERY

MONTREAL, May 5.—May-day has come and gone and with it some of the nervousness that featured business a week or so ago seems to have disappeared, although industry is still disturbed by the rumblings of wage and working agreements. It does not seem that the metal working trades will be seriously affected in this respect, as those chiefly concerned are the building and the printing trades. It is even thought that early and satisfactory adjustments will be made in industries affected. Business activity in this district shows gradual but slight improvement, even though some reports indicate marked depression. Others reflect better business, so that on the whole there is a feeling that a slow return to normal is taking place.

### Bar Base Quotations Lower

While the steel situation here has become steadier as a result of the recent stabilization of prices in the States the market cannot be said to be one where a definite price prevails throughout all quarters of the trade. The liquidation of stocks is still going on and quotations fluctuate with the nature of the order and the needs of the customer. Orders range from tons to small parcels in pound weights of less than two figures. Despite the realization that steel prices are likely to remain quite firm for some time there has been little evidence of active buying on the part of many consumers, and the situation has changed but little from that of the past couple of months. It is thought by dealers here that no pronounced change in attitude will be shown until more settled conditions obtain in regard to railroad affairs. There has been a revision in local steel quotations, the base on bars being now $3.75 per hundred lbs. Quotations on chequered floor plates are now 6 cents per lb. Better movement for tubes and sheets is reported for last week.

### Buying Still Limited

Users of machine tools are still refraining from placing orders for equipment other than that required for immediate needs. The general situation has not improved sufficiently to warrant the expenditure necessary in acquiring machinery that would only be used in busy times, and this still seems to be an unknown quantity and one that will only be used in solving the problem of the future. The question of the present is one of keeping down the overhead, and doing with what you have got is one way out of the difficulty. This is evidently the attitude of the majority of the consumers, and the reaction on general business is that of retarding production, and consequently delaying the time when normal business will be the order of the day. It is often found that in order to make a sale the dealer or the salesman will require to meet the purchaser in the matter of price, as only in this way will the user be persuaded to buy. This condition is particularly pronounced in the acquisition of supplies, as it is these lines that the consumer must have, and yet has the choice of selecting from a great number of dealers, or calling salesmen, and in a measure, getting each seller to compete against the other for business. It is doubtless true that the prices ruling to-day are the lowest that could possibly obtain under the existing conditions of manufacture, where very

often the cost of production is on a par with the prices received for the goods.

### Scrap Still Stagnant

"There is nothing to indicate that industrial activity is on the increase, as business in general continues more or less quiet. Past experience has shown us that the forerunner of active times, invariably, is noticeable in the old material yards before any appreciable improvement is visible in other directions. This is caused by the period of preparation usually necessary in getting back to busier times, when plants and factories are laying in a stock of raw materials for manufacturing purposes. The demand for all grades of scrap is very light and prices (though firm as quotations) are subject to change with the conditions under which the sale is made." This statement by an old material dealer reflects the continued dullness prevailing in scrap circles, and the consensus of opinion seems to justify the claim that the summer will be well spent before active operations will be resumed.

## LITTLE CHANGE IN TORONTO DISTRICT

**Market Conditions Remain Much the Same—Buying Being Done in Small Quantities**

TORONTO.—Market conditions in this district remain spotty. Were a person to make one or two calls, and if these calls happened to be on the ultra-conservative class, the conclusion might easily be formed that there was no business moving at all. On the other hand by the time one has gone over a dozen or so places in the machine tool, steel and iron market, it is found that although the general business moving is small in volume there are several bright spots where firms are getting a fair amount of orders. In the latter class, when the previous months and and general conditions are considered, there is a marked tendency to state openly that business is improving, and that they have no reason to complain.

Various guesses are put out for the holding up of orders during the last couple of weeks, when it has been quite noticeable. One is that the payment of the income tax has taken up a lot of money, and has also had the effect of making people hang on tighter to what they have. Another is the amount of money that is being put into the stocking up of cellars against the last day of importation. There is no doubt considerable reason for the advancing of both reasons.

### Orders Are Not Placed

Almost any dealer can show you a fair list of prospects, and from a number of these he is quite certain that he is going to secure orders. For the present, though, the orders are not being placed, and dealers who are specializing on a few lines are having it harder than firms that are carrying a more varied line. April has not been a good month for most of the firms, although some of them could not state definitely how it compared with other months this year and last. The month in a number of cases seemed to start out very well, but before it had gone half way there was another slowing down, which tended to spoil the totals for the whole period.

### Stocks Getting Low

Evidence that the policy of getting stock down to the minimum is having its effect is found in several places. For some time some of the firms handling a large number of lines have been selling out as though they had no thought of continuing in business. Ordering has been done direct to the factories just as requirements made it necessary, and there has been a decided departure from the old idea of the well-assorted stock-rooms. There are cases coming to notice where stocks are not kept up well enough to cater to trade that comes into the market quickly and that wants immediate service. One dealer instanced this week a case where there were twenty-two of a certain article wanted, and he could supply only eight. He did not get the order for the eight because the purchaser found some other place where he could place his whole order in the one lot.

"It requires a lot of study to avoid just such a happening as that," commented the dealer. "We want to get our stock down to the bone, and yet once we get it down in that direction we run into the danger of not being able to look after our customers. Once the trade gets the idea that your stock is shot to pieces you have lost ground that is going to take hard work to regain in the future. There are two options, keeping stock up and taking your losses as goods are marked down, or getting rid of your stock and protecting yourself against a loss in that way, and at the same time losing a certain amount of business through not having enough stock on hand. It requires a fairly good lot of serious thought to frame a policy that can be followed successfully now. It looks to me as though any policy and any staff should be more versatile now than at any time in the past."

### Steel Market Quiet

Prices have not been changed during the week on lines in the steel market, and the trade generally considers that the prices now named as the standards of the market will probably be continued for some time. This has not encouraged buying to any extent, although it was hardly to be expected that there should be an immediate response to the new price list.

Here is an opinion of one of the dealers in steel: "There have been a number of statements given out that the new price in steel is likely to have a very good effect on the situation. As a matter of fact many of the men who give opinions are not rendering a good service because they always try to throw some undue optimism in the future. I believe all this had the effect of keeping labor prices up. When the men in the shops or in the offices see what some of the leaders have been saying they get a false idea of their own position or of the importance of the work they are doing. I know of one case that actually occurred, where the manager of a firm that was running four days a week in order to keep the men employed over the winter gave out one of those 'going-to-be-all-right' interviews. The men in the shop and in the office at once got the idea that things were going to break all right, and the idea spread that the putting of the works on four days a week was nothing short of an injustice and an imposition on them. I think we have got to get down to production on a lower and a better basis. Labor costs must come down or I cannot see how building is going to go ahead. The steel market will recover when the labor market gets down to brass tacks, and not before," was his concluding remark.

### The Scrap Metal Market

The waste material markets in Canada have been sluggish, demand from consumers showing no quickening. Hand-to-mouth purchasing by manufacturers

## POINTS IN WEEK'S MARKETING NOTES

**Pittsburgh says that some of the mills are now running around 40 per cent. The new price list of the Corporation caused quite a tonnage to be released.**

—

**U.S. export trade in machine tools has fallen off sharply. They are meeting very sharp competition from other countries.**

—

**May Day passed with few strikes in the metal working industries. Leaders say it is due to the amount of unemployment in these lines.**

—

**Montreal warehouses have named a price of 3.75 on bar iron and steel.**

—

**Structural steel should be moving much better were there going to be an improvement in building operations.**

—

**The scrap market is still very much down. Dealers could probably make contracts at present prices but it would be difficult to get the material with which to fill these contracts.**

has been all that has been done, and most waste material dealers do not look for any immediate improvement in the situation. Most guesses are that it will be yet a month before industry in general will begin to move at a normal pace. Signs of expansion in operations have not been lacking, but most manufacturers seem to be using up such raw material as they have on hand.

In scrap iron and steel Toronto dealers report no change. The tendency of prices has been easy despite the better outlook resulting from the disposition of steel products prices to stabilize around the new levels announced recently by the United States Steel Corporation. Excepting in scrap, few transactions have been reported. Most holders of scrap are waiting for higher prices on open-hearth and rolling mill scrap, and not pressing for business.

The consumption of metal products in the Dominion and in the States is reported to be steadily expanding, but scrap dealers in Toronto have not done any business to speak of. Small lots of scrap grades have been called for. Prices are rather firm at last quoted levels. Generally dealers state they are not being offered much scrap and that their supplies are relatively light.

# PITTSBURGH STEEL MARKET IS BOTH STEADY AND VERY QUIET NOW

Special to CANADIAN MACHINERY

PITTSBURGH, May 5.—The steel market situation might be summed up very briefly by saying that the market is very steady and also extremely quiet. As to steadiness, the prices recently developed are being strictly maintained, and while in pre-war times that was not an unusual but rather the usual condition, it has not been so usual since the war, since for two-thirds or three-fourths of the time the independent and Steel Corporation prices have been different, the independents being usually either above or below the Corporation. That is the better way to put it, rather than to say that the Steel Corporation has been above or below the independent prices, since it is the independent prices that have done nearly all the fluctuating.

Already there is some speculation in trade circles as to whether or not the independents will cut the prices they have lately adopted. Just now the various producers strongly assert that they will not, because they cannot afford to, but it was only last November they stopped saying they could not sell at the Industrial Board prices, while about the beginning of February they began to cut those prices. The unit cost of production is very high, on account of poor distribution of overhead with the present light operations, but an individual mill might figure that if it secured additional business, furnishing a more economical operation, it could thus afford to sell at a lower price. As to the Steel Corporation making any further reductions, the Steel Corporation's general policy is well understood. The Corporation would reduce its prices if thereby a broader consuming market for steel could be developed, but it is plain that this could not be done at present or in the near future. There is a very strong probability that steel prices will be reduced readily when a latent demand develops large enough to give the steel industry reasonably full employment, but no one expects such a condition to develop in the near future. There are possibilities of it for next September or October, but the common view in the steel trade is that there will be no really heavy demand before next year. A heavy demand would be a demand more than 50 per cent. greater than the present demand, which is running, at long range view, at about 40 per cent. of capacity.

### Quiet Market

The Steel Corporation is undoubtedly receiving more business than formerly, or since it reduced its prices, this carrying with it a modification of contracts. The Corporation's customers are naturally more disposed to specify now than a few weeks ago, when the cost was higher than prices that could be done with independents. However, the increase in the Steel Corporation's specifications is perhaps not altogether as great as might have been expected to result from the change in prices.

This Steel Corporation business, however, does not appear in the open market, being simply in the form of specifications against old contracts. In the open market there is very little business. No new or increased wants have arisen, and the volume of business being booked by independents is particularly small now, as is naturally to be expected from the circumstance that customers of independents closed rather freely at the time when the independents were withdrawing their former quotations in favor of the advanced prices they are now adhering to, and to which the Steel Corporation reduced.

### Steel Prices

The following quotations, developed in the readjustment that fell approximately within the period April 8 to April 15 still rule: Billets, $37; slabs, $38; sheet bars and small billets, $39; rods, $48; bars, 2.10c; shapes, 2.20c; plates, 2.20c; hoops and hot rolled strip, 2.75c; cold rolled strip, 5.50c; plain wire, 3c; wire nails, $3.25; standard steel pipe, 62½ per cent. basing discount; blue annealed sheets, 3.10c; black sheets, 4c; galvanized sheets, 5c; tin plate, $6.25.

In manufactured steel products there were some changes in the past week. At first, in the readjustment, some spike makers, as noted in last week's report, set standard spikes at 3.30c, small spikes at higher base prices and boat and barge spikes at 3.85c. Then the Illinois Steel Co. and Inland Steel Co. put out a uniform base price of 3.40c applicable to all spikes, subject to extras in the list used during the war control, and the other spike makers are disposed to use this price basis when in competition, but some of them assert that they will not do it regularly.

Last week's quotation on chain, 6.35c, was based on the quotation of one producer, who had reduced from 6.75c. The other producers have since reduced from 6.75c to 6.25c, base, at the same time decreasing the advances on ½-inch and smaller by a quarter cent.

### Operations

The Steel Corporation has probably a slightly heavier operation now than at its low point about three weeks ago, when the rate was scarcely 40 per cent. of capacity. The independents are doing better, probably operating at 40 per cent. or more. In January the Steel Corporation operated at about 90 per cent. and the independents at about 30 per cent.

### Pig Iron and Coke

Foundry iron is easier. While some producers are still quoting $25, valley, and state they are picking up small orders from regular customers, one producer has gone to $24.50 and it is possible $24 might be done, the price at any rate being quoted by some middlemen, perhaps on resale iron.

Merchant furnaces that were holding basic iron at $25 have withdrawn the figure and have no open quotation. When any worth while inquiry develops they will decide what to quote. A steel works interest that sold over a month ago at $23 has gone up to $25. Lower sellers remain, and the question just now is whether they will develop enough competition with each other to do $22 or less, or will withdraw on account of other producers having gone up, and with the idea of giving the steel market some sentimental support. One valley steel interest has sold several small lots of basic iron at intervals at $22.50, while a Canton interest states it was quoted as low as $22 on its recent inquiry for 10,000 tons for May. No purchase was made as the company will blow in its own furnace instead, probably because it has a by-product coke plant that would make the operation more economical than that of a furnace selling pig iron at $22 and buying Connellsville coke. The question is whether the $22 quotation made for Canton was from Weirton, valley or Cleveland, as the three points have the same freight to Canton, $1.96.

Connellsville furnace coke shows quite a range. Sales three weeks ago were at $3.50, while since then coke has sold both lower and higher, at $3.25 or $3.30 and at $3.75, possibly at $3.90. It is

unusual for there to be such a spread. Some furnaces believe they could buy at $3 if they could offer a good tonnage, sufficient to operate a coke plant economically. As it is, most coke producers keep their plants idle as there is less loss in that than in running to produce the very small quantities for which orders could be secured. Spot foundry coke remains at $5 to $5.50.

## NEW YORK SEES NO IMPROVEMENT

**Booking Going to the Mills Is Small—Bidding Hard to Secure Export Business**

Special to CANADIAN MACHINERY

NEW YORK, May 4.—Despite the fact that machine tool business is showing no improvement, prospects continue to multiply, indications that some buying may be done when the psychological time for business resumption has arrived. Undoubtedly there is an improvement in the general situation, but it is extremely slow and there is nothing in sight yet to indicate the speedy revival that has frequently followed business depressions of the past.

Much of the business in machine tools now being talked of is for export. The Japanese Government has a list of machines on which it is getting bids both here and in England. It is reported that only a dozen or so of the machines will be bought in the United States. The South Manchurian Railway is doing a little buying here, and an inquiry for China is in the hands of Dowler, Forbes & Co., an export house, with English connections. Another export house has a list of about twenty machines for the Argentine, but it is not known whether purchasing may be expected within the near future.

Some of the large manufacturing companies in the East are known to be figuring on large lists of shop equipment, but it is clearly stated that no buying will be done at present, and the lists are merely being prepared in a time of quiet so that they will be in readiness to buy as soon as business stability is restored.

Machine tool builders are booking very little business. Many of the plants are operating at 10 per cent. or less. The dullness of business was directly responsible for the cancellation of the spring meeting of the National Machine Tool Builders' Association, which was to have been held at Atlantic City May 19 and 20. There is a bare possibility that a meeting may be called for June if business picks up.

## Scrap Metal

The scrap market in some centres shows better demand, with somewhat higher quotations, but speculative considerations are a factor.

All dealers would like to pick up some cheap material for throwing down in their yards, but they have not been especially successful for the reason that the disposition of producers has been to let the material accumulate rather than sell it at the prices which have been offered. It is very doubtful if heavy melting steel could be bought for less than $15 per gross ton, delivered, on the Pittsburgh market.

The transactions on the New York market are so few that it is difficult to determine actual prices. The only inquiry of interest during the past week was that of the Bethlehem Steel Co. for from 25,000 to 30,000 tons of heavy melting steel at $11 per ton, delivered. Some dealers consider it doubtful if sucn a large tonnage can be obtained at present for this price.

Though a better feeling is evident on the Buffalo market, sales do not bear out the feeling. One buyer claims to have been offered by Pennsylvania dealers locomotive grate bars delivered to his yard near Buffalo at $13.50 per gross ton. Car wheel prices are down $1 per ton. A sale of 2,000 tons of heavy melting steel was made recently at $13.

As a result of several mills coming into the market there was considerable revival of activity in the scrap market at Cleveland during the week. A Cleveland mill purchased 3,500 tons of shoveling turnings at $8.50. A Canton mill is again accepting shipments which it had held up for several months. As a result of buying by mills, there is some demand from dealers for heavy melting steel at $13 for Youngstown delivery.

On the Chicago market dealers in anticipation of better demand are bidding against each other for railroad material which they are stocking in their yards, and present buying prices on a number of commodities have advanced under the stimulus of speculative purchases.

## Pig Iron Market

The outstanding feature of the pig iron market at Pittsburgh, has been the abandonment by merchant producers of the steel making grades of their recent price position which involved quotations of $25, furnace, for basic and $27, furnace, for Bessemer, and a refusal to consider less on the ground that these prices represented costs. These interests have no fixed quotation now, and are ready to consider bids.

Sales, on the New York market, have been limited to small lots, but the feeling in the market is somewhat improved. Foundrymen report a slow but encouraging increase in their melt and the settlement of the wage controversy by the Stove Founders' National Defence Association gives rise to the belief that many strikes now pending may be adjusted on an equitable basis, and that the demand for pig iron will increase.

On the Boston market the activity centres in Pennsylvania iron. One lot of 1,000 tons of No. 2X was sold this week by an eastern Pennsylvania furnace to a Massachusetts consumer. It is intimated that the price was around $24, furnace, but the terms are confidential.

A few more foundry pig iron consumers are showing an inclination to buy for two or three months ahead on the Philadelphia market, but sellers are discouraging such business. One furnace declined to accept an order for May-June-July shipment, its present quotations holding good only for delivery within thirty days.

A Cleveland automobile foundry has released shipping orders for 2,000 tons of foundry iron per month; a steel plant has released 5,000 to 6,000 tons per month, and a Michigan automobile foundry has released four or five carloads a week, this being the first iron this foundry has taken in several months.

Conditions in foundries in the Chicago district are slowly but steadily improving. Contracts for automobile castings are being let and while this work is not evenly distributed it has been reflected in a fair number of orders for pig iron for prompt shipment.

## FARM MACHINERY MARKET IS FLAT

**Explanation Given At Harvester Plant In Hamilton for Closing Down the Works**

In a recent edition of the International Harvester's Bulletin is the report of A. H. Young, manager of the International relations, showing why it is necessary to close down for the present. Mr. Young stated that the present rate of exchange, and the extreme poverty of European countries have operated to completely cut off export trade, which amounts to 50 per cent. of the Harvester business. The tremendous reduction in the price of farm products, the large sums spent for high priced seed and labor last year, has made the farmer unwilling to sell at the present greatly reduced prices. They simply cannot buy new machines at their present high cost; and not only that—they are organizing and say they are not going to buy until the I. H. C. and other makers have reduced their prices, so that our domestic trade has also fallen flat, and therefore our manufacturing program for the future is not encouraging.

The death occurred at Gananoque on May 2 of David Bain, general superintendent of the Ontario Steel Products Co. Thirty-five years ago he entered the Axle Company as foreman, and remained with it until it was merged in the Ontario Steel Products Co., becoming its general superintendent. Mr. Bain has been a resident of Gananoque for more than forty years, coming there as a machinist from Carleton Place to enter the company of his cousin, the late George Gillies.

# SELECTED MARKET QUOTATIONS

**Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.**

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $25 00 |
| Lake Superior, charcoal, Chicago | 40 50 |
| Standard low phos., Philadelphia | 41 50 |
| Bessemer, Pittsburgh | 28 96 |
| Basic, Valley furnace | 26 00 |
| Toronto price:— | |
| Silicon, 2.25% to 2.75% | 34 10 |

## IRON AND STEEL

| Per 100 lbs. to Large Buyers | Cents |
|---|---|
| Iron bars, base, Toronto | $4 00 |
| Steel bars, base, Toronto | 4 00 |
| Iron bars, base, Montreal | 3 75 |
| Steel bars, base, Montreal | 3 75 |
| Reinforcing bars, base | 3 75 |
| Steel hoops | 4 50 |
| Tire steel | 4 00 |
| Spring steel | 6 00 |
| Band steel No. 10 gauge and 3-16 in. base | 4 00 |
| Chequered floor plate 3-16 and heavier | 6 00 |
| Bessemer rails, heavy, at mill | 2 35 |
| Steel bars, Pittsburgh | 2 10 |
| Tank plates, Pittsburgh | 2 20 |
| Structural shapes, Pittsburgh | 2 20 |
| Steel hoops, Pittsburgh | 3 05 |
| F.O.B., Toronto Warehouse | |
| Small shapes | 4 50 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 3 48 |
| Structural shapes | 3 58 |
| Plates | 3 78 |
| Small shapes under 3-in. | 3 48 |

## FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

| | C.L. | L.C.L. |
|---|---|---|
| Montreal | 58½ | 73 |
| St. John, N.B. | 84½ | 106½ |
| Halifax | 86 | 108 |
| Toronto | 38 | 54 |
| Guelph | 38 | 54 |
| London | 38 | 54 |
| Windsor | 35 | 50½ |

Current surcharge, 8 per cent.

## METALS

| | Gross. Montreal | Toronto |
|---|---|---|
| Lake copper | $18 00 | $17 50 |
| Electric copper | 17 50 | 17 50 |
| Castings, copper | 17 25 | 18 00 |
| Tin | 38 00 | 39 00 |
| Spelter | 7 75 | 7 50 |
| Lead | 6 50 | 7 50 |
| Antimony | 8 00 | 8 25 |
| Aluminum | 34 50 | 30 00 |

Prices per 100 lbs.

## PLATES

| | | |
|---|---|---|
| Plates, 3-16 in. | $5 00 | $4 75 |
| Plates, ¼ up | 4 50 | 4 25 |

## PIPE—WROUGHT

Standard Buttweld Pipe S/C

Per 100 feet.

| Size | Steel Blk. | Steel Galv. | Gen. Wrot Iron Blk. | Gen. Wrot Iron Galv. |
|---|---|---|---|---|
| ¼ in. | $ 6 50 | $ 8 50 | $ | |
| ⅜ in. | 4 89 | 6 99 | 5 91 | 8 01 |
| ⅜ in. | 4 89 | 6 99 | 5 91 | 8 01 |
| ½ in. | 6 50 | 8 03 | 7 36 | 9 46 |
| ¾ in. | 7 99 | 10 06 | 9 95 | 12 02 |
| 1 in. | 11 82 | 14 88 | 14 71 | 17 77 |
| 1¼ in. | 15 99 | 20 13 | 19 90 | 24 04 |
| 1½ in. | 19 11 | 24 06 | 23 79 | 28 74 |
| 2 in. | 25 72 | 32 38 | 32 01 | 38 67 |
| 2½ in. | 40 66 | 51 19 | ..... | ..... |
| 3 in. | 53 17 | 66 94 | ..... | ..... |
| 3½ in. | 67 62 | 84 18 | ..... | ..... |
| 4 in. | 80 12 | 99 74 | ..... | ..... |

Standard Lapweld Pipe S/C

Per 100 feet.

| Size | Steel Blk. | Steel Galv. | Gen. Wrot Iron Blk. | Gen. Wrot Iron Galv. |
|---|---|---|---|---|
| 2 in. | $29 42 | $36 08 | $35 71 | $42 37 |
| 2½ in. | 44 17 | 54 70 | 54 11 | 64 64 |
| 3 in. | 57 76 | 71 53 | 70 76 | 84 53 |
| 3½ in. | 69 46 | 86 02 | 85 10 | 101 66 |
| 4 in. | 82 30 | 101 92 | 100 83 | 120 45 |
| 4½ in. | 95 89 | 1 20 | 1 30 | 1 54 |
| 5 in. | 1 12 | 1 40 | 1 52 | 1 80 |
| 6 in. | 1 45 | 1 81 | 1 97 | 2 33 |
| 7 in. | 1 89 | 2 37 | 2 53 | 3 01 |
| 8L in. | 1 99 | 2 49 | 2 66 | 3 16 |
| 8 in. | 2 29 | 2 87 | 3 07 | 3 64 |
| 9 in. | 2 74 | 3 43 | 3 67 | 4 36 |
| 10L in. | 2 54 | 3 18 | 3 41 | 4 05 |
| 10 in. | 3 28 | 4 10 | 4 39 | 5 21 |

**Prices—Ontario, Quebec and Maritime Provinces**

## WROUGHT NIPPLES

4-in. and under, 50 per cent.
4½-in. and larger, 40 per cent.
4-in. and under, running thread, 20%.
Standard couplings, 4-in. and under, 20%
Dd., 4½-in. and larger, net.

## OLD MATERIAL

Dealers' Average Buying Prices

| | Per 100 Pounds. Montreal | Toronto |
|---|---|---|
| Copper, light | $ 8 50 | $ 9 00 |
| Copper, crucible | 11 00 | 11 00 |
| Copper, heavy | 10 50 | 11 00 |
| Copper wire | 11 00 | 11 00 |
| No. 1 machine composition | 9 50 | 9 75 |
| New brass cuttings | 7 00 | 8 00 |
| Red brass turnings | 7 50 | 8 00 |
| Yellow brass turnings | 5 00 | 6 00 |
| Light brass | 3 50 | 5 00 |
| Medium brass | 5 50 | 6 00 |
| Scrap zinc | 4 00 | 4 00 |
| Heavy lead | 3 50 | 4 00 |
| Tea lead | 2 00 | 2 00 |
| Aluminum | 12 00 | 10 00 |

| | Per Ton | Gross |
|---|---|---|
| Boiler plate | $10 00 | $12 00 |
| Heavy melting steel | 9 00 | 14 00 |
| Axles (wrought iron) | 22 00 | 20 00 |
| Rails (scrap) | 12 00 | 14 00 |
| Malleable scrap | 12 00 | 20 00 |
| No. 1 machine cast iron | 22 50 | 25 00 |
| Pipe, wrought | 8 50 | 8 00 |
| Car wheel | 25 00 | 25 00 |
| Steel axles | 18 00 | 18 00 |
| Mach. shop turnings | 5 00 | 6 00 |
| Stove plate | 20 00 | 20 00 |
| Cast boring | 3 00 | 7 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent |
|---|---|
| Carriage bolts, 7-16 and up | Net list |
| Carriage bolts, ⅜" and less | 15 |
| Coach and lag screws | —20 |
| Stove bolts | 55 |
| Wrought washers | —25 |
| Elevator bolts | Net |
| Machine bolts, 7-16 and over | —5 |
| Machine bolts, ⅜-in. and less | —30 |
| Blank bolts | Net |
| Bolt ends | —5 |
| Machine screws, fl. and rd. hd., steel | 27 |
| Machine screws, o. and fil. hd., steel | +25 |
| Machine screws, fl. and rd. hd., brass | Net |
| Machine screws, o. and fil. hd., brass | Net |
| Nuts, square, blank | +25 add $2 |
| Nuts, square, tapped | add 2 |
| Nuts, hex., blank | add 2 |
| Nuts, hex., tapped | add 2 |
| Copper rivets and burrs, list less | 27 |
| Burrs only, list plus | 10 |
| Iron rivets and burrs | 37½ and 5 |
| Boiler rivets, base ¾" and larger | $8 |
| Structural rivets, as above | 8 |
| Wood screws, O. & R., bright | 67 |
| Wood screws, flat, bright | 67 |
| Wood screws, flat, brass | 55 |
| Wood screws, O. & R., brass | 55 |
| Wood screws, flat, bronze | 50 |
| Wood screws, O. & R., bronze | 47 |

## MILLED PRODUCTS

(Prices on unbroken packages)

| | Per Cent |
|---|---|
| Set screws | Less 40% |
| Square and hexagon head cap screws | Less 30% |
| Round head cap screws | Plus 10% |
| Fillister head cap screws | Less 10% |
| Flat head cap screws | Net list |
| Button head cap screws | Plus 10% |
| Studs | Less 20% |
| Semi-finished nuts up to and including 1-in. | Less 35% |
| Semi-finished nuts 1⅛ to 1½" | Less 30% |
| Semi-finished nuts 1⅝ to 2 in. | Net list |
| Coupling bolts | Plus 10% |
| Taper pins | Less 40% |
| Planer bolts without fillet | Plus 40% |
| Planer bolts with fillet | Pus 50% |
| Patch bolts | Plus 80% |
| Hollow set screws | Plus 20% |
| Thumb screws | Less 35% |
| Thumb nuts | Less 65% |

## BILLETS

F.O.B. Pittsburgh.

| | Per gross ton |
|---|---|
| Bessemer billets | $43 50 |
| Open-hearth billets | 43 50 |
| O.H. sheet bars | 39 00 |
| Forging billets | 48 50 |
| Wire rods | 48 00 |

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails, base | $4 50 |
| Cut nails, base | 5 10 |
| Miscellaneous wire nails | 50% |

## ROPE AND PACKING

| | |
|---|---|
| Plumbers' oakum, per lb. | 0 10¼ |
| Packing, square braided | 0 38 |
| Packing, No. 1 Italian | 0 44 |
| Packing, No. 2 Italian | 0 36 |
| Pure Manila rope | 0 26 |
| British Manila rope | 0 20 |
| New Zealand hemp | 0 20 |

## POLISHED DRILL ROD

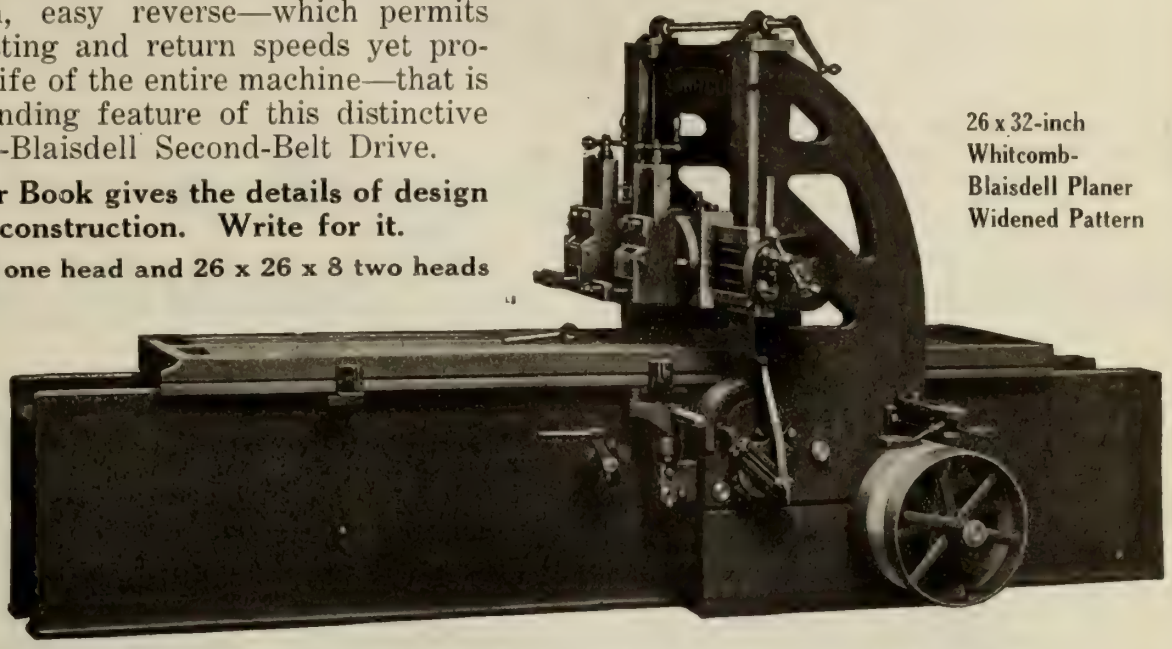
| | |
|---|---|
| Discount off list, Montreal and Toronto | Net |

# The Planer with the Second-Belt Drive

A smooth, easy reverse—which permits higher cutting and return speeds yet prolongs the life of the entire machine—that is the outstanding feature of this distinctive Whitcomb-Blaisdell Second-Belt Drive.

**Our Planer Book gives the details of design and construction. Write for it.**

**24 x 24 x 6 one head and 26 x 26 x 8 two heads in stock.**



26 x 32-inch Whitcomb-Blaisdell Planer Widened Pattern

## THE A. R. WILLIAMS MACHINERY CO., LIMITED

Halifax, St. John, Montreal, Winnipeg, Vancouver

If it's Machinery—Write "Williams"

64 Front Street West TORONTO

# Greaves-Etchells Electric Furnace

FURNACES FOR EVERY PURPOSE

**Electric Furnace Construction Co.**

908 Chestnut Street Phila., Pa.

# CASTINGS

MALLEABLE AND GREY IRON

**FITTINGS** Limited, OSHAWA

# THE

TRADE K—T MARK

# FOUNDRY

GALT, ONT.

# Do Your Castings Cost Too Much?

A rearrangement of your patterns might cut their cost 25 per cent.; a different method of molding them might double your production at no increase in molding cost. We can advise you and we have expert metal and wood patternmakers who are able to make any changes that may commend themselves to you.

## If you need some new Patterns

send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.

We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us. Ask us.

***We have for our and your requirements, a large stock of assorted White Iron Stars, suitable for light agricultural to medium weight machinery castings, while they last, at 8 cents per lb. F. O. B. Galt.***


*If interested tear out this page and place with letters to be answered.*

# Apprentice Should Have an Education

## Many of The Boys Who Go Into The Business Do Not Seem to Understand That There is Real Study and Work Before the Status of a Real Machinist Can Be Attained

By CECIL H. SMITH

REAMS of paper have been used in the attempt to describe an ideal method of making machinists, but so far no method has been discovered that will produce a good mechanic out of every apprentice. Conditions being equal, the apprentice system is far superior to the breaking in of handy men. True, success has been attained in many instances through the using of mechanically inclined handy men, but had these same men served an apprenticeship in their younger days, they would have had a wider usefulness and been more independent.

Conditions during the past few years have changed to such an extent that the old-fashioned, all-round machinist is almost a thing of the past. While some of the larger plants have organized part time schools to supplement the work of the shop, there has been very little accomplished by the average shop in Canada to make the most of their apprentices. To my mind co-operation between the manufacturer and the boys will accomplish a great deal, and following are a few suggestions which I believe could be followed out to good advantage.

### The Plant's Reputation

When employers begin to regard the making of their mechanics as equally important with the quality of their product, then we will secure better all-round machinists who will be a credit to the trade. A machinist developed and trained in a shop is as much the product of that plant as the rest of the machine tool equipment. The class of mechanic turned out will, to a large extent, give the firm a good or indifferent reputation. I remember a case in point. A mechanic was applying for a position in Winnipeg. On being asked where he served his time, he named a certain plant in Ontario. "Oh, that's where you come from? — well, consider yourself engaged." This is not an imaginary incident, and it proves what I firmly believe, viz., that reputation goes a long way.

### Care Necessary in Getting Boys

Great care should be exercised in selecting material for mechanics. To my mind the boy should be at least sixteen years of age, have an entrance certificate, and give some good reason for wishing to become a machinist. After a few months' trial, a stock taking should take place to ascertain whether he is still anxious to be a mechanic, also if he appears to have it in him to become a machinist. Many a boy wants to be a machinist who never will become worth while as he is not suited to the business. Six months or even less should clearly demonstrate his fitness.

The chief failing that seems to exist amongst boys is that they cannot see the necessity of absorbing everything mechanical within their reach. They seem to imagine that four years in any machine shop automatically makes them a machinist, just the same as a tap will make a thread, without any effort on the part of the tap itself.

If manufacturers were to call in their apprentices to-morrow, asking them if they read the various magazines pertaining to their trade, I feel sure the answers would both surprise and disappoint them. This, in spite of the fact that such magazines can be perused free at any public library. Enter any library to-day and you will find that 90 per cent. of the men who are reading such journals are the ones holding responsible positions.

### Must Have Better Education

It is my contention that the boys should be told of the need of getting this education. Ask them questions they should be able to answer, then if they cannot answer them tell them where they can obtain the information. Give them a periodical examination, one that can be prepared by the superintendent or foreman. Find out if they can calculate gearing, how to cut tapers, the principles of threading, etc. Get the fundamentals thoroughly instilled, and you need have no fear of the future of your machine shop.

On the other hand the boys should do their part in making good tradesmen of themselves, and a few suggestions from one who has passed through the mill might not be amiss. Do not be afraid of producing too much work, or doing tasks you consider beneath your dignity. It is very seldom that the right type of boy is imposed on. Use discretion in asking questions, but ask enough so that you will know WHY you are doing a piece of work in some certain manner. Think ahead, and plan your moves ahead. Do not imagine the foreman is not aware you are loafing, simply because he hasn't caught you flat-footed at it. He may say nothing about it, but that is no true sign. Perhaps it's a sign he has lost all interest in you through your own laziness.

About as good advice as I can offer is this: "Use the same enthusiasm at your work as you do in your sports. Do not let the other fellow beat you; keep ahead, not by a spurt now and then, but by consistent application to the trade you have chosen as a life work."

## PROVINCE BUILDS CEMENT PLANT

### Believes It Can Turn Out the Required Supply at Price Below Market

The Ontario Legislature in committee of supply on the estimates approved of a vote of $1,000,000 for the carrying out of Hon. F. C. Biggs' scheme to establish a provincial cement plant. The Minister explained that the amount voted would build a one-unit plant with a capacity of something over 300,000 barrels annually, which would be sufficient to supply the needs of the province for its provincial highway program. He stated the location of the plant had not been decided upon, but that the department was negotiating for options on alternative sites. It was expected that the province would be able to produce cement at prices much below those prevailing, and moreover would be assured of an adequate supply instead of having its work held up by difficulty in getting delivery.

## PORT ARTHUR STACK SOLD FOR MILLION

### Report Says Development Work Will Be Carried On in That District

Sudbury.—A great deal of talk has been heard in the north about the development of the iron ore industry, but the first important step in that direction has just been taken, with the announcement that the Port Arthur blast furnaces have been sold for the sum of $1,000,000.

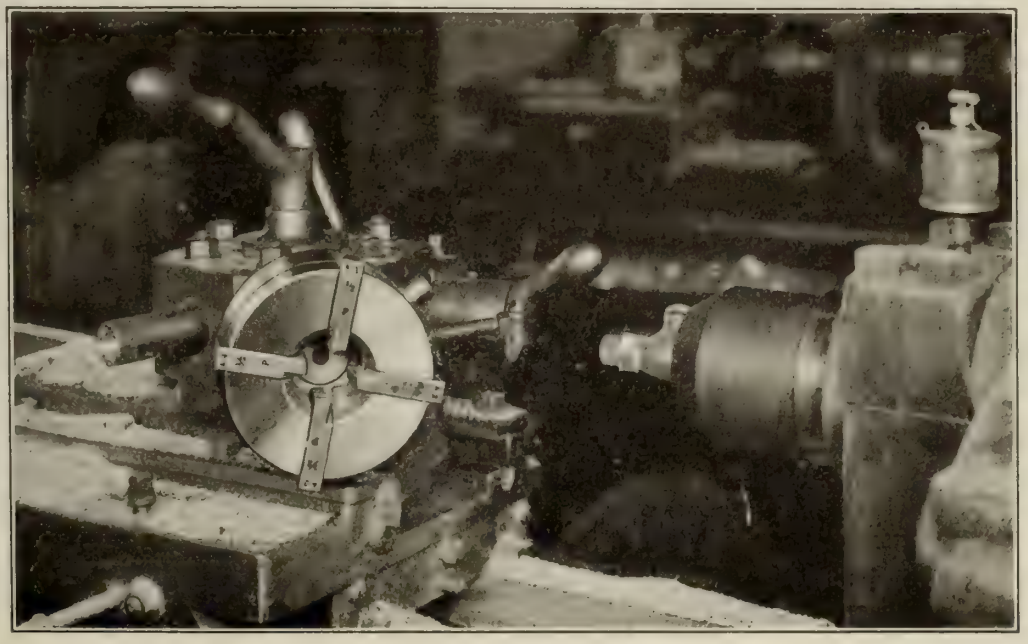
American interests are said to have concluded the deal. The terms call for the purchasers to pay $200,000 within four years, and, if at the end of that period they decide to continue, the balance shall be paid, half of it as cash. The deal must secure the endorsation of the people of Port Arthur. The large plant has been standing idle since 1912.

It was only recently that the Atikokan mine was optioned but it is said that the two deals have no connection.

Mackenzie and Mann interests built the furnace in 1905 and operated it seven years. When operations resume 200 men will be employed.

Right in the Lead

# A Busy Corner Of A Notably Successful Shop



The Geometric Die Head illustrated has just cut the ½-in. pipe thread on the bibb shown. The equipment of this shop consists of many standard and special Geometric Tools.

These people express themselves as very strong for the Geometric line, and are always glad to recommend the use of these Tools. They have themselves used Geometrics for a great many years.

If you can find a user of Geometric Screw Cutting Tools who is not satisfied with them, you will do us a great favor by telling us who he is and where we can find him.

**THE GEOMETRIC TOOL COMPANY**
**NEW HAVEN CONNECTICUT**

***Canadian Agents:***

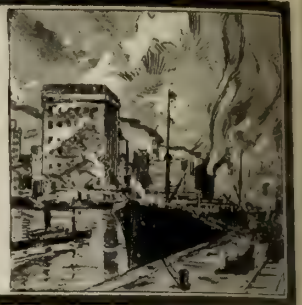
Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, St. John, N.B., Halifax, N.S.

*If interested tear out this page and place with letters to be answered.*



# INDUSTRIAL NEWS

## NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES



### TRADE GOSSIP

**Want Black Pipe.**—Vineland Canners, Ltd., Vineland Station, Ont., want to know where they can secure a used steam heating system for a building 60 feet by 120 feet, or about 500 feet of used black iron pipe.

**Wants Equipment.** — L. R. Reynolds, Tramping Lake, Sask., wants to secure a lathe, drill press and cylinder boring machine.

**Used Mill Wanted.**—James Cunningham, 34 Brock Avenue, Montreal West, is in the market for a used ball mill, and tube mill, and would be pleased to receive particulars of same.

**Wants Garage Equipment.** — Norman Demaine, of Ashworth, Ont., wants to secure some garage equipment as soon as possible.

**Garage Equipment.**—D. L. Ancoin, 3187 Henri Julien, Montreal, is in the market for garage equipment, such as a drill press, air compressor and tank, two vises, forge blower and anvil 150 pounds, grinder, countershaft, shafting, hangers, pulleys, etc.

**Buying Fire Equipment.**—The Board of Control of Toronto is asking tenders up to May 23 for the following: One combination hose and chemical motor truck; one 75-foot aerial ladder truck, front chain drive, with tiller, gasoline driven; four automobile triple combination pumping engine, hose and chemical wagons, pumping capacity 800 Imperial gallons per minute.

**Running Full Time.** — Announcement was made by Wallace R. Campbell, secretary-treasurer of the Ford Motor Co. of Canada, that the main factory of the company at Ford, Ont., will start work on full time basis. The factory for the last few months has been working but four days a week.

**Cancel Convention**—The National Machine Tool Builders' Association announces that its spring convention, scheduled for May 19 and 20 at Atlantic City, N.J., is cancelled. The triple convention of the American Supply and Machinery Manufacturers' Asociation, the National Supply and Machinery Dealers' Association and the Southern Supply and Machinery Dealers' Association will be held on May 16, 17 and 18, as planned, it having been erroneously reported that this convention also would be cancelled.

**Conditions Better.**—Employment conditions in Sudbury district have loosened up to a great extent during the past week and for the first time since last summer a severe shortage of unskilled labor is reported by the employment bureau. Registrations are not falling off appreciably, however, and the men are snapped up as soon as they apply. There is a big demand for river drivers. The pay this year is from $2 to $3 a day with free board and lodging. General unskilled labor is also scarce, the pay for this class of work being from 30 to 35 cents an hour, the working day being from 8 to 10 hours.

**Secure Contract.**—The Canada Car & Foundry Co., Ltd., of Montreal, has received the contract from the Toronto Transportation Commission for 100 motor cars and 60 trailer cars. The contract price is approximately $1,270,000 and is exclusive of electrical and air-brake equipment, for which prices are now being received by the Commission. H. H. Couzens, general manager, Toronto Transportation Commission.

**Should Be Standard.**—Canadian consumers are getting less coal and more dirt in what they purchase during recent years, according to J. C. Hurcomb, of the C. C. Ray Co., Ottawa, coal merchants, who was examined by the special House Committee on fuel supplies. Mr. Hurcomb believed there should be a Government standard of quality for coal and producers should be required to supply coal to that standard.

**Russian Trade.** — Brantford agricultural implement firms would not be adverse to trade with Russia, providing that financial arrangements were satisfactory, according to Mayor George Wedlake, vice-president and general manager of the Cockshutt Plow Co., commenting on the reported visit of M. Krassin, Soviet representative, to Canada, as has been announced. He added that a trade commissioner from Russia had been a visitor in Brantford recently, but nothing definite resulted. Soviet Russia offered a big field for agricultural implements, and the need there was great, while if trade with Russia were reopened it would mean a big thing for the agricultural implement industry and aid considerably in reviving it.

The Sidney Roofing & Paper Co., Sidney, B.C., will rebuild their plant which was destroyed by recent fire.

Yorkton Steel & Machinery, Ltd., are preparing plans for foundry.

If satisfactory agreement can be reached with the city officials, the Imperial Oil, Ltd., will build a wharf costing $100,000 at Confederation Street, Sarnia, Ont. The company requests the city to surrender a lease on certain land required.

The plant of the Ideal Vulcanizing Co., Belleville, Ont., was destroyed by fire on April 29. George Deline, the manager, was repairing a tube and gasoline took fire. The stock of tires and accessories owned by the company was badly damaged, and no insurance was carried on the stock.

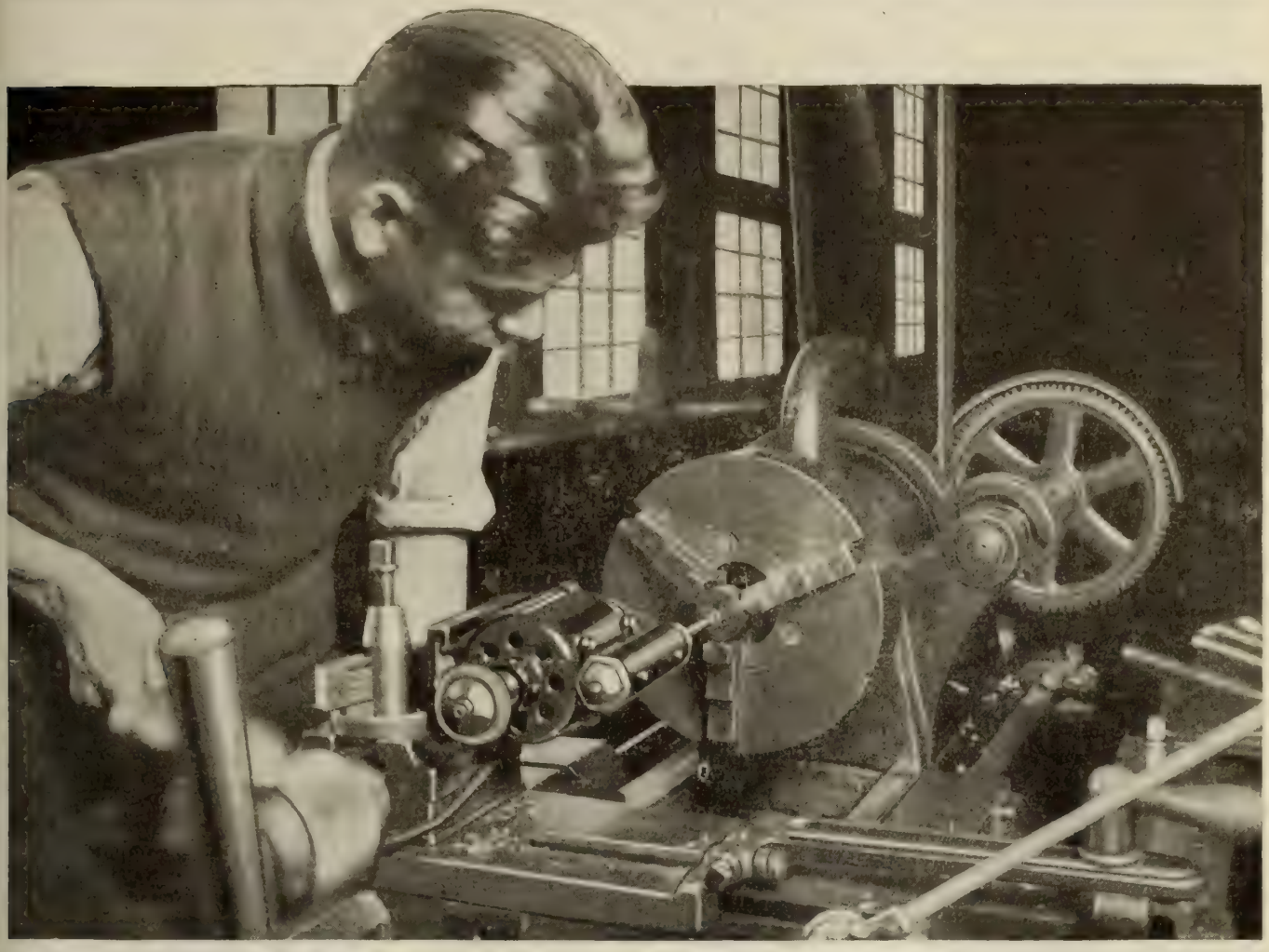
## SHOW THAT THEY WANT BUSINESS

### How One Dealer Sizes Up the Attitude of Some of the American Firms

"If American firms want to secure business in the machine tool field in Canada, they must do two things. First, they must make up their minds that they want the business that is going here, and in the second place they must prepare to go out and get it."

That is part of the conversation that took place between a Chicago man and a dealer in machine tools in Toronto.

He continued: "Too often in the past the American firm has taken it for granted that he could ship up some of his surplus and get rid of it in this country, and that attitude has resulted in the dealer here not getting the support and the backing that he should receive. There has been a very marked change in this attitude in the last three months, and it is not very hard to see the reason. Business is needed and badly needed, and right now we are getting supplied with data and up-to-the-minute information that we could never get before, and we also have promises of more advertising assistance in getting the lines better known to the trade. The Canadian market is well worth while, but it has to be studied and followed up closely to secure success."



# Grinding Diameters on Ring Gages to Close Limits

In the Terry Turbine Company of Hartford, Conn., Dumore Grinders are used on jobs where accuracy is of the utmost importance.

The job shown here is a special Gage—diameter .750-in. with plus or minus limits of .0002 in. Because the Dumore grinds to extremely close limits it is just the tool for work of this character. Besides, the ease with which it can be set up for service wherever necessary gives it an advantage over other methods of handling many kinds of work.

Dumore Grinders can be used anywhere, taking their power from the nearest lamp socket; extremely simple and durable, they offer an economical method for accurately finishing work without changing the setting.

See the Dumore at work. Ask a man who uses one. Or have your dealer give you a demonstration.

## Wisconsin Electric Company

**2935 Sixteenth Street - Racine, Wisconsin**

# DUMORE HIGH SPEED GRINDERS

*If interested tear out this page and place with letters to be answered.*

# SCHWAB SAYS LABOR COSTS ARE THE DETERMINING FACTOR JUST NOW

New York.—Germany, through economy and sacrifices of her working people, has settled down to real production, and is outstripping the United States and allied nations in the fight toward normalcy, Charles M. Schwab declared here in an address before the Chamber of Commerce of the State of New York.

"Germany to-day can put a ton of steel in England at a price $20 a ton cheaper than England can make it," he said, "and is selling pneumatic tools in Detroit, where formerly we shipped such machinery to Germany and sold it cheaper than she could make it.

"The difference is solely a matter of labor costs.

### Idle Workers in U. S.

"It is estimated that 5,000,000 men are out of work in this country. It is accordingly of supreme importance to the working man as well as to the capitalist to restore our prosperity.

"Never before was the need for products so great, never before was such valuable producing machinery and facility available, never before was there so much that needed to be done.

"I have just returned from Europe, and I came with renewed admiration for the courage, the enterprise, the determination displayed in Italy, Belgium, France and England. Germany was ahead of all of them in production.

### Germany May Win by Labor

"Is it possible that, after having won the war, we of the allied nations, with everything in our hands, will allow Germany to win the peace through the efforts of her labor?

"Labor, on the whole, can be paid only what labor as a whole earns, and if some sections of labor exact more than their share of the current product of the world, other sections are going to suffer. I understand that our railroads to-day pay to labor over 60 cents out of every dollar received. The labor cost of making a ton of steel to-day is 85 cents out of each dollar of total cost.

### Basis of Prosperity

"In so far as our people in America are prepared to go to work at reasonable wages, in so far as we are prepared quickly to abandon the artificial extravagances of the war, will we lay the foundations for a new prosperity such as we have never enjoyed before.

"This is the route through which not merely America but the peoples of our allies can find their way out, and triumph in peace as they did in war."

# MONTREAL NOTES

The Montreal offices of the Canuck Supply Company, formerly located at 416 St. James Street, have been removed to more commodious quarters at 371 Aqueduct Street.

W. J. Brown, manufacturers' agent, 117 Youville Square, Montreal, has taken the Eastern Canadian agency for R. S. Newall and Son, of Liverpool, England, manufacturers of wire rope since 1838.

The marriage took place a few days ago of Walter R. Kingsland and Miss Lorna M. Clerk. Mr. Kingsland is on the sales force of the A. R. Williams Co., Montreal.

A. H. Chase, of A. H. Chase & Co., has arrived back in Montreal after a six months' touring trip in the South. This firm is now acting as distributors for the Mechanical Engineering Company of Three Rivers.

The Swedish Steel and Importing Co. are moving their offices from 137 McGill Street to 170 McGill Street, where they have taken over the entire fourth floor of the building. They are contemplating extension to their present activities.

On the occasion of his recent marriage Mr. Charles Bulley, educational instructor of apprentices at the Angus shops of the C. P. R., was presented with a beautifully engraved gold watch by the apprentices of the different departments, in appreciation of the great interest he had always taken in advancing the learning of the boys under his charge. Mr. C. Kyle, supervisor of apprentices, presided at the meeting.

The Blashill Wire Machinery Co., of Montreal, are in the market for a portable electric welder capable of handling the work of butt welding wire up to and including No. 9 gauge. This firm has vacated the ground floor of No. 307 St. James Street and taken offices upstairs in the same building. They expect to be making wire fencing in a very short time, construction operations taking place at their Shearer Street plant.

The last construction order now on the books of the Canadian Vickers Company will be completed before the close of the present month. Wednesday of next week has been set aside for the launching of the Norwegian cargo vessel, "Topdalsfjord," a sister ship to the Idefjord which was placed in the water a couple of weeks ago. When this vessel has been completed it will end the building operations at this yard, unless in the meantime additional business has been secured, and in the face of the present high costs of construction and the surplus of available bottoms, this seems very unlikely. It has been reported that the Government are in the market for an ice-breaker, but nothing definite has been announced as to who will receive the contract.

The order placed with the Canadian Car and Foundry Company by the Toronto Transportation Commission for street car equipment to the extent of a million and a quarter dollars is expected to keep the plant in operation for a couple of months. Some little time will elapse before actual construction will be commenced, as it will require a few weeks to get the material together that will be required for the work. It was stated by officials of the company that the present agreement with the men will be extended during the period necessary for the completion of this contract, but at the expiration of the order the question of wages and working conditions will come up for consideration. Ordinarily the agreement with the men would terminate on the first of May, so that this car order will give an added lease of life to the employees of this plant.

A very successful working test was made last week of the two new 30,000,000 gallon electrical pumps recently installed at the low level pumping station of the Montreal water works. These pumps will be put into regular service immediately, and with the other electrical unit that has been in operation for the past two years, will deliver approximately 75,000,000 gallons daily. It may be necessary to use some of the steam units but the majority of the steam pumps will be held in reserve and used only in cases of emergency. Plans are now under way whereby the entire amount of water required for the uses of the city will be filtered. At present the filtration plant has a capacity of about 50,000,000 gallons per day, and when the new additions are installed, at a cost of about $2,000,000, it is expected that about 120,000,000 gallons will pass through the beds daily.

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Work is being started on an $80,000 packing plant by the Mace Construction Co. for the Dumart Packing Co., Ltd., Kitchener, Ont. The Mace Construction Co. is being organized by Mr. Mace, care of Wm. F. Sparling & Co., 54 University Avenue, Toronto.

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Steps are already being taken by the Northern Canada Power, Ltd., to help prevent a repetition of the power scarcity which prevailed last fall in the North country. At the present time a conservation dam is being erected at Kemoganissee Lake, on the Metagami River, with a view to increasing the storage water for the power. It has been stated by mining men just back from Northern Ontario that the water is exceptionally high, in fact it has never been known before to be as high as it is north of the height of land.

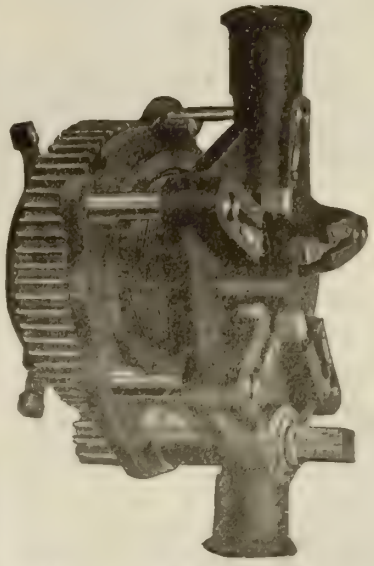
*Buy Them At*

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# PIPE THREADING TOOLS

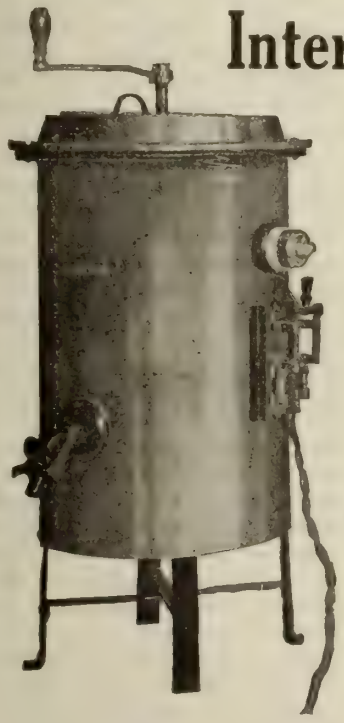
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These tools possess unusual features that result in perfect operation and the greatest economy. The taper thread is not formed by taper dies, but by a receding motion of the cutters from the pipe centres as the die advances. This is a tremendous advantage, since it eliminates friction, and with half the exertion required with a tapered die makes a thread of perfect taper equal to lathe work.

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# International Electric Glue Heaters



The "International" not only keeps the glue in more perfect condition but soon saves its cost in time saved and in more economical current consumption. The one quart heater consumes only one cent's worth of current per day, while the 13 quart consumes less than the ordinary electric flat iron.

The "International" has three heats—full, medium and low. **Full** heat is used for melting. **Medium** provides a lower degree of heat for holding the glue at the correct working temperature of 145 to 150 degrees **Fahr.**, at which temperature glue has the greatest tensile or "sticking" strength. **Low** heat holds the glue at the correct temperature when it is not being used but when it is desirable to keep it hot and ready for instant use.

**Full information and prices are yours for the asking.**



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Throw out the germ-laden Drinking Cup!

Give your men a clean drink

PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)



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Puro Sanitary Drinking Fountain Co.

*Canadian Agents:*
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Machine Springs, Valve Springs, Automobile Cushion Springs, etc., of a quality that defies competition. Tell us your requirements. Send sample or specification for price.

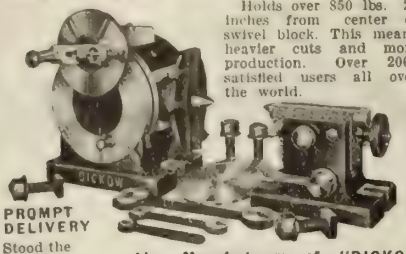
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## NEWS OF THE C.E.S.A.

A meeting of the main committee of the Canadian Engineering Standards Association was held at Ottawa recently, Sir John Kennedy in the chair, and the following were some of the more important matters dealt with: Sir John Kennedy was re-elected chairman; Mr. T. A. Russell and Mr. H. H. Vaughan were re-elected vice-chairmen, and Dr. J. B. Porter was re-elected honorary secretary-treasurer.

The following gentlemen were welcomed as members of the main committee: Mr. J. B. Reade, Purchasing Commission of Canada; Mr. G. A. Mountain, Board of Railway Commissioners for Canada; Lt.-Col. E. W. Stedman, the Air Board; Dr. L. V. King, McGill University; Mr. T. F. Sutherland, Canadian Institute of Mining and Metallurgy.

The attendance of Mr. R. J. Durley, secretary of the conference of secretaries of national standardizing bodies in London, was approved. This conference is of an informal nature and is intended to facilitate the interchange of information and data regarding standardization, especially in its international aspect, and with regard to planning the methods of intercourse and co-operation to be adopted between the various national standardizing bodies. It is expected that the meeting will be attended by delegates from Belgium, Great Britain, Canada, France, Holland, Italy, Sweden, Switzerland, and the United States. Each secretary will present a report on the work of the conference to his committee or council on his return.

The activities of the association during the past year and the present state of the work of the various committees are briefly covered by the attached report. Among the subjects on which the association has recently been requested to take action may be mentioned the following:

A request from the Air Board has been made for the preparation of specifications for certain aircraft materials which cannot be obtained under commercial conditions in Canada, the war-time specifications of the British Air Board being much too elaborate for use under peace conditions. The necessary committees are being arranged for. Co-operation with the American engineering standards committee has been requested in connection with the aeronautical safety code, the American safety code for logging and sawmill machinery, and the American committee which is considering the standardization of parts of elevator machinery.

Requests for co-operation have also been received from the Canadian Electric Railway Association and the American Gear Manufacturers' Association.

In connection with the work of the sub-committee on Portland cement which is engaged in revising and redrafting the specification for that material originally issued by the Canadian society of

civil engineers, the main committee approved of the suggestion of the sub-committee as to the desirability of experimental work on Canadian cements with regard to the best method of determining normal consistency. The main committee also directed that arrangements should, if possible, be made with the proper authorities for the standardization of cement sieves in Canada.

### MAKING BOLTS FIT TIGHT

In connection with some work on American battleships, a report of the Bureau of Standards says it was found necessary to use bolts capable of withstanding unusually high shearing stresses. The best type of bolt for such purposes is one having a tight bearing over its entire length. The bureau was requested to devise a method by which such tight-fitting or "body-bound" bolts could be secured. Two methods were tried, both of which gave satisfactory results.

In the first case the bolts were finished a little larger than the holes in the plates. They were then immersed in liquid air until they contracted sufficiently to enter the holes quite easily. Upon warming up, the bolts expanded, gripping the plates tightly. In the second method each bolt was provided with a small hole along its axis and was finished to be an easy fit in the plates.

After insertion a charge of powder was exploded in the small hole. This expanded the bolt, causing it to grip the plates. Subsequent physical tests indicated that the strengths of the joints secured by both methods were sufficiently high for the purpose.

### COMPARATIVE OUTPUT OF PIG AND STEEL

The National Federation of Iron and Steel Manufacturers, London, England, has put the comparative output of pig iron and steel among the five leading countries as follows:

| | Pig iron | |
|---|---|---|
| | 1913 | 1920 |
| United States ... | 30,966,000 | 36,403,000 |
| United Kingdom. | 10,260,000 | 8,008,000 |
| Germany ..... | 19,007,000 | *7,000,000 |
| France ..... | 5,126,000 | 3,265,000 |
| Belgium ..... | 2,445,000 | 1,113,000 |
| Total . . ..... | 67,804,000 | 55,789,000 |

| | Steel | |
|---|---|---|
| | 1913 | 1920 |
| United States ... | 31,301,000 | 40,773,000 |
| United Kingdom. | 7,664,000 | 9,057,000 |
| Germany ..... | 18,648,000 | *9,000,000 |
| France ..... | 4,620,000 | 2,915,000 |
| Belgium ..... | 2,428,000 | 1,216,000 |
| Total . . ..... | 64,661,000 | 62,961,000 |

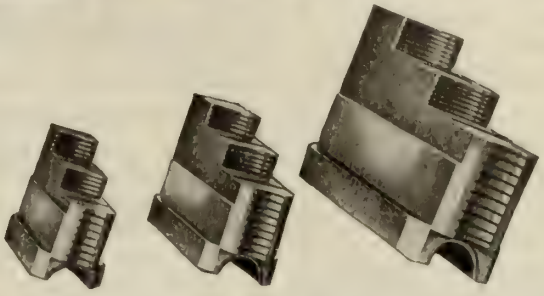
*Estimated.

The data for Germany for 1920 are stated to be a rough estimate since Germany declines to publish figures of iron and steel production.




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BUILT FOR HEAVY DUTY



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# CLOSING TIME

Condensed advertisements for this section must be in our composing room Tuesday morning prior to day of issue. Display advertisements for this section must be in Monday afternoon.

In order that the announcements of your wants, machinery for sale, etc., etc., shall not be delayed, please try to have them in our office with the Tuesday morning mail.

**Canadian Machinery**

---

## Used Machinery For Sale

1—12" x 5' Engine Lathe.
1—16" x 6' Bertram Lathe.
1—18" x 8' Stevens Lathe.
1—12" Drill Press.
1—20" Drill Press.
1—36" x 36" x 10' Bertram Planer.

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Boilers—Firebox—40 h.p.
Boilers—Economic Type—20, 30, 40, 60, 80, 100 h.p.
Boilers—Tubular—40, 50, 70, 80, 100, 150, 175 h.p.
Boilers — Water-tube — 135, 200, 230, 275 h.p.
Engines — Corliss, Automatic, Throttling—all sizes.
Pumps—Steam, Centrifugal and Motor Drive.
Woodworking Machinery of all kinds.
Iron Working — Lathes, Shapers, Drills, Planers, etc.
Generators and Motors.
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We carry right in stock a large quantity of used Belting, Pulleys, Hangers, Shafting, etc., in good condition, which we sell at half the price of new. Inquiries solicited. In writing mention sizes wanted. L. S. Tarshis & Sons, 92 Wellington St., Montreal.

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makers of **"the Guaranteed Motor."**
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2—54 in. x 12 ft. Phoenix with stacks.
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1—60 hp. De La Vergne, Type D.H.
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DO YOU REQUIRE A MECHANICAL ENgineer, or shop superintendent? If so, I am open to accept a position of this nature from May 15th. Can supply first-class references. Have record for lowering cost of production. Will be pleased to talk matters over with anyone interested. Was 8 years with one concern. Box No. 775, Canadian Machinery. (c18m)

POSITION AS FOUNDRY SUPERINTENDENT or foreman on grey iron and non-ferrous metals. 25 years' experience on green and dry sand work, casting from a few ounces to 25 tons. Experienced cupola manager, melt by analysis, and have had lots of experience with molding machines. Best references. Box 776, Canadian Machinery.

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WANTED—TWO 3-PHASE, 60-CYCLE, 2300-volt, 150 to 200 K.W. generators to run at speed of 720 r.p.m. or less, with sliding base and shaft for pulley drive. Generator should have outboard bearing and each complete with exciter and switchboard. Switchboard must be equipped with generator, field switch and rheostat; exciter field switch and rheostat, generator main oil switch, voltmeter, ammeter, instrument transformers and exciter ammeter. Box 774, Canadian Machinery. (c17m)

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LATHES—All sizes and lengths of bed. Special price quoted on rebuilt 20 in. x 8 ft. C.M.C.

AIR COMPRESSOR—8 in. x 8 in. Chicago Pneumatic.

TANKS—10 Tanks 10 ft. 6 in. diam. x 29 ft. 6 in. long. 19,000 gals.
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PUMPS—1 Triplex Power Pump, 1½ in. x 6 in. Hydraulic Machy. Co. Also 1 in. x 5 in. West Tire Setter.
1—Centrifugal Pump, 2½ in. x 1½ in. Gould.
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Milling Cutters and Reamers, full assortment, all sizes and shapes, at less than half price. Send us your enquiries.

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WANTED—BY AN ESTABLISHED CONCERN. Twelve to fifteen thousand dollars for a period of from one to three years, to take care of business expansion. This concern will stand the fullest investigation. 8% is offered with ample security to principals only, with an opportunity of becoming permanent associates with the partners, if mutually satisfied. Box 767, Canadian Machinery. (etfm)

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MACHINERY FOR RENTAL—H. W. PETRIE, Ltd., will rent by the month, motors, hoists or contractors' equipment of any description. (cfm)

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66 x 14 H.R.T. Dyment boiler, complete with fittings, 100 lbs. pressure.

20″ Barnes Drill, W and L feed, T and L pulley, in A1 condition.

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I am offering these exceptional millers at the cut price of $1,500, f.o.b. anywhere in Canada.

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**LATHES**

1—30" x 12' "Blaisdell" (used).
1—30" x 14' "Niles-Bement-Pond" (used).
1—26" x 14' Niles-Bement-Pond, 2 C.G., (used.
1—24" x 10' "Milwaukee" (new).
1—18" x 8' Rae, Q.C.G. (new).
1—16" x 6' Reed, Q.C.G. (used).
1—12" x 8' "LeBlond" Tool Room (used).
1—12" x 6' Worcester, Q.C.G. (used).
1—8" "Rivett" with Cabinet, several attachments, (used).
1—7" Cataract Precision, several attachments (used).

**GAP LATHES**

1—38" x 54" x 12' Bertram (used).
1—22" x 40" x 16' McDougall (used).
1—21" x 30" x 7' South Bend.
1—20" x 38" x 12' C.M.C. (used).

**TURRET LATHES**

No. 4 Millhollands, capacity 1⅝" (used). Several Davis and other makes. Various capacities.

**SHAPERS**

1—16" "MacKenzie" B.G. Crank Shaper, (new).
1—16" "Rae" B.G. Crank Shaper (slightly used).
1—24" "McGregor-Gurley" B.G. Crank Shaper (used).

**PLANERS**

1—42" x 42" x 20' Putnam, 1 head (used).
1—30" x 30" x 10' Pond, 1 head (used).
1—24" x 24" x 6' Powell, 1 head (new).

**MILLING MACHINES**

1—Briggs High Duty, Type "A," 22" Traverse (new).
1—Briggs High Duty, Type "B," 42" Traverse (new).
1—Whitney Hand Miller, 18" x 6" table (used).
1—No. 3 Ford-Smith Plain (used).
1—No. 3 Ford-Smith Universal (used).
1—No. 4 Cincinnati Plain (used).

**DRILLS**

1—10" Burke Sensitive (Bench type) (new)
1—16" No. 2B Edlund H.S. Sensitive (new)
20" "Sibley," "Champions," "Rockwell" and "Silver" (new) and (used).
1—36" C.M.C. Heavy Duty (used).
1—3-spindle 20" Silver Gang Drill (used).
3—4-spindle W. & R. Sensitive (cap. ½") (used).

**BORING MACHINES**

1—66" Bement-Niles Vertical, 2 heads, 24" under rail (used).
1—Universal No. 2½ Horizontal Table, 42" x 22" (used).
1—Bullard "New Era" Vertical Turret, 36", complete equipment (new).

**POWER HACK SAWS**

1—No. 10 Racine 8" x 8" Cap. (new).
1—No. 7 Watkins 9" Cap., 18" Blade (used).
1—No. 1, 6" x 6" Racine (used).
1—No. 3 Robertson 6" x 6" (used).

**AIR COMPRESSORS**

1—8" x 8" Sullivan, Class W.G.-3, Belt driven (used).
1—8 x 10 x 8 Bury, Steam driven (used).
1—12" x 18" Ingersoll-Sargent, belt drive (used).
1—12" x 12" Can. Ingersoll Rand NE-1 (used).

**GRINDING MACHINES**

1—Landis No. 4 Universal (used).
1—Landis Plain, self-contained, 36" x 12" (used).
1—Fitchburg Cylindrical, 8" x 36" (new).
Several Tool and Cutter Grinders (new) and (used). "Globe," "Stevens," "LeBlond" and "Cincinnati."

**MISCELLANEOUS**

2—No. 4 Jno. Hall Pipe Machines (1 used) (1 new).
1—Lennox Rotary Bevel Shear, 1" Cap. (new).
1—"High Speed" Riveting Hammer, No. 3A (used).
1—Beaudry Champion Power Hammer, No. 9 (used).
1—"Grant" Rivet Spinning Machine, No. 80A, (new).
1—"Grant" Rivet Spinning Machine, No. 80B, (used).
1—Arbor Press, No. 4 "Greenerd" (new).

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# Fairbanks-Morse Machinery Stock List—*Continued*

## In Stock at Montreal

**DRILLS FOR RADBORE ATTACHMENT**

1—¾"—B.
1—1"—B.
1—1¼"—B.
1—1½"—B.
1—1¾"—A.
1—1⅞"—A.

**DRILLS, ELECTRICAL**

1—Dumore Sensitive Bench Drill, Model 2 A.D., Universal Motor, 2/16" capacity.
1—⅜" U. S. E. Co. Universal Motor Drill, 110 v., type EU.
2—½" Type DAU Electrical Tool Co.'s Drills.
1—½" Type DU Electrical Tool Co.'s Drill.
1—5/16" Type BUA Electrical Tool Co.'s Drill.

**BUFFERS**

1—No. 8 Perfect Buffing Machine complete.
1—No. 8 Perfect Buffing Machine complete (New Style).
1—No. 6 Perfect Buffing Machine complete.

**GRINDERS**

1—No. 1 B. & S. Universal Grinder (Used).
1—1-A Wells Drill Grinder, cap. 1/16" to 1¼".
1—No. 4 McDougall Grinder Comp., cap. 14 x 2 x 1⅛.
1—No. 6 Perfect Grinder and Countershaft, cap. 12 x 2 x 1.
2—No. 10 Perfect Grinder Bases Only, cap. 10 x 1½ x ¾.
1—No. 2 Blount Grinder Head Comp., cap. 8 x 1 x ½.

**GRINDERS, ELECTRICAL**

1—U.S. Elec. Grinder, Type HJU, 110 v.
1—U.S. Elec. Grinder, Type J/DC Motor (Used).

**HACK SAWS**

2—No. 0 Perfect Power Hack Saws, cap. 6 x 6.
2—No. 2 Perfect Power Hack Saws, cap. 6 x 6.
2—No. 3 Perfect Power Hack Saws, cap. 6 x 6.

**MILLING MACHINES**

1—No. 0 B. & S. Plain Milling Machine, with Pump.

**PRESS**

1—No. 173 Brown-Boggs Foot Press, with Legs.

**PIPE MACHINES**

1—Hall No. 6 Standard Improved Pipe Lathe, cap. 1 to 6", complete with 5 sets of dies.
1—Hall No. 4-W Simplex Pipe Lathe (Oster Type), cap. 1" to 4", weight 1,400 lbs.
1—Landis 6" Pipe Threading Machine with Chasers.
1—Landis No. 4 Stationary Pipe Die Head, with set of 8 Pitch High Speed Chasers.
1—Landis 8" Stationary Pipe Die Head, with set of 8 Pitch High Speed Chasers.
We have in stock pipe chaser holders and large assortment (about 345 sets) Chasers.

**SHAPERS**

1—16" Walcott Back Geared Crank Shaper.

**MISCELLANEOUS**

1—Cowan Wood Bench Lathe, 12".
1—MacKenzie Combination Saw Table.
1—Elliot No. 5 Woodworker, Motor Driven, Motor 110, 200 v., 60 cycle, single phase, 1,725 r.p.m.
1—¾" Plug for Claflin No. 2 Beater.
1—No. 30 Style A Casler Offset Boring Head.
1—No. 40 Style A Casler Offset Boring Head.
1—No. 60 Style A Casler Offset Boring Head.
1—No. 80 Style A Casler Offset Boring Head.
1—No. 306 Boring Bar, Casler.
1—No. 409 Boring Bar, Casler.
1—No. 612 Boring Bar, Casler.
1—No. 615 Boring Bar, Casler.

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Halifax, St. John, Quebec, Montreal — Ottawa, Toronto, Hamilton — St. Catharines, Windsor, Fort William — Winnipeg, Regina, Saskatoon — Calgary, Edmonton, Vancouver, Victoria

# Machinery Stock List

## *In Stock at Toronto*

### TURRET LATHES

1—Gisholt "H," 21", Standard Turret Lathe, complete.

### ENGINE LATHES

1—McDougall 26" x 14', D.B.G. and Q.C.G. Engine Lathe.
1—20" x 10' Walcott, D.B.G. and Q.C.G. Engine Lathe.
2—26" x 12' Walcott, D.B.G. and Q.C.G. Engine Lathes.
1—20" x 8' Walcott, D.B.G. and Q.C.G. Engine Lathe.
1—18" x 8' Walcott, D.B.G. and Q.C.G. Engine Lathe.
1—14" x 6' Walcott, D.B.G. and Q.C.G. Engine Lathe, with taper attachment.
1—Reed-Prentice 14" x 6' Toolroom Lathe, Q.C.G., Gear Box taper attachment, draw-in chuck, one collet and regular equipment.
1—Reed-Prentice 14" x 6' Toolroom Lathe, Q.C.G., taper attachment, compound rest relieving attachment, draw-in chuck, and one ½" collet and oil pan.
1—Seneca Falls 12" x 6' Toolroom Lathe, Q.C.G., Taper Relieving and draw-in attachments and pan bed.
1—Seneca Falls 12" x 6' Toolroom Lathe, Q.C.G. and pan bed.
1—Seneca Falls 12" x 6' Toolroom Lathe, Q.C.G. and standard equipment.
1—Seneca Falls 11" x 6', Quick Change Gear Lathe.
1—Seneca Falls 9" x 4', Plain Engine Lathe.

### SCREW MACHINES

2—No. 2 Brown & Sharpe Automatic Screw Machines.
1—No. 0 Brown & Sharpe Automatic Screw Machine.
1—Warner & Swasey (used) No. 4 Hand Screw Machine, pan bed, friction head, without power feed to turret.
3—Foster No. 4 Hand Screw Machines (used), with friction head, pan bed, without power feed to turret.

### MILLING MACHINES

2—Brown & Sharpe No. 1 Universal Milling Machines.
2—Brown & Sharpe No. 2 Universal Milling Machines.
1—Brown & Sharpe No. 2A Universal Milling Machine.
1—Ford-Smith No. 2 Universal Milling Machine.
1—Ford-Smith No. 3 Universal Milling Machine.

### BOLT THREADING MACHINES AND ACCESSORIES

1—Landis 1" Double Head Bolt Threading Machine with leadscrew attachments.
1—Landis 1½" Single Head Bolt Threading Machine.
1—Landis 2" Single Head Bolt Threading Machine.
3—Landis ½" Rotary All Steel Bolt Die Heads.
3—Landis 1" Rotary All Steel Bolt Die Heads.
3—Landis 1½" Rotary All Steel Bolt Die Heads.
2—Landis 2" Rotary All Steel Bolt Die Heads.
1—Landis 1¼" Automatic Die Head.

## *In Stock at Montreal*

1—Gisholt 21" Std. Turret Lathe, 3½" Spindle, comp. with set boring and turning tools.
1—McDougall 26" x 14', D.B.G., Q.C.G. Engine Lathe.
1—McDougall 20" x 10', S.B.G., P.C.G. Engine Lathe.
1—Walcott 26" x 12', D.B.G., Q.C.G. Engine Lathe.
1—Walcott 20" x 10', D.B.G., Q.C.G., Engine Lathe.
1—Walcott 20" x 8', D.B.G., Q.C.G. Engine Lathe.
1—McDougall 18" x 8', D.B.G., Q.C.G. Engine Lathe.
2—Walcott 18" x 8', D.B.G., Q.C.G. Engine Lathes.
1—Walcott 18" x 8', D.B.G., Q.C.G. Engine Lathe, complete with pan bed and taper attachment.
1—Walcott 16" x 6', D.B.G., Q.C.G. Engine Lathe.
1—Walcott 14" x 6', D.B.G., Q.C.G. Engine Lathe.
1—Seneca Falls 12" x 6', Style E Tool Room Lathe, draw-in chuck, one collet, ¼" taper attachment.
1—Seneca Falls 12" x 6', Style E Tool Room Lathe.
1—Seneca Falls 12" x 6', Style H Tool Room Lathe, pan bed.
1—Seneca Falls 11" x 5', Style E Tool Room Lathe, draw-in chuck, one collet, ¼" taper attachment.
1—Seneca Falls 9" x 4', Tool Room Lathe with pedal attachment.

### BALERS

1—Climax Hand Baler, No. 2, capacity bale 14 x 18 x 28.

### BOLT MACHINES

1—No. 734 Wells Bolt Threading Machine with friction countershaft, cap. ¼ to 2".
1—Landis 1½" Single Head Threading Machine without chasers.
1—Landis 2" Single Head Threading Machine without chasers.
1—Landis 1½" Double Head Threading Machine without chasers.
2—Landis 1" Bolt Cutter Heads without chasers.
2—Landis 1½" Bolt Cutter Heads without chasers.
2—Landis 2" Bolt Cutter Heads without chasers.
1—1¼" Landis Automatic Screw Cutting Die Head without chasers.

We have in stock large assortment chasers (About 345 Sets)

### DRILLING MACHINES

2—No. 3 McDougall 20", B.G., Power Feed Drills, cap. 1¼".
2—No. 14 Perfect Column Drills, cap. 9/16" drills.
1—5/16" McKenzie Column Drill.
1—No. 18 Perfect Bench Drill, cap. 5/16" drills.
1—No. 15 Perfect Bench Drill, cap. 9/16" drills.
1—5/16" McKenzie Bench Drill.
1—No. 1 10" Burke Sensitive Drill, cap. 0 to ⅜".
2—Buffalo 10" Bench Drills, 9/16" capacity.
2—No. 28 Canedy Otto Sensitive Bench Drills, 0 to ½".

### RADBORE DRILLING ATTACHMENT

1—No. 5, Milling Machine Type.

**Continued on page 104**


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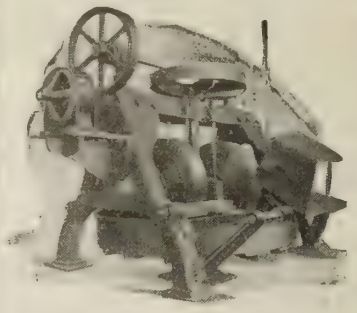
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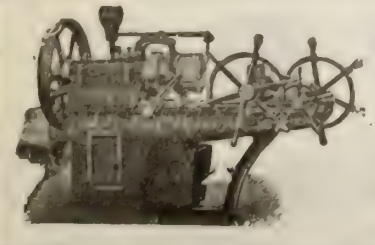
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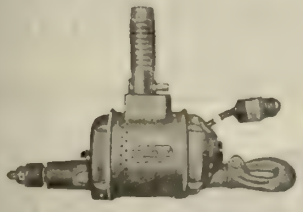
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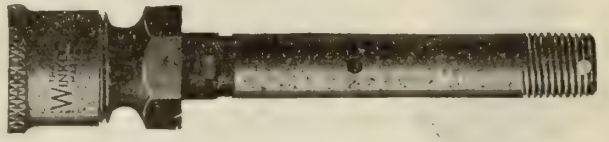
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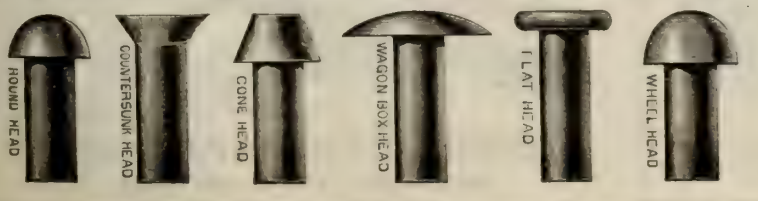
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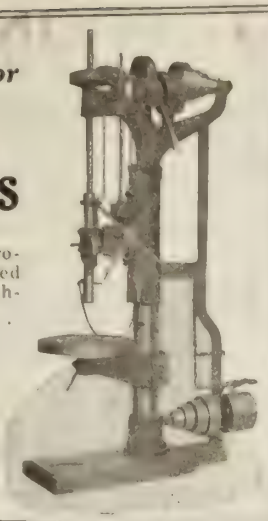
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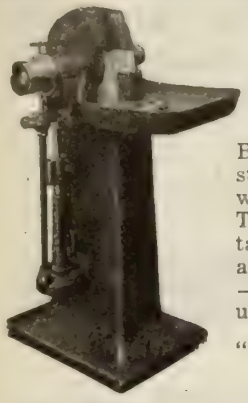
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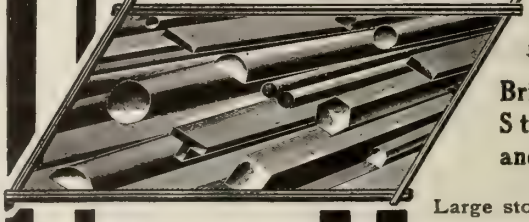
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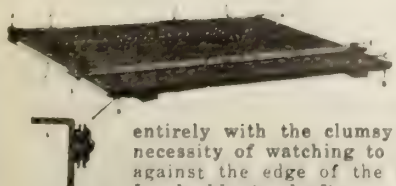
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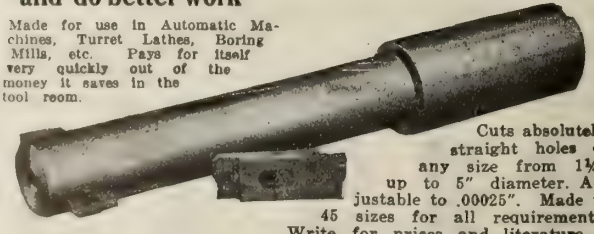
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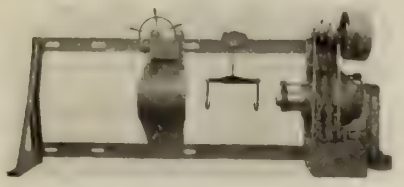
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Universally adopted, direct reading, inexpensive, and the only instrument that agrees with others of its kind in all parts of the world, thus solving problems of ordering materials to specification.

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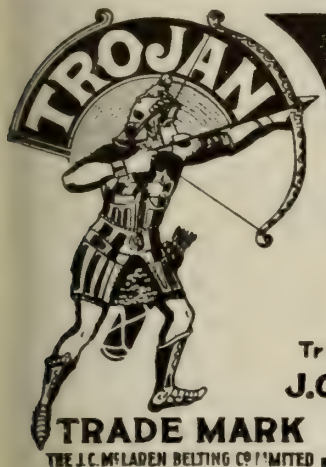
THE SCLEROSCOPE (Set)

## Heat Indication

THE PYROSCOPE

by optical means is fast becoming the correct thing. The PYRO SCOPE has solved the problem. Perfect constancy, inexpensive, no electricity used. Built to stand rough usage, and upon common-sense lines. Used by the Government and best firms.

**The Shore Instrument & Mfg. Co.** Van Wyck Ave. & Carll St. JAMAICA, N.Y.
A. R. Williams Machinery Co., Ltd., Toronto, Canada




## A BALATA BELTING

**Which We Guarantee Second To None And Entirely Satisfactory**

Try One And Be Convinced

**J.C.McLAREN BELTING CO.**
Limited
MONTREAL TORONTO WINNIPEG

TRADE MARK
THE J.C. McLAREN BELTING CO. LIMITED

# Lock Washers!

For the production of Lock Washers upon a tonnage basis, we offer you equipment of the most up-to-date kind. Ask for Bulletins Nos. 312 and 320.

**Sleeper & Hartley, Inc.**
Worcester, Mass.



ALL KINDS

**Spur, Bevel, Spiral, Herringbone and Intermittent Gears**

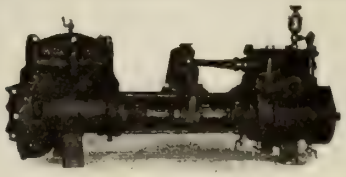
in all metals, rawhide or fiber.

The best of service — try us on a Rush Order.

Distributors of Diamond Chains.

Our catalogue is full of gear data—yours for the asking.

**PHILADELPHIA GEAR WORKS**
Vine Street
PHILADELPHIA, PA.



Steam and Power

# PUMPS

VERTICAL AND HORIZONTAL

Our long experience in pumping problems is at your service and we solicit your correspondence.

**The Smart-Turner Machine Co.,**
Limited
Hamilton, Canada

# STEEL CASTINGS

**1 to 5,000 pounds**

## Highest Quality

PROMPT AND RELIABLE SERVICE

**SWEDISH CRUCIBLE STEEL CO. OF CANADA, Ltd., Windsor, Ont.**



## Hand Oil Pumps

which obviate drips and oil-soaked floors, thus minimizing fire hazard, and providing economical means of handling.

**Air Compressors, Gear Cutting.**

**Hamilton Motor Works**
LIMITED
Hamilton, Canada

# "The Spectre"

*By Guy Morton*

"LONGREEN was not a quibbler.

"'I am sorry, Grimley' — he came straight to the point—'but we are compelled to dispense with your services at the end of the month. Turner's for the past six months has been having a terrible pull. We got overstocked on the rising market and now, with the market falling every day and getting more and more into the customers' hands, we have to retrench or crash. We have chosen to retrench. Every stick of decorative employment is being cut out of the store. . . .'"

*What Spectre?* The Spectre of Unemployment—a spectre which all too many have encountered during the past few months. If you have not personally encountered this spectre, so graphically described in its causes and consequences by Guy Morton, you may count yourself amongst the fortunate, but there will be no doubt as to your interest in his story. If you have encountered it, nothing can stop you, once you start this story, from reading it to its unusual and constructive conclusion.

It is a great piece of fiction, told by the same author who wrote "Personality Plus" in the March 15th MACLEAN'S.

## Review of Reviews

Social Revolution in England
Sir Philip Gibbs

Can Germany Pay?...Stephane Lauzanne

Lighter Side of Diplomacy
Maurice Francis Egan

The African Lung Fish
Scientific American Monthly

Shock Cures Shock.....A Psycho-Analyst

Ten and a Half Dollar Novels
George Moore

Soil Subsidence in England....Daily Mail

## Ten Others

**"The Drama of our Great Forests": Life and Love Return—** *By Arthur Heming*

This is the seventh installment in Mr. Heming's wonderful account of life in our northern forests and pictures the fascination of real romance in the wilds.

**"Have Faith in Our Nationals"—** *By Agnes C. Laut*

There is no use always knocking, says Miss Laut. By a constructive policy of immigration and settlement, some of these deficits can be vastly reduced.

**"Conversation vs. Closure"—** *By J. K. Munro*

Premier Meighen is struggling against great odds to carry through some constructive legislation. According to Mr. Munro, they are really not getting anything done at Ottawa—and he tells how they do it in his masterly, pungent, pithy, witty fashion.

**"She Wasn't a 'Type' So She Became a Directress"—** *By Edith M. Cuppage*

The story of a B.C. woman who wanted to get into the movies—and got there, despite everything, in the administrative side.

**"Heads Million Dollar Corporation"—** *By Dorothy G. Bell*

The story of a Canadian girl who went to the States with an idea that she might become a dancer, but has made for herself a niche as head of a million dollar financial corporation.

**"Our Own Mediterranean"—** *By Elton Johnson*

What's what at the present time in regard to the movement which is on foot to make ocean ports of our Great Lake ports.

**"Making Good on Four Ambitions"—** *By Sinclair Laird*

The story of W. S. Bullock, a member of the Provincial Legislature of Quebec Province, who did not know his multiplication table at 19 and is now a leading educationalist.

**"Pawned"—** *By Frank L. Packard*

This masterly story of a triple regeneration is drawing swiftly to its conclusion; John Bruce and Crang meet again at death-grips.

**"The Gates of Tien T'ze"—** *By Leslie Howard Gordon*

The first "gate' is entitled "The Gate of Wu" and starts off this thrilling, absorbing, melodramatic story with several full pages of gripping adventure.

**"The Cage of Iron"—** *By William Merriman Rouse*

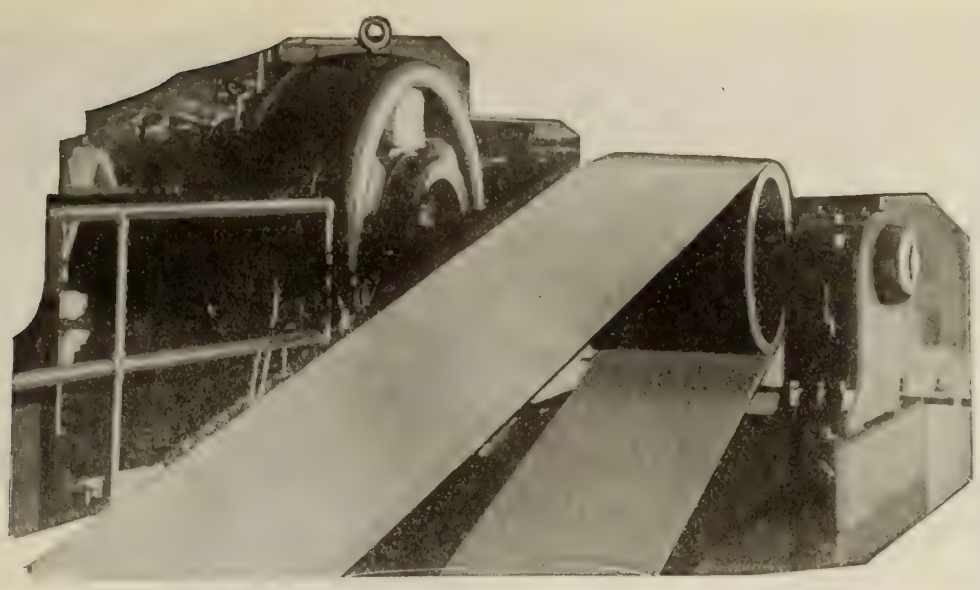
A story of an old man who thought he could take into his own hands the vengeance which the Creator intended should be left for Himself.

## MAY 1st ISSUE 20c.

NOW ON ALL NEWS-STANDS

# MACLEAN'S

"CANADA'S NATIONAL MAGAZINE"



# Transmission Insurance

Are your drives insured against belt unreliability? Power economy in machine shops and power plants is gained only by transmission efficiency. The highest efficiency is reached with Dominion Rubber System Friction Surface Belting—properly installed—because it represents the skill and experience of the largest manufacturers in Canada.

One of our belting men, from our nearest Service Branch, will gladly inspect conditions in your plant and submit recommendations for your approval.

## Dominion Rubber System

### Service Branches

| | | | | |
|---|---|---|---|---|
| Halifax | Ottawa | Kitchener | Brandon | Calgary |
| St. John | Toronto | North Bay | Regina | Lethbridge |
| Quebec | Hamilton | Fort William | Saskatoon | Vancouver |
| Montreal | London | Winnipeg | Edmonton | Victoria |

## DOMINION RUBBER SYSTEM PRODUCTS

### Belting

**Transmission:** "Dominion," "Keewatin," "Para."

**Conveyor:** "Rockproof," "Canadian," "Hiheat"

**Elevator:** "Dominion," "Rockproof."

**Agricultural:** "Dominion," "Star."

**Grain Elevator:** "Metcalf Standard," "Grain King."

### Hose

**Air:** "Kushion Kover," "4810 Airtite," "Star."

**Steam:** "Indestructible," "Rockproof," "Para."

**Water:** "Indestructible," "Para," "Kushion Kover," "Star."

**Suction:** "Para," "Star," "Trade."

**Garden:** "Canadian," "Dominion."

### Packing

**Sheet:** "Join-Tite," "Star," "Importers."

**Rod:** "Cabestos," "Valve-Bestos," "Canadian."

**Valves:** "Montreal," "Commercial" "Canadian."

### Miscellaneous

**Mats,** Matting and Flooring.

**Moulded** Goods.

**Plumbers'** Specialties.

**Hard** Rubber Goods, Tubing.

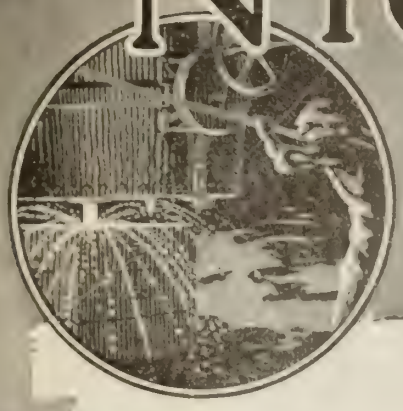
**Rubber** Covered Rolls, Deckle Straps.

**Friction Tape,** Splicing Compound.

DOMINION RUBBER SYSTEM AND ASSOCIATED COMPANIES

*If interested tear out this page and place with letters to be answered.*

# Nichrome the Casting Durable



## Carbonizing Containers

of Cast Nichrome are at once a source of economy and an aid to quality results.

Since the very principle of carbonizing and hardening is one of quality and service, the reasons for the extensive use of Cast Nichrome Containers are obvious.

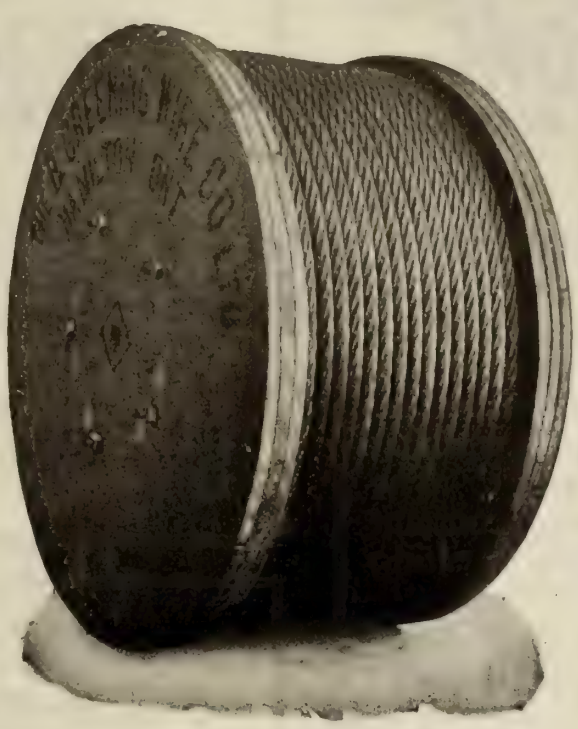
Thousands of hours of service, at 1,800 deg. F., without warping, growing, cracking or scaling means not only economy, but also uniformly good results in the heat-treated parts. Shorter heats, greater furnace capacity and less fuel are added advantages. All Cast Nichrome containers are backed up by the Cast Nichrome economy guarantee.

*Manufactured under HENDERSON Patents by*

CANADIAN DRIVER-HARRIS CO.
WALKERVILLE, ONT.
American Office and Works
Chicago-Detroit Harrison, N. J. England-France



# WIRE ROPES



*High-Grade* *Quick Service*

*FOR*

**HOISTING**
**HAULAGE**
**CABLEWAYS**
**DREDGES**
**STEAMSHOVELS**
**SHIPS' RIGGING**

*Prices Promptly Quoted*

## The B. Greening Wire Co., Limited

Hamilton, Ont. Montreal, Que.

*If interested tear out this page and place with letters to be answered.*




## LEARNED From Experience

WHEN *ARMSTRONG* earned his living by RUNNING A LATHE he often wished he could get a set of Lathe Dogs which would stand up to the work. The Screws especially were a constant source of trouble, points upsetting and threads stripping.

His practical experience is the basis upon which the *Armstrong* line of Dogs and Clamps is built. The bodies are Drop Forged of a special grade of steel selected for its high degree of stiffness and great tensile strength. Screws can't be beat for long lasting qualities; they are made of Chrome-Nickel Steel, given a special heat treatment, and the points are hardened.

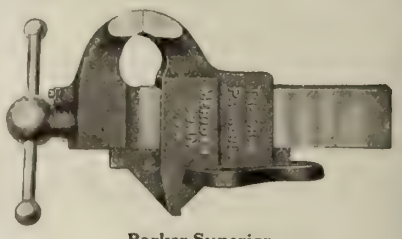
*Specify Armstrong when ordering and get the best.*

**Catalog mailed free upon request.**

ARMSTRONG BROS. TOOL CO.
"THE TOOL HOLDER PEOPLE"
306 N. FRANCISCO AVE. CHICAGO, U.S.A.
STRONG STRONG

# PARKER VISES

*Pioneers 1842* *Leaders Ever Since*



Parker Superior

*Parker Superior says—*

## There are 7

reasons why our Branch of the Parker Family are demanded. Watch the next seven issues and learn.

## The Charles Parker Company

*Master Vise Makers*

Meriden Conn., U.S.A.

C N C

**COLUMBIA PYRAMID BRUSHES FOR STREET CAR MOTORS**

*Uniform in Structure*
*Uniform in Capacity*
*Uniform in Size*
*Uniform in Performance*

**There is one BEST type of Columbia Pyramid Brush for YOUR motors. Let us put on exactly the brush you need.**

CANADIAN NATIONAL CARBON COMPANY, LIMITED
TORONTO AND WINNIPEG

4520

# TOOL GRINDING CHART

Showing clearance and rake angles for cutting tools. 17 x 27½ inches, printed in two colors on heavy manilla stock.

A splendid thing for any tool room. One large engineering firm, in acknowledging this chart, stated that they would like two additional copies as they intended adopting it as standard in their tool room.

We would like these charts placed in every shop in the Dominion and if there is not one in YOUR tool room, write for your copy at once. IT'S FREE.

CANADIAN MACHINERY,
153 University Avenue, Toronto.

Please send me / us free, one of your tool grinding charts.

Signed .....

Firm Name .....

St. Address .....

City .....

Prov. .....

Diamond·F

# Built for Wear

# BUSHINGS

Diamond Fibre Bushings are especially adapted for use where toughness and ability to withstand hard usage are of paramount importance. They are made in every style: flanged, tapped, threaded, countersunk, tapered, or a combination of all these styles.

Diamond Fibre is particularly suited for use in the Automotive Industry because of its imperviousness to oil and grease, its high dielectric strength, its light weight and great strength, and the ease with which it takes extreme machining.

**Some of the Many Uses Where Diamond Fibre has Proved Superior**

- Battery box linings
- Brake bands
- Bushings
- Bush rod tappets
- Clutch linings
- Conduits for wiring
- Discs
- Frictions
- Gaskets
- Insulation
- Packings
- Speedometer gears
- Starting crank handles
- Switch handles
- Timer rings
- Transmission handles
- Washers
- Wire manifolds
- Parts for starting, lighting and ignition systems.

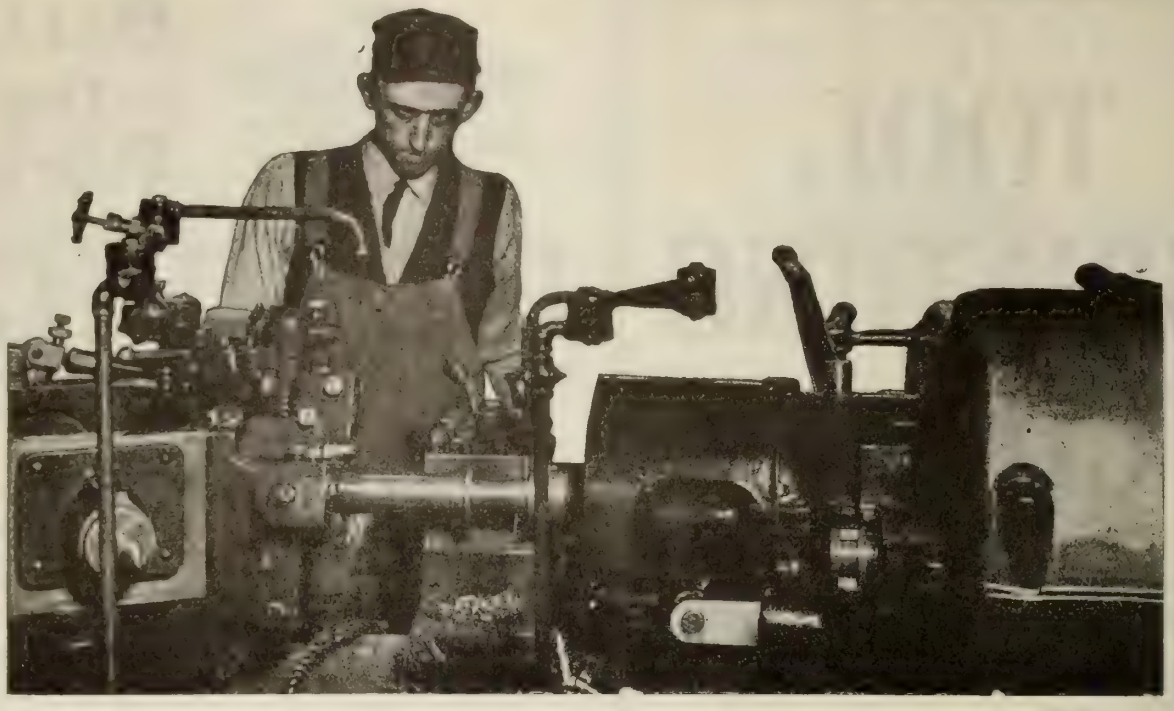
We are fully equipped to take care of special shapes made to your specifications for any article you desire, or can supply the basic material in sheets, tubes, or rods.

*We will be glad to advise you on any production problem that is bothering you. Our engineers and experts are at your service. Send for our new illustrated catalogue about Diamond Fibre and its uses.*

## DIAMOND STATE FIBRE COMPANY OF CANADA LIMITED

*Head Office and Works:*
235 Carlaw Avenue - - TORONTO, CANADA
MONTREAL BRANCH - 84 St. Francois Xavier St.

*If interested tear out this page and place with letters to be answered.*



# To Decrease Operating Costs

The side carriage is an important part of the W.&S. turret lathe. It reduces operating costs, often by as much as one-half. It operates simultaneously with the turret and independently of it. The side carriage has a separate feed rod.

Take some of the simplest bar jobs; by cutting off with the side carriage while the turret tools are finishing their work, you save most of the cutting off time.

Here is the picture of a W.&S. 2-A in a railroad shop. This machine makes bolts, pins, oil cups, valve parts, piston rods, and many other parts used in the repair of locomotives and cars.

On all these parts both turrets operate together.

Take this feature and the fact that the machine operates easily and accurately, and you know why the machine is popular with the shop men. It delivers the goods.

Send us blue prints of your parts and we'll tell you how long it will take to do your work the W.&S. Way.

## The Warner & Swasey Company

### Cleveland, U.S.A.

BRANCH SALES OFFICES:
NEW YORK: Singer Building
CHICAGO: 618-622 Washington Boulevard.
BOSTON: Oliver Building.
BUFFALO: Iroquois Building.
DETROIT: 5928 Second Boulevard.
MILWAUKEE: 209 Sycamore Building
INDIANAPOLIS: 940 Lemcke Annex.
DAYTON: 518 Mutual Home Building.

CANADIAN AGENTS—
A. R. Williams Machinery Company, Ltd., Toronto, Winnipeg, Vancouver, St. John.
Williams & Wilson, Ltd., Montreal

FOREIGN AGENTS—
Charles Churchill & Company, Ltd., London, Birmingham, Manchester, Bristol, Newcastle-on-Tyne, Glasgow.
Allied Machinery Company, Paris, Turin, Zurich, Barcelona, Brussels.
Wilhelm Sonesson Company, Malmo, Copenhagen, Stockholm, Gothenburg.
R. S. Stokvis en Zonen, Rotterdam.
Benson Brothers, Sydney, Melbourne, Adelaide.
Yamatake Company, Tokyo, Osaka, Nagoya, Fukuoka, Dairen.
McLeod & Company, Calcutta.
Andersen, Meyer & Company, Ltd., Shanghai.
Brossard-Mopin & Company, Saigon, Singapore, Haiphong.

MADE-IN-CANADA

# Torrington

MACHINE SCREWS

## Cut Down the Work on Your Screw Machines

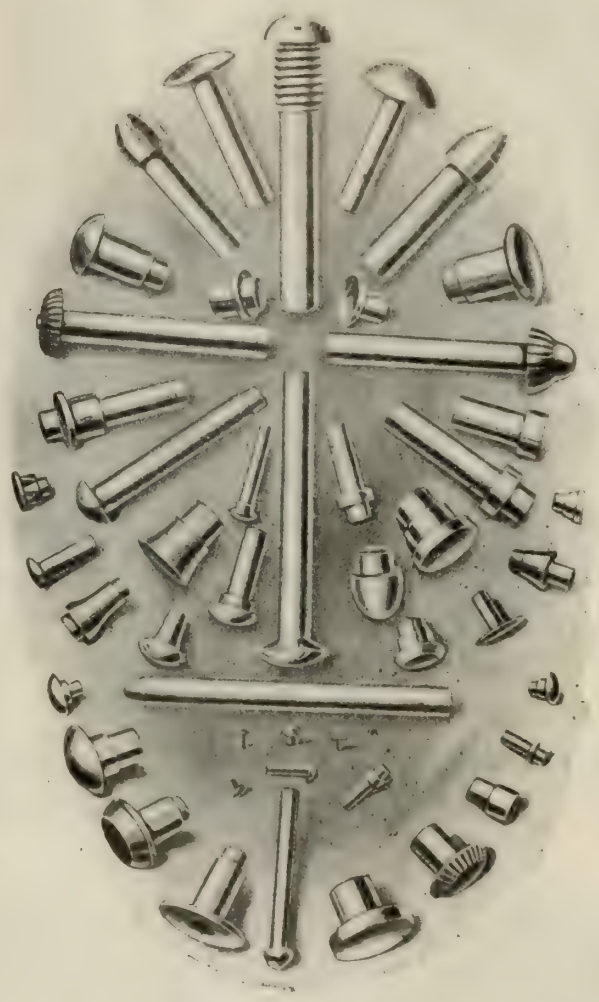
NATURALLY you want to reduce your manufacturing costs in every way you can.

A great many parts now made on screw machines can be produced by our process at a great saving in cost.

And back of every order sent to this company is an enviable reputation for products superior in quality and workmanship.

In addition to our standard line of machine screws we manufacture special sizes and styles to order when required.

We also manufacture special parts, after the style herewith illustrated, upon receipt of samples. All kinds of high-grade Rivets, from Brass, Copper, Steel, German Silver and Aluminum—to order only.



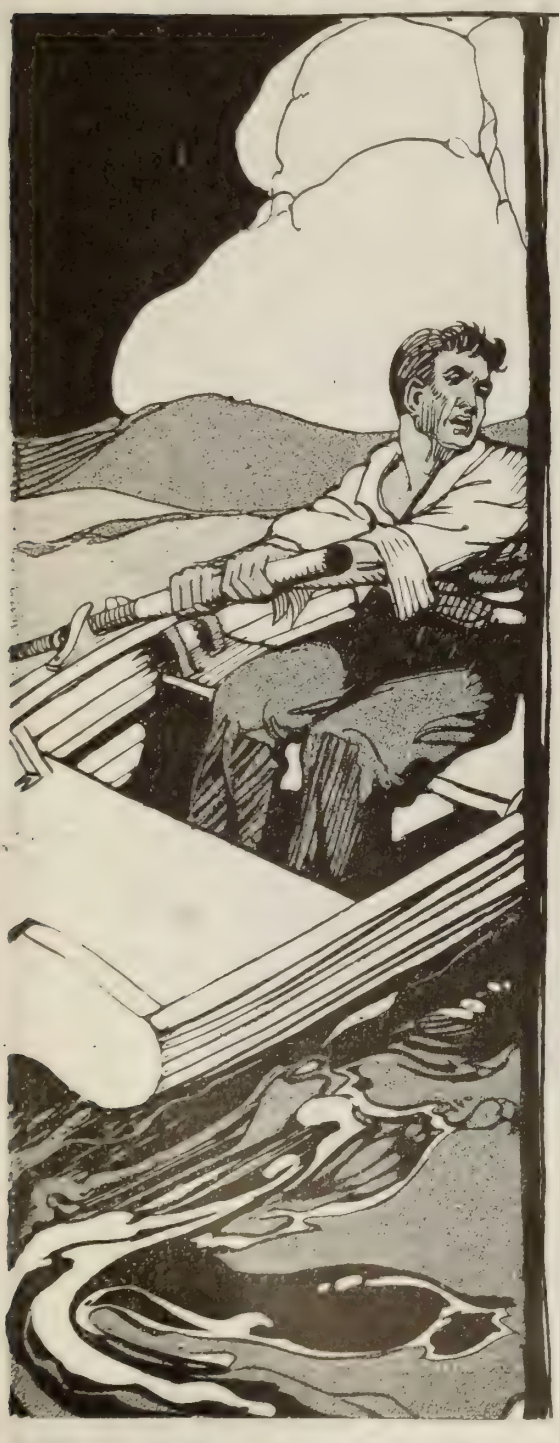
**These are but a few of the many parts we frequently make.**

## THE TORRINGTON COMPANY, LIMITED

UPPER BEDFORD, QUEBEC

*If interested tear out this page and place with letters to be answered.*

# You Can't Row a Boat with One Oar



An unbalanced advertising campaign, like a one-oar boat, never gets anywhere.

Sound copy must be balanced by scientific space selection. Mediums deserve as much attention as merchandising.

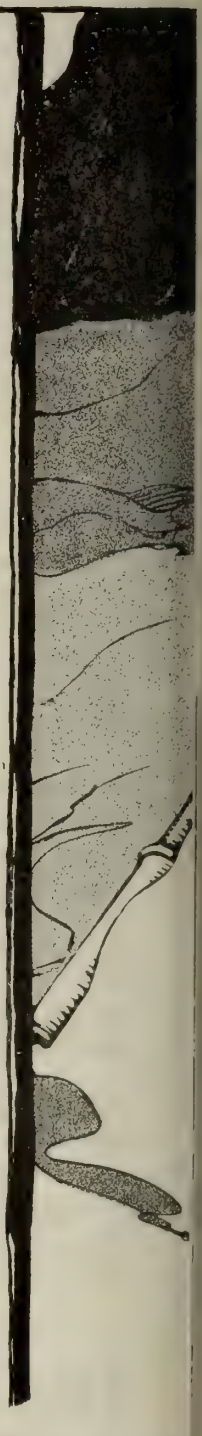
To buy space scientifically circulation must be *analyzed*—not merely counted.

Do you ask of a publication not only "How much?" but also "How did you get it?" and "Where does it go?" If you fail in these particulars you are trying to make an advertising campaign go with only one oar.

The answers to these questions can be obtained by studying the A. B. C. reports. To read the circulation figures only is not enough, even though they are verified by the A. B. C. audit. This is but the beginning.

Advertising is being put to a test to-day, which it can meet if you put circulation to the test of A. B. C. reports.

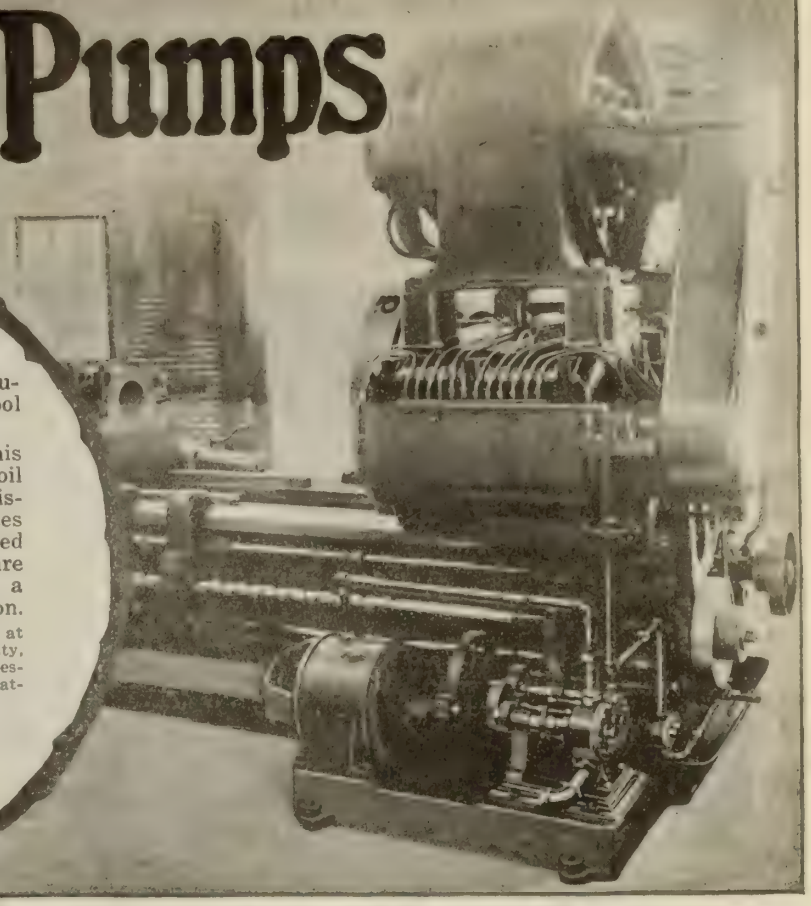
Canadian Machinery is a member of The Audit Bureau of Circulations.



**The MacLean Publishing Co., Limited, Toronto**

*EIGHT BRANCH OFFICES*

# Trahern Pumps



**On Springfield Tools**

Here is one of the huge machines, manufactured by the Springfield Machine Tool Co. of Springfield, Ohio.

Two TRAHERN Pumps are used on this machine. The smallest pump draws oil from reservoir under headstock and distributes to bearings. Oil then passes through special strainer and is pumped by the larger pump under 80 lbs. pressure to the tools. There could hardly be a more efficient or economical installation.

TRAHERN Pumps are Rotary Geared, operate at low speed giving long life, have large capacity, forceful, non-pulsating streams against high pressure. They will supply coolant to one or a battery of machines.

*Let us send a sample pump for trial in your plant*

TRAHERN PUMP DIVISION
Geo. D. Roper Corporation
Rockford, Ill.

# STEEL *for*
## Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

**We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.**



Steel Ingots
*by the*
**HARMET**
Liquid Process

## Nova Scotia Steel and Coal Co., Limited

*Head Offices:*
New Glasgow, N.S.

Sales Offices:
Western Room 14 Windsor Hotel
MONTREAL




*Name of Hardware Merchant and further details supplied upon request*

# The Answer is—He Didn't!

THE crowd was drawn by a hardware firm in an Ontario town of 700 population. This crowd of over 1,000 people represents customers of the store, drawn from miles around, to attend the picnic given by this firm to its customers. Surely this is evidence of the close relationship between this hardware firm and its customers.

The close relationship between retailer and customer in this instance is typical of conditions existing in hundreds of Canadian towns, villages and cities.

The average hardware merchant (particularly in the smaller cities and towns) has been established for many years. He has a big business connection built up through years of efficient service to his customers. He is well rated, and a desirable man with whom to do business. He influences the buying habits of the people in his community, and in over 90% of the sales made, he is the deciding factor.

*"Which one do you recommend?"* is a question asked thousands of times each day in the hardware stores of Canada.

If you can get the effort and enthusiasm of the retail hardware merchants and their clerks, plus their window and interior displays and local advertising behind your goods, you will have secured the co-operation of one of the greatest available selling forces.

HARDWARE AND METAL is paid for, and read, by all the wholesale hardware buyers of Canada, and over 90% of the retailers from coast to coast. They are the men who control the sale of your products to the hardware consumers. HARDWARE AND METAL can put your story before, practically, the entire Canadian hardware trade. One of our representatives would be glad to give further details.

(Only hardware paper in Canada with membership in the Audit Bureau of Circulations).

## HARDWARE & METAL

*Canada's National Hardware Weekly since 1888*

**143-153 University Avenue - - Toronto, Canada**

*Published every Saturday since 1888. The only weekly hardware paper in Canada, and the only hardware paper in Canada that gives you a circulation statement audited by the Audit Bureau of Circulations*

**Montreal Branch, Southam Building** **Winnipeg Branch, Union Trust Building**



No. 4

# Darn Few Blind Men Pay an Income Tax

*Wear your Goggles!*

This is No. 4 of a series of short paragraphs which is appearing regularly in our advertising. Permission is freely given Safety Engineers, Editors of Employees' Magazines, and others to use this material as they wish. In addition, we shall be glad to furnish these paragraphs in leaflet form, in any quantity, for insertion in pay envelopes or as posters for bulletin use.

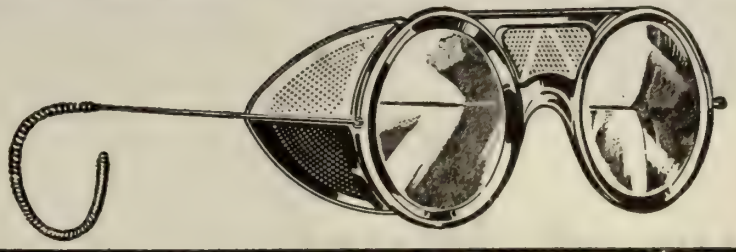
# Operators on Grinding Wheels Need

## STOCO SAFETY GOGGLES

(Pat. Dec. 12, 1916)

*with*

## "CELOGLAS" Shatter-Proof Lenses



The STOCO Safety Goggle has a broad, smooth surface bearing on the nose, which comfortably distributes the weight of the glass over a wide area instead of concentrating it on the sensitive bridge of the nose. That is one of the several reasons why men who must have continuous eye protection favor the STOCO Safety Goggle.

The STOCO Safety Goggle.

Price each (f.o.b. Geneva, N.Y.)

With "Celoglas" Shatter-Proof Lenses ..... $1.15

With Optical Glass Lenses .... .90

Attractive Discounts for Quantity Orders.

Comfortable earbows or black elastic headbands at the same price.

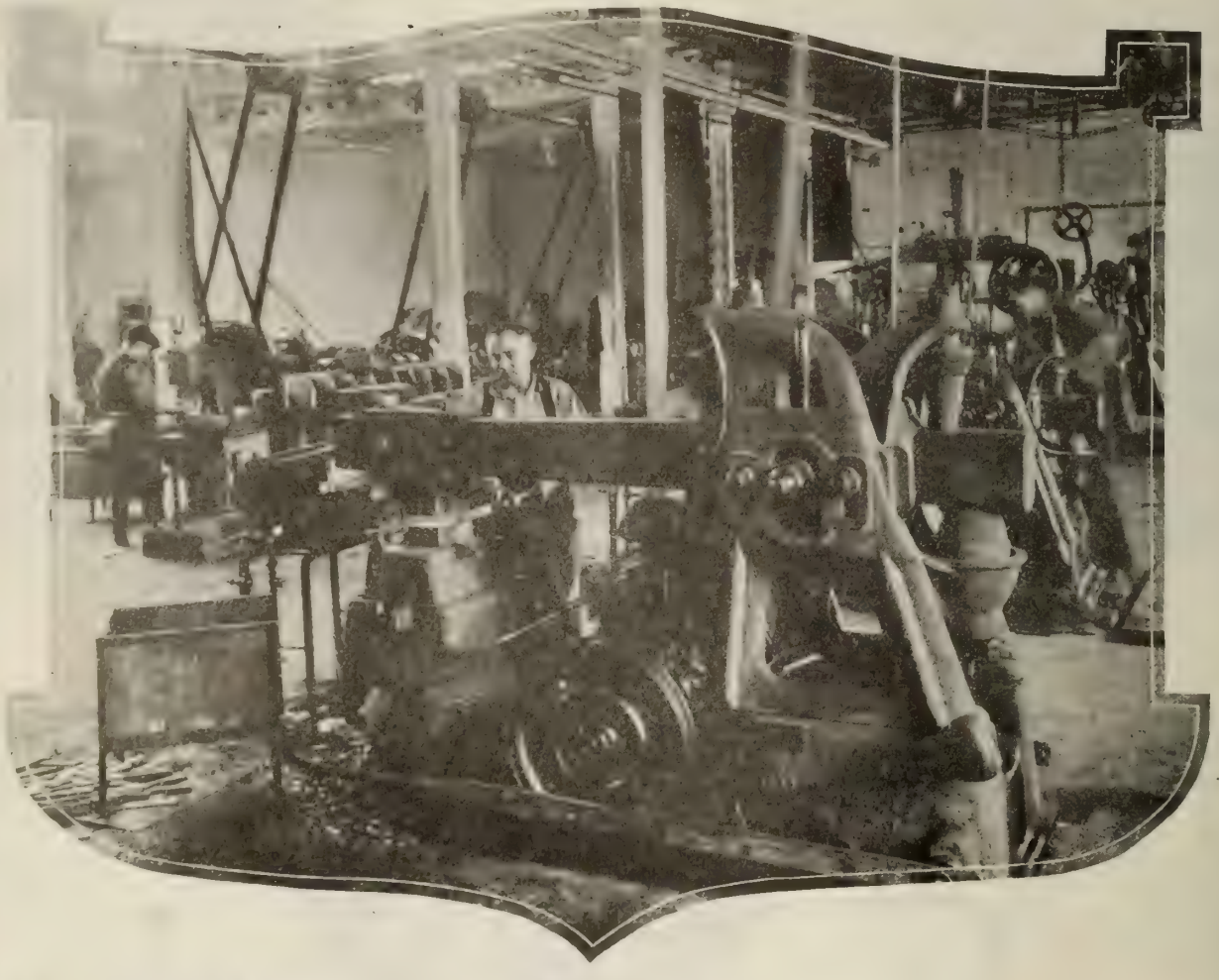
NOTE.—A sample STOCO Safety Goggle will be sent interested, responsible people on receipt of request on letterhead.

## THE STANDARD OPTICAL CO. GENEVA N.Y.

*If interested tear out this page and place with letters to be answered.*

# BRADLEY HAMMERS

**If it's a hammer job—*"Forge ahead with a Bradley"***



## *Bradleys at Work*

There is a complete battery of Bradley Hammers at work pointing files for the Ingersoll File Company, Ingersoll, Ontario. Each is "forging ahead" with the usual Bradley efficiency.

Bradley Hammers fit into almost any production scheme. Their simple, sensitive, one-man control permits a wide choice in force and speed, making them adaptable to a wide variety of operations on a broad range of work.

**Let us tell you all about them.**

**C. C. BRADLEY & SON, INC.**
**Syracuse, N.Y., U.S.A.**

**FOREIGN AGENTS:** England, Buck & Hickman, Ltd., London; France, Fenwick Freres & Co., Lyons, Rhone; Italy, Fenwick Freres & Co., Turin; Belgium, Fenwick Freres & Co., Liege; Brazil, Fenwick Freres & Co., Rio de Janeiro; Switzerland, Fenwick Freres & Co., Zurich; Portugal, Fenwick & Co., Lisbon; Spain, Fenwick Freres & Co., Barcelona; Alsace-Lorraine, Fenwick Freres & Co., Luxembourg; China, Anderson Meyer & Co., Ltd., Shanghai; Norway, Sweden, Denmark, Chr. A. Herstad, Copenhagen, Denmark.



WHEN a young fellow comes to me for advice on what tools to buy, I tell him

# Starrett Tools

"I've found that Starrett Tools are easiest to use. Every adjustment is made simple and positive.

"When you've got a complete kit of Starrett Tools, you feel that you're ready for any job that comes along. That's a good feeling to have. It gives you confidence.

"And keep your weather eye out for new Starrett Tools.

"If you want to keep on improving your work, you'll need to keep on improving your tool kit.

"Round out your Starrett Tool outfit—ask the hardware dealer what's new.

"The Starrett Catalog No. 22 is a book every mechanic should have around. Write for it now."

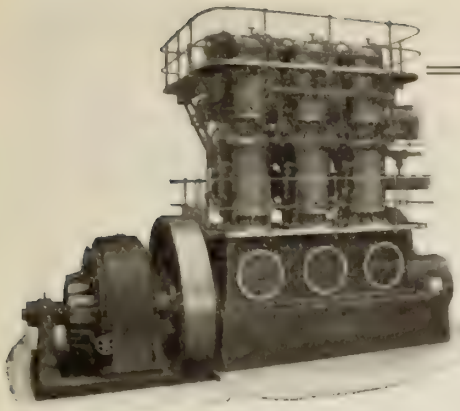
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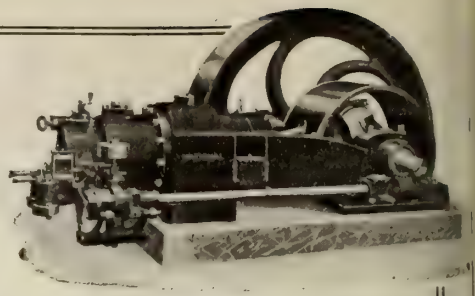
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# Canadian Machinery BUYERS DIRECTORY

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**Abrasive Discs**
Norton Co. of Can., Ltd., Hamilton, Ont.
Oakey & Sons, Ltd., John London S.E., Eng.

**Abrasive Materials**
Can. Hart Products, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Acetylene, Dissolved**
L'Air Liquide Society, Toronto, Ont.

**Accumulators, Hydraulic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Air Lifts**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Analyses, Chemical**
Toronto Testing Laboratory, Toronto, Ont.

**Angle Bars**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Anvils**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Columbia Howe Division, Cleveland, O.
Petrie, Ltd., H. W., Toronto, Ont.

**Arbors**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Cleveland Twist Drill Co., Cleveland, O.
Ford-Smith Machine Co., Hamilton, Ont
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Jacobs Mfg. Co., Hartford, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.

**Axles, Car**
Dom. Foundries & Steel, Hamilton, Ont.

**Babbitt Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.

**Balls, Brass, Bronze and Steel**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian SKF Co., Toronto, Ont.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

**Barrels, Tumbling**
McDougall Co., Ltd., R., Galt, Ont.

**Bars, Boring**
Armstrong Bros. Tool Co., Chicago, Ill.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Madison Mfg. Co., Muskegon, Mich.

**Bars, Boring, Portable**
Underwood Corp., H. B., Philadelphia, Pa.

**Bars, Bronze Cored**
Moore & Son, Thos., Montreal, Que.

**Bars, Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Bars, Steel**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.
United Alloy Steel Corp., Canton, Ohio
Vanadium Alloys Steel, Latrobe, Pa.

**Bearings, Ball**
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Railway Roller Bearing Co., Syracuse, N.Y.

**Bearings, Bronze**
Railway Roller Bearing Co., Syracuse, N.Y.

**Bearings, Die-Cast**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Tallman Brass & Metal Co., Hamilton, Ont.

**Bearings, Journal**
Fisher Motor Co., Ltd., Orillia, Ont.

**Bearings, Roller**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

**Belt Cement**
McLaren Belting Co., J. C., Montreal, Que.

**Belt Dressings and Fillers**
Aikenhead Hardware Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.

**Belt Fasteners**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

## For list of Dealers see the last page of This Buyers' Directory

**Belt Hooks**
Torrington Co., Ltd., Upper Bedford, Que.

**Belt Lacing**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

**Belt Lacing, Steel**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing, Hinged**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing, Flexible Steel**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing Machines**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
McLaren Belting Co., J. C., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Belt Joiners, Conveyor**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Tools**
Graton & Knight Mfg. Co., Worcester, Mass

**Belting, Chain**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Belting, Fabric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
McLaren Belting Co., J. C., Montreal, Que.
Sumner & Co., New York City

**Belting, Leather**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Smith Belting Co., Toronto, Ont.
Sumner & Co., New York City.
Tullis & Son, Ltd., John, Glasgow, Scot.

**Belting, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.
Quaker City Rubber Co., Philadelphia, Pa.

**Belts, Abrasive**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.

**Bench Countershaft Standards**
Ford-Smith Machine Co., Hamilton, Ont.

**Benches, Work**
Aikenhead Hardware Ltd., Toronto, Ont.

**Bending Machines, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bertrams Ltd., Edinburgh, Scotland.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Bins, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Blocks**
Ford Chain Block Co., Philadelphia, Pa.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Chain (See Hoists, Hand)**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Ford Chain Block Co., Philadelphia, Pa.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Die**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Blocks, Pillow**
Can. Link-Belt Co., Toronto, Ont.

**Blowers**
Can. Blower & Forge Co., Ltd., Kitchener.
General Combustion Co. of Can., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Bolt and Nut Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Bolt and Nut Machinery, Automatic**
National Acme Co., Cleveland, Ohio.

**Bolts and Nuts**
London Bolt & Hinge Works, London, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Petrie, Ltd., H. W., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Bolt Threading Die Heads**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa

**Boosters**
Sturtevant Co., B. F., Boston, Mass.

**Boring and Turning Mills, Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.

**Boring, Drilling and Milling Machines, Horizontal**
Armstrong-Whitworth of Canada, Ltd. Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy. Co., Toronto, Ont
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa.

**Boring, Drilling and Milling Mach. Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Boring Heads**
Aikenhead Hardware Ltd., Toronto, Ont.

**Boring Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Gisholt Machine Co., Madison, Wis.

**Brakes, Magnetic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Brass**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bricks, Fire**
Elk Firebrick Co. of Can., Ltd., Hamilton, Ont.

**Bridges**
Hamilton Bridge Works Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

**Broaching Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Bronze**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bronze, Phosphor**
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bucket Carriers, Pivoted**
Can. Link-Belt Co., Toronto, Ont.

**Buffing or Polishing Machines (See Polishing and Buffing Machines)**
Blount Co., J. G., Everett, Mass.
Can Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O

**Bulldozers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Burners, Oil and Gas**
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

**Bushings**
Fisher Motor Co., Ltd., Orillia, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Cabinets, Oil**
S. F. Bowser & Co., Ltd., Toronto, Ont.

**Calipers**
Brown & Sharpe Mfg. Co., Providence, R.I.
Starrett Co., L. S., Athol, Mass.

**Cams**
Canada Foundries & Forgings Co., Welland, Ont.

**Can-Making Machinery (See Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont
MacKinnon Steel Co., Sherbrooke, Que

# BUYERS' DIRECTORY

Union Carbide Co. of Can., Ltd., Welland, Ont.

**Cars, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Castings, Aluminum**
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Brass and Bronze**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Copper**
Can. Hanson & Van Winkle Co., Toronto, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Marine**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Castings, Die Molded**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Ferro-Alloy**
Can. Steel Foundries, Montreal, Que.

**Castings, Iron**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown Boggs & Co. Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Hyd. Press**
Can. Steel Foundries, Montreal, Que.

**Castings, Monel Metal**
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

**Castings, Naval Bronze**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Nichrome**
Can. Driver-Harris Co., Walkerville, Ont.

**Castings, Nickel**
Can. Hanson & Van Winkle Co., Toronto, Ont.

**Castings, Semi-Steel**
Davidson Mfg. Co., Thos., Montreal, Que.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

**Castings, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

**Cements, Iron**
Smooth Mfg. Co., Jersey City, N.J.

**Centering Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Chains (See Sprockets and Chains)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chains, Driving**
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chasers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chemists**
Toronto Testing Laboratory, Toronto, Ont.

**Chucking Machines**
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Chucks, Drill**
Jacobs Mfg. Co., Hartford, Conn.

**Chucks, Drill and Tap**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Lathe**
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Magnetic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**
Columbia Hdwe. Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

**Cleaners, Metal, Waste, General**
Oakley Chemical Co., New York, N.Y.

**Clocks, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Clutches, Friction**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**
Can. Link-Belt Co., Toronto, Ont.

**Collars, Shaft or Set**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

**Collets**
Ackworthle, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compressors, Air**
Curtis Pneumatic Machinery Co., St Louis, Mo.

**Compressors, Air and Gas**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**
Ford-Smith Machine Co., Hamilton, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Conveyor Belt Joiners**
Flexible Steel Lacing Co., Chicago, Ill.

**Copper**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Cored Bronze Bars**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Cotter Pins**
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Counterbores**
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Countershafts**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Couplers, Car and Locomotive**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Couplings, Flexible**
Holden Co., Ltd., Montreal, Que.

**Couplings, Rigid**
Bernard Industrial Co., A., Fortierville, Que.

**Couplings, Shaft**
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

**Cranes, Electric**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.

**Cranes, Hand (See Hoists, Hand)**
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

**Cranes, Locomotive**
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Cranes, Traveling**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Crank Pin Turning Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia, Pa.

**Cutters, Flue**
Holden Co., Ltd., Montreal, Que.

**Cutters, Gear**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Milling**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Machine Co., Cleveland.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.

**Cutters, Stay Bolt**
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Thread**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.

**Cutting-Off Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Cutting-Off Machines, Pipe (See Pipe-Cutting and Threading Machines)**
Landis Machine Co., Inc., Waynesboro, Pa.
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Cutting-Off Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Pilot Steel & Tool Co., Montreal, Que.

**Cutting Oil Filters (See Oil Filtering Systems)**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Cataract Refining Co., Toronto, Ont.

**Cutting, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

**Cutting, Oxy-Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Dealers, Machinery (See Searchlight Section)**
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Deckle Straps**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Diamonds, Black and Rough**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond, Carbon and Bortz**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Desmond-Stephan Co., Hamilton, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Wheel Truing Tool Co., Detroit, Mich.

**Diamond Crossings**
Can. Steel Foundries, Montreal, Que.

**Die-Castings**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Dies, Pipe-Threading**
Jones & Lamson Machine Co., Springfield, Vt.

**Die Sinking Machines, Automatic**
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

**Die Sinkers**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Screw and Thread Cutting**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

# BUYERS' DIRECTORY

**Dies, Forging**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

**Dies, Hammer**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Self-Opening, Adjustable**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Moreland Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Dies, Threading-Opening**
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Moreland Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Disc Cement**
Rubber Supply Co., Toronto, Ont.
Norton Abrasives Co., Chicago, Ill.

**Dividing Heads**
Ackworthle, Ltd., John, Birmingham, Eng.
Dickson, Fred. C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Dogs, Lathe and Milling Machine**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drafting Boards and Tables**
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Drafting Materials**
American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Dressers, Grinding Wheel**
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Drill Holders**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drill Rods**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Alker and Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Drill Speeders**
Canada Machinery Corp., Galt, Ont.

**Drilling Machine Heads**
Heald & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

**Drilling Machines, Automatic**
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

**Drilling Machines, Bench**
Beacon Engineering Co., Tipton, England.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Heald & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Electric and Hand**
Alker and Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Gang**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drilling Machines, Heavy Duty**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Multiple Spindle**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

**Drilling Machines, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Drilling Machines, Portable**
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Radial**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Drilling Machines, Sensitive**
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Turret**
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

**Drilling Machines, Vertical**
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng.
Tower Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Drills, Center**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drills, High Speed Twist**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Twist Drill Co., Cleveland, O.
Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Drills, Twist and Flat**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.

**Dust Handling Equipment**
Can. Blower & Forge Co., Ltd., Kitchener.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Electrical Instruments**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Electrical Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O.

**Elevating Trucks (See Trucks)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Elevators and Conveyors**
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Emery Wheels (See Grinding Wheels)**
Alkenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Hart Products, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Engines, Capstan**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Engineers, Mechanical**
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.

**Expanders, Tube**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Eyeglasses, Safety (See Goggles, Safety)**
Prest-O-Lite Co. of Can., Toronto, Ont.
Willson Goggles, Inc., Reading, Pa.

**Fans, Electric**
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal
Northern Electric Co., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Exhaust**
Can. Blower & Forge Co., Ltd., Kitchener.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Ventilating**
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**File Handles**
Ingersoll File Co., Ltd., Ingersoll, Ont.

**Files and Rasps**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Filing Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Filler, Iron (See Cements, Iron)**
Smooth Mfg. Co., Jersey City, N.J.

**Fire Extinguishers**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Fittings, Pipe**
International Malleable Iron Co., Guelph, Ont.

**Flexible Shafts**
Alkenhead Hardware Ltd., Toronto, Ont.

**Flux, Galvanizing**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Fluxes, Welding**
L'Air Liquide Society, Toronto, Ont.

**Forging Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scotland.

**Forgings, Drop**
Canada Foundries & Forgings Co., Ltd., Welland, Ont.
Dominion Forge & Stamping Co., Ltd., Toronto, Ont.

**Forgings, Hammer**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Ltd., Welland, Ont.
Can. Atlas Crucible Steel Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Foundry Equipment**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Foundry Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Frogs, Spring or Rigid**
Can. Steel Foundries, Montreal, Que.

**Fuel Oil Burning System**
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Coal**
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Oil and Gas**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bellevue Industrial Furnace Co., Detroit.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces and Ovens, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

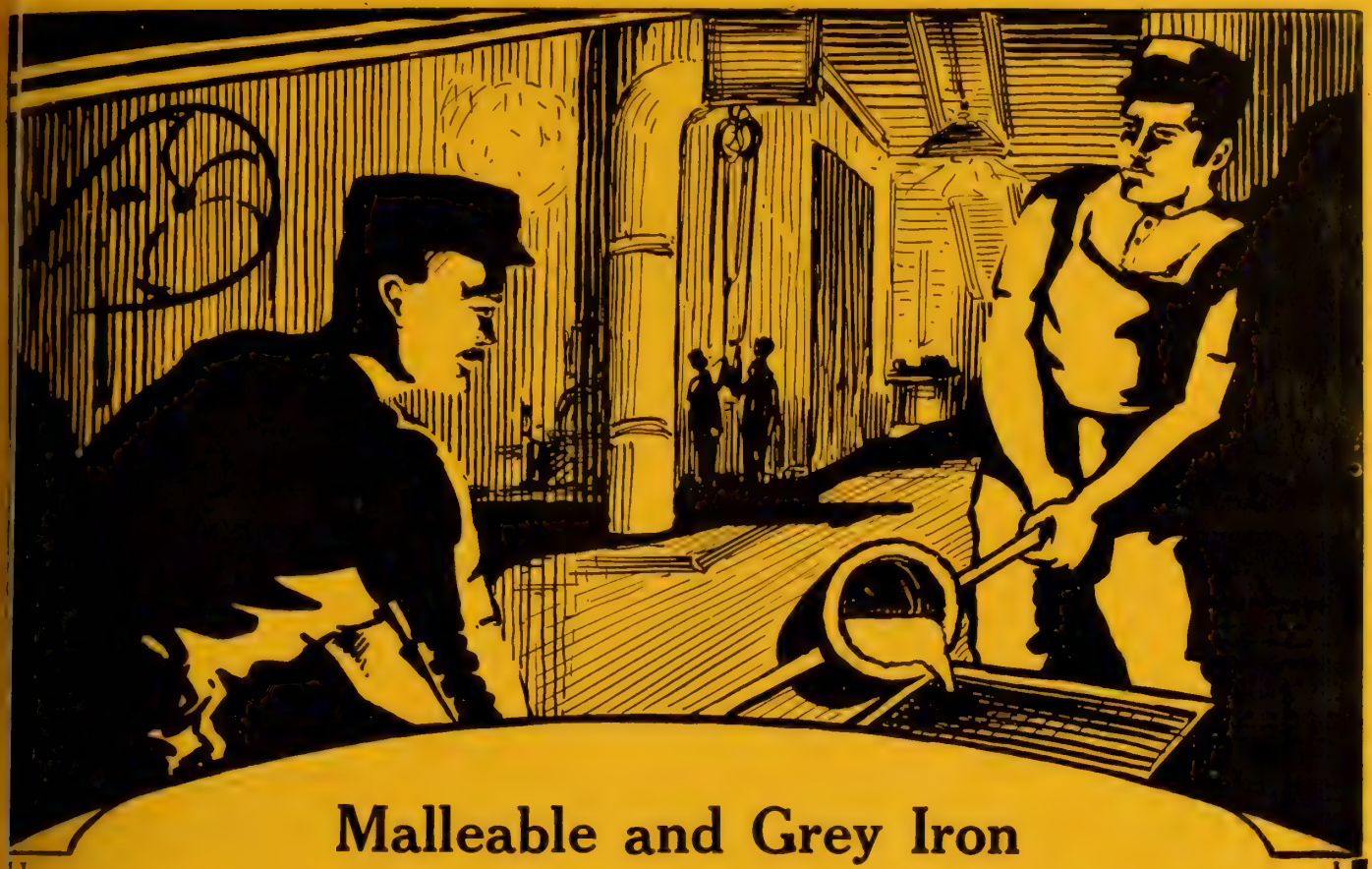
**Furnaces, Tempering and Annealing**
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furniture, Machine Shop**
Garlock-Walker Mchy. Co., Toronto, Ont.

**Gages, Comparator**
Jones & Lamson Machine Co., Springfield, Vt.
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont.
Perdue, W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass.

**Gages, Measuring (See Tool Work)**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Gages, Recording**
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.



## Malleable and Grey Iron

# CASTINGS

Also
**Malleable**
and
**Cast Iron**
**Pipe**
**Fittings**

IM

### *Large Capacity--Quick Service*

The Machinery Manufacturer, the Agricultural Implement Maker, the Automobile Builder, and Specialty Manufacturer—can secure his Malleable and Grey Iron Castings quickly when he orders International Malleable Products. We have the facilities for making exceptionally good deliveries on the largest of orders.

Specify "International Malleable" on your next order for Malleable and Grey Iron Castings, and Malleable and Grey Iron Pipe Fittings.

In addition to quick service you secure reasonable price and quality products.

## INTERNATIONAL MALLEABLE IRON COMPANY
LIMITED
GUELPH, ONTARIO, CANADA

*If interested tear out this page and place with letters to be answered.*

# Odd, Isn't It

that some people think of advertising as a means of benefiting only the seller, when its basic function *must be* to render a necessary service to the buyer, else it could not exist. Merchandise lives or dies as it does or does not meet a human need. Advertising is subject to the same law of service. The real measure of its value is what it *gives*, not what it gets.

In the light of these truths, the marvellous growth of advertising in itself, is an impressive demonstration of its essential character in our economic system.

But you are not interested in *all* advertising any more than you are in all merchandise. That is one big reason why you have a highly specialized Business Paper in your field such as the one carrying this advertisement. It was born of your needs, not of any man's desire to be a publisher.

## *How It Works for You*

What it does for you and your field editorially is self-evident, but its *ad*itorial service is just as vital. Instead of a buyer having to depend upon gossip, hearsay and driblets of information from this or that source, he gets it all between two covers.

Timely, authoritative, comprehensive statements about needed materials pass in review as the advertising pages are turned. Confident judgments can be formed, and intelligent decisions made.

Yet advertising is NOT an *added* expense, but an improved distributive process, which takes the place of slower, more costly and less efficient methods.

That is why it pays to *read* advertising even more than it pays to advertise. Especially if you read it in papers which have met the exacting requirements of membership in The Associated Business Papers, Inc., for one of its standards of practice requires that a paper must *decline any advertisement which has a tendency to mislead or which does not conform to business integrity.*

**You are invited to consult us freely about Business Papers or Business Paper advertising**

**LIST OF MEMBERS**

*Each has subscribed to and is maintaining the highest standards of practice in its editorial and advertising service.*

Advertising and Selling
American Architect
American Blacksmith
American Exporter
American Financial Director
American Hatter
American Machinist
American Paint Journal
American Paint and Oil Dealer
American Printer
American School Board Journal
Architectural Record
Automobile Dealer and Repairer
Automobile Journal
Automotive Industries

Bakers Weekly
Basket Maker
Boot and Shoe Recorder
Brick and Clay Record
Buildings and Building Management
Building Supply News
Bulletin of Pharmacy

Canadian Grocer
**Canadian Machinery & Mfg. News**
Canadian Railway & Marine World
Canadian Ice Cream
Canadian & Metallurgical Engineering
Clothier and Furnisher
Coal Age
Coal Trade Journal
Concrete
Cotton

Dairy Metal Trade
Distribution and Warehousing
Domestic Engineering
Dry Goods Economist
Dry Goods Journal
Dry Goods Reporter

Electric Railway Journal
Electrical Merchandising
Electrical Record
Electrical World
Employers' Monthly
Engineering and Contracting
Engineering and Mining Journal
Engineering News-Record

Factory
Farm Implement News
Farm Management
Farm Power
Farm and Water Engineering
Forgings (The)
Foundry Journal
Fuel and Manufacturer and Artisan
Furniture Merchants' Trade Journal

Gas Age
Gas Record
Grand Rapids Furniture Record

Hardwareman
Hardware Age
Hardware and Metal

**LIST OF MEMBERS**
*(Continued)*

Heating and Ventilating Magazine
Hide and Leather
Hospital Management
Hotel Monthly

Hotel Review
Illustrated Milliner
Implement and Tractor Age
Implement & Tractor Trade Journal
Industrial Arts Magazine
Inland Printer
Iron Age
Iron Trade Review

Lumber
Lumber Trade Journal
Lumber World Review

Manufacturers' Record
Manufacturing Jeweler
Marine Engineering
Marine Review
Millinery Trade Review
Mill Supplies
Mining and Scientific Press
Modern Hospital
Motor Age
Motorcycle and Bicycle Illustrated
Motor Truck
Motor World

National Builder
National Petroleum News
Nautical Gazette
Northwest Commercial Bulletin
Northwestern Druggist
Nugent's, The Garment Weekly

Oil News
Oil Trade Journal

Plumber and Steam Fitter
Power
Power Boating
Power Farming Dealer
Power Plant Engineering
Price Current—Grain Reporter

Printers' Ink
Railway Age
Railway Electrical Engineer
Railway Maintenance Engineer
Railway Mechanical Engineer
Railway Signal Engineer
Retail Lumberman
Rubber Age

Shoe Findings
Shoe and Leather Reporter
Shoe Retailer
Southern Engineer
Southern Hardware & Implement Journal
Sporting Goods Dealer
Starchroom Laundry Journal

Tea and Coffee Trade Journal
Textile World

Welding Engineer
Woodworker

# THE ASSOCIATED BUSINESS PAPERS, Inc.

JESSE H. NEAL, Executive Secretary

**HEADQUARTERS: 220 West 42nd Street NEW YORK CITY**

*If interested tear out this page and place with letters to be answered.*

# BUYERS' DIRECTORY

**Gages, Snap, Thread and Cylindrical**
Ackworthie, Ltd., John, Birmingham, Eng
Brown & Sharpe Mfg. Co., Providence, R I
Can. Fairbanks-Morse Co., Ltd., Montreal
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Standard**
Armstrong Whitworth Co. of Can., Lt Montreal, Que.
Athins & Co., Inc., E. C., Indianapolis, Johansson Inc., C. E., Windsor, Ont.

**Gages, Thread**
Ackworthie, Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Garnet, Emery and Flint Paper and Cloth**
Ritchey Supply Co., Toronto, Ont.

**Gas, Coal Compressed**
L'Air Liquide Society, Toronto, Ont.

**Gas, Compressed**
Prest-O-Lite Co. of Can., Toronto, Ont.

**Gaskets**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

**Gear Blanks**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario
Philadelphia Gear Works, Philadelphia, Pa.

**Gear-Cutting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I
Can. Fairbanks-Morse Co., Ltd., Montreal.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn

**Gear Testing Machines**
Brown & Sharpe Mfg. Co., Providence, R I
Lees-Smith Machine Co., Hamilton, Ont.

**Gears, Cast**
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

**Gears, Cut**
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont
Ford-Smith Machine Co., Hamilton, Ont.
Gardiner & Son, Robt., Montreal, Que
Hamilton Gear & Machine Co., Toronto, Ontario
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glasco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Gears, Dressed**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Gears, Forged**
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co, Montreal, Que.

**Gears, Herringbone**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont
Philadelphia Gear Works, Philadelphia, Pa

**Gears, Machine Moulded**
Can. Steel Foundries, Montreal, Que.

**Gears, Rawhide (See Gears, Cut)**
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear, Silent Chain**
Gardiner & Son, Robt., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Can. Link-Belt Co., Ltd., Toronto, Can
Hans Renold of Canada, Ltd., Montreal, Quebec

**Gears, Worm**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario

**Generators, Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Generators, Electric**
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Goggles, Safety**
Perdue, W. B., San Francisco, Calif
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa

**Grab Buckets**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co, Ltd, Niagara Falls, Ont.

**Grease Cups, Pressed Steel and Brass**
Can. Winkley Co., Ltd, Windsor, Ont.

**Greases, Lubricating**
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

**Grinding Discs**
Ritchey Supply Co., Toronto, Ont

**Grinding Machines**
Brown & Sharpe Mfg. Co., Providence, R I
Can. Fairbanks-Morse Co., Ltd., Montreal

**Grinding Machines, Abrasive Belt**
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Automatic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Bench**
Aikenhead Hardware Ltd., Toronto, Ont
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co, Rockford, Ill.
Roelefson Machine & Tool Co, Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.
Terry & Co., John C., Birmingham, Eng
Strelinger Co of Can., Ltd., Chas A., Windsor, Ont.
Wilkinson & Kompass, Hamilton Ont
Williams Machinery & Supply Co., A R., Montreal, Que.

**Grinding Machines, Center**
U.S. Electrical Tool Co, Cincinnati, O.
Wisconsin Electric Co., Racine, Wis

**Grinding Machines Chaser**
Jones & Lamson Machine Co., Springfield, Vt.

**Grinding Machines, Cutter and Reamer**
Cincinnati Milling Machine Co., Cincinnati, Ohio
Garlock-Walker Mchy. Co., Toronto Ont
Greenfield Machine Co, Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Cylindrical**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Die**
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

**Grinding Machines, Disc**
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont

**Grinding Machines, Drill**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que

**Grinding Machines, Face**
Ford-Smith Machine Co., Hamilton, Ont

**Grinding Machines, Floor and Tool**
Beacon Engineering Co., Tipton, England
Blount Co., J. G., Everett, Mass
Ford-Smith Machine Co, Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa
National Acme Co., Cleveland, Ohio
Petrie, Ltd., H. W., Toronto, Ont
Terry & Co., John C., Birmingham, Eng

**Grinding Machines, Internal**
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Portable**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Power Oscillating Tool**
Herbert Ltd., Alfred, Toronto, Ont.

**Grinding Machines, Ring Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Snagging**
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Surface**
Garlock-Walker Mchy. Co., Toronto Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont

**Grinding Machinery, Tool Post**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Universal**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co, New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.

**Grinding Wheels**
Aikenhead Hardware Ltd., Toronto Ont
Atkins & Co., Inc., E. C., Indianapolis I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont
Ford-Smith Machine Co., Hamilton, Ont
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Guards, Emery Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Guards, Machinery and Window**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Guards, Electric Lamp**
Flexible Steel Lacing Co., Chicago, Ill

**Gun-Barrel Machinery**
Steinle Turret Machine Co, Madison, Wis

**Hack Saws, Power**
Ackworthie, Ltd., John, Birmingham, Eng
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I
Clemson Bros., Hamilton, Canada
Garlock-Walker Mchy. Co., Toronto, Ont
Lyman Tube & Supply Co, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hammers, Chipping**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hammers, Drop**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co. Ltd., Hamilton, Ont
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

**Hammers, Electric**
Aikenhead Hardware Ltd., Toronto, Ont
Brown, Boggs & Co. Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Hammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich

**Hammers, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont
Brown, Boggs & Co. Ltd., Hamilton, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hammers, Riveting**
Cleveland Pneumatic Tool Co., Toronto Ont.

**Hangers, Shafting**
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F. Montreal, Que.
Terry & Co., John C., Birmingham, Eng
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hardening, Case-Hardening and Tempering**
Hamilton Gear & Machine Co., Toronto, Ont.

**Hardness Testing Apparatus**
Shore Instrument Co., Jamaica, N.Y.

**Heating**
Skinner Bros. Mfg. Co., Inc., St. Louis Mo.

**Hobbing Machines**
Herbert Ltd., Alfred, Toronto, Ont
Petrie, Ltd., H. W., Toronto, Ont.

**Hobs**
Armstrong-Whitworth of Canada, Ltd. Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R.I
Greenfield Tap & Die Corp., Galt, Ont
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.

**Hoists, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Shepard Electric Crane & Hoist Co. Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

**Hoists, Hand**
Lyman Tube & Supply Co., Montreal, Que
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Hoists, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Curtis Pneumatic Machinery Co., St Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont

**Holders-On, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Cleveland Pneumatic Tool Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill

**Hose, Flexible Steel**
Can. Fairbanks-Morse Co., Ltd., Montreal
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Hose, Industrial**
Dunlop Tire & Rubber Goods Co., Ltd. Toronto, Ont.
Goodyear Tire & Rubber Co. of Can. Ltd., Toronto, Ont.

**Hose, Rubber**
Can. Consolidated Rubber Co., Ltd. Montreal, Que.
Can. Foamite Firefoam Co., Hamilton Ont.

**Hydraulic Leather**
Graton & Knight Mfg. Co., Worcester, Mass.

**Hydraulic Machinery**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Stewart & Co., Duncan, Glasgow, Sco.

**Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Index Centers**
Dickow, Fred. C., Machinery Co., Chicago, Ill.

**Igniters, Gas Engine**
Canada Foundries & Forgings Co., Welland, Ont.

**Indicators, Speed and Test**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.

**Insulation**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Jacks, Hydraulic**
Norton, A. O., Boston, Mass.

**Jacks, Planer**
Armstrong Bros. Tool Co., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que
Crescent Machine Co., Ltd., Montreal, Q.

# BUYERS' DIRECTORY

**Jigs and Fixtures (See Tool Work)**
Fisher Motor Co., Ltd., Orillia, Ont.
Ford Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Keyseating Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Keys, Machine**
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

**Knives, Machine**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Simonds Canada Saw Co., Montreal, Que.

**Knurl Holders**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lacing Leather**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

**Lamps, Electric**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**Lathe Attachments**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.

**Lathe Pans, Portable**
Canada Machinery Corp., Galt, Ont.

**Lathe Tools**
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

**Lathes, Automatic and Semi-Automatic**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Bench**
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lathes, Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
McDougall Co., Ltd., R., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio

**Lathes, Engine**
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Sidney Machine Tool Co., Sidney, Ohio
Stredinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Extension and Gap**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Lathes, Heavy Duty Projectile Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blaishill Wire Machy. Co., Ltd., Montreal
Sidney Machine Tool Co., Sidney, Ohio
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio.
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Polishing (See Polishing and Buffing Machines)**
Ford-Smith Machine Co., Hamilton, Ont.

**Lathes, Relieving**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Lathe, Universal Hand**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Lathes, Screw-Cutting**
Jones & Lamson Machine Co., Springfield, Vt.

**Lathe, Speed and Hand**
Blount Co., J. G., Everett, Mass.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Lathes, Spinning**
Terry & Co., John C., Birmingham, Eng.

**Lathes, Threading**
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

**Lathes, Vertical Turret**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

**Lathes, Wood Turning**
Blount Co., J. G., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Lead Pipe**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Lighting Fixtures**
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

**Linoleum Mill Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Liquid Air Plants**
L'Air Liquide Society, Toronto, Ont.

**Lockers, Clothes**
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

**Lubricants**
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Lubricating Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Machinists' Small Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Bertrams Ltd., Edinburgh, Scotland
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Stredinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Mandrels, Expanding**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Mandrels, Solid**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Measuring Machines**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Metals, Alloy**
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Tallman Brass & Metal, Ltd., Hamilton, Ontario.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Metalite Cloth**
Ritchey Supply Co., Toronto, Ont.

**Micrometer Calipers**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Milling Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Milling Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**Milling Machines, Automatic**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Bench**
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Hand**
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

**Milling Machines, Horizontal and Planer Type**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Milling Machines, Plain**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Milling Machines, Universal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Milling Machines, Vertical**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

**Monel Metal**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Motors, Electric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Moulded Rubber Goods**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Nail Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Nails and Staples**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Nickel, Bars, Sheets, Wire, Etc.**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Nickel Plating Outfits**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Nickel Silver**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Nitrogen**
L'Air Liquide Society, Toronto, Ont.

**Nut Tappers (See Bolt and Nut Machinery)**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

**Nuts, Finished and Semi-finished**
Galt Machine Screw Co., Galt, Ont.

**Nuts, Machine Screw**
Torrington Company, Ltd., Upper Bedford, Que.

**Nuts, S.A.E., Plain and Castellated**
Galt Machine Screw Co., Galt, Ont.

**Oil Filtering and Storage Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oil Storage Engineers**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oils**
Canadian Oil Companies, Ltd., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Hole Covers**
Can. Winkley Co., Ltd., Windsor, Ont.

**Oils, Soluble**
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oxygen**
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

**Oxy-Acetylene Apparatus**
L'Air Liquide Society, Toronto, Ont.

**Packing, Hydraulic**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

**Packing, Steam**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

**Paper Mill Conveyors**
Bertrams Ltd., Edinburgh, Scotland.

**Patents**
Fetherstonhaugh & Co., Ottawa, Ont.
Marion & Marion, Montreal, Que.

**Pans, Wet and Dry**
Frost Mfg. Co., Chicago, Ill.

**Pattern-Shop Machinery (See Woodworking Machinery)**
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Patterns, Wood and Metal**
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Wraggis Pattern Works, Galt, Ont.

**Penstocks, Steel**
MacKinnon Steel Co., Sherbrooke, Que.

# BUYERS' DIRECTORY

**Phosphor Tin**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Photographic Duplicating Machines**
Commercial Camera Co., Providence, R.I.

**Pig Iron**
Steel Co of Canada, Ltd., Hamilton, Ont.

**Pipe Bending Machines**
American Pipe Bending Machine Co., Boston, Mass
Can Fairbanks-Morse Co., Ltd., Montreal.
Underwood Corp., H. B., Philadelphia, Pa
Williams Machinery Co., A. R., Toronto, Ltd.

**Pipe Couplings**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Cutting and Threading Machines**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**
Landis Machine Co., Inc., Waynesboro, Pa.

**Pipe Fitters' Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa.

**Piston-Ring Machines**
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Planers, Parallels**
L. & P. Mfg Co., Niagara Falls, Ont.

**Planing Machines**
Bertram & Son Co., Ltd., The John Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Planing Machines, Rotary**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Pneumatic Tools**
Can Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Blount Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Pots, Steel**
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Pressed Steel Parts**
Ackworthie, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich.
Can. Fairbanks-Morse Co., Ltd., Montreal.
L. & P. Manufacturing Company, Ltd., Niagara Falls, Ont.
National Engineering Co., Sarnia, Ont.
Petrie Ltd., H. W., Toronto, Ont.
Streiinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Presses, Drop and Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Can Fairbanks-Morse Co., Ltd., Montreal.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Foot and Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

**Presses, Forcing**
Atlas Press Co., Kalamazoo, Mich.
Stewart & Co., Duncan, Glasgow, Scot.

**Presses, Hydraulic**
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

**Presses, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Protractors**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Propellers**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Pulleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal and Fibre**
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Pulp and Paper Mill Equipment**
MacKinnon Steel Co., Sherbrooke, Que.

**Pumps, Automobile Tire**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Pumps, Barrel and Boiler-feed**
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coolant**
Trahern Pump Co., Rockford, Ill.

**Pumps, Geared and Hand**
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**
Can. Fairbanks-Morse Co., Ltd., Montreal
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

**Pumps, Lubricant and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Jardine & Co., A. B., Hespeler, Ont.

**Punches, Power**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

**Punching Machines, Horizontal**
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Racks, Cut**
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**
Holden Co., Ltd., Montreal, Que.

**Reamer Holders**
Cleveland Twist Drill Co., Cleveland, O
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

**Reamers, Expanding**
Aikenhead Hardware Ltd., Toronto, Ont.
Can Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Reamers, Solid**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Reamers, Taper**
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Recorders, Temperature**
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Recorders, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Rheostats**
Northern Electric Co., Montreal, Que

**Resistance Materials**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Respirators**
Willson Goggles, Inc., Reading, Pa.

**Rivets**
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

**Rivet Heaters**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.

**Riveting Machines**
Bilton Machine Co., Bridgeport, Conn.
Can. Fairbanks-Morse Co., Ltd., Montreal
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**
Stewart & Co., Duncan, Glasgow, Scot.

**Rolls (Rubber Covered)**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rudder Frames, Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Rubber Goods, Mechanical**
Quaker City Rubber Co., Philadelphia, Pa.

**Rules, Steel**
Chesterman & Co., Ltd., J., Sheffield, Eng.

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R.I

**Rust Preventatives**
Oakley Chemical Co., New York, N.Y.

**Sand Equipment**
Can. Link-Belt Co., Toronto, Ont.

**Sand Mills**
Frost Mfg. Co Chicago, Ill.

**Sanding Machinery**
Oliver Machy. Co., Grand Rapids, Mich

**Sand Rammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Saw Frames and Blades, Hack**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que

**Sawing Machines, Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que

**Sawing Machines, Power Hack**
Ackworthie, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Saw Sharpening Machines**
Atkins & Co., Inc., E. C., Indianapolis, I
Oliver Machinery Co., Grand Rapids, Mich.

**Saw Tables, Universal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Hot and Cold**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Saws, High Speed Steel**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Metal Band**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saws, Metal, Power**
Clemson Bros., Inc., Hamilton, Ont.

**Saws, Metal Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

**Saws, Milling**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Saws, Screw Slotting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Swing Cut-off**
Oliver Machinery Co., Grand Rapids, Mich.

**Scales**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal. Q.

**Screens**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Screw Drivers, Optical, Jewelry and Novelty**
Torrington Co., Ltd., Upper Bedford, Que.

**Screw Driving Machine**
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill

**Screw Extractors**
Cleveland Twist Drill Co., Cleveland, O

**Screw Machine Work**
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio
Tallman Brass & Metal Co., Hamilton, Ont.

# BUYERS' DIRECTORY

**Screw Machinery, Wood and Lag**
Cook Co., Asa S., Hartford, Conn

**Screw Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Screw Machines, Automatic**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

**Screw Machines, Plain or Hand**
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio.

**Screw Machine Products**
Torrington Company, Ltd., Upper Bedford, Que.

**Screw Plates**
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

**Screws, Cap and Set**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Lock Cap**
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Machine**
Barnes Co., Wallace, Bristol, Conn.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Safety Set**
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Screws, Side Knob**
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Thumb**
Torrington Company, Ltd., Upper Bedford, Que

**Second-Hand Machinery**
**(See Searchlight Section)**
Petrie, Ltd., H. W., Toronto, Ont.

**Separators, Moisture and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Separators, Oil and Waste**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Shafting**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Shapes, Cold-Drawn Special Steel**
Union Drawn Steel Co., Hamilton, Ont.

**Shaping Machines**
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Walcott Lathe Co., Jackson, Mich
Williams Machinery Co., A. R., Toronto, Ont.

**Shapers, Wood**
Oliver Machinery Co., Grand Rapids, Mich.

**Shears, Hand**
Can. Blower & Forge Co., Ltd., Kitchener

**Shears, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y.
[illegible] & Co., Duncan, Glasgow, Scot
Toledo Machine & Tool Co., Toledo, Ohio
Williams Machinery Co., A. R., Toronto, Ont.

**Shearing Machines, Angle, Iron Bar and Gate**
Bertrams Ltd., Edinburgh, Scotland.

**Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio.

**Sheets, Nickel, Resist, Alloy**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Sheets, Nickel, Monel and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Side Frames, Locomotive**
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Slotting Attachments**
Ford-Smith Machine Co., Ltd., Hamilton, Ont
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio

**Slotting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

**Solders**
British Smelting & Refining Co., Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Canada.

**Snap Fiasks**
Oliver Machy. Co., Grand Rapids, Mich.

**Special Machinery and Tools**
Brown Engineering Corp., Ltd., Toronto
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Specialties, Swaged and Headed Work**
Torrington Company, Ltd., Upper Bedford, Que.

**Spectacles, Industrial**
Willson Goggles, Inc., Reading, Pa.

**Springs**
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

**Spring-making Machinery**
Sleeper & Hartley, Inc., Worcester, Mass

**Sprockets and Chains**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Squares**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Stamping, Metal**
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Stamps, Steel**
Diamond Saw & Stamping Works, Buffalo, N.Y.

**Stairways, Wrought Iron**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Steam Specialties**
Crane Ltd., Montreal, Que.

**Steel Plate**
Dom. Foundries & Steel, Hamilton, Ont.

**Steels, Tool**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel Blooms and Billets**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steel, Cold-Rolled Strip**
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Steel Castings**
Dom. Foundries & Steel, Hamilton, Ont.

**Steel Forgings**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Steel, Shafting and Free Cutting Screw**
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

**Steel, Sheet**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Rolland Steel Ltd., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

**Steel, Tanks**
Can. Johns-Manville Mfg. Co., Toronto, Ont.

**Steel, Stainless**
Canadian Allegheny Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel Wire Rods**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steels, Alloy, Open Hearth and Electric**
United Alloy Steel Corp., Canton, Ohio.

**Steels, Alloy and Carbon**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steels, High-Speed**
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel, Magnet**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel, Structural**
MacKinnon Steel Co., Sherbrooke, Que.

**Steel Tubing, Close Joint and Welded**
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

**Stern Frames, Cast Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Straightening Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Studs**
Galt Machine Screw Co., Galt, Ont.

**Surface Plates**
Bilton Machine Co., Bridgeport, Conn.

**Swaging Machines**
Atkins & Co., Inc., E. C., Indianapolis, I

**Switches, Railway**
Can. Steel Foundries, Montreal, Que.

**Switches and Switchboards**
Northern Electric Co., Montreal, Que.

**Tablets, Bronze, Memorial**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Tachometers**
Aikenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

**Tanks, Steel**
MacKinnon Steel Co., Sherbrooke, Que.

**Tanks and Pumps, Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

**Taper Cutting Dies.**
Jones & Lamson Machine Co., Springfield, Vt.

**Tap Holders**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taper Pins**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Tapes, Measuring**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass.

**Tapping Machines and Attachments**
Ackworthle, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Taps and Dies**
Ackworthle, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que
Can. Fairbanks-Morse Co., Ltd., Montreal
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
International Machinery & Supply Co Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Machine Co., Ne Bedford, Mass.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Lt Dundas, Ont.

**Taps, Collapsing**
Geometric Tool Co., New Haven, Conn
Jardine & Co., A. B., Hespeler, Ont.
Murchey Machine & Tool Co., Detro Mich.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Teeth, Dredge Bucket**
Kennedy & Sons, Wm., Owen Sound, Or

**Testing Metals and Materials**
Toronto Testing Laboratory, Toronto, Or

**Thermometers**
Bristol Co., Waterbury, Conn.

**Thread-Cutting Tools**
Butterfield & Co., Inc., Rock Island, Q
Greenfield Tap & Die Corp., Galt, Ont
Jones & Lamson Machine Co., Springfie Vermont.
Murchey Machine & Tool Co., Detro Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Lt Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Thread Cutting Machines**
Jones & Lamson Machine Co., Springfie Vermont.
Landis Machine Co., Inc., Waynesboro, I

**Threaded Wires**
Torrington Company, Ltd., Upper Be ford, Que.

**Threading Machines**
Acme Machinery Co., Cleveland, Ohio
Geometric Tool Co., New Haven, Conn
Greenfield Tap & Die Corp., Galt, Ont
Jones & Lamson Machine Co., Spri field, Vt.
Murchey Machine & Tool Co., Detr Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Bra ford, Ont.

**Thread Lead Testing Machines**
Jones & Lamson Machine Co., Spri field, Vt.
Pratt & Whitney Co., of Canada, Lt Dundas, Ont.

**Thread-Rolling Machines**
Bliss Co., E. W., Brooklyn, N.Y.

**Tongs**
Hepburn Ltd., John T., Toronto, Ont

**Tool Cases**
Rice Lewis & Son, Ltd., Toronto, On

**Tool Holders**
Armstrong Bros. Tool Co., Chicago.
Bilton Machine Co., Bridgeport, Conn
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y

**Tool Markers, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbroo Que.

**Tool Posts, Lathe**
Bertram & Son Co., Ltd., The Jo Dundas, Ont.
Canada Machinery Corp., Galt, Ont
Williams & Co., J. H., Brooklyn, N.Y

**Tool Steels for all Purposes**
Canadian Atlas Crucible Steel Co., L Toronto, Ont.

**Tools, Small (See Machinists' Sm Tools)**
Armstrong-Whitworth of Canada, Montreal, Canada.
Armstrong Bros. Tool Co., Chicago.
Bertrams Ltd., Edinburgh, Scotland
Burgess & Marchand, Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Mont
Chesterman & Co., Ltd., J., Sheffi Eng.
Foss Machinery & Supply Co., Geo Montreal, Que.
Geometric Tool Co., New Haven, Conn
Greenfield T & Die Corp., Galt, On
Hamilton neering Service, Ltd., Hamilton, t.
Keller Pneumatic Tool Co., Grand Ha Mich.
Kimber & Hillier Mfg. Co., St. Cat rines, Ont.
National Machine Tool Co., Racine, W
Rapid Tool & Machine Co., Lachine, C
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockf Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toron Ont.
Williams Machinery & Supply Co., A Montreal, Que.

**Tool Work**
Brown Engineering Corp., Ltd., Toron
Crescent Machine Co., Ltd., Montreal.
Ford-Smith Machine Co., Hamilton.

# BUYERS' DIRECTORY

**Torches, Blow**
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Trackwork, Railway**
Can. Steel Foundries, Montreal, Que.

**Trackwork, Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Transformers**
Northern Electric Co., Montreal, Que.

**Transmission Machinery**
Bernard Industrial Co., A., Fortierville Que.
Can Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Jones & Glassco, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Toronto, Ont.
Renold (Hans) of Canada, Ltd., Montreal Que.

**Transportation Systems (See Trucks)**
Mathews Gravity Carrier Co., Port Hope, Ont.

**Treated Bits**
Can. Atlas Crucible Steel Co., Toronto Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Trolleys and Tramways**
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Trucks**
Can. Fairbanks-Morse Ltd., Montreal Q
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Maple Leaf Mfg. Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Trucks, Industrial Motor**
Maple Leaf Mfg Co., Montreal, Que.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Tube, Products**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Electric Welded or Oxy-Acetylene Welded**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Flexible**
Dunlop Tire & Rubber Goods Co., Ltd Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Tubing, Seamless Steel**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Seamless Steel, Brass and Copper and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Steel Products Co., Brantford, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Tubing, Welded**
International Nickel Co. of Can., Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Tubing, Welded Steel**
Tube Co. of Canada, Toronto, Ont.

**Turbines, Water**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Turret Heads**
Ackworthie, Ltd., John, Birmingham, Eng
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Turret Machines (See Lathes, Horizontal Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Cook Co., Asa S., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Seneca Turret Machine Co., Madison, Wis
Warner & Swasey Co., Cleveland, Ohio

**Turrets, Tool Post**
Gisholt Machine Co., Madison, Wis.

**Unions, Pipe**
Crane Ltd., Montreal, Que.

**Universal Joints**
Gold Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Valves**
Can. Fairbanks-Morse Ltd., Montreal Q
Cleveland Pneumatic Tool Co., Toronto, Ont.
Crane Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd. Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Vises, Drilling Machine**
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.

**Vises, Metal Workers'**
Aikenhead Hardware, Ltd., Toronto, Ont.
Columbia Hdwe. Division, Cleveland, O.

**Vises, Milling Machine**
Brown & Sharpe Mfg. Co., Providence, R I.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Victor Tool Co., Waynesboro, Pa.
Parmenter & Bulloch Co., Gananoque, Ont.

**Voltmeters**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Wagon Loaders**
Can. Link-Belt Co., Toronto, Ont.

**Washers**
Barnes Co., Wallace, Bristol, Conn.
Diamond State Fibre Co., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

## DIRECTORY OF DEALERS

THE Buyers' Directory of CANADIAN MACHINERY was originally intended to contain information regarding lines actually manufactured by our advertisers. We now carry the advertising of leading machinery dealers, some of whom represent scores of manufacturers in addition to being manufacturers themselves in some cases. This necessarily widened the scope of our Directory, but it would be impracticable to list all the lines handled by all the dealers. We recommend, therefore, if our subscribers cannot find what they want in our Directory that they communicate with the dealers whose names appear herewith.

### MACHINE TOOLS AND METAL WORKING EQUIPMENT

Chas. P. Archibald & Co., Montreal, Que.
The Canadian Fairbanks-Morse Co., Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont
R. S. Holly, Toronto, Ont.
H. W. Petrie Limited, Toronto, Ont
The Standard Equipment & Tool Co., Montreal, Que.
Chas. A. Strelinger Co. of Canada Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Wilson-McGovern Limited, Toronto Ont.
Yeates Machinery Co., London, Ont

### MACHINE SHOP AND FACTORY SUPPLIES

Chas. P. Archibald & Co., Montreal Que.
The Canadian Fairbanks-Morse Co., Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
H. W. Petrie Limited, Toronto, Ont.
The Standard Equipment & Tool Co., Montreal, Que.
Chas. A. Strelinger Co. of Canada, Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Wilson-McGovern Limited, Toronto Ont.
Yeates Machinery Co., London, Ont

### POWER EQUIPMENT AND SUPPLIES

The Canadian Fairbanks-Morse Co Montreal, Que.
MacGovern & Co., Montreal, Que.
H. W. Petrie Limited, Toronto, Ont.
The Standard Equipment & Tool Co Montreal, Que.
Wilson-McGovern Limited, Toronto. Ont.
A. R. Williams Machinery Co., Montreal, Que.

### WOODWORKING MACHINERY

Chas. P. Archibald & Co., Montreal, Que.
The Canadian Fairbanks-Morse Co., Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont
H. W. Petrie Limited, Toronto, Ont
Chas. A. Strelinger Co. of Canada Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Yeates Machinery Co., London, Ont

**Vises, Pipe**
Columbia Hdwe. Division, Cleveland, O.
Greenfield Tap & Die Corp., Galt, Ont.

**Vises, Planer and Shaper**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Superior Machine Co., London, Ont.

**Vises, Wood Workers'**
Columbia Hdwe. Division, Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Oliver Machy. Co., Grand Rapids, Mich

**Washers, Rubber**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Welding Apparatus, Oxy-Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Welding, Electric**
All-Weld Company, Toronto, Ont.
Carter Welding Co., Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.

**Welding Filler Rods**
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

**Welding Machines, Oxy-Acetylene**
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif
Prest-O-Lite Co. of Can., Toronto, Ont.

**Welding, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Prest-O-Lite Co. of Can., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

**Welding Rod, Tobin, Manganese Bronze and Aluminum**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Welding Supplies**
British Smelting & Refining Co., Ltd., Montreal, Que.
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Canada, Ltd., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

**Wheels, Cast, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Wheels, Industrial**
American Pulley Co., Philadelphia, Pa.
Hull Iron & Steel Foundries, Hull, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.

**Winches, Electric**
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

**Winches, Headgate**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Winches, Stoplog**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Wire**
Barnes Co., Wallace, Bristol, Conn.
Canada Metal Co., Ltd., Toronto, Ont.
Dennis Wire & Iron Works, London, Ont
Greening Wire Co., B., Hamilton, Ont.
Northern Electric Co., Montreal, Que.

**Wire Cloth**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Wire Coiling Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Wire Rope**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Wire Straightening and Cutting Machinery**
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Schuster Co., F. B., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

**Wire, Welding**
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Wires, Special**
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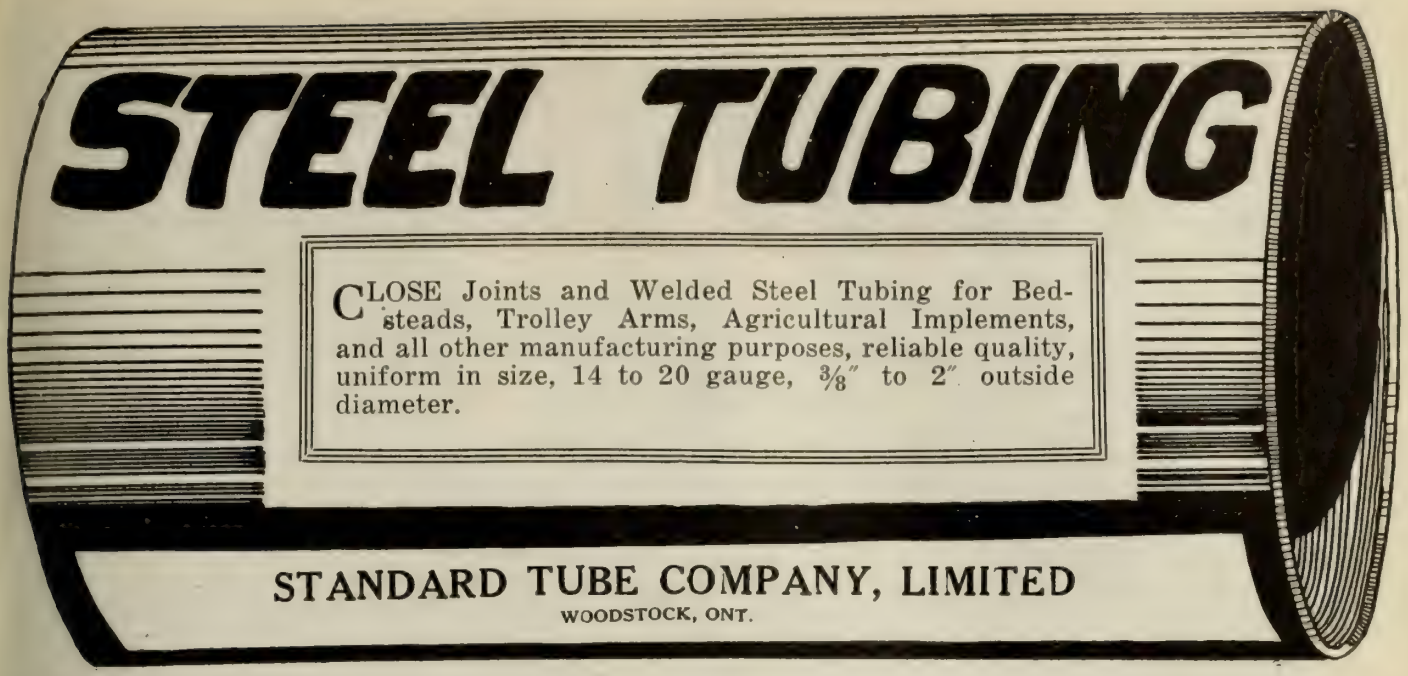
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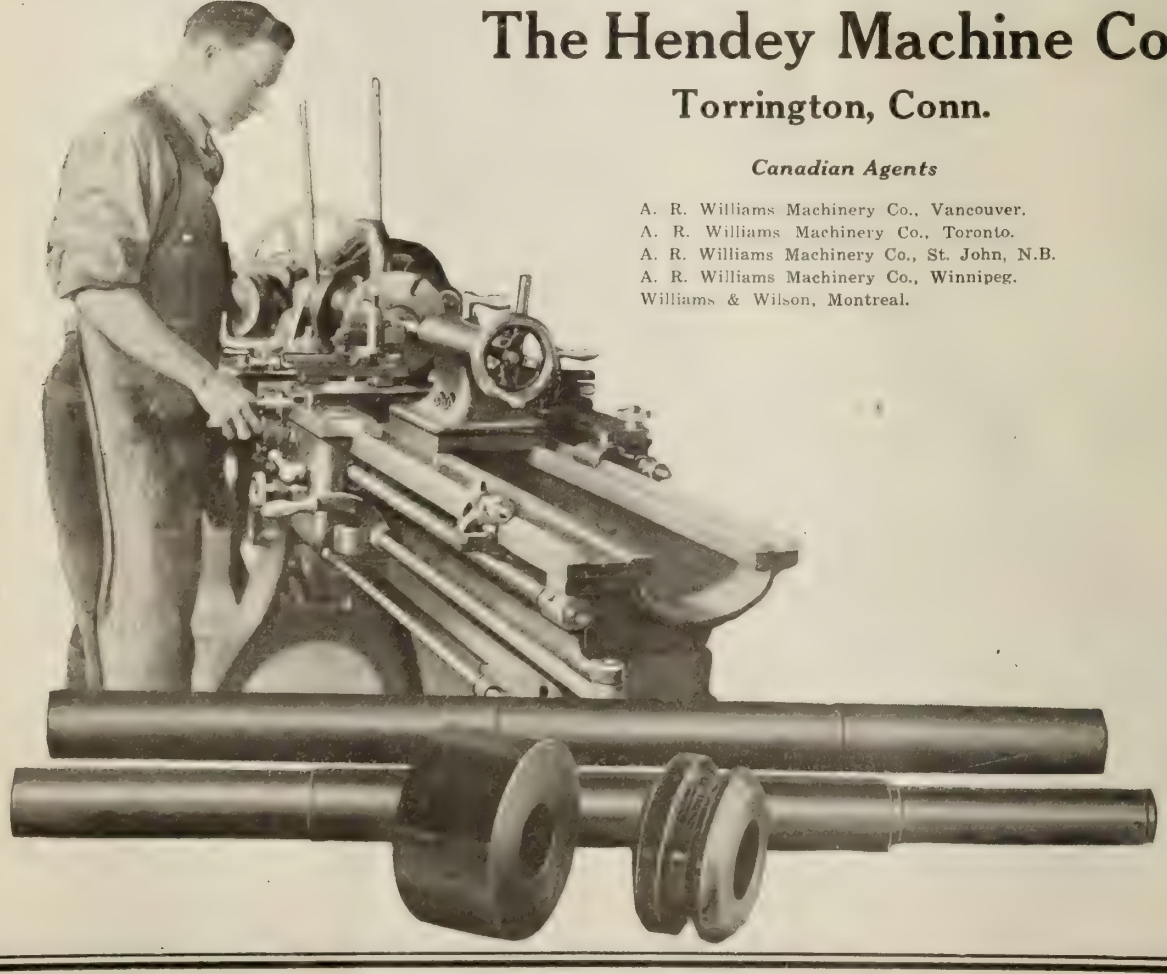
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| READ AND PASS TO | Check | See Page | READ AND PASS TO | Check | See Page |
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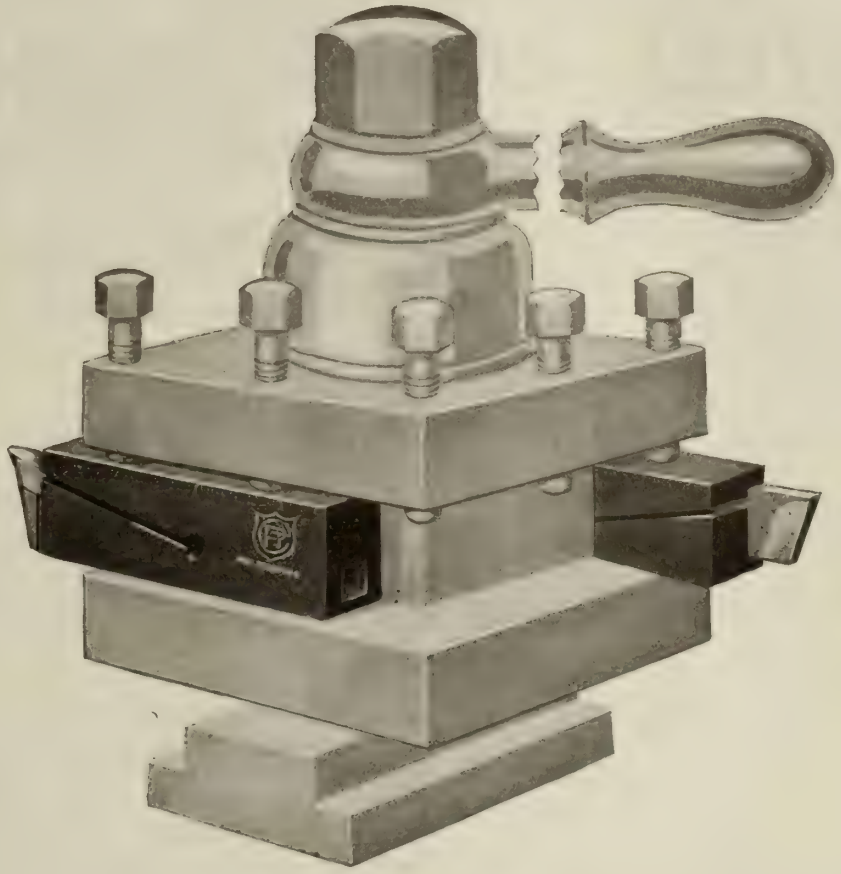
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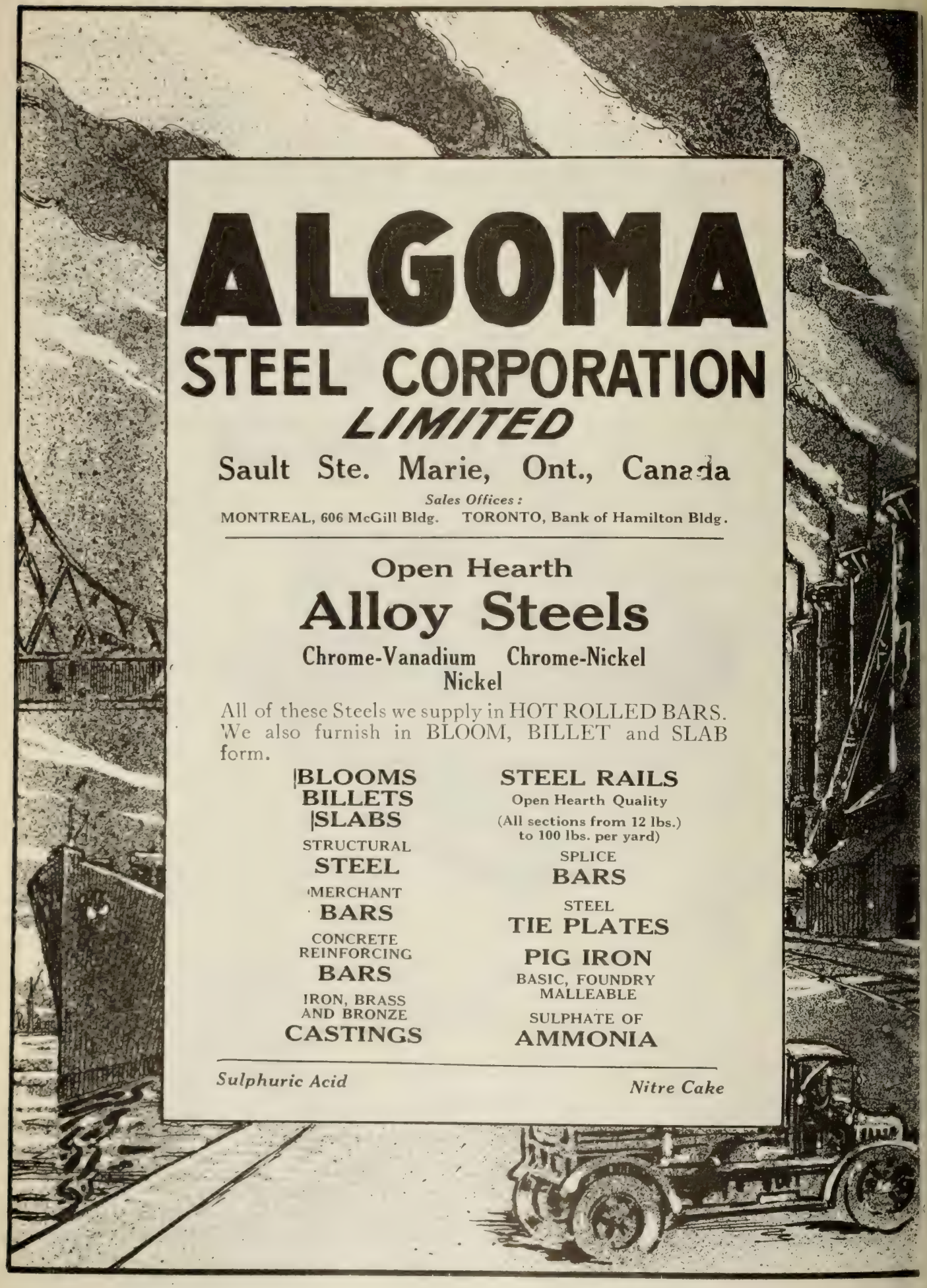


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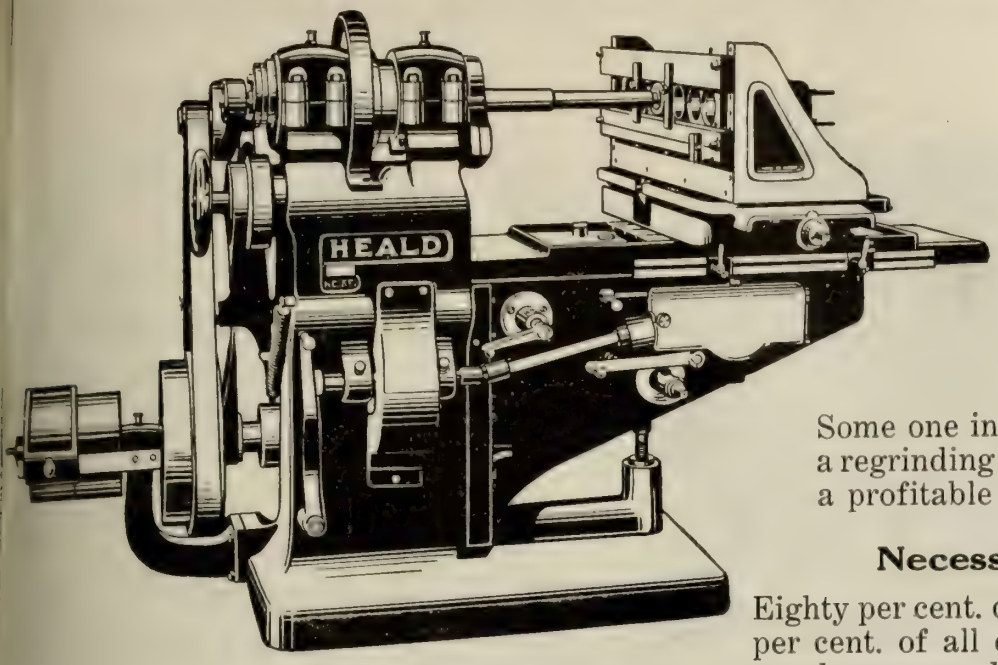
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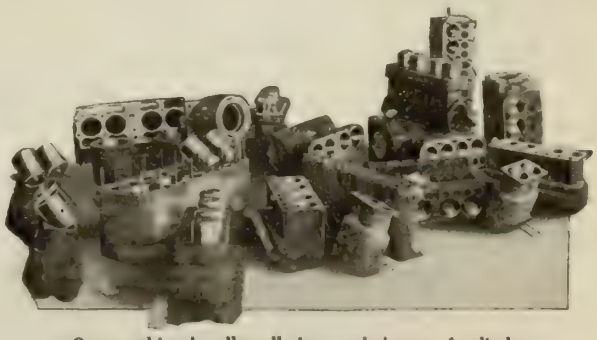
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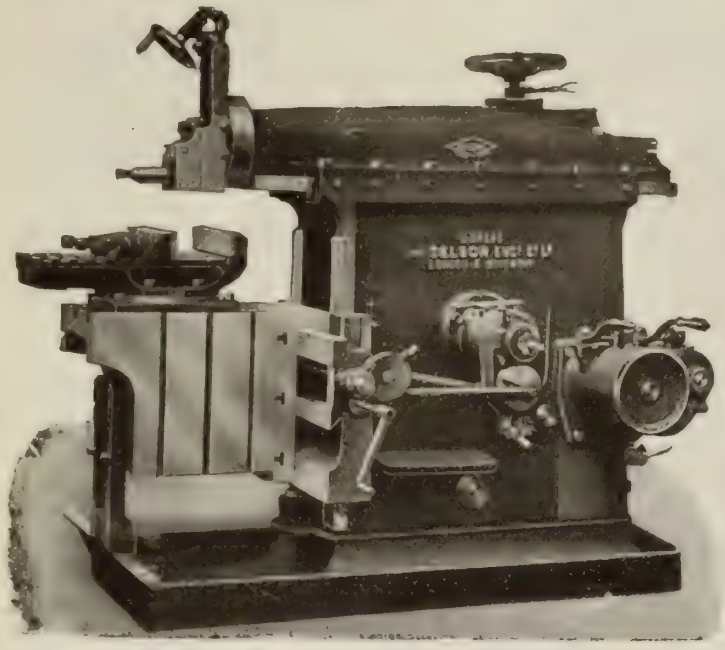
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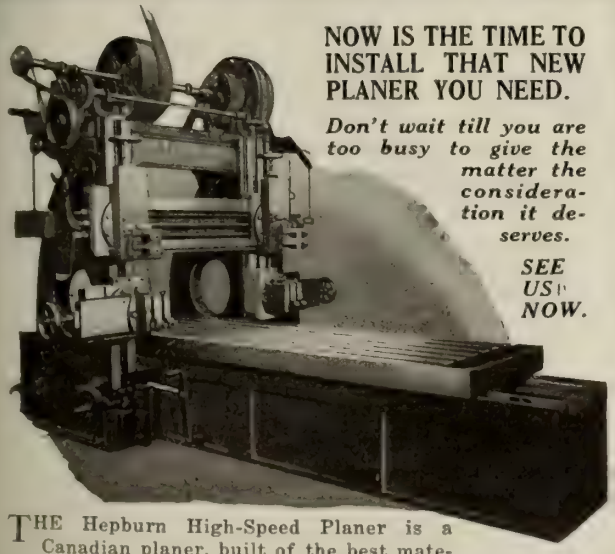
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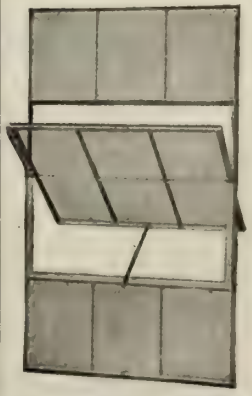
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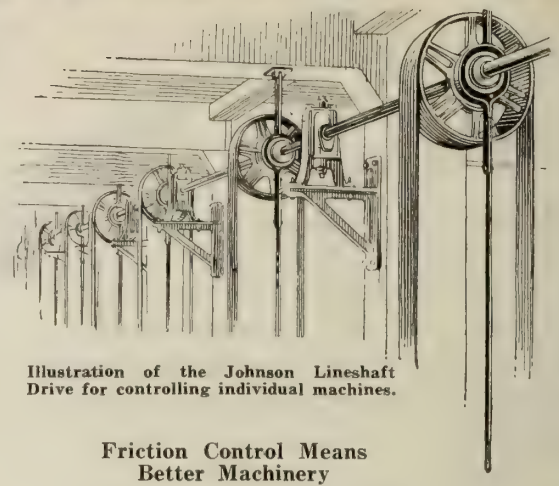
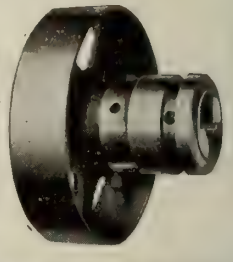


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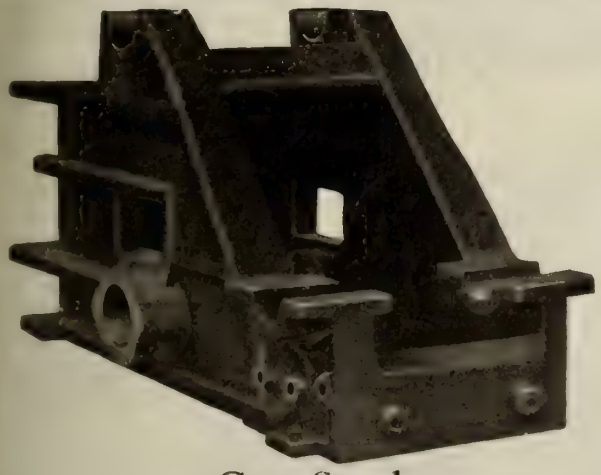
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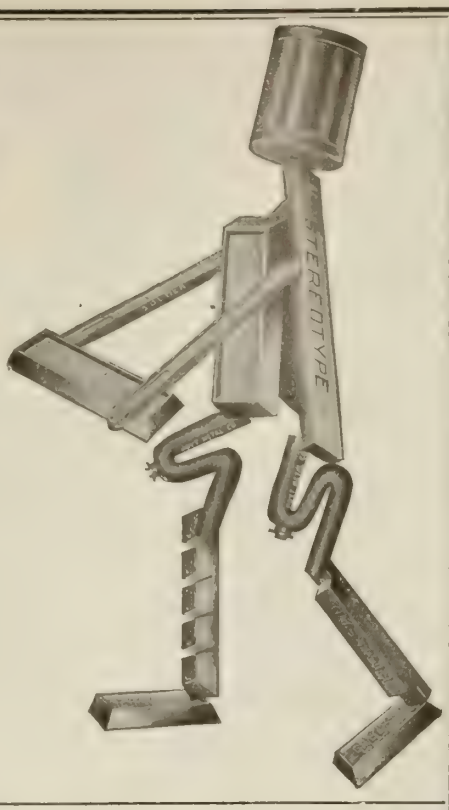
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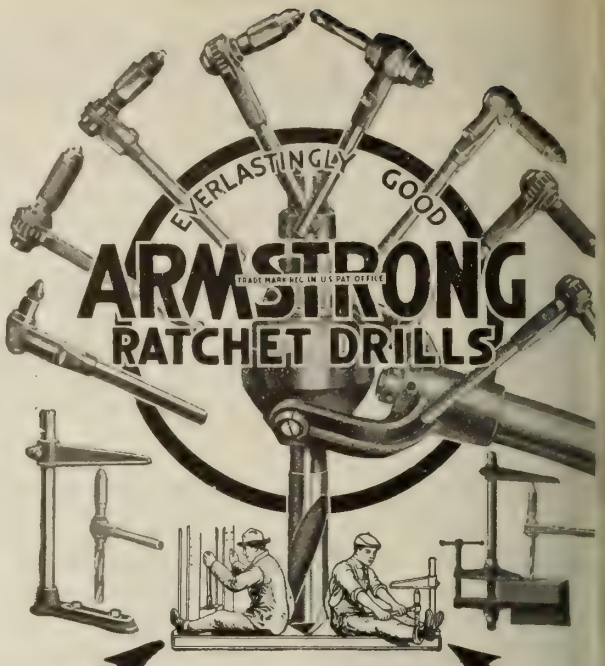
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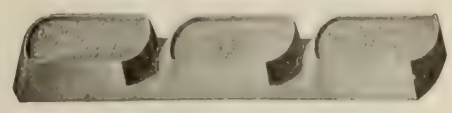
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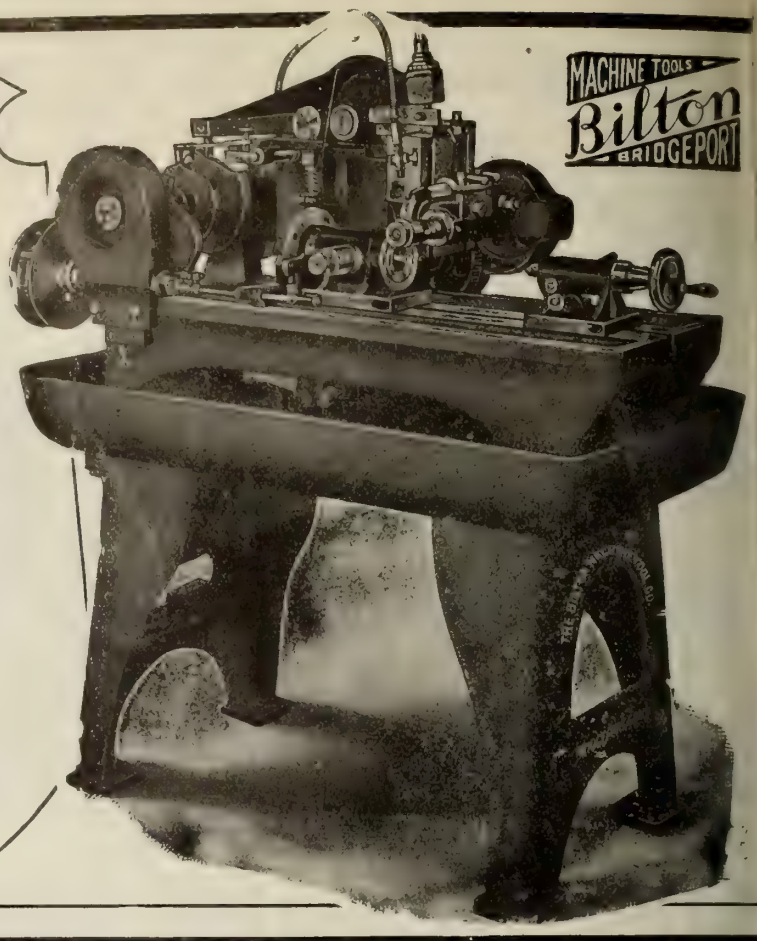
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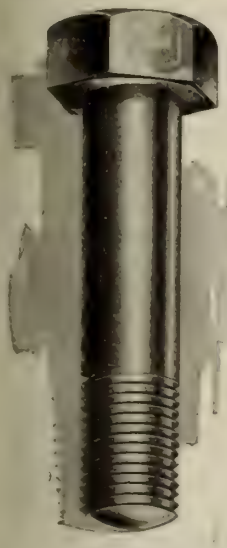
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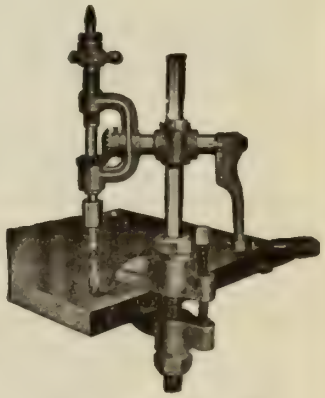
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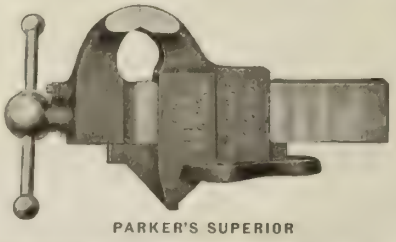
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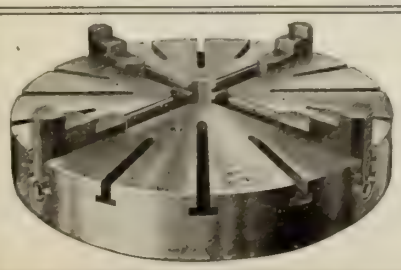
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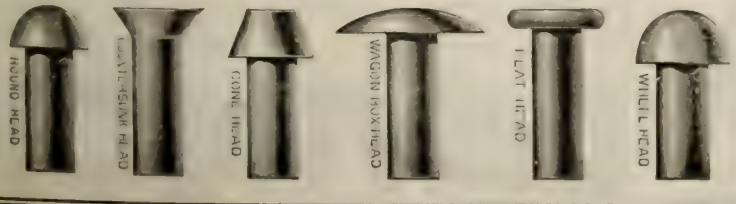
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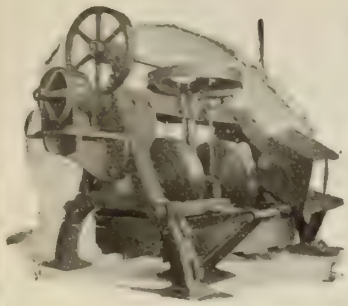
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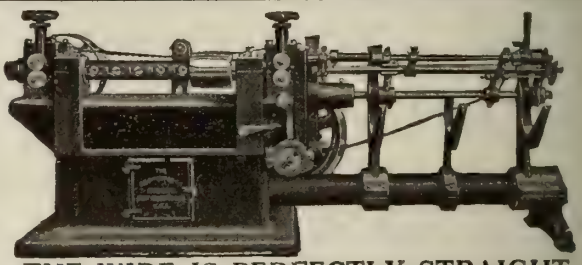
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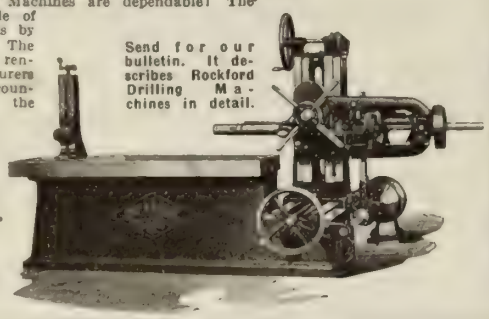
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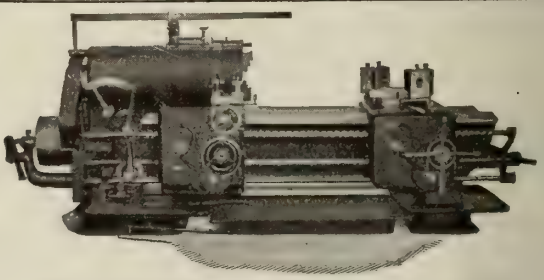
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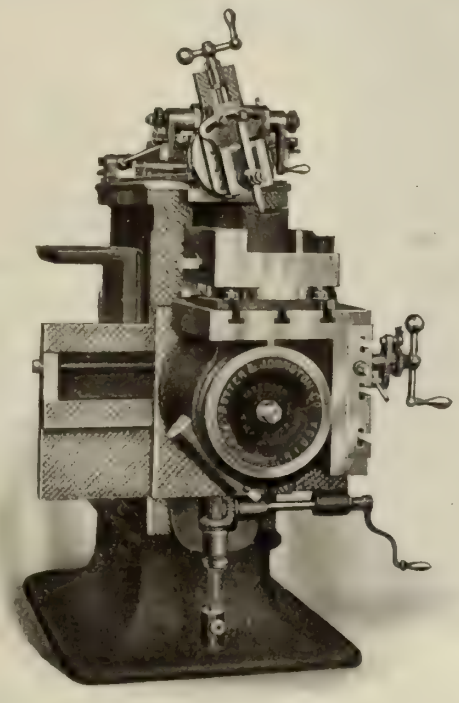
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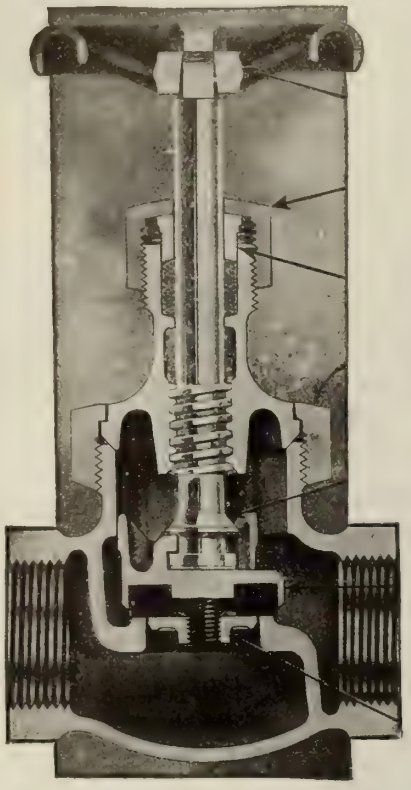
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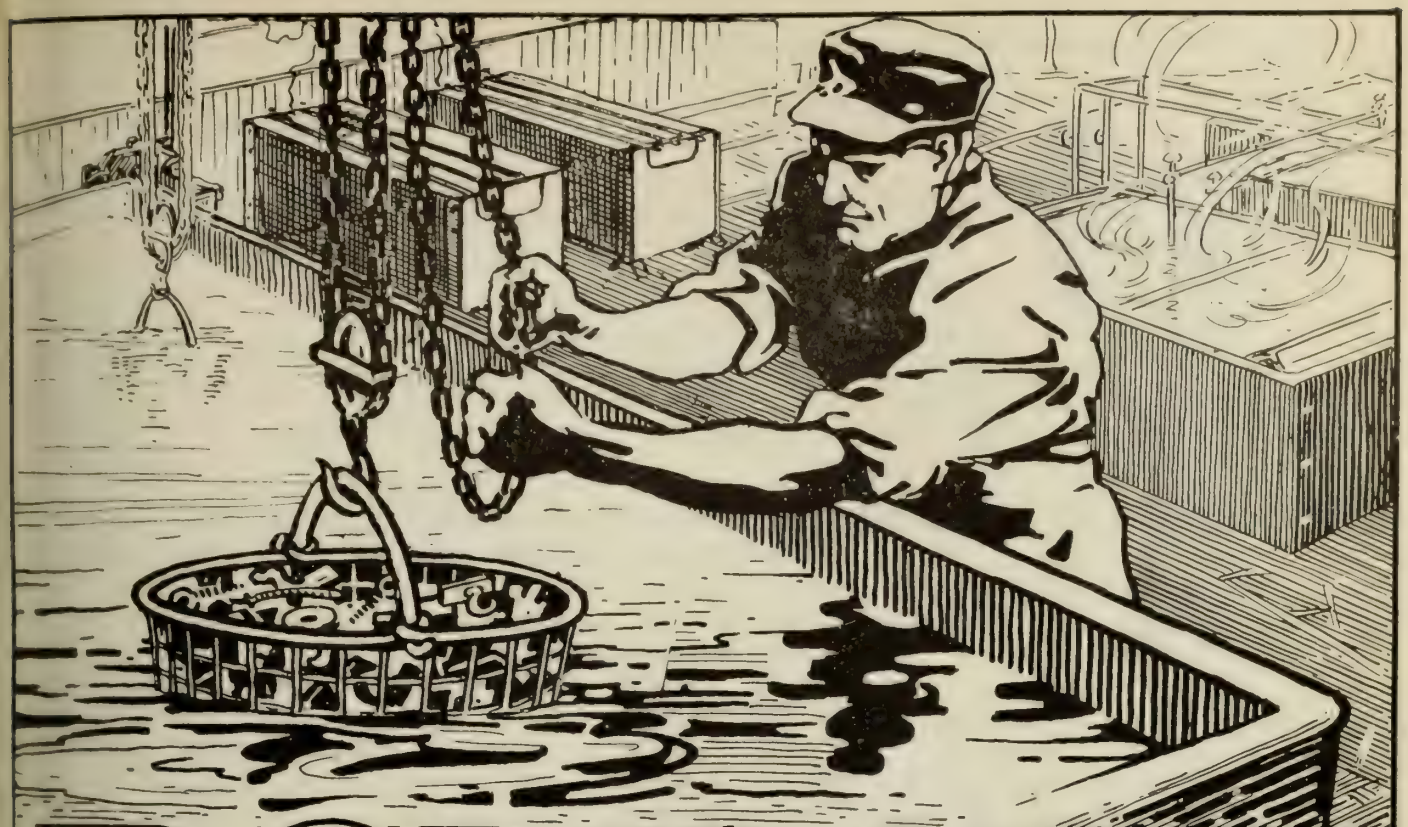
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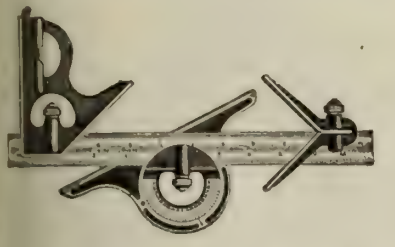
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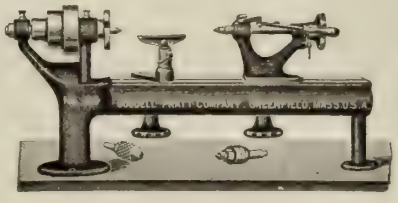
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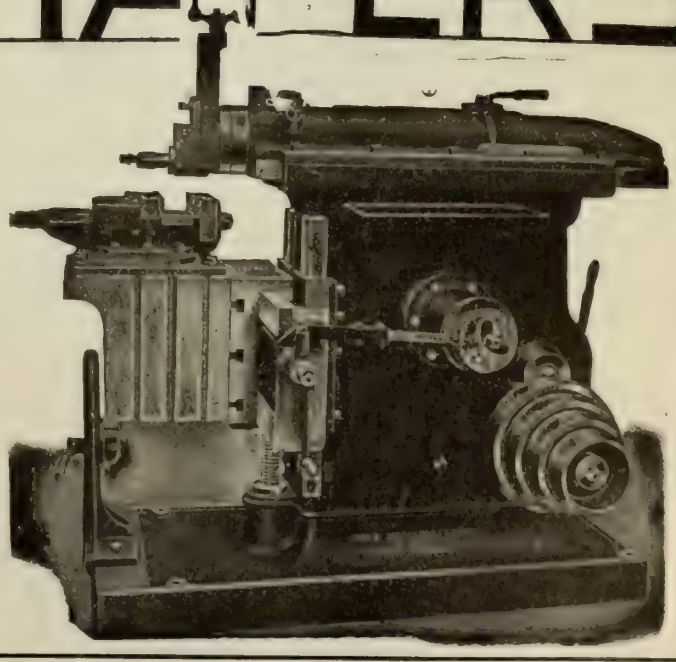
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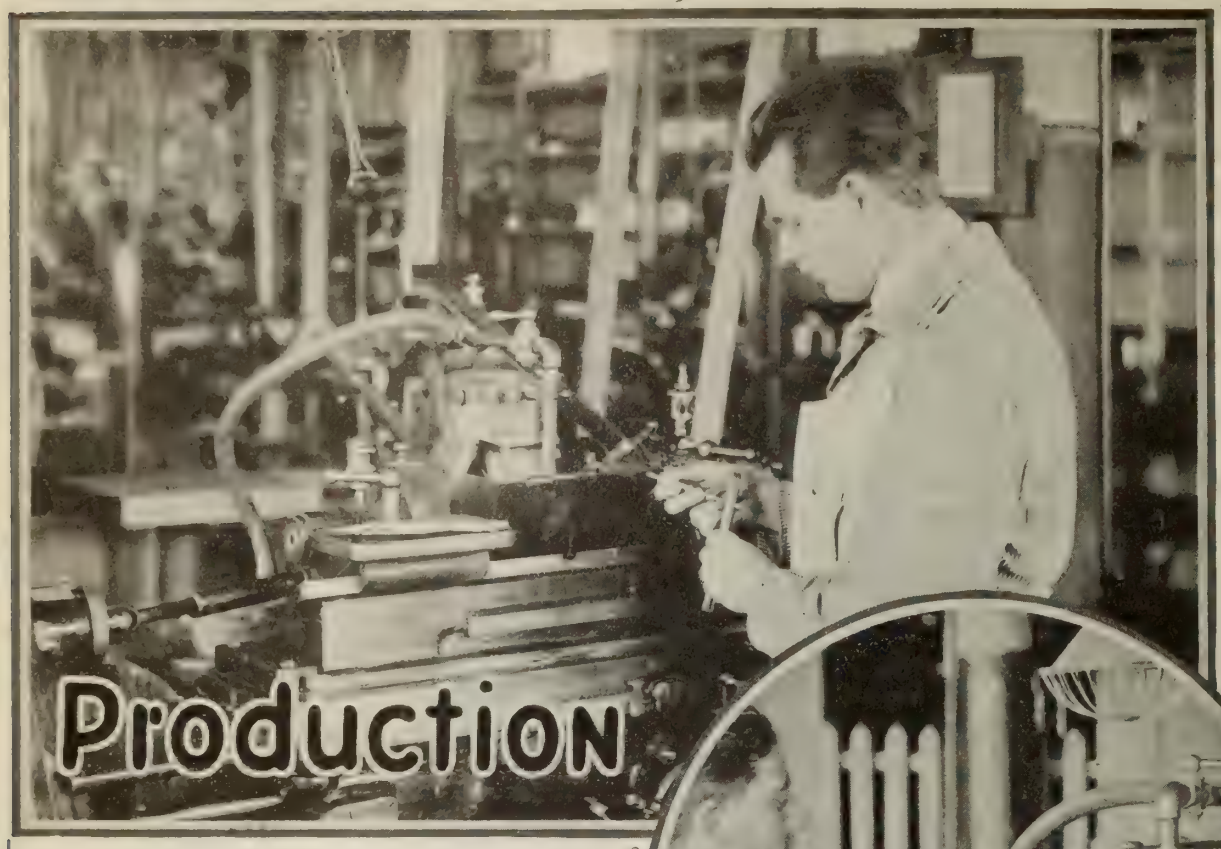


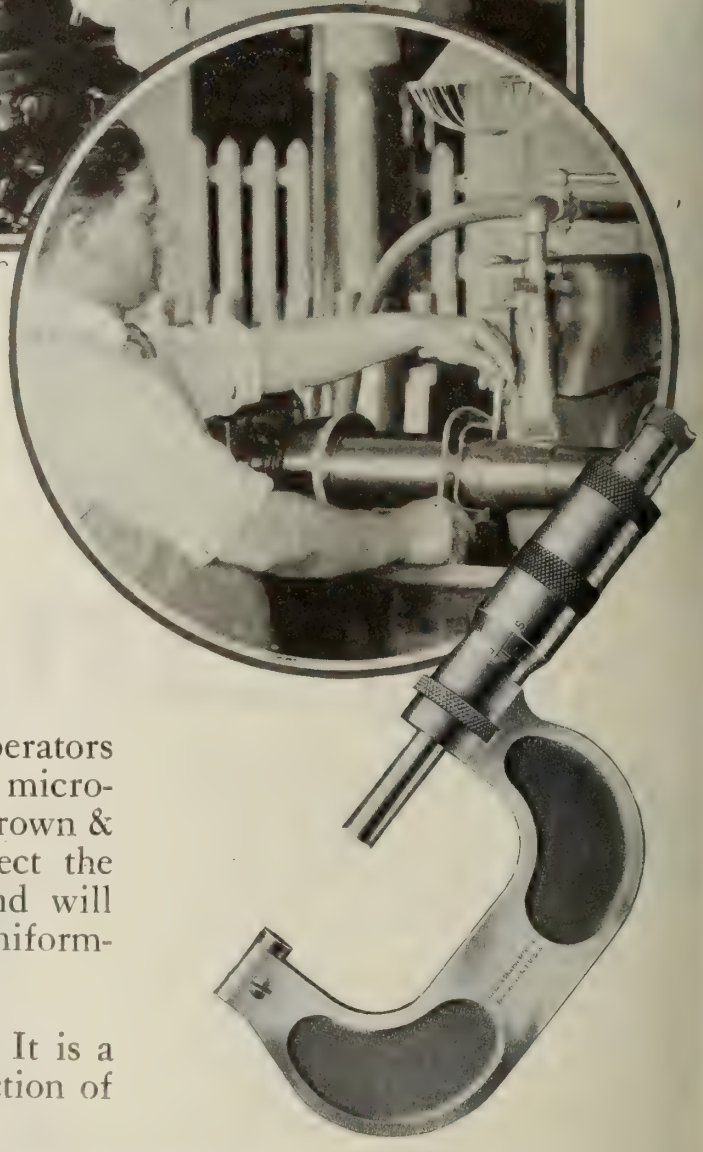
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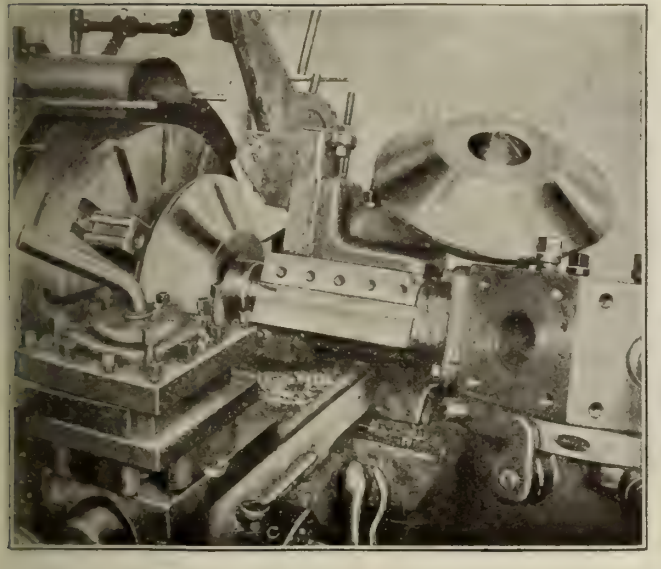
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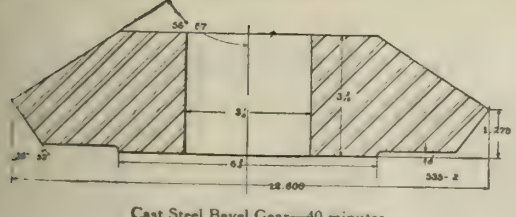
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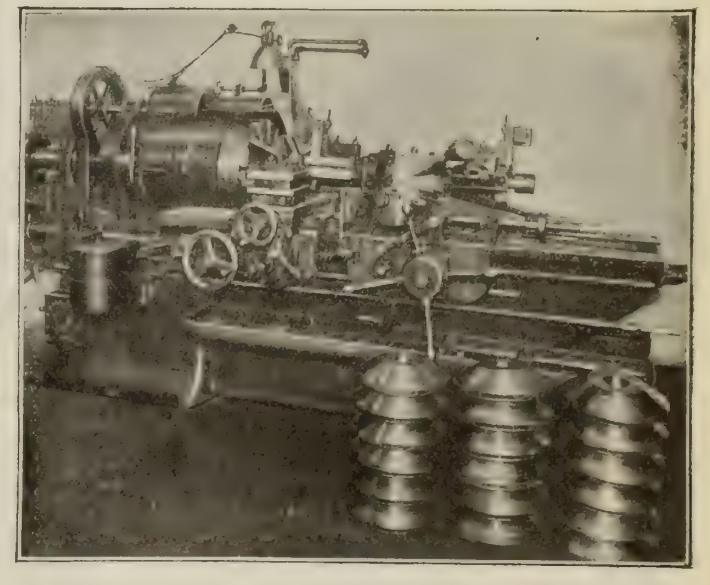




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CANADIAN MACHINERY
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MANUFACTURING NEWS

VOL. XXV. No. 19. May 12, 1921

# Roller Bearing Equipment for Line Shafting

## Power Loss, Through Friction in Line Shafting, is a Dividend-Reducing Leakage—It Can Be Avoided—Development of Roller Bearings Has Increased Their Popularity— Points on Maintenance

By J. F. McGUINNESS*

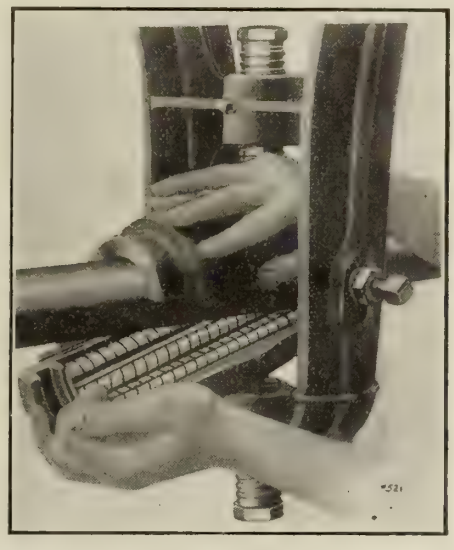
THE question of suitable bearings for line shafts is now receiving a greater amount of careful consideration than ever before, and manufacturers generally have proven for themselves that the loss of power through friction in line shafting is a dividend-reducing leakage that can be eliminated. Let us tackle the proposition from the viewpoint of the manufacturer, the man who pays the bills and is directly interested in keeping down to a minimum the cost of plant operation.

### Power Absorption

The line shafts that carry power to the machinery throughout a plant really constitute the arteries of the plant, and as such should be given sufficient freedom in operation to insure proper and efficient distribution of the energy carried to the productive equipment. Every hampering factor, exerting pressure on the shafting, will tend to destroy its efficiency and create a loss of power, which cost many dollars to develop.

It is generally conceded that the friction created by contact between line shafting and plain babbitted bearings supporting it amounts to more than half of the total friction loss between the prime mover and the producing machines, and in most plants this friction load averages about 30 per cent. of the total power used and is reflected in high coal bills or electric power bills. Statistics show that more fuel is consumed per a year in turning the line shafting of the country's manufacturing plants than in the operation of all the railroads.

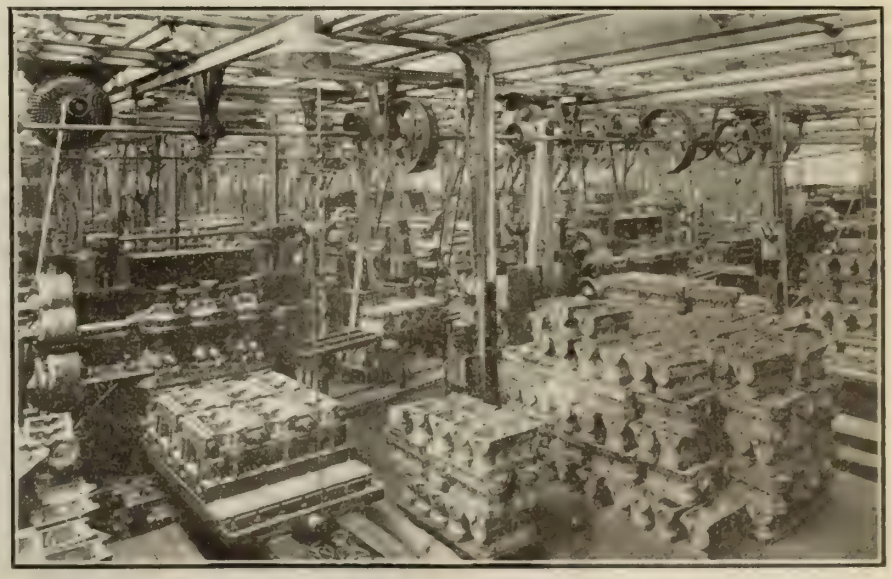
To such an extent has the magnitude of this loss become evident to mechanical engineers and factory owners that a sufficient demand for better shaft hangers has resulted in the appearance of a number of very good ball and roller bearings, all differing somewhat in design and construction, but functioning in one direction—providing rolling action instead of rubbing friction.



SHOWING HOW SIMPLE IT IS TO APPLY ROLLER BEARINGS TO THE SHAFT WITHOUT DISTURBING THE PULLEYS, COLLARS, OR COUPLING, OR TAKING DOWN THE LINE SHAFT.

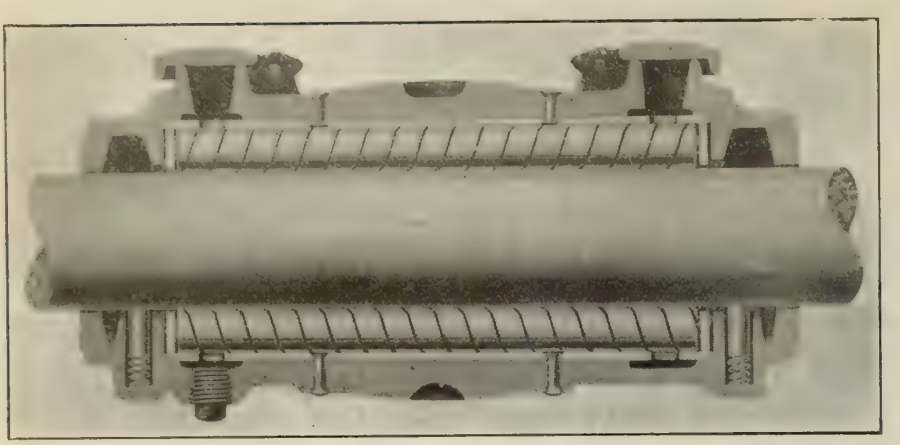
In the pioneer days of anti-friction bearings, the cost of ball and roller bearings for use as power transmission equipment was very high in comparison with that of plain boxes. The cost of power on the other hand was comparatively low ten years ago, so that with these cost factors to consider, the use of anti-friction bearings did not appear as a very attractive proposition to the manufacturer and the idea was naturally slow in taking root.

Development and perfection of the manufacture of anti-friction bearings, and the increased demand for equipment of this character has enabled manufacturers to market ball and roller bearing hangers at prices within the reach of all. Combined with this is the increase in the cost of developing power, power costs on the average being higher than formerly. This figure of cost per horsepower year varies according to locality.



A SMALL PORTION OF THE FORD MOTOR PLANT. NOTE THE METHOD OF SUPPORTING LINE SHAFTING. ROLLER BEARINGS ARE USED EXCLUSIVELY IN THIS PLANT.

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RELATIVE POSITIONS OF SHAFT, ROLLERS, OUTER RACE AND OILING
RELATIVE POSITIONS OF SHAFT, ROLLERS, OUTER RACE AND OILING
ARRANGEMENT.

With a reduction of 15 per cent. in the cost of power, or, to present it in another way, reducing the cost of each horsepower year, there is sufficient saving to produce a substantial return on whatever investment is made in anti-friction bearings. As the prices vary, however, it cannot be stated here with any degree of accuracy just how long a period is covered before the bearings will pay for themselves on the basis of power saving only. In any case, two years is the maximum time required, although a number of tests have been made showing a return of the investment in half of that time.

### Maintenance

In addition to the enormous loss created by friction when line shafting is operated in plain bearings, the cost of oil and oiling labor is worthy of careful consideration. In this respect, plain or babbitted boxes to my mind can be classified as luxuries because of the constant lubricating attention they require. Some of the plain boxes now in use require a charge of oil daily. Others must be looked after at least once a week and there are a number of boxes with devices for storing lubricant so that an oiling once a month is necessary. The average plain bearing, however, requires oiling every week or 52 oilings per year. The slightest omission in lubrication of babbitted boxes, or forgetfulness on the part of the oiler, immediately endangers the plant to the possibilities of interrupted production through hot bearing trouble. Only a small portion of the lubricant used in oiling plain bearings serves its real purpose. The greater percentage is destroyed by heat caused through the development of friction or leaks out uselessly.

With the reduction of friction in ball or roller bearings, a destructive feature is eliminated. With nothing to create waste, no more than four oilings per year are necessary for any type of anti-friction hanger and the amount of oil required for each oiling is no greater than that used once a week with each plain box. Eighty per cent. is a very conservative estimate of the saving in oil and oiling labor where anti-friction bearings are used, and, as it is with power saving, there are hundreds of pieces of evidence testifying to the low maintenance cost of anti-friction hangers.

### General Advantages

The successful manufacturer is the one who strives for highest efficiency on the part of every one connected with his organization. He insists that every employee produce to the maximum or seek employment elsewhere. It is only logical therefore that this idea be carried out and applied to wastful plant equipment, especially to such equipment that can be easily replaced by units already assembled and requiring very little effort in their installation.

While the direct benefit derived from the use of anti-friction bearings is reflected in power and maintenance charges, it must also be remembered that where line shafting is running in plain bearings, there exists a wear and tear on motors, engines, belting and even on driven machinery, which adds considerably to upkeep costs. With the elimination of the destructive factor responsible for this, the life of belting is materially increased, motors and engines require overhauling less frequently and power is delivered to the producing machinery with greater uniformity, and in greater volume.

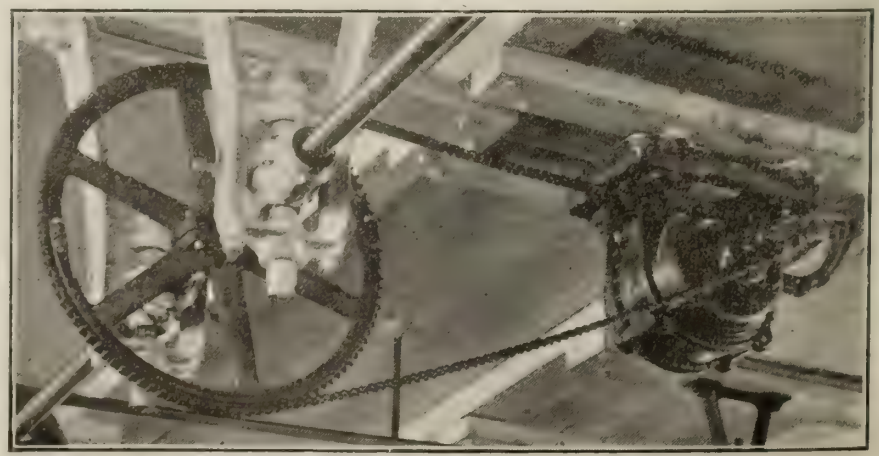
In a word, the reduction of the cost of plant operation is so pronounced where anti-friction bearings are in use that the user of power who realizes that he must utilize all of it for the purpose for which it is developed, with the least possible loss, will find it to his advantage to look into the conditions existing in his plant with a view towards placing his transmission equipment on the most efficient basis possible.

## THE RECLAMATION OF SCRAP

One good thing that came out of the war was the awakening to the value of so-called scrap material. At a recent meeting of the American Railway Engineering Association, it was shown that at the present time many railroads have special reclamation shops.

A reclamation plant established by the Rock Island lines at Silvas, Ill., has a scrap dock 48 ft. wide and 1,500 ft. long, with six bins 28 x 42 ft. for storing unsorted scrap, eight bins, 28 x 30 ft., for sorted scrap, and 74 bins of various sizes for sorted scrap. Three traveling gantry cranes of 4 and 10 tons capacity have lifting magnets for 1,500 and 8,500 lb. loads. A shop 25 x 270 ft. contains a 100 pound hammer, two 150 pound hammers, double and single alligator shears, bolt shear, rattler for cleaning, drill press, nut tapping machine, four electric welders, four oxygen welding outfits, air-operated shear, and air-operated punch.

This plant is doing such work as welding cast-iron spokes on driving wheels, building up worn spots on firebox castings with acetylene welding; mating and repairing flange-worn steel-tired wheels before turning, thereby saving a great deal of labor; reclaiming salt deposits from refrigerator cars for use in thawing switches during the winter, and for use in fire barrels; pressing oil from waste (one barrel of waste netting about 20 gal. of oil); burning the waste and reclaiming about 50 lbs. of babbit, reclaiming barbed wire for use in building rip-rap.



THIS STYLE ROLLER BEARING CAN BE APPLIED WTH THE LINE SHAFT, COLLARS AND COUPLINGS IN PLACE.

# Various Forms of Die Beds and Punch Holders

## Sub-Press and Drop Hammer Type—Beds With Forming Slides—For Round Dies With Extension Backs—Diagonal Post Dies—Spring Pad Arrangement—Pillar or Post Die Beds

By F. SCRIBER

ONE of the most common machines in use, and one, therefore, which is apt to be overlooked, is the punch press. To some this machine merely consists of a surface to set a die on and a ram operating up and down which carries punches. The function of this article is to describe die beds, some of which are in common use, others which are of rather a special nature. It has been the writer's experience that the men who have the upkeep of punch presses are rather prone to adopt one form of die bed or "die holder" as a preference, regardless of conditions, thus sacrificing more advantageous setups which can be obtained by taking a broader view of the subject. Before going further, it is perhaps well to define just what is meant by die bed. This, in the sense used by the writer, is that portion of the die which is usually made of cast iron, and into, or upon which the cutting die, which has to be replaced from time to time, is mounted. It is customary to mount this die bed on a bolster plate contained on the body of the press.

Referring to Fig 1, to the left of this view is shown a die holder having a dovetail slot cut across it with screws to hold the die in place. This holder is for simple blanking dies used in making up job lots where small production is required. The die proper, A, is set into the cast iron block B, and is held in place by screws C. Above the die holder is shown a punch holder of similar construction. This punch holder has a round shank D, which fits a hole in the ram of the press, and is operated as a unit thereto. At the right of Fig. 1 is a die holder having a steel gib E, between the die and the holder, against which the screws F, come. In the punch holder shown above is a tapered gib G. This is for wedging the die in place, a tap on end H, with a hammer securely holding the die or punch in place, while a tap on the opposite end permits the removal of same, it being customary to employ either of the two constructions shown on the same class of work.

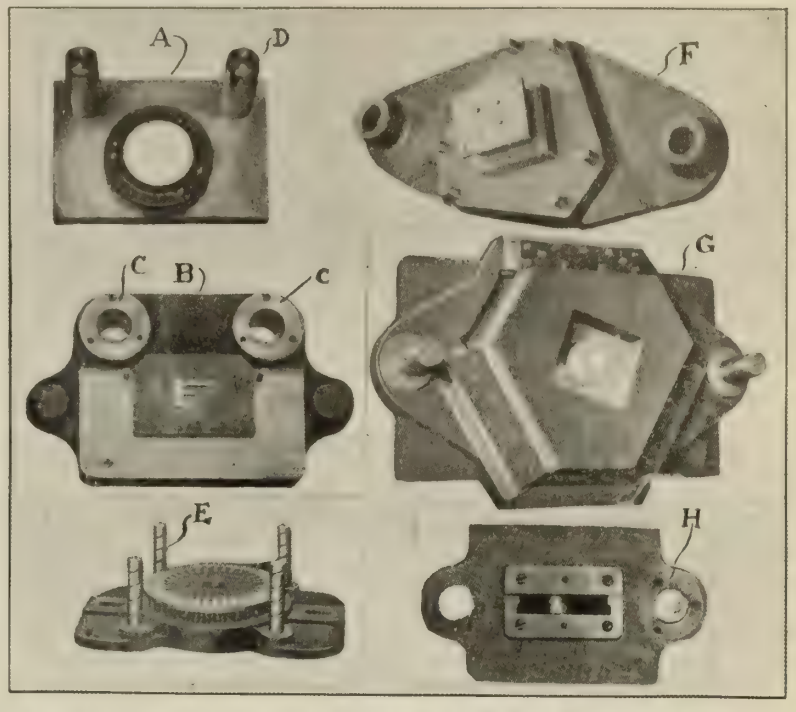



FIG. 4—A GROUP OF PILLAR OR POST PUNCH AND DIE HOLDERS.

Fig. 2 illustrates four types of die beds. A is a cast iron bed having a square seat, B, in which the dies are fitted and doweled against movement. C shows the same type of die bed fitted with a plain hole D, and elongated hole E. This construction permits of loosening the bolts without removing the die holder from the press, pivoting the same on bolt D, thus bringing the die from under the ram of the press, so it can be removed from the holder for grinding purposes.

In the upper right hand corner is

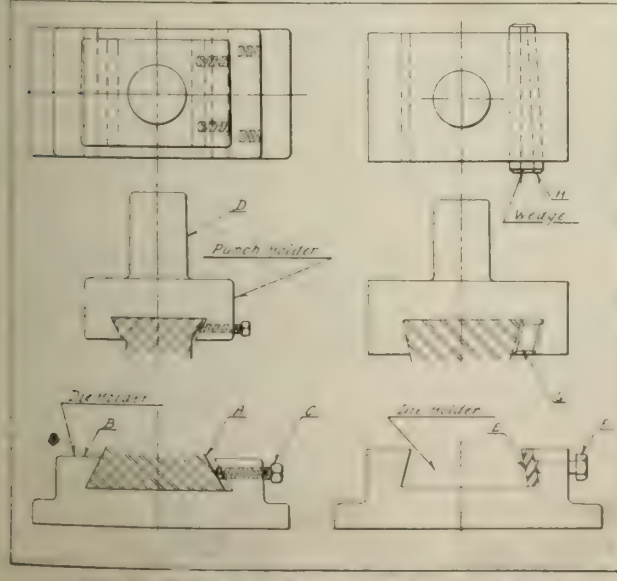



FIG. 1—TWO TYPES OF PUNCH AND DIE HOLDERS.

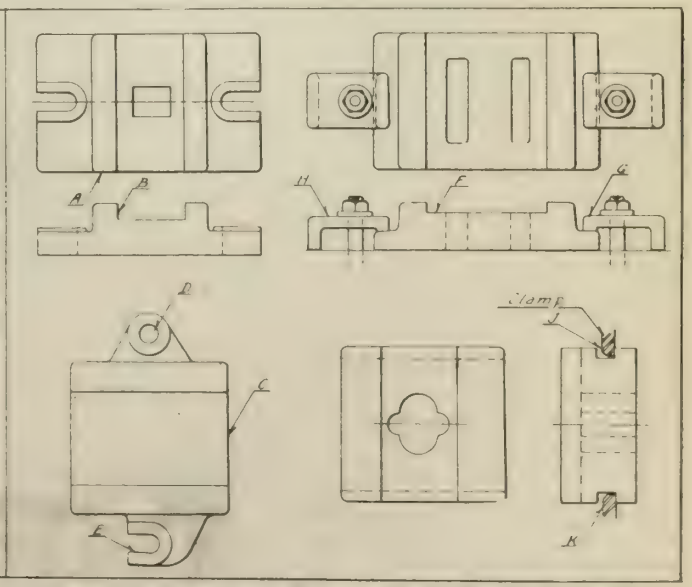



FIG. 2—VARIOUS DIE BED HOLDING DOWN METHODS.

shown a die bed F. This depicts two clamps, G and H, which are used for holding the bed in place. This construction permits the use of a number of different die holders on the same bolster without drilling various holding down bolt holes. It also obviates the necessity of putting holes or slots in the die beds. In the lower right hand corner is shown a die bed which has slots, J and K, cut into it. Clamps may be inserted into these for holding the die bed to the bolster on the press.

### Keep in Line

In the construction of die beds as often made, it is necessary for the operator in setting up the press to be very careful and have the punches in line with the dies. In the construction shown at Fig. 3 two steel posts, or guide pins, are provided to keep the two members (die holder and punch holder) in line. The punch, or punches, are mounted on surface B of the holder, while at C are mounted the die units. The posts are provided with oil grooves and the punch holder slides up and down on these posts. The application of this post construction is particularly desirable for blanking and piercing operations, although not so necessary for forming where the natural contour of the form keeps the punch and die in alignment. Posts of this design are shown at opposite corners, and the group of die and punch holders shown in Fig. 4 are of interest in this connection, as they illustrate varied applications of these die holders. At A is a punch holder containing two posts at the rear, below this at B is the die holder used with the punch. In this die holder are certain bushings, C, and posts, D, slide in these bushings. At E in the lower left hand corner is a die holder containing four posts, while in the upper right hand corner is a holder having two post holes directly opposite on the centre line. This holder is indicated at F. At G is the die used for this work. In the lower

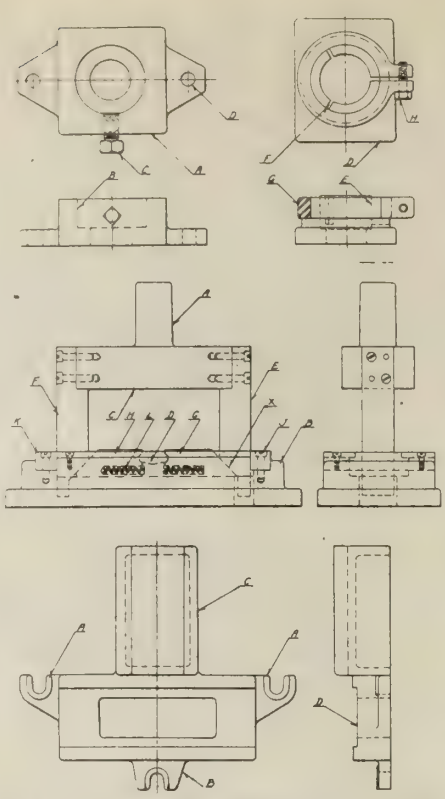


FIG. 5—TOP VIEW SHOWING TWO DIE BEDS FOR ROUND DIES.
FIG. 9—CENTER, SHOWING DIE BED WITH SLIDES FOR SIDE FORMING.
FIG. 10—BOTTOM VIEW. DIE BED WITH EXTENSION BACK.

right hand corner at H is a small die holder, in which the guide pin holes are bushed and are directly opposite on the centre line. It is preferable where two guide posts are used to have them either as shown at F, G and H at the centre, or as shown in Fig. 3 diagonally opposite.

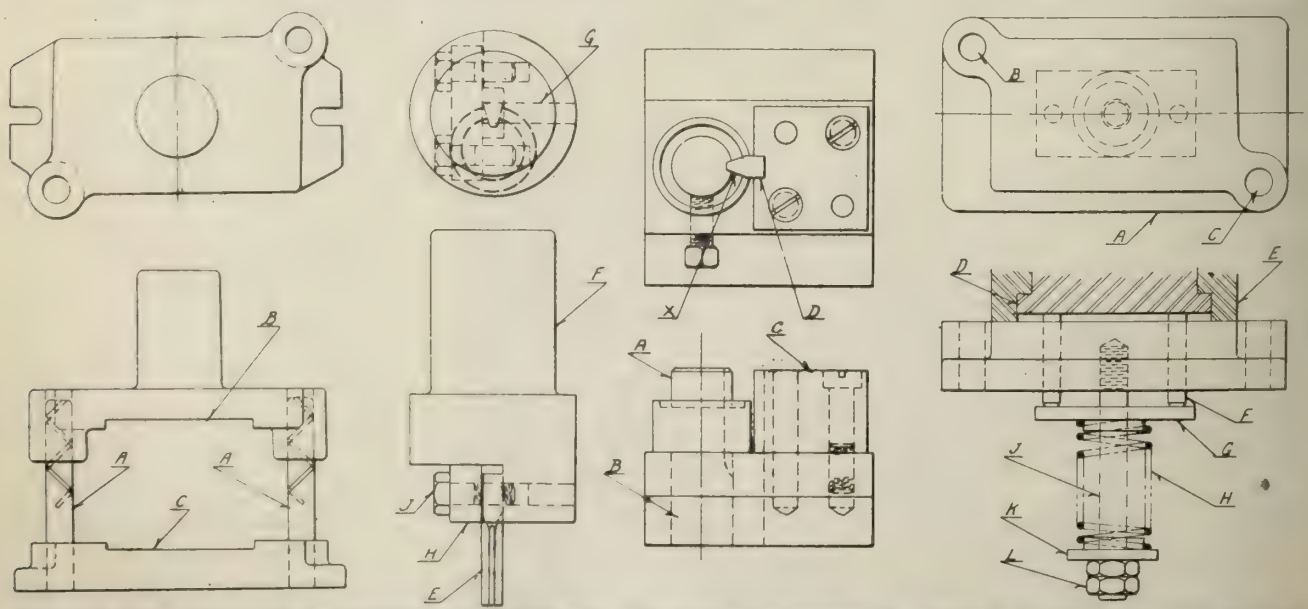
If diagonally opposite, the stock from which the blanks are made can be fed through on the centre line the long way of the die holder and be clear of the posts, a condition which is obviously impossible where the die is constructed as shown in F, G or H in Fig. 4. This condition is merely pointed out as one to be guarded against in die design, as, of course, it was not necessary to feed the stock in the aforementioned manner when using these dies. When using die and punch holders with two posts at the rear, there is a tendency to have the slide member cramp on the post, where there is lost movement in the slide of the press, while where four posts are used it involves more work in making the die bed, while the die surface is not as accessible.

Two constructions especially adapted for holding round dies are illustrated in Fig. 5. The first of these at the left shows a simple holder A, counterbored at B, to receive a die which is held therein by a set screw C. This holder has two holes, D, for holding it to the bolster plate of the press. It is frequently the practice to omit the screw C and hold the round dies in place with filister head screws from the top. At the right of Fig. 5 is a holder made of steel and indicated at D. This is also counterbored to receive the die at E and has three saw slots, F, cut into it. Over the outside of holder a split collar, H, is mounted, and with the die in the hole, E, tightening of split collar with bolt H, securely holds the die in place.

### Other Examples

With one or two exceptions the foregoing illustrations have been devoted to detailed description of die holders. In the remaining views are shown arrangements which involve a description of some of the operative units of die construction. No attempt will be made to show definite applications of the tools to the work, that being outside of the scope of the present article.

Referring to Fig. 6. This shows at the left a sub-press type of die holder while at the right is a drop hammer die holding arrangement. In the case of the drop hammer the die holding mem



READING FROM LEFT: FIG. 3—DIAGONAL POST DIE BED. FIG. 7 ARRANGEMENT OF SIMPLE PUNCH AND DIE HOLDER.
FIG. 8—DIE BED CONTAINING SPRING PAD ARRANGEMENT.

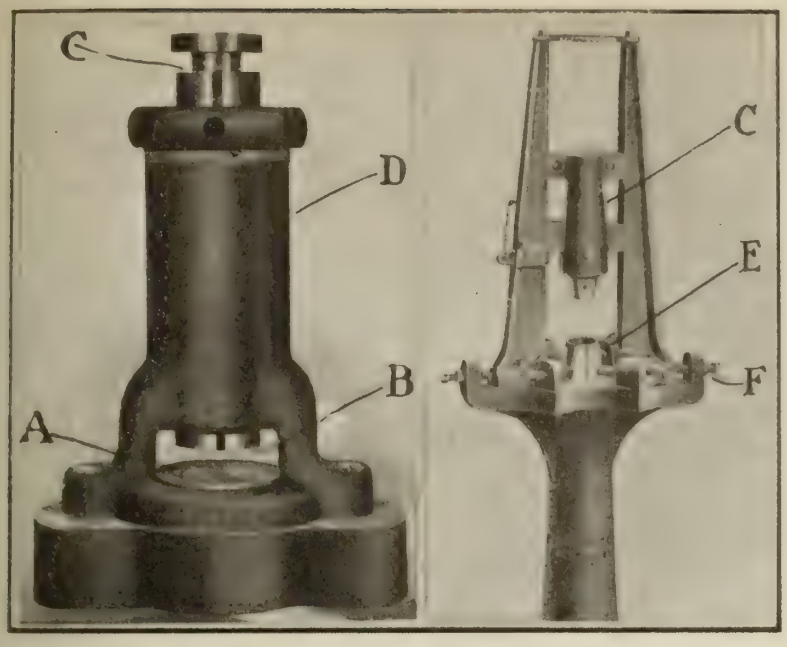



FIG. 6—TWO FORMS OF DIE SET-UPS. LEFT, THE SUB-PRESS TYPE. RIGHT, THE DROP HAMMER BED.

ber is built permanently into the machine. Referring to the sub-press type, the die is located at A, while suitable punches are placed in the plunger B. This plunger is attached to the ram of the press at C, and slides up and down in the bracket D. This holds the die and punch in alignment and adjustable bearings are provided to hold plunger snugly in the body of the sub-press. This type of die holder is used mostly for small accurate work.

Again referring to the drop hammer type. Die E is held in place by screws F, which are contained in lugs on the body of machine. The ram G contains the punch, and it is customary in using this tool to raise the ram, letting it drop by its own weight to perform the work. An arrangement of a die and punch holder where the units are all made of steel is illustrated in Fig. 7. The construction of this is rather simple and embodies principles of good design. The die A consists of a round stud hardened and drawn to the proper temper. This is mounted in a steel block B. At C is another steel block, which is cut away at D, so that it will back up the punch, which cuts a tapered slot as indicated at X, when the punch descends. It is a simple matter to renew the die A while retaining the other parts, B and C, thus reducing the repair costs to a minimum. The punch E for this die is mounted in a steel holder F, which fits into the ram of the press. This punch slips over a dowel pin G, held on the holder F, the holder being grooved out to receive the same. A steel clamp H, held in place by two screws J, securely holds the punch in place, all of which makes a very substantial arrangement for performing the operation shown. In the design of numerous types of dies it is often necessary to incorporate a spring pad. This is particularly true where blanking and forming operations are performed in the same die.

Figure 8 illustrates one method of arranging the die to accommodate such conditions. The die holder A, made of cast iron, contains two guide posts at B and C. The spring pad is indicated at D and this is retained in place by an outer ring or block E, which limits the upward movement of the spring. Two pins, F, pass through holes in the die bed and come against a plate G. Against the underside of this plate is a spring, H, that is attached to a stud J, being held thereon by a suitable collar K and check nuts L. When the ram containing the punches descend, the spring pad D is forced down, thereby causing the pins F, through the medium of the plate G, to compress the spring, which is held to the underside of the die body by the stud J. When the ram comes up the spring, pressing against the plate G, forces the spring pad D back to its original position, as shown. Rubber is quite often used in place of the spring for this purpose and it is also quite common to put springs directly under the spring pad D in the cast iron die bed A.

Another complication often met with in press work is the necessity of forming from the sides of the dies. This is usually done in conjunction with a form made from the top, and to illustrate one of the principles of construction used for such work let us refer to Fig. 9. In this illustration A is the punch holder, which is attached by a round shank to the ram of the press. B is the die holder. Attached to surface C of the punch holder would be some form of punch that would make the shape desired. This would be made with a spring pad, so that when it bottomed on the surface of die D, it would remain stationary while the punch holder would continue to descend. This would cause the plunger E and F, which have beveled surfaces on their lower ends at X, to force slides G and H towards the centre surface D. These plungers are backed up by steel seats J and K, while two springs, L and M, are used to keep the sliding members apart. Forcing these slides, H and G, in causes the slides to form from the side, thus in this construction we have three functions performed, that of forming from the top, and from the two sides. The slides, H and G, are sometimes made as side forming punches, and on other occasions are made with punches attached to the slides. It will, of course, be understood that various modifications of this design, embodying one plunger, four or even more are employed in die design to suit the particular job in hand.

Referring to Fig. 10 we see a die body which is held down by three bolts, two of which are at the sides A, and one directly in front at B. This has an extension at the back C, the construction being one that is sometimes used for holding a die on surface D, while the extension C would be used for holding necessary associate parts of the die that have to withstand very little of the cutting strain usually imparted in die works.

In die work the best rules of construction cannot be laid down, as similar methods cannot be employed for making anything from metal buttons to automobile bodies. The type of press and large extent govern the features incorporated in the design.

## POINTS FOR TWIST DRILL USERS

If the drill chips on the edge it indicates that the lip clearance is too great and fails to support the cutting edge. This may be because the drill is too hard. It is advisable to ease off on the feed and watch the grinding.

If it splits in the web, it is either ground with improper centre lip angle or the feed is altogether too heavy. The centre lip should be at about 45 degrees to the cutting lips of the drill. The drill is in best condition when the chip comes in a close coil.

If the outer corners wear it shows that the speed is too high and it should be reduced. This is particularly noticeable in drilling cast iron.

Drilling cast iron can be done at a little faster speed than for steel, but the corners must be watched.—Belts.

## SHOP FLOOR BUCKET

A new type of bucket for use in machine shops or foundries has been introduced by a Cleveland manufacturer. The bucket is retained in a hole especially constructed for it in the floor of the shop and scrap is easily swept into it. Fitting over bucket is a cover of 5-16 inch steel plate which gives a level surface, permitting the operating of trucks over it when closed. An overhead crane raises the bucket from the hole and it is carried to a storage dump where it is emptied, or directly to cars which haul it away to the dumping place.

# Taking the Machinery Out of Promotions

## Reward the Man Who is Really Trying—Take the Mystery Out of Promotion and Rewards—Get a Rating on the Man Independent of His Own Opinion of Himself

By WALTER A. WILLIAMS

THE president of one of America's largest and best known industries, said recently: "Right now, to-day, is the time to take inventory. Not just an inventory of parts and goods and stock, but of the human element. It is a good time to get rid of mental cobwebs, outworn business customs, wasteful habits, and also wasteful, inefficient people. From now on there is going to be man's work for everybody who is willing. Each one of us will have to do more work, and do it better. It is a time to get rid of the slackers and to reward and promote the fighters. For the rest of 1921 is going to be a fine year for fighters."

Now those are good words. They sounded good when heard. They sound good now because they are true. But they have a challenge for every man in business. It is easy enough to get rid of Miss Johnson, who can't manage to get in on time, or to fire Pete Smith, who never did take any interest in his job, but it is just as essential to reward the man who is really trying, to find out who the fighters really are, to take the chance and mystery out of promotions and rewards. Here is the case of Bill Green, for example.

Bill Green doesn't push himself forward. Maybe he lacks what some people call poise, others brass. Yet his type,—the workman who wants to get ahead through better work, who wants to earn his pay and a lot more besides,—is our most valuable national asset to-day. Anyhow, Bill wants an ever-increasing standard of living. He wants to give a full day's work for a full day's pay, and then do a little extra to earn this standard. He doesn't see how he is going to get these facts across to his chief. Nobody in authority knows, for instance, how Bill saved his concern big money when he cut down to seventeen minutes an operation which used to take an hour and a half. When he told his wife, Mary, about designing that new method of joining parts, and they figured out the saving to the firm as almost $16,000 a year, both agreed that Bill deserved promotion. But Bill's foreman, in what happened to be a machine shop, was interested primarily in getting credit for the saving in labor costs as shown by the figures in his own department. He was a good mechanic, was this foreman, but a poor leader of men.

Now, Bill and his kind are numerous, and they are discouraged. They see men getting laid off, but they know they are earning their pay and more. They want to get ahead. They get more discouraged when some man is promoted over their heads because of an accidental discovery by the big chief,—or some other reason which Bill doesn't understand and can't see any reason for. And these mysterious promotions, this lack of some definite method of appraisal of the latent human material in a plant, is one of the most important questions facing every employer to-day. Getting rid of inefficient workmen is important—but promoting the right kind insures future efficiency and is more important still. It makes no difference whether you have an office force of sixteen people in a small town bank, or own a factory employing eighty thousand hands. Some method of taking the mystery out of promotion, some means of getting a rating on a man, independent of his own opinion of himself, and regardless of accidental discovery, is essential if real esprit de corps and morale are to be maintained. And a really sound basis of business prosperity instead of boom times requires better individual efficiency which comes from high morale.

**POINTS BROUGHT OUT**

This is a good time to get rid of mental cobwebs and wasteful habits, for the rest of 1921 is going to be a fine year for fighters.

Reward the men who are really trying. Make no mystery about their promotion. Tell the men you appreciate their efforts, and reward them according to their worth, their true worth, not always what they themselves believe they are worth.

Base your salary on actual ratings, not on guess work. Keep tab on the men's activities. In other words "kill the mystery by means of mathematics."

Let a man have easy access to his rating record. In many cases he can strengthen himself where he is weak, and by hard study and conscientious effort can make real progress.

One concern has done a thing which seems obvious and practical, and it seems to contain a suggestion for every man who employs other men in any capacity. The Boston branch of a nationally known automobile company adopted a plan which does take the mystery out of promotions. And the curious thing is that this concern merely took the best plan in the world for its own use. When I say the best method in the world it isn't quite the exaggeration it sounds because it was the final plan worked out after the best brains in the country had been called in for advice. It is a practical business adaptation of the plan adopted by both the army and navy during the war, to keep in close touch with the latest ability of its officers. Why more concerns haven't stolen the idea, nobody knows. For human nature in industry is the same, and men respond to pretty much the same incentives.

With this concern, it is applied to foremen, sub-foremen, inspectors, and testers, with possible later extension to more subordinate positions. There are now in this concern certain and sure means of discovering relative abilities and shortcomings, and rewarding accordingly; of uncovering dissatisfaction before it starts; of building up a real organization morale so important for making a better product and making the concern a better place to work.

The rating plan used is really a modification of grading proficiency in the various studies, such as those old-time school reports which used to worry us. The qualifications required for each position are carefully analyzed and listed, and the individual is rated on each item with the percentage of his attainment in comparison with the possible. Each qualification is considered in its part relation to the whole. A typical rating scale as used by the army and adopted for industry might read as follows:

**Rating Scale for Foremen**

| | | |
|---|---|---|
| 1.—DEPARTMENT ABILITY. Consider kind and amount of experience; knowledge and resourcefulness in using machines tools, materials, and trade methods. | Highest.. 15<br>High.... 12<br>Middle... 9<br>Low..... 6<br>Lowest.. 3 |
| 2.—ABILITY TO PLAN AND SUPERVISE. Consider ability to maintain standard quality work; to place help where they can do the best work; to plan ahead, so as to have materials, men and tools ready to get out orders on schedule time with minimum production costs, and to keep a steady force. | Highest.. 25<br>High.... 20<br>Middle... 15<br>Low..... 10<br>Lowest.. 5 |
| 3.—ABILITY TO HANDLE MEN. Consider initiative, decisiveness, resourcefulness, energy, self-control, and ability to deal fairly with his help; to earn their respect, good-will and confidence; to maintain just discipline and a staple working force. | Highest.. 15<br>High.... 12<br>Middle... 9<br>Low..... 6<br>Lowest.. 3 |
| 4.—ABILITY TO TEACH. Consider his ability to explain his work clearly and thoroughly to a beginner, to gain the beginner's confidence and make him interested in the work; his success in developing all-around men, bettering men of lower grades, and increasing generally the knowledge and skill of the help under him. | Highest.. 15<br>High.... 12<br>Middle... 9<br>Low..... 6<br>Lowest.. 3 |

| | | |
|---|---|---|
| 5. GENERAL VALUE TO THE COMPANY. Consider his years of service, his loyalty, his ability to understand and carry out the company's policies; orderliness of his department; his readiness and ability to co-operate with other departments and the management in giving new ideas and methods a fair trial. | Highest | 30 |
| | High | 24 |
| | Middle | 18 |
| | Low | 12 |
| | Lowest | 6 |

This plan, of course, can easily be changed to fit any man who has other men under him. The chief clerk in an office or the assistant manager of a department store might have different qualities and percentages which can be substituted. The sum of ratings is 100 per cent. General value to the company, the most general title, is placed highest with a rating of 30. Other qualities are considered worth 15 points apiece, except ability to plan and supervise, which gets 25.

All men in the company now coming under the plan are rated against these scales, revision of ratings taking place every three months. Salaries are based not on guess work, but on the actual ratings. An increase in total points of rating means a sure increase in the pay envelope. To show that the plan has actually increased morale, it may be mentioned that average ratings have increased about 35 per cent. in the year during which the plan has been used.

Promotions also are always made on the basis of ratings. The several candidates are measured by the scale, taking into consideration the requirements of the new position, and the promotion made absolutely on the basis of points. Thus mystery is killed off by mathematics, and the chronic grouch is left without a leg to stand on when another man gets the job he wanted.

### A Typical Case

Not long ago a new foreman was needed in the plant. On the old basis, the natural way would have been to promote the assistant foreman of the department or bring in a new man from outside for the job. Instead, the rating scales were studied and from these three possible names were selected. Two were at the time assistant foremen of departments, the third was employed not in the shop, but in a totally different department, the sales inspection. His was the job of meeting the customers who brought in cars for repair. These three men were each rated for the new position by three of their superiors independently. Then they were brought together, informed they were candidates for the position, and asked to rate each other by the same scale.

Curiously enough, at least from the cynic's point of view, the one receiving the highest estimate from the three superiors received nearly the same rating from his two rivals. It was the man holding the position of sales inspector; and he received the promotion in consequence. The three candidates shook hands all round, declared the choice to be fair, and the assistant foreman of the department, who was one of the candidates, went to work under the new boss with increased "pep"—he knew he had been given a square deal.

This brings up the most important feature in the application of the new plan—the method used in determining the ratings. To prevent possibility of unfairness, each man is graded by three people, eliminating the element of personal prejudice, favorable or unfavorable, conscious or intuitive. To reduce the influence of personality still further, a practical plan has been worked out by which all graders operate on the same basis. The comparisons for grading are made not against some nebulous ideal like a star in the Einstein theory, but against definite individuals. Observe that on the rating scale are five gradings for each qualification. Let us imagine that the particular quality is "Ability to Plan and Supervise." Quite a good quality, and one which every man has in some small or great amount. The grader runs through in his mind the names of a dozen men in similar positions, selects the one he considers to be most expert in this respect, and writes his name opposite the word "highest." He picks Pete Johnson, for example, who married his oldest sister, for this honor. Opposite "lowest" he sets down the name of the individual whose attainments in this phase of the work are least—Henry Dubb, let us say. He does the same with "middle," "high" and "low." There are now five names with abilities running from highest to lowest on this chart.

"The names of the highest and lowest," read the instructions, "must represent extreme cases—the best and the poorest you have ever known. The name for the middle should be that of an average foreman, for example, half way between the extremes. High and low should be half way between the middle and the extremes."

The grader now compares his estimate of the foreman being graded with these definite individuals. Thus he estimates that Henry Jones, who is being graded, is equal in planning and supervising ability to Dave Henderson, whose name he finds written opposite high on the schedule. Jones, therefore, receives a grading of 20 in planning and supervising ability.

In this way results are certain to be comparatively true. Foremen, understanding the method of making the ratings, are convinced that the figure is fairly arrived at and represents a correct estimate.

### Men Are in on It

Another step to kill off mystery should be noted, and it is an important one. Men are free to inspect their ratings at any time and discuss them with their superiors. Executives are enabled thus to point possible roads to development. The great virtue of the ratings here is in permitting the matter to be discussed in detail rather than in mere generalities, and giving the man the chance to develop a quality as he would a muscle.

One man who was an inspector desired to be promoted into the sales department. His rating scale was discussed with him and he was shown to lack the right kind of selling personality. Properly guided, he set out to develop an agreeable manner, and to build up on points where he was weak. Through reading, hard study and real, conscious evolution on his part he made progress. He called in the evening on men he knew who were salesmen and studied them. In four months he earned a better rating and got the promotion he wanted.

As a corollary to the rating plan, promotion charts were drawn up to indicate possible opportunities for advancement in position in addition to wage increases in positions then filled. Most men felt that, having reached a foremanship, they had arrived at the pinnacle of their career—there was nothing beyond to which they might aspire, and this feeling is general in many concerns. It is a real ambition killer. To one of these men there were shown at least five possible positions ahead if he could earn them. The promotional opportunities laid out in diagram presented them visually and impressively and gave a real incentive. One showed, for example, that when a man reached the position of sales inspector, two roads were open for him ahead, one in the direction of shop foreman, the other in the direction of sales of new cars, used cars, or trucks. In every other industry, this pointing out the path ahead is possible and it will always increase morale.

Practically all men are being promoted in this plant from the inside. Any man who has worked in a place where all good jobs were given to outsiders will realize what this means in better team-work. Promotion of a sales inspector to foremanship created five promotions down the line. Each time an advance is made a bulletin is issued announcing it. This is the kind of publicity that helps Babe Ruth knock more home runs, and the promotion is given a real dignity. It also helps to bring home to each man similar opportunities before him. These chances are talked over at home and it shows in the results at the office.

Having worked out the plan whereby a man's strength and weakness might be pointed out to him and used as a basis of pay and promotion, it was next desirable to get a practicable plan by which he might be helped to develop himself. A foreman's training school was therefore organized, attended by sub-foremen and foremen and a few selected mechanics. Attendance was voluntary, but all foremen and their assistants joined with the exception of one or two. Sessions were held once a week, in the evening. In addition, conferences were arranged between the foreman and service superintendent daily between 9 and 10 a.m., on a pre-arranged schedule,

(Continued on page 33)

# The Proper Selection of Grinding Wheels

## Two Types of Artificial Abrasives and Four Types of Band Used —Adaptability of the Two Abrasives—Grinding Action of Wheel —Variable Factors Incurred—Wheel Speed—Personal Factor

By R. N. JOHNSON*

TWO distinct types of artificial abrasives and four types of bond are used in the manufacture of grinding wheels. There are still a few wheels on the market which are made up of natural abrasives, such as emery and corundum, but these are very much in the minority.

### Abrasives

One type of artificial abrasive is made up essentially of crystalline aluminum oxide and is spoken of as aluminous abrasive. The aluminous abrasives may be recognized by such trade names as alundum, aloxite, alowalt, borolon, corowalt, oxaluma, rex, carbo-alumina, corolox and sterlith.

The other type is composed of silicon and carbide and spoken of as silicon carbide. It may be recognized by such trade names as crystolon, carbolite, carbolon, carbowalt, corex, electrolon, gresolite and sterbon. The artificial aluminous abrasives are made by fusing bauxite (a mineral containing a high percentage of aluminum oxide) in an electric furnace.

Silicon carbide is made by heating coke (carbon), silica sand, sawdust and salt together in a resistance type of electric furnace. The carbon of the coke and the silicon of the sand combine chemically, forming the abrasive. This abrasive is screened and is then ready for use.

### Adaptability of the Two Abrasives.

The aluminous abrasives are tough and more adapted to grinding all kinds of high tensile strength materials, such as soft steel, hardened and high speed steels and annealed malleable iron. The silicon carbide abrasive is hard and brittle and is most efficient when used for grinding cast iron, brass and other materials of lower tensile strength. Four different types of bond are used, namely, vitrified, silicate, rubber and elastic.

### Uses of the Different Bonds.

The silicate bond is used when wheels must be manufactured quickly, where wheels larger than 36-inch are used, and for some surface and tool grinding work. One of the largest fields is that of knife grinding, such as paper knives, pocket knives, wood working knives, etc.

Elastic wheels are used in cases where very thin wheels are required for cutting off stock and where cool cutting and a fairly good finish is desired, such as ball race grinding.

Rubber wheels are usually made of harder grades than elastic wheels. They are used where thin wheels are required on rather severe operations on which a thin elastic wheel might break. Some thick rubber wheels are used for snagging, and on rather severe operations where the strength of a vitrified wheel might not be sufficient to assure entire safety.

All other wheels, probably at least 80 per cent. of those manufactured, are made by the vitrified process and used on all kinds of cylindrical, snagging, surface grinding, tool and cutter and internal work.

### Grinding Action.

The grinding action of a wheel depends on two factors, namely, the kind and size of abrasive, and the grade of wheel. "Grade" is the term used to denote the hardness of a grinding wheel. It actually represents a measure of the strength of the bond or the cohesive force exercised by the bond to retain the grain in its setting. For each grinding job there is a particular wheel that will give best results, a wheel having a certain size of abrasive grain held together with a bond of certain strength. Grinding action is, of course, dependent on the kind of abrasive used in the wheel.

**THINGS TO REMEMBER**

Aluminous abrasives are tough and more adapted to grinding all kinds of high tensile strength materials such as soft steel, hardened and high speed steels, and annealed malleable iron.

Silicon Carbide Abrasive is hard and brittle, is most efficient when used for grinding cast iron, brass and other materials of low tensile strength.

Considering the same material—remember that the harder it is, the softer the wheel must be to cut efficiently. The broader the contact of the work to the wheel, the softer the grade should be.

Sharp fins on castings wear ordinary snagging wheels much more rapidly than flat broad surfaces, consequently they should be ground with harder and finer grain wheels.

The type of machine used is important as each type creates certain grinding conditions which must be thoroughly known in order to make the most intelligent wheel selection. Vibration in a machine should never be tolerated if good work is desired.

Several general rules govern the action of grinding wheels. These could be specified as follows:

1. Use aluminous abrasives for high tensile strength materials.
2. Use silicon carbide for low tensile strength materials.
3. Use fairly soft wheels when wheel wear can be sacrificed for production. There is, of course, a limit.
4. Coarse grain wheels usually cut more rapidly than fine ones, and consequently wear faster. There is a limit to the coarseness of grain used in wheels, governed by the material being ground and power required to make each individual grain penetrate into the material ground.
5. Coarse grain wheels will not always produce as fine a finish as fine grain wheels. However, in some kinds of precision work, a very fine finish can be obtained with coarse grain wheels, provided they are properly trued.
6. Fast cutting wheels are usually cool cutting wheels.

The selection of grinding wheels for a given job involves: first, consideration of a set of more or less fixed conditions that the wheel must fit into; and second careful attention to influential factors capable of modification or change to suit the conditions. These factors might be grouped as follows:

### Given Conditions.

1. Material. 2. Shape and dimensions of work. 3. Contact. 4. Type of grinding machine.

### Variable Factors.

1. Wheel speed. 2. Work speed. 3. Condition of machine. 4. Personal factor.

### Material.

This factor determines the kind of abrasive that should be used. Considering the same kind of material, the harder it is the softer the wheel must be to cut efficiently.

The shape and dimensions of the work, especially in cylindrical grinding will have some effect on the size, grain and grade of wheel employed. Short stiff work can often be ground with a wide wheel by feeding straight in, while long, slender work requires that the wheel be traversed, and will call for a somewhat narrow wheel and the use of steady rests.

The broader the contact of the work to the wheel, the softer the grade should be. For instance, a ring wheel employed for surface grinding is usually of softer grade than that employed for

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cylindrical grinding, while a ring wheel employed for internal grinding is still softer than that employed for internal grinding; all on account of the contact between the work and the wheel. Sharp fins on castings wear ordinary snagging wheels much more rapidly than flat, broad surfaces, and consequently they should be ground with harder and finer grain wheels.

### Type of Grinding Machine

The kind of machine employed for the various classes of work and size of wheel it mounts is important in making a selection of wheels. For example, a surface grinding machine, which mounts a rather large diameter, broad face wheel, will call for a coarser and softer grade than another type of surface grinding machine which mounts a rather small diameter, narrow face wheel. Still another type of surface grinding machine, which mounts a cup or ring wheel, will present a broader contact to the work and will, therefore require an even coarser wheel than either of the two types mentioned. Each type of machine creates grinding conditions which must be thoroughly known in order to make the most intelligent wheel selection.

### Wheel Speed

Past experience has shown that a certain range of wheel speeds gives best results for the various oeprations. The faster the speed, the harder the wheel will act, and vice versa. The more common recommended wheel speeds are given below:

| Kind of Grinding | Peripheral Speed in Feed per Minute |
|---|---|
| Cylindrical grinding | 5500 - 6500 |
| Snagging and general off-hand grinding | 5000 - 6000 |
| Surface grinding | 4000 - 5000 |
| Knife grinding | 3500 - 4000 |
| Wet tool grinders | 4000 - 5000 |
| Vertical spindle surface grinding | 4000 - 4500 |
| Elastic and rubber cut-off wheels | 9000 -12000 |

The speed at which the work is revolved in both cylindrical and internal grinding, or the speed at which it is either revolved or traversed back and forth on surface grinding, has a great deal to do with the action of a particular grain and grade of wheel. Space does not permit our covering this subject here. It can only be said that there is no fixed work speed which can be recommended, but rather it must be determined by experiment for each individual operation.

### Condition of Machine.

A machine in poor condition is naturally quite hard on a grinding wheel. The greater the vibration of the wheel on the work, the faster it will wear out, and consequently the harder the wheel must be to stand up on the machine which is in a poor condition. Vibration not only wastes the wheel, but tends to ruin the machine, and should be eliminated at all times if grinding is to be carried out most economically and efficiently with a resultant high quality of work.

### Personal Factor

The operator is the biggest factor in the success or failure of a grinding wheel or machine. He can waste wheels by being careless in the use of a dresser, by not taking care of the machine he is using, by forcing a wheel beyond its ability to cut, and by operating wheels at incorrect speeds. An intelligent grinding machine operator can usually obtain good results on a grinding operation with a range of grains and grades of wheels, provided he understands how to vary conditions, such as work speed, wheel speed and application of the work to suit the particular wheel in use.

Have you some trouble in the use of your wheels? If so see if any of these remedies will help you out. Suppose the wheel does not cut, try these suggestions:

1. If running too fast, reduce the speed of wheel. 2. Try a softer wheel. 3. Try coarser wheel if finish is not important. 4. Be sure the abrasive is the right kind for the material.

If wheel wears too rapidly, try these: 1. If running too slow increase wheel speed. 2. Try harder wheel. 3. Try finer wheel. 4. Eliminate vibration in machine. 5. Reduce pressure of work on the wheel.

If wheel does not give good finish (precision grinding): 1. Dress the wheel to a perfect cylinder. 2. Put smooth face on the wheel with a diamond. 3. Eliminate vibration of machine spindle. 4. Balance wheel if it is out of balance. 5. Use finer wheel. 6. Use elastic wheel.

For wheel loads: 1. Increase speed if below that recommended. 2. Try coarser wheel. 3. Try softer wheel.

For wheel glazes: 1. Reduce speed if above that recommended. 2. Try softer wheel. 3. Be sure the correct abrasive is being used.

For wheel burns use the same suggestions as given for wheel not cutting.

If wheel does not hold shape, use suggestions for wheels wearing too rapidly.

## PROMOTION MYSTERY

Continued from page 31

and department conferences between foremen and assistants at definite times, which latter conferences the superintendent frequently took occasion to join.

Men meeting together in this way helped iron out the hard and rough places and got to know each other better. The whole scheme is thus closely linked up and everybody knows how it works, and why.

The immediate effects of any such plan are at first intangible, felt rather than seen. There is a different attitude in the air, more loyalty, finer co-operation. Individuals have been re-made, according to their own words, in this particular plant. One was formerly a tester with a continual grouch. Members of other departments hesitated to approach him or ask for his assistance. He was a real bear. The change the plan worked in him has brought him promotion. He is now in charge of new car deliveries, a job which brings him in contact with customers. His manner, disposition and feeling are entirely reversed. The spirit of antagonism between the sales inspection and the shop departments has been knocked on the head. More work is done on time. The sales inspector who may observe something on the car while it is moving which would puzzle or escape the mechanic with the car standing in the shop, takes the trouble to write a suggestion on the other card. Each man knows he can't get ahead by stepping on another man. Team-work is the only thing that can win when a man may be rated any day by the man next to him.

To sum up, this plan of building morale consists of analyzing the individual, making his opportunity plain to him instead of mysterious, training him for the better job ahead, and killing off the occult. It is a plan of human management which can be applied to places where the usual methods of promotion study, bonus and the like are impossible. It is a plan of working for efficiency through the development of men, more than through the development of methods. It has collective bargaining lashed to the mast for fairness and development. And it removes the word discouragement from Bill Green's vocabulary, which is a good word to have removed at a time when more courage, more interest and better work all around are so essential to our national welfare.

## FACTORY LIGHTING

During the year 1915 a special committee formed by the British Government issued an interesting report on the lighting of factories and workshops. The subject was dealt with from the standpoints of the safety and health of the operatives and also of the increase of production. Largely as a result of this report the standard of illumination in the British munition factories erected during the war was exceptionally high and there was a marked improvement in the lighting of ordinary factories. The report was in the nature of an interim document, and the inquiry has now been resumed under the guidance of several experts. An investigation will be made into the general conditions necessary to secure suitable lighting in factories and workshops and into the effects of mixed and artificial lighting, with special reference to underground workrooms.

# FOR SALE

## LONGUEUIL STEEL WORKS

**the property of**

# Armstrong Whitworth of Canada, Ltd.

## Location

The plant is situated on the South Shore of the St. Lawrence River opposite the City of Montreal.

## Land and Buildings

The land consists of a tract of 180 acres with a 2,200-foot frontage on the St. Lawrence River directly opposite the Harbor of Montreal. The main line of the Q. M. & S. Ry. runs through the property within 100 yards of the main buildings, with a siding into works.

**Main Building**
1 Story, Steel Frame and Concrete.

Small Tool Dept. .....175 x 94
Carpenter & Pattern Shop 40 x 60
Tyre Rolling Mill .....275 x 60
Hammer Shop .....275 x 60

Annealing and Finishing Dept.
Rolling Mill .....275 x 60
Steel Foundry .....275 x 94

Open Hearth .....91 x 88
Crucible Dept. .....100
Repairs and Electrical Dept.

**Office Building and Stores**
2 Stories, Brick
133 x 41 ea. story.

**Laboratory**
Metal Lath and Cement
60 x 33

**Boiler House**
Steel Frame and Concrete
74 x 54

**Power House**
Steel Frame and Concrete.

**Powdered Coal Plant**
Steel Frame and Concrete
64 x 34

**Transformer House**
Steel Frame and Concrete
52 x 24

Scrap Shed, Brick Sheds, Oil House, Employees' Houses, Pump House, Freight Shed, etc., etc.

## Shipping Facilities

The St. Lawrence River frontage has not been improved but could be developed, allowing vessels to use the 30-foot deep channel running from Montreal to the sea.

The property is served with a siding from the Quebec, Montreal & Southern Ry., with spur tracks to all parts of buildings.

## Power Plant

The Power Plant consists of two 500 h.p. B. & W. Boilers; two 500 h.p. Goldie & McCulloch Boilers; two 250 h.p. Goldie & McCulloch Boilers equipped with Foster Superheaters; one Canadian Ingersoll-Rand Air Compressor, free air capacity 732 cu. ft. per minute; one Swedish General Electric Steam Driven Generator, 375 K.W.; two Bruce Peebles Motor Generator Sets, 350 K.W. each; three Transformers, 300 K.V.A., 22,500/2,200 V.; six Transformers 140 K.W. 22,500/2,200 V.

This plant is well situated for serving domestic requirements and also for export. There is a plentiful supply of skilled and unskilled labor. The Locomotive Tire Rolling Mill is the only plant rolling tires in Canada.

**ARMSTRONG**
**of Canada**
**298 St. James S**

# PARTIAL LIST OF EQUIPMENT

### TOOL DEPARTMENT

8—Racine Hack Saws.
4—Ed. Herbert Hack Saws.
2—16" L. & S. Lathes.
2—16" Reed Prentice Lathes.
1—20" Reed Prentice Lathe.
3—14" C.M.C. Lathes.
1—Bench Lathe.
1—¾" Cleveland A.S. Machine.
1—1¼" Cleveland A.S. Machine.
1—1¾" Gridley A.S. Machine.
2—2" Cleveland A.S. Machines.
1—2¼" Gridley A.S. Machine.
1—4¼" Gridley A.S. Machine.
1—No. 2 B. B. & S. Plain Miller.
1—Reinecker Plain Miller.
2—No. 6 Whitney Hand Millers.
5—Cincinnati Plain Millers.
1—Hendey Centering Machine.
2—Wells Centering Machines.
1—Alfred Herbert Drill.
1—Avery Drill Press.
2—Greenard Arbor Presses.
1—Bertram Drill Press.
1—¼" to ½" Holroyd Fluting Machine.
1—½" to 1" Holroyd Fluting Machine.
1—1½" to 2" Holroyd Fluting Machine.
1—3¼" Warner & Swasey Turret Lathe No. 2 A.
1—P.&W. Duplex Spindle Profiler No. 11
1—No. 2 American Tool Oil Separator.
1—Hoefer Tap Threading Machine.
1—Noble & Westbrooke Stamping Machine.
1—Taylor & Hobson Etching Machine.
1—Holroyd Universal Relieving Lathe.
1—No. 2A Reinecker Universal Relieving Lathe.
1—Flather Relieving Lathe.
4—A.W. Relieving Lathes.
1—Sand Blast, Hardening and Tempering Furnaces.
1—No. 3 Walker Double Stroke Surface Grinder.
1—10" Walker Single Stroke Surface Grinder.
1—No. 1½ Cincinnati Universal Grinder
1—Norton Plain Grinder, 10" x 50".
2—No. 3 B. & S. Cutter Grinders.
3—No. 1½" Cincinnati Universal Cutter Grinders.
1—Wells Grinder.
3—No. 2 B. & S. Cutter Grinders.
1—8" Walker Surface Grinders.
2—No. 11 B. & S. Plain Grinders.
2—No. 10 B. & S. Plain Grinders.
1—No. 3 B. & S. Universal Grinder.
1—No. 13 B. & S. Surface Grinder.
2—No. 70 Heald Boring Grinders.
1—No. 3 Rivet Boring Grinder.
1—10" x 20" Landis Grinder.
1—12" x 42" Landis Plain Grinder.
Etc., etc.

WHITWORTH
Limited
Montreal
Canada

### CARPENTER AND PATTERN SHOP.

1—Band Saw.
1—Circular Saw.
1—Aluminium Stamping Machine.
1—Wood Lathe.
1—Small Drill.
Etc., etc.

### TYRE ROLLING MILL

1—Morgan Eng. Tyre Rolling Mill.
1—Morgan Eng. Tyre Rolling Mill.
1—C.C. Twin, Rolling Mill Engine, 1,000 H.P.
1—Tyre Centering Press.
1—Tyre Stamping Press.
1—2,000-ton Press.
1—1,000-ton Press.
1— 600-ton Press.
1—Hydraulic Accumulator.
2—Tyre Charging Machines.
1—5-ton Whiting Crane.
1—Continuous Furnace.
3—Reheating Furnaces.
Etc., etc.

### HAMMER SHOP

1—5-ton Whiting Crane.
1—500-ton Forging Press.
1—3-ton Bertram Steam Hammer.
1—1-ton Massey Steam Hammer.
1—12 cwt. Massey Steam Hammer.
1— 8 cwt. Massey Steam Hammer.
1— 4 cwt. Massey Steam Hammer.
Reheating Furnaces.
Etc., etc.

### ROLLING MILL

1—Brightside Roll Turning Lathe.
1—9" Boonton Rolling Mill.
1—12" Lamberton Rolling Mill.
1—Porter Allen Steam Engine, 350 H.P.
1—Todd Steam Engine, 1,000 H.P.
1—5-ton Whiting Crane.
3—Reheating Furnaces.
Etc., etc.

### STEEL FOUNDRY

1—15-ton Whiting Crane.
1—15-ton Wellman Seaver & Head Crane.
3—6-ton Heroult Electric Furnaces.
1—3-ton Heroult Electric Furnace.
1—5-ton Ladle.
6—10-ton Ladles.
1—Ladle Heater.
1—Coke Grinder.
1—7 ft. Wet Pan.
Swing Grinders, etc., etc.

### OPEN HEARTH

2—18-ton O.H. Furnaces.
1—Charging Machine.
1—Track Scale, 15 Tons.
1—25-ton Crane.
40—Charging Boxes.
20—Charging Box Trucks.
4—20-ton Ladles.
Etc., etc.

### CRUCIBLE DEPARTMENT.

1—Crucible Furnace.
1—Pot Annealing Furnace.
1—Pot Molding Machine.
Etc., etc.

### REPAIR DEPARTMENT

1—Radial Drill.
1—Planer 42" x 36" x 14' 0".
1—24" Gap Lathe.
1—24" Lathe.
1—Threading Machine.
1—26" Vertical Drill.
1—16" Lathe.
Etc., etc.

### OFFICE BUILDING

Complete office equipment with fireproof vaults for Superintendent's Office, Accounting Department, Engineer's Office, Timekeeper's Office, first aid, complete restaurant equipment. Storehouse, necessary bins. Warehouse, necessary racks, etc., etc.

### POWER HOUSE

1—Swedish General Electric Steam-driven Generator, 375 K.W.
2—Bruce Peebles Motor Generator Sets, 350 K.W. each.
1—Switchboard, 11 panels.
1—Overhead Crane, 10 Tons.
Etc., etc.

### LABORATORY

Chemical and Physical.
Scales, Instruments, complete.
Tensile and Bending Testing Machine.
Micro-Photographic Instrument.
Brinell Testing Machine for hardness

### POWDERED COAL PLANT

1—Powdered Coal Plant, complete. Capacity, 5 tons per hour. Holbeck System.

### BOILER HOUSE

2—500 H.P. B. & W. Boilers.
2—500 H.P. G. & McC. Boilers.
1—2,000 H.P. Cochrane Feed Water Heat
1—Weir Feed Pump
1—Vacuum Pump.
Etc., etc.

### TRANSFORMER HOUSE

Lightning Arresters.
Oil Brake Switches.
Current Transformers for overload relay.
Single Pole Disconnecting Switches.
3—200 K.V.A. Transformers, 22500/2200 V.
6—140 K.W. Transformers, 22500/2200 V.
Etc., etc.

### YARD

1—Yard Locomotive, 4-wheel saddle tank
1—15-ton Brownhoist.
1—Track Scale, 100 tons.
1—Flat Car.
1—Dump Car.
3—Oil Storage Tanks (underground). Oil Pumps.
1—Lime Kiln.
Etc., etc.

### PUMP HOUSE

2—Allis-Chalmers Electrically-driven Hydraulic Pumps, capacity 550 gals. per minute.



# WHAT OUR READERS THINK AND DO



## TURNING IRREGULAR FORMS

By J. DAVIES

WE recently had a considerable number of punches to be made to the form shown in Fig. 1. These were to be used in punching chain links. At the first attempt we rough turned one, leaving enough stock on to get the shape. Then we marked off the profile on the end, milled as near as we could to the lines, and filed the rest. This process was altogether too slow, so we did a little experimenting on the lathe with entirely satisfactory results. I do not pretend to know the exact theoretical method of developing cams, so will give an account of our experiments, and should any reader have any correction or improvement we shall be glad to hear from them.

First, we secured a casting from the scrap heap and machined it to dimensions given in Fig. 2. We next turned a concentric roller to suit, then fitted the bracket on the back of the cross slide of lathe so that the centre of the roller was the exact height of the centre of the lathe. We then bored a piece of cast steel 4 inches in diameter and 1¼ inches wide a close push fit for the body of the punches to be turned. This piece of steel was to be used for a cam, and could have been any convenient diameter, but it was thought that the larger the diameter the easier the action, as the amount of throw remained constant irrespective of the size of the cam.

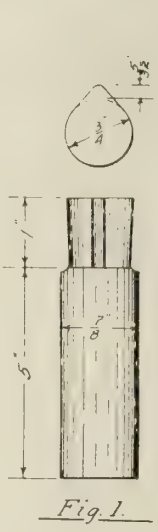



Fig. 1.

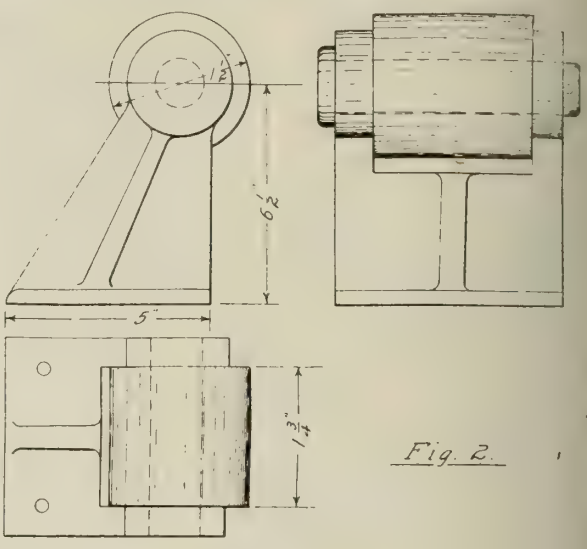
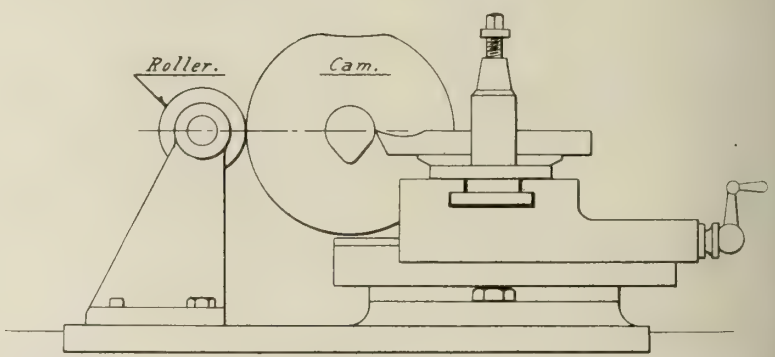



Fig. 2.




SHOWING STYLE OF CASTING USED AND METHOD OF CUTTING THE FORM.

The next step was to lay out a cam that would produce the desired shape. This was done as shown in Fig. 3. The basic principle adopted in the laying out of the cam was the fact that as the roller was constantly pressed against the cam, and the bracket carrying the roller and tool post carrying the tool were both attached to the same slide, the distance between the tool and the roller would always be the same wh measured in a straight line through centre of roller centre of cam, to cutting edge of the tool. When I this distance was constant, I mean

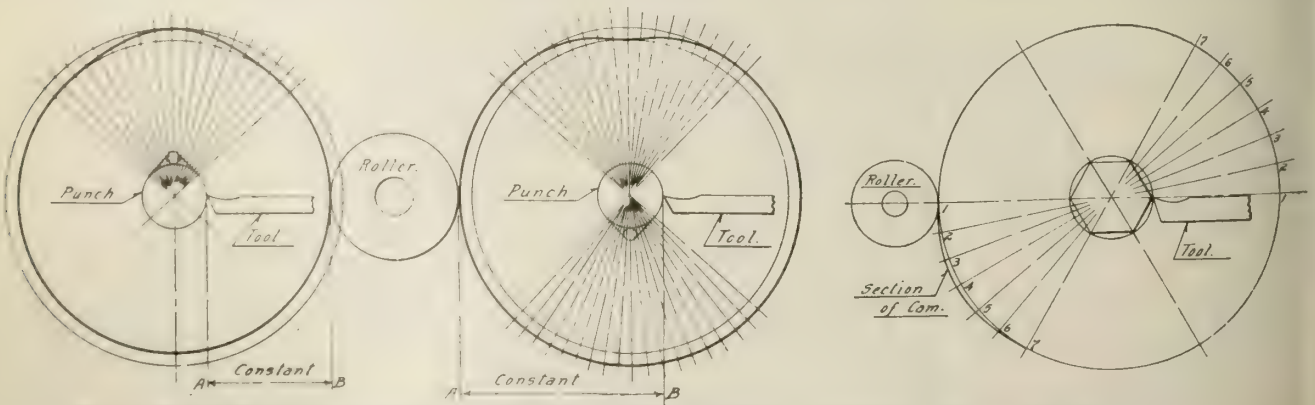



FIG. 3—THE METHOD OF LAYING OUT THE CAMS. SKETCH SHOWING AUTHOR'S IDEA OF HEXAGON CAM.

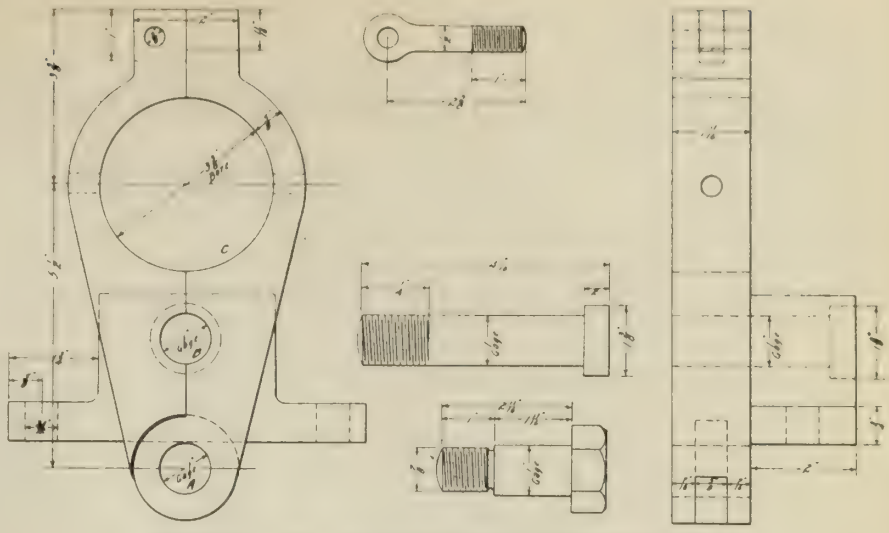
was constant during the same cut. The feed was put on by using the compound. This shortened the distance at every cut and produced a different shaped punch. So it remained for us to develop our cam to produce the right shape, and of the right size. This we did by marking off as shown in sketch, taking the distance from roller to tool as a constant when the tool was on the finishing cut, and marking off a number of lines through the centre of roller and cam to the cutting edge of tool. The number of lines is immaterial. The more lines, the more points in the curve, and consequently greater accuracy.

We next removed the transverse feed screw and inserted a strong spiral spring in its place at the back of the slide to keep the cam up to the work. The cam was fastened to the punch, being turned by a ½-inch bristo safety screw sunk below the surface, leaving enough stock sticking out through the end of cam to form the punch. This gave us an entirely satisfactory job, the punches being finished perfectly to form and size. I venture to say that by this method any irregular form can be accurately turned practically as quickly as turning an ordinary round bar. This rig would be no use to produce a single piece, but for repetition work I think it will prove very useful. We took the precaution to put taper dowel pins in the bracket at the back so that the whole attachment could be replaced on the lathe in about five minutes. We have not yet tried to turn an hexagon, but I believe it could be done and I have shown a sketch of the cam required for such work.

## BORING FIXTURE

By Cecil H. Smith

In the manufacture of a certain class of pump, it is essential that the shaft sleeves for the main shaft be very accurately bored. These sleeves vary in diameter, the smallest being 1 7/16 inches outside diameter, while the largest is 4 inches. They range in length from 4½ inches to 17½ inches, so it will readily be seen that it was quite a task to design one fixture to handle all sizes. The result is shown at Figs. 1 and 2.



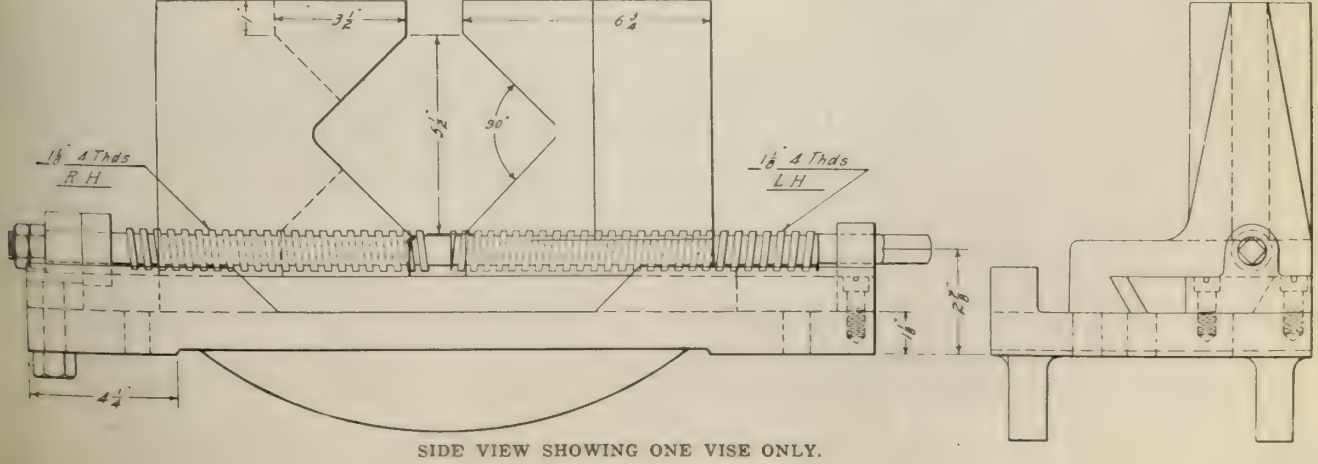
GENERAL VIEW AND DETAILS OF THE CLAMP USED.

An ordinary lathe was used, the regular tool slide being dismantled, the two vises, as shown at Fig. 1, being fastened through the medium of the regular Tee head bolts to the saddle. On the shorter brasses we used only one vise, taking off the second vise until the shorter sleeves were completed. Next let us glance at Fig. 2.

This view shows the boring bar guide, two of these being used, one at each end of the fixture. It is readily understood that these guides had to swing out of the way while inserting a new sleeve and placing the boring bar, so provision was made for so doing. The guide swings open from the pivot point A and cannot close further than the gauge point B. This pin centres the two halves of the guide, and guarantees that the boring bar is properly supported. The eye bolt at top holds the complete guide together.

A bar having a double fly cutter is used, and the bar itself is supported by a separate socket which is screwed to the spindle of machine. A standard taper hole in this socket allows all bars to fit the same socket. In some cases, the end of the boring bar is built up by intermediate drill sockets until they fit the socket on the lathe spindle. Three cuts are usually taken, a roughing, semi-finishing and finishing cut, and as these sleeves are made from high quality brass an excellent finish is secured. Since adopting the fixture production time has greatly improved, and we have no inaccuracy, the holes being perfectly round. Chatter is also eliminated, so that I can pass the idea along with perfect confidence.

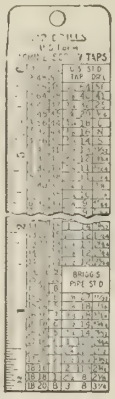
A survey of the oil districts of California has been made by the United States Bureau of Mines in order to ascertain whether the visible masses of wasted oil-bearing sands would be a profitable source of supply. From the data collected, it is estimated that 2,359,100 barrels of oil, valued at more than $3,500,000, could be obtained from the sand piles about producing wells, and from the outcroppings in the vicinity of the fields. Also, many times that amount of oil scattered over nearly the total oil-producing area might be recovered from seepage—that is, the oil permitted to soak into the ground or spread over the surface. The character of these wastes and possible methods of recovery are given in a recent report issued by the bureau.




SIDE VIEW SHOWING ONE VISE ONLY.

# Improve Your Powers of Perception—Try This Contest

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.



The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

## What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

Several contestants had eleven out of the twelve questions correct, but only one reader, J. A. Scarsbrook, 307 Poplar Ave., Winnipeg, Man., submitted a correct list. A scale goes forward to him at once. Who will be the next?

**CONTEST FOR MAY 12TH ISSUE**

**Contestants are required to write us, stating to which advertisements we refer in this number.**

1 Something that requires no special vises or fixtures.
2 A product said to be always accurate and dependable.
3 A product that has been turned out in thousands during the past 11 years.
4 How to solve a certain kind of problem.
5 A case where you are requested "Not to Wait."
6 Something that is a special feature. It is made in Canada.
7 A product that is made in one grade only.
8 What to do if you come from Missouri.
9—A product said to be long-lasting under hardest use.
10 A new discovery that works very quickly.
11 Something that has seven features.
12 How to get accurate production.

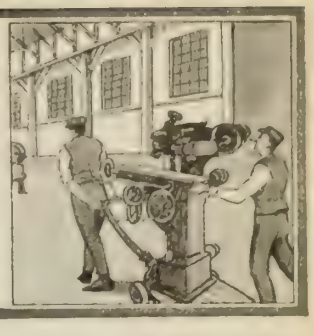
**These are Correct Answers for List from April 21st Issue:**

1—Geometric Tool Co.
2—Diamond State Fibre Co.
3—Shepard Electric Crane & Hoist Co.
4—Hamilton Gear & Machine Co.
5—Aikenhead Hardware, Ltd.
6—H. W. Petrie, Ltd.
7—Canadian Link-Belt Co., Ltd.
8—Canadian Hart Products Co.
9—Ingersoll Machine & Tool Co.
10—J. C. McLaren Belting Co.
11—The Torrington Co.
12—The Toledo Machine & Tool Co.

## Closing Date for This Contest is June 2nd



# DEVELOPMENTS IN SHOP EQUIPMENT



## VARIOUS LINES

The Selson Engineering Co., Ltd., 85 Queen Victoria Street, London, England, have given us some interesting information regarding three of their lines. At Fig. 1 is shown their 13-inch swing, vee bed, gap lathe. This machine has a bed of strong section, and the headstock has steel reverse gears. The spindle is of .5 carbon steel, large diameter, and is accurately ground to size. The gear box has three changes of feed and the gears are totally enclosed.

The apron including most of the bearings is cast in one piece and carries self-acting, sliding, surfacing and screw cutting mechanism. The standard equipment can be varied by the omission of the tray, the substitution of an American type tool post instead of the four-tool turret tool post, and also of a quick change gear box for the semi-quick box. The lead screw can be made metric if required or 127-tooth change wheel added as an extra.

### Heavy Cut Shaper

The shaper shown at Fig. 2 is capable of running at high speed and taking heavy cuts. The ram adjustment is secured by a hand wheel, rack and pinion, while a locking lever is placed directly under the wheel as shown. An index for the stroke is provided, and the stroke adjustments can be effected at rest or in running condition.

The feed motion is of original patented design and the moving parts of the feed mechanism are brought to rest by depressing a hand lever when the machine is running at any speed, thus allowing the feed to be altered or reversed in perfect safety without stopping the machine. Single pulley, cone pulley or motor drive can be used on this machine.

This concern also produce a patented central-thrust high speed radial drilling machine which contains some very interesting points in design. The carriage of these drills is gibbed to the front and underside of the arm. The front plate carries the top bearing of spindle, driving gears and feed mechanism, while the under plate forms the lower bearing and takes the central thrust of the drill.

On the six-foot machine a fine radial adjustment is placed on the carriage and the operator can control all motions for setting the drill without leaving his working position. Other parts are likewise well designed, but for lack of space we cannot enter into further detail.

## INTERESTING TOOL HOLDER

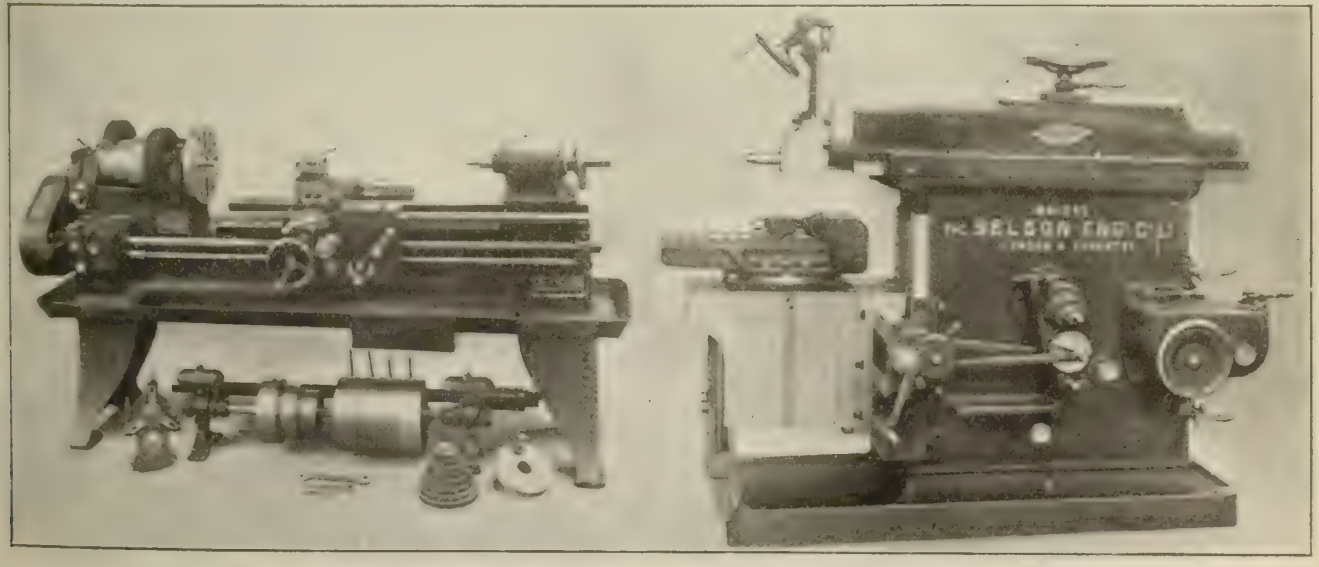
A special tool and holder, known as the "Twisto," that has several points of interest is now offered to the trade by John H. Hontstream, of Hartford, Conn. The cutting tool, which is held in a special holder, is in the form of a short length of steel with helical grooves, similar to a twist drill. It is thus provided with six separate cutting edges. The bits are furnished in 2-inch lengths and it is claimed that each bit will provide 6¾ inches of cutting length. When sharpening only the ends are ground. A special holder is used for clamping the tool bits and it may be adapted for the holding of the shanks of forming cutters.

## OPEN-SIDE CRANK PLANER

The Automatic Machine Co., of Bridgeport, Conn., have placed on the market a new model of their open-side planer especially adapted for tool-room work. The machine is equipped with a combination clutch and brake mechanism, which provides for instantaneous starting or stopping of the table without changing the direction of rotation of the motor or countershaft. When starting the machine the brake is released immediately the clutch is engaged and vice-versa. Drive is transmitted from the friction pulley through sliding gears to the bull wheel and crank that drive the table. Driving shafts are fitted with ball bearings. Quick return stroke is provided for the table.

## PRESSED-STEEL PLATFORMS.

Pressed-steel platforms for use with elevating trucks are now being made by the Powell Pressed Steel Company of Hubbard, Ohio. These platforms may



GENERAL VIEW OF A 13" LATHE, ALSO A HEAVY CUT SHAPER PRODUCED BY THE SELSON CO.

be of any desired size, limited only by the size of sheet obtainable. The strengthening ribs are placed six inches apart and are ¾ inch by 1½ inches. The clearance space ranges from 6½ to 12 inches. The platforms may be made of any desired material, but the usual practice is to use 7, 9, 10 or 12 gauge stock. A platform made of No. 9 gauge steel will carry a load of about six tons. Containers of any special shape or size may be spot-welded to the top of the platform.

## NEW DRILL CHUCK

The Jacobs Manufacturing Co. has placed a new drill chuck on the market, this to be known as the "Jacobs' Super" chuck. This is a specially patented chuck and the body is made of a steel of special process, deeply case hardened. Through a special process in the heat treating, the taper hole is left soft, fitting it for use on a hardened and ground arbor. This taper hole is ground to give perfect accuracy. A hole is drilled and tapped through the centre of the body and fitted with a threaded plug which may be easily removed with a screwdriver if it is desired to insert rods or other material through the chuck. The taper holes on the chucks are of the same dimensions as those of the previous design. Through careful design the weight of the new chuck has not been increased. Each of these chucks has been designed to meet the changed drilling methods of the last few years with relation to design, weight and capacity. All needless weight has been eliminated.

Ball bearings inserted between the nut and the body reduce friction to a minimum, making it possible to redesign the thread on the nut and the jaws with a coarser pitch. Reduction of friction makes it possible to tighten the chuck with greater ease than formerly, preventing undue wear on the keys, sleeves and other parts of the chuck, at the same time giving greater gripping qualities. An oil hole inserted in the back end of the chuck makes it possible to lubricate all of the working parts.

According to this company actual tests have proved that this new chuck has shown that one-half the pressure on the key in tightening the chuck will produce the same results as in chucks of the previous design. The change in pitch of the thread on the jaws has resulted in reducing by one-half the number of turns of the sleeve to tighten or loosen the chuck.

The Jacobs improved drill chuck was patented and invented in 1902. It is claimed that it was the first chuck of the toothed key and sleeve type. Previous to the invention of the chuck of the toothed sleeve and key it had been necessary to use a spanner wrench to tighten or loosen the prevailing type of chuck. The use of the toothed key and sleeve type resulted in a chuck with greater holding power, less exertion in the tightening of the chuck and the elimination of the holding of the spindle against rotation.

The new "Super" chuck was invented and patented in 1909, and later patents were issued in 1915. This new chuck in outward appearance is very similar to the old one. Its outward design has been changed slightly to give it better proportions. A number of these new chucks have been in actual service for a period of six years, during which time they have proven beyond a doubt their efficiency. They have been subjected to every conceivable test for accuracy, ease of operation and durability.

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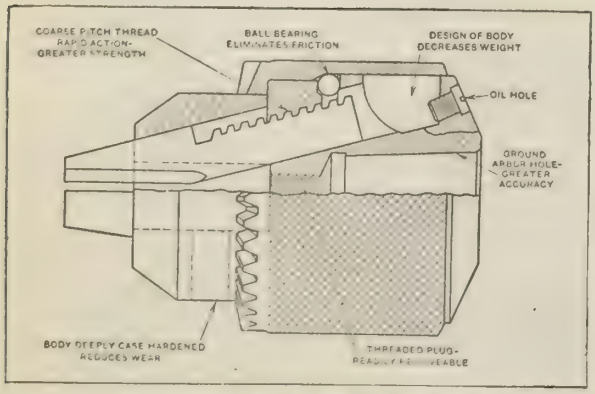
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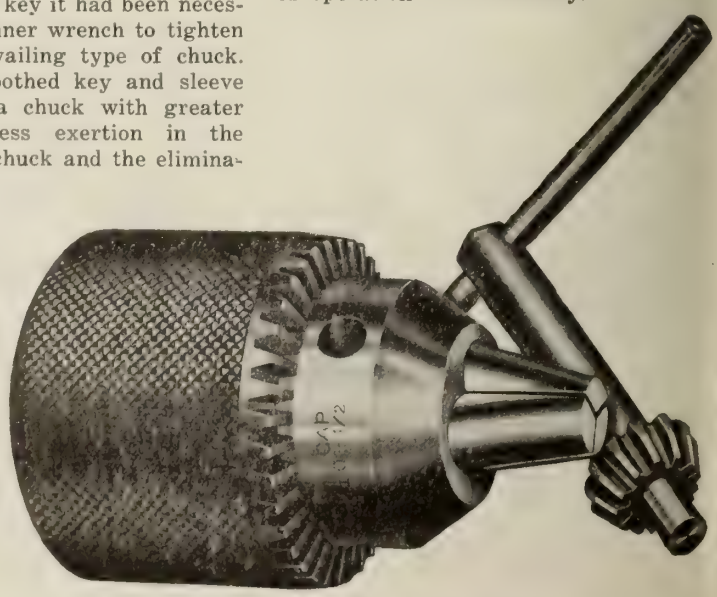
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SECTIONAL VIEW OF THE CHUCK.



GENERAL VIEW OF THE CHUCK.

# CANADIAN MACHINERY
## AND MANUFACTURING NEWS

Published in the Interests of the Machinery, Manufacturing, Iron, Steel, and Metal Working Industries.

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## Our Buying and Selling

FOR the twelve months ending March, 1921, Canada bought from United States goods to the value of $856,613,430. In the same period she sold to United States goods valued at $542,304,456.

In that year she bought from the United Kingdom $213,910,988 worth and sold to that country $312,842,921 worth of goods.

In our exports four lines stand out prominently: (1) vegetable products; (2) wood, wood products and paper; (3) animal products, while iron and its products come fourth, although a long way below the other three classes.

In imports, vegetable products lead as they do in exports. Then comes iron and its products. It is worthy of note here that United States still dominates this market, sending in here shipments valued at $226,862,456, against $16,698,085 from the United Kingdom. Both countries used to have about an equal share of this business, but in 1920 it stood 16 to 226 in favor of United States.

The fourth largest item in imports was fibres and textile products, where Britain, as might be expected, has a lead, but not so large as might be expected, considering the advantage of the preferential tariff.

In the period mentioned, Canada imported goods valued at $1,240,125,056 and exported goods valued at $1,189,163,701.

## Where German Goods Go

THE German statistical office has been sending out some interesting figures, showing where its goods are going. The comparisons shown here are for the purpose of giving the destination of German-made goods for 1920 against 1913. The figures show percentages in each case:

| Country— | 1920 | 1913 |
|---|---|---|
| Holland | 21.2 | 6.9 |
| Switzerland | 9.2 | 5.3 |
| Sweden | 7.1 | 2.2 |
| Norway | 3.0 | 1.6 |
| Denmark | 6.1 | 2.8 |
| Finland | 1.7 | 1.0 |
| Spain | 2.5 | 1.4 |
| Austria-Hungary | 7.8 | 10.9 |
| Balkans and Turkey | 1.1 | 3.1 |
| Russia and Poland | 2.5 | 8.7 |
| Great Britain | 6.4 | 14.3 |
| France | 3.0 | 7.8 |
| Belgium | 3.1 | 5.4 |
| Italy | 3.0 | 3.9 |
| Other European Countries | 5.1 | .6 |
| United States | 7.2 | 7.1 |
| Other Extra European Countries | 10.1 | 16.9 |

## Hard to Hold Men's Confidence

IT is nothing new to have a manufacturer state that one of his hardest problems now is to get and hold the confidence of his men.

Several of them have stated almost this same fact to this paper. One manufacturer, speaking of this matter, said: "When a deputation comes in here from the shop now to talk to me one of the things that hurts me most is the sensation, openly and plainly conveyed to me at times, that they do not believe what I am saying about the condition of my business."

There is a very pressing need for a common ground to be established where employers and employees can meet in the fullest confidence.

This is not common to the steel or iron working industries, but employers in other lines will tell you the same thing, viz., they feel that they are not as close to the workshop as they used to be.

There are cases where access to the books of the company is demanded before the men are prepared to accept the claims put forward by employers.

Other firms are finding a way out, but they are finding the same difficulty stated above.

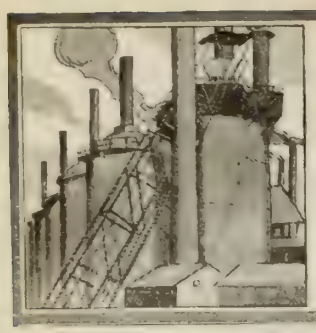
The problem is simply one of making living costs and wage costs come down step for step, and it is a bigger problem than this country has yet successfully solved.

## The U.S. Steel Corporation Cuts Wages

THE United States Steel Corporation has cut its wages 20 per cent., making the second reduction in wages since 1904. In the intervening time there have been numerous increases, sufficient to bring the 1920 average wage to $6.96 per day, as against $2.68 in 1912. The 20 per cent. reduction will leave the average daily rate of the Corporation $5.57.

The steel market is inclined to be critical of the manner in which the Corporation has made the move. A month or so ago its selling prices were cut and the market had reason to believe prices would stay on that basis for some time. Now comes the cut in wages and immediately buyers ask "Will there be further cuts in the price of steel?"

It looks as though there were ground for the belief that it would have been better to make both cuts together, selling prices and labor costs. Had this been done the market would have been spared the chance to start asking questions again about probable declines.



# MARKET DEVELOPMENTS



## Steel Mill Average 31 per cent This Week

### Reduction of Wages Causes Some Questioning in the Market—Price Cutting Still Bothering the Markets in Toronto—Fair Orders Have Been Secured by Machine Tool Dealers in This District

DULLNESS is the outstanding characteristic of the trade in steel, iron and machine tools this week, but in spite of it some firms report receiving very fair orders, while a number of others have prospects that look certain for real business in a short time. Prices in a number of special lines are being cut to some extent, while firms that find themselves with too much stock in certain lines of small tools are making the prices attractive enough to move them.

Price-cutting in the steel market of Toronto is also a well-established fact and just now most of it seems to centre around the bar mill material. Some of this is due to the fact that dealers find that they still have too great stocks of certain lines and are anxious to keep on liquidating. Then buyers are well aware of the anxiety to do business and they are doubtless taking full advantage of it being very much a buye market yet. There is a certain amount of questioning in t steel market as to whether there will be an adjustment prices to follow the cut in wages of the Steel Corporation e ployees of 20 per cent. These questioners forget that the pri of steel was cut before the rate of wages. The Steel Corpo tion is, at the reduced wage, paying an average of $5.57 p day, against $2.56 in 1912.

There have been a few bright spots in the scrap met market in United States, but they were short lived and t general tendency of the trade all over the continent is dull wi little volume of business moving. Prices quoted, the deale claim, are purely nominal, and if they find occasion to bu they will pay the amount. If not, they are simply out of t market entirely.

## SOME MONTREAL FIRMS SEEM TO BE GETTING SOME VERY FAIR ORDERS

Special to CANADIAN MACHINERY.

MONTREAL, May 12.—Industrial conditions in this district have not developed an active strain of late, as a summary of various reports exemplifies the pronounced quietness that prevails in all quarters. Railroad shops are operating spasmodically—on for a few weeks and off for a week. The curtailment of shipbuilding operations at the Canadian Vickers has added to the depression in marine circles. Despite this, however, reports of some dealers in mechanical equipment indicate a slight increase in orders received. Generally speaking, it seems that dullness is still the ruling factor.

#### Steel Prices May Decline Further

Apart from the expectation on the part of some dealers that steel prices may be subjected to a further reduction before many weeks have passed, the situation differs little from that of other weeks this year, where the outstanding feature has been expressed in the term, "Little doing." A factor which may have an early influence on the market is the fact that American steel producers are facing the possibility of competition with European manufacturers of steel. Commenting on this phase of the situation one dealer here stated: "It is possible now to secure steel products laid down in Canada from Belgian mills at 50 cents a ton less than it would cost to obtain the same from United States producers. This is a condition that must be considered, and with this prospect facing the trade it is not anticipating too much to expect lower quotations in the near future."

The labor situation has become less acute and this will doubtless assist business operations, provided construction can be started on a greater scale. "Many mills in the States," said a dealer, "are only working a couple of days a week. The practice is to shut down until sufficient orders are in to run the mills for a few days, and when the steel has been made, the plant is again closed for a week or two."

A manufacturer of wire rope stated that they had received an inquiry for a substantial supply of rope, but that owing to it being for a size beyond their capacity they had to pass it up. This firm, however, has reported some good business during recent weeks. A conc tion that will eventually aid in the qui return to normal activity when busine operations are again accelerated is t depleted state of many factories. Whi speaking to a master mechanic of plant here last week the writer wa given a little insight into shop condition A workman came up and requested se eral incandescent globes and was i structed to secure them from other part of the shop. Another request was for dozen shovels, but after considerable dis cussion the requisition was reduced t six. "This," explained the m. m., "ha been the policy for several months. W are not buying anything but what is abso lutely essential; giving to one depart ment at the expense of another. Whe business comes back to normal we cer tainly will have a lot of buying to do."

#### Non-Ferrous Lines Improve

With very few exceptions the old ma terial situation continues to reflect th dullness that has dominated the marke for many weeks past. The only varia tion from previous solitude is the slight activity reported in non-ferrous scraps and it is only by turning the good ear in the right direction that the ring of business can be heard. The small increased movement is almost entirely confined to the copper lines and dealers

re do not think the demand will last. ·ad is the only metal showing strength, having advanced ¼ cent to 3¾ cents r lb. New brass cuttings are quoted ½ cent off at 6 cents per lb. Medium ass shows a similar decline at 4½ nts per lb. Red brass turnings at 7¼ nts is ¼ cent easier. Little demand is ported on steel lines and weakness in notations is developing. Wrought iron cles are down to $20 per ton, car heels $22 per ton, and stove plate $17, ıe decline of the latter two being $3 er ton.

## 'ORONTO MARKETS HAVE FEW SALES

### rice Cutting Has Been Going On in Steel Market—The U.S. Corp. New Wage Scale

ORONTO.—Several aggressive dealers are taking considerable satisfaction out of the fact that they have been ble to do a lot of service and missionry work during the past months, and hey seem to be quite certain that the ime is not far distant when they are going to realize on these efforts.

There have been some orders placed luring the week, and although the busiess was not very large, it was new quipment all through. Dealers still ınd it very necessary to make certain f the financial standing of customers, s several cases have been reported durng recent weeks of surprises that have ıeen sprung on some of the houses.

"We have done a lot of work in the ast six months," remarked one dealer his week, "and were it to be judged by he returns we have received so far it ıust be reckoned as a rank failure, but ve are satisfied that judged by results a few months from now it will be called a complete success." This same dealer aims that it is a good stroke of busiess to keep in touch with the users of our equipment after it is put in operaon. Several times he has found maines that, from lack of tooling or spe-al equipment, were not producing anyhing like capacity. This has been drawn o the attention of the purchaser of the achine, and recommendations made ing certain lines. The result has been hat the machine does exactly what is ormed for it, whereas were it left alone might drop back to the pace that ome of the operators might set for it.

#### Right After Business

One of the paper companies in Northn Ontario was receiving tenders for number of conveyor systems during the ast week, and seven firms were represented in going over the figures. Bidding was brisk, as the business was large enough to be desirable.

In other lines the same thing is experienced by the salesmen. Where there is chance of anything being placed, the buyer has a number of very good options before placing the business.

#### Cutting in Steel

Toronto steel warehouse men will tell you very plainly that the local market is about as ragged as could be imagined. Prices are being cut and the cuts made are fairly deep at times. The price pruning seems to centre around bars more than any other line, and although efforts have been made at various times to bring the market to something more like a standard, efforts have failed. Some of the merchants have stocks on hand yet that they are anxious to dispose of, and the only way just now is by making the price do the moving. As long as liquidation is being indulged in quite freely the chances of making anything like a uniform market seem quite remote.

Selling has been going on in small lots; and the orders placed are for much smaller amounts than usual. It all tends to make business more expensive to conduct, as it takes more office work and more trips in delivery.

Representatives of Philadelphia mills are in this district looking for business. One of the salesmen stated that he understood from some reports he had seen that buying in Canada was better than in the United States, and he came over to get in on the business that he thought would be moving. He went back after finding that there was nothing in this field for the present to interest him.

#### The Cut in Wages

In the steel market one hears the question: "Will there be a cut in prices of steel following the reduction in wages of the United States Steel Corporation?" There has been a lot of publicity given to this point, one of the Toronto papers using the following:

"It is taken for granted that further cuts in steel prices will follow the wage cut, which reduces the price of steel by about $8 per ton."

Local representatives of the United States Steel Corporation stated that they had heard nothing at all about any contemplated changes in the schedule of prices and pointed out that the price of steel had been cut first and the price of labor after, whereas they both had a close relation.

Other steel merchants expressed the belief that it was a mistake to make two moves on the subject. "If the Corporation had cut their prices and the price of labor at the same time they would have done a much better piece of business. As it is we have this unsettling element in the market again, and people are asking whether there is going to be a further reduction, whereas a week ago it was generally accepted that the price was going to stand for some time."

## POINTS IN WEEK'S MARKETING NOTES

**Pittsburgh reports that the total operations of the Corporation and independent steel mills average 31 per cent. of capacity this week.**

—

**Furnace men estimate that in the majority of districts consumption of pig iron is equal to the rate of production.**

—

**U.S. Steel Corporation cuts wages 20 per cent. and market asks if this means cheaper steel. Prices were cut about a month ago.**

—

**Some salesmen from Philadelphia steel mills were in this district looking for orders, being under the impression that business was fairly good here.**

—

**Steel merchants in Toronto claim the market is being cut all the time in order to secure orders. Bar mill material is just now the center where most of the cutting is taking place.**

—

**This should be the season of the year when reinforcing material would be in demand, but warehouses report sales as being very small and confined mostly to government contracts.**

—

**Scrap market has had a few flashes in U. S. points, but they died quickly. Values are unchanged in Canada. Sellers are not taking on much and holders, if they are able, prefer to hang on for better prices.**

—

**Machine tool market remains spotty. A few very fair orders have been secured during the week.**

## TRADE OPENINGS IN ARGENTINA

### Mr. Pollard Is In The City For a Time Looking For Suitable Trade Connections

H. Pollard, who has been spending some time recently in Argentina as the representative of the Handley-Page Co., is in Toronto. Mr. Pollard, during the war, was sent to this country as an instructor in the mechanical and engineering departments of the big Leaside flying camp. He made a splendid record while there. During his stay in Canada Mr. Pollard contributed a number of articles to Canadian Machinery and also published a handbook for the use of airplane mechanics. Leaving here at the conclusion of the war he returned to England for purposes of demobilization, and has since been with the Handley-Page Co. For a time he was on the London to Paris trip, then in Spain and

Portugal for a time. Following this he went to Argentina and Uruguay for the same company, and was successful in placing some thirty of their machines.

Mr. Pollard has been impressed with the opportunities there are in Argentina for Canadian lines. United States firms and British houses are well represented there, but not so with Canadian companies. He is in Toronto at present and has been in touch with several engineering and machinery lines, openings for which he believes exist in Argentina. Mr. Pollard for the present is staying at the Gladstone Apartments, 225 Gladstone Ave., Toronto (phone Parkdale 3222) and if there are any Canadian manufacturers interested in having their lines placed in that country Mr. Pollard can be communicated with as above.

# U.S. STEEL MILLS ARE RUNNING AT ABOUT 30 PER CENT. CAPACITY

Special to CANADIAN MACHINERY.

PITTSBURGH, May 12. — Production of pig iron in the United States is now at the rate of about 14,000,000 tons a year, which compares with rates of 39,000,000 tons last October and 40,000,000 tons in March, these being the two high months of the year. Actual production as officially reported was 36,925,987 tons in 1920 and 39,434,794 tons in 1916, the record year. Thus the present rate of output is extremely low and indeed is lower than the actual production in any year since 1900. By comparison with capacity the showing is still worse, for the capacity is considerably in excess of outputs previously attained. In 1916 there was production approximately equal to the existing capacity, but since then the capacity has been materially increased, for very little of the war-time construction became effective in 1916. Last year there was an effort during the first eight or nine months to make maximum output, but transportation difficulties prevented any full attainment, chiefly through causing a shortage of coke.

The capacity is fully 45,000,000 tons, this figure not representing theoretical capacity, but the actual production that could undoubtedly be realized if there were reasonably fair manufacturing conditions, such as existed in 1916, and were normal before the war, including proper transportation service and an adequate supply of efficient labor. Compared with 45,000,000 tons capacity the present rate of production of 14,000,000 tons a year is 31 per cent.

The merchant blast furnaces make a much poorer showing than the steel works furnaces, since the merchant furnaces are producing at the rate of only about 2,000,000 tons a year, their capacity being approximately 12,000,000 tons, so that their rate is only about 17 per cent. The steel works furnaces are producing at about 12,000,000 tons a year, or 36 per cent. of their estimated capacity of 33,000,000 tons.

The chief reason the merchant furnaces are operating at a much lower rate than the steel works furnaces is not that there is a much smaller demand upon the malleable and gray iron foundries, steel foundries and detached steel works that use merchant pig iron, as compared with demand upon the steel works that have blast furnaces of their own, though there may be a little difference in this respect. The difference is due chiefly to the existence of stocks of merchant pig iron in the hands of both producers and consumers. The steel works that have blast furnaces naturally do not stock pig iron to any extent, partly because they do not buy or sell, and partly also because they normally use molten iron, which is much more economical, and make it as they consume it. In the case of merchant iron, on the other hand, consumers normally carry stocks and some months ago these stocks increased, while the furnaces also have stocks. A blast furnace must either run or not run and the merchant furnaces are either single or in small groups. As demand slumped off suddenly the average furnace, before blowing out, shipped all the iron on contract that the customers would take, and also made up some stocks preliminary to blowing out. Numerous furnaces announced late last year that they would not make any stocks, but that on account of high costs they would blow out as soon as they became unable to ship their make, but in practice the theory was violated.

### Not Stocking Up Now

The conclusion from all this is that the rate of consumption of merchant pig iron is in excess of the current production and that as stocks are consumed a steadier market will develop. That there will then be higher prices than those now ruling is a possibility but it is somewhat more likely that prices will decline further before there is an upturn. A factor that may intervene before pig iron prices tend to stiffen is that of freight rates on ore, limestone and coke. These are expected to come down and that would decrease furnace costs. It is fairly safe to make one prediction, that before the end of the year there will be an advance in pig iron, from whatever low point is meanwhile developed. That is, some pig iron is likely to be sold at lower prices than the price that would encourage an idle furnace to blow in. An idle furnace does not lose much money, while it is very awkward to have a furnace in blast and making a fresh cast of iron every six hours, Sundays included, if there is no market for it. Accordingly there will have to be inducements before idle furnaces blow in.

### Steel Market Stagnant

The steel situation is no worse than it was, but it looks worse because there was good reason to expect an increase in mill operations on account of the price changes in the second week in April. At that time the independents advanced their prices and the Steel Corporation reduced its prices, resulting in the equalized market that is now steadily maintained. As the independents are withdrawing their lower prices they cleaned up all the new business in sight at the lower figures, and this was expected to give them a better operation though of course only for a time. The Steel Corporation, on the other hand was in line to receive heavier specifications from its regular customers, having old contracts, since the contract figures were revised when the Corporation reduced its prices.

In neither case has there been an increase in operations, and naturally this is disappointing, though fundamentally the situation is no worse than it was a month ago. The independents are operating at about 30 per cent. of capacity and the Steel Corporation at about 35 per cent., making an average of about 33 per cent. for the whole industry.

While 33 per cent. is a very low rate the tonnage itself is not so bad. What has been intimated about pig iron as to increase in capacity, holds more strongly still as to steel, for there has been a 50 per cent. increase in steel capacity since 1914. Thus a 33 per cent. operation now is the same tonnage as a 50 per cent. operation would have been in 1914, while it is equal to a 66 per cent. operation with the capacity of almost twelve years ago and a 100 per cent. operation with the capacity of eight or nineteen years ago. One may say that the steel capacity has grown too fast for present conditions, and in a sense that would be true, but at a long range view the more reasonable opinion is that conditions as to the consumption of steel are not what they should be, being distinctly unfavorable. The artisans in the building trades are unwilling to work hard and want more wages than investors feel it safe to tie up in construction work. It costs too much in wages to keep the railroads going, on account of high rates and too many men on the payrolls, and the railroads cannot make improvements that the country needs. Thus it is all along the line.

While steel prices are absolutely unchanged since the equalization some four weeks ago, pig iron is easier. The \$24, valley, quotation on foundry pig iron, intimated last week as a possibility, has become an actual fact, and perhaps \$24 could be shaded a trifle. Basic iron has again sold at \$22.50, with a rumor that \$22 has been done or could be done.

The Portsmouth, O., blast furnace that recently bought a five weeks' supply of Connellsville coke, 500 tons a day, at $5.50, has renewed the contract for 30 to 60 days at $3.40. Foundry coke remains quotable at $5 to $5.50.

## Scrap Metal

Pittsburgh reports that the improved tone of the market noted a week ago is maintained due to the fact that a number of the independent steel companies have put on additional open-hearth capacity in the past week, and that they are more interested in supplies of scrap than they were a very short time ago.

Consumers have been in the market during the week at Chicago, and while they have not made large purchases they have purchased sufficient quantities to advance the prices of a number of grades.

On the New York market, the heavy melting steel consumer in eastern Pennsylvania, which came to the market recently for considerable tonnage, is reported to have filled its requirements. Business is at a very low ebb, and there is talk among some dealers of shutting down yards until there is greater activity.

The interest at Buffalo, which has bought approximately 5,000 tons of heavy melting steel in the past month, is reported willing to buy up to 10,000 tons at a $13 price.

The spurt of buying which was noted last week at Cleveland was short lived, and the market has again settled down to a generally inactive state.

## Pig Iron Market

The April output of pig iron was a daily average of 39,768 tons, or less than any daily rate since July, 1908, when the country's capacity was much smaller. Fifteen furnaces were blown out or banked in April, but nine were blown in.

Little of interest has taken place on the Pittsburgh market during the past week outside of an additional purchase of 2,000 tons of basic by the Sharon Steel Hoop Co. at $22.50, furnace, from a valley steel maker.

On the Chicago market melters are buying from hand to mouth and orders of 100 tons or more are the exception.

Prices as low as $24, base, on eastern Pennsylvania and Buffalo iron, and $22 for No. 2 southern have been rumored on the New York market, but no transactions are reported at these low prices.

Though there is little life in the Cincinnati market, the feeling is better. Shipping instructions for iron held up are being received.

Boston reports that the Sullivan Machinery Co., Claremont, N.H., this week closed on 100 tons Pennsylvania malleable, 100 tons eastern Pennsylvania silicon 2.25 to 2.75 and 100 tons Virginia No. 1-X iron at private terms. Other sales were confined to an occasional car lot.

Little activity developed during the week at Cleveland. Owing to intimations from buyers that foundry and malleable iron can be bought at considerably lower than recently quoted prices, the market is in a rather unsettled state as regards prices. One sale was made of 500 tons of malleable iron to a Barberton foundry and the purchaser got a price lower than $24.

No improvement is noted in the demand for pig iron on the Philadelphia market. Sales of carloads and 100 to 300-ton lots predominate and purchases are almost wholly for prompt shipment, though a few buyers are apparently willing to cover for two or three months ahead at present prices. Sellers, however, are not willing to sell ahead, as they hold that if prices should decline further the buyer would insist upon a revision of price on his contract, but would not consent to an advance should prices go up.

## LET RAIL ORDERS ONLY "AT A PRICE"

**Matter Came Up During a Debate on the Matter in the House at Ottawa**

OTTAWA.—That certain individuals were given to attempting to use political influence to secure contracts for ties, and that it was the business of the committee to frown on such practices, was stated before the special Parliamentary Committee on Government-owned railways and shipping by Hon. T. A. Crerar, Progressive party leader.

While Mr. Crerar had every sympathy with the farmers "getting out" ties, the railways must be run on well-accepted business principles. Railway officials would not be fulfilling their duties if they permitted themselves to be influenced.

**Buy in Best Market**

R. C. Vaughan, vice-president and director of purchasing and supplies for the National Railways, said the ties were purchased where the price was favorable to the railways. Other supplies were purchased on a similar basis. Mr. Vaughan gave an explanation of the purchasing methods, and said the directors did not interfere, except in the case of extra large purchases.

Later Mr. Crerar said a section of the public looked on the National Railways as a cow that could be milked, and he, for one, objected to being an agent between the public and the railway even for his own electorate. The public would do its business direct with the company.

**Compare Rail Costs**

Mr. Vaughan informed Mr. Murphy that few rails were purchased in the United States. The United States price was $48.60 a ton, and the Canadian price $67 a ton. The Canadian price was lower than the United States rails when exchange, duty and freight were considered.

Dr. Reid said the Canadian companies reduced the price to $60 a ton. This price, however, was considered unfair, as the directors of the road thought the Canadian price should not exceed the American price plus duty. The Algoma Steel Co. agreed to this, and took a contract for 55,000 tons at $55 a ton.

So far the Dominion Iron & Steel Co. had not "come to time."

## HARDER TO HOLD MEN'S CONFIDENCE

**Manufacturer Tells Of Case Where His Men Asked For Records To Prove His Words**

A manufacturer who takes a great deal of pride in his business, and who has always tried to make conditions as desirable as possible around his plant, discussed an interesting point with Canadian Machinery.

"One of the hardest things I have to do," he remarked, "is to get a basis on which to deal with the men in my own shop. I do not know exactly what is the trouble, but I have a well fixed belief that when I meet my men in conference regarding business conditions and matters of wages there is an element of suspicion that makes it harder for me to make progress. Just a few days ago there was a committee in here and we went over the situation in detail. I stated the case as fairly as I knew how, and I proposed just as small a cut as possible because I realize that the cost of living is still pretty well up. When I was through I was met with a request that I produce my books and the records of my business office in order that the men might verify the statements that I had made. I know this is a day when there is not much sentiment in business, and when people are generally held to be robbers until they are found to be not guilty, but that was the hardest thrust I ever received. I haven't been out in the shop since because I haven't the heart to go out, and it is one thing I miss more than anything else. I was brought up in this shop, and I know the men. I have discussed the matter with other manufacturers, and find that they have had somewhat the same experience. I don't know whether it is the men's organizations or what encourage these moves, but I am bound to confess that it is making it harder for me to feel that I have the co-operation and sympathy and backing of my men in going through a period such as we are experiencing right now."

# SELECTED MARKET QUOTATIONS

**Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.**

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $25 00 |
| Lake Superior, charcoal, Chicago | 40 50 |
| Standard low phos., Philadelphia | 41 50 |
| Bessemer, Pittsburgh | 28 96 |
| Basic, Valley furnace | 26 00 |
| Toronto price:— | |
| Silicon, 2.25% to 2.75% | 34 10 |

## IRON AND STEEL

| Per 100 lbs. to Large Buyers | Cents |
|---|---|
| Iron bars, base, Toronto | $4 00 |
| Steel bars, base, Toronto | 4 00 |
| Iron bars, base, Montreal | 3 75 |
| Steel bars, base, Montreal | 3 75 |
| Reinforcing bars, base | 3 75 |
| Steel hoops | 4 50 |
| Tire steel | 4 00 |
| Spring steel | 6 00 |
| Band steel No. 10 gauge and 3-16 in. base | 4 00 |
| Chequered floor plate 3-16 and heavier | 6 00 |
| Bessemer rails, heavy, at mill | 2 35 |
| Steel bars, Pittsburgh | 2 10 |
| Tank plates, Pittsburgh | 2 20 |
| Structural shapes, Pittsburgh | 2 20 |
| Steel hoops, Pittsburgh | 3 05 |
| F.O.B., Toronto Warehouse | |
| Small shapes | 4 50 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 3 48 |
| Structural shapes | 3 58 |
| Plates | 3 78 |
| Small shapes under 3-in. | 3 48 |

## FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

| | C.L. | L.C.L. |
|---|---|---|
| Montreal | 58½ | 73 |
| St. John, N.B. | 84½ | 106½ |
| Halifax | 86 | 108 |
| Toronto | 38 | 54 |
| Guelph | 38 | 54 |
| London | 38 | 54 |
| Windsor | 35 | 50½ |

Current surcharge, 8 per cent.

## METALS

| | Gross Montreal | Gross Toronto |
|---|---|---|
| Lake copper | $18 00 | $17 50 |
| Electric copper | 17 50 | 17 50 |
| Castings, copper | 17 25 | 18 00 |
| Tin | 38 00 | 39 00 |
| Spelter | 7 75 | 7 50 |
| Lead | 6 50 | 7 50 |
| Antimony | 8 00 | 8 25 |
| Aluminum | 34 50 | 30 00 |

Prices per 100 lbs.

## PLATES

| | | |
|---|---|---|
| Plates, 3-16 in. | $5 00 | $4 75 |
| Plates, ¼ up | 4 50 | 4 25 |

### PIPE—WROUGHT

**Standard Buttweld Pipe S/C**

Per 100 feet.

| Size | Steel Blk. | Steel Galv. | Gen. Wrot Iron Blk. | Gen. Wrot Iron Galv. |
|---|---|---|---|---|
| ⅛ in. | $ 6 50 | $ 8 50 | $ .... | $ .... |
| ¼ in. | 4 89 | 6 99 | 5 91 | 8 01 |
| ⅜ in. | 4 89 | 6 99 | 5 91 | 8 01 |
| ½ in. | 6 50 | 8 03 | 7 95 | 9 48 |
| ¾ in. | 7 99 | 10 06 | 9 95 | 12 02 |
| 1 in. | 11 82 | 14 88 | 14 71 | 17 77 |
| 1¼ in. | 15 99 | 20 13 | 19 90 | 24 04 |
| 1½ in. | 19 11 | 24 06 | 23 79 | 28 74 |
| 2 in. | 25 72 | 32 38 | 32 01 | 38 67 |
| 2½ in. | 40 66 | 51 19 | ..... | ..... |
| 3 in. | 53 17 | 66 94 | ..... | ..... |
| 3½ in. | 67 62 | 84 18 | ..... | ..... |
| 4 in. | 80 12 | 99 74 | ..... | ..... |

**Standard Lapweld Pipe S/C**

Per 100 feet.

| Size | Steel Blk. | Steel Galv. | Gen. Wrot Iron Blk. | Gen. Wrot Iron Galv. |
|---|---|---|---|---|
| 2 in. | $29 42 | $36 08 | $35 71 | $42 37 |
| 2½ in. | 44 17 | 54 70 | 54 11 | 64 64 |
| 3 in. | 57 76 | 71 53 | 70 76 | 84 53 |
| 3½ in. | 69 46 | 86 02 | 85 10 | 101 66 |
| 4 in. | 82 30 | 101 92 | 100 83 | 120 45 |
| 4½ in. | 95 89 | 1 20 | 1 30 | 1 54 |
| 5 in. | 1 12 | 1 40 | 1 52 | 1 80 |
| 6 in. | 1 45 | 1 81 | 1 97 | 2 33 |
| 7 in. | 1 89 | 2 37 | 2 53 | 3 01 |
| 8L in. | 1 99 | 2 49 | 2 66 | 3 16 |
| 8 in. | 2 29 | 2 87 | 3 07 | 3 64 |
| 9 in. | 2 74 | 3 43 | 3 67 | 4 36 |
| 10L in. | 2 54 | 3 18 | 3 41 | 4 05 |
| 10 in. | 3 28 | 4 10 | 4 39 | 5 21 |

**Prices—Ontario, Quebec and Maritime Provinces**

## WROUGHT NIPPLES

4-in. and under, 50 per cent.

4½-in. and larger, 40 per cent.

4-in. and under, running thread, 20%.

Standard couplings, 4-in. and under, 20%

Dd., 4½-in. and larger, net.

## OLD MATERIAL

Dealers' Average Buying Prices

Per 100 Pounds.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $ 8 50 | $ 9 00 |
| Copper, crucible | 11 00 | 11 00 |
| Copper, heavy | 10 50 | 11 00 |
| Copper wire | 11 00 | 11 00 |
| No. 1 machine composition | 9 50 | 9 75 |
| New brass cuttings | 6 00 | 8 00 |
| Red brass turnings | 7 25 | 8 00 |
| Yellow brass turnings | 5 00 | 6 00 |
| Light brass | 3 50 | 5 00 |
| Medium brass | 4 50 | 6 00 |
| Scrap zinc | 4 00 | 4 00 |
| Heavy lead | 3 75 | 4 00 |
| Tea lead | 2 00 | 2 00 |
| Aluminum | 12 00 | 10 00 |

| | Per Ton | Gross |
|---|---|---|
| Boiler plate | $10 00 | $12 00 |
| Heavy melting steel | 9 00 | 14 00 |
| Axles (wrought iron) | 20 00 | 20 00 |
| Rails (scrap) | 12 00 | 14 00 |
| Malleable scrap | 12 00 | 20 00 |
| No. 1 machine cast iron | 22 50 | 25 00 |
| Pipe, wrought | 8 50 | 8 00 |
| Car wheel | 22 00 | 25 00 |
| Steel axles | 18 00 | 18 00 |
| Mach. shop turnings | 5 00 | 6 00 |
| Stove plate | 17 00 | 20 00 |
| Cast boring | 3 00 | 7 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent |
|---|---|
| Carriage bolts, 7-16 and up | Net list |
| Carriage bolts, ⅜" and less | 15 |
| Coach and lag screws | —20 |
| Stove bolts | 55 |
| Wrought washers | —25 |
| Elevator bolts | Net |
| Machine bolts, 7-16 and over | —5 |
| Machine bolts, ⅜-in. and less | —30 |
| Blank bolts | Net |
| Bolt ends | —5 |
| Machine screws, fl. and rd. hd., steel | 2½ |
| Machine screws, o. and fil. hd., steel | +2 |
| Machine screws, fl. and rd. hd., brass | Ne |
| Machine screws, o. and fil. hd., brass | Ne |
| Nuts, square, blank | +25 add $2 0 |
| Nuts, square, tapped | add 2 5 |
| Nuts, hex., blank | add 2 5 |
| Nuts, hex., tapped | add 2 5 |
| Copper rivets and burrs, list less | 2½ |
| Burrs only, list plus | 1 |
| Iron rivets and burrs | 37½ and |
| Boiler rivets, base ¾" and larger | $8 0 |
| Structural rivets, as above | 8 0 |
| Wood screws, O. & R., bright | 6½ |
| Wood screws, flat, bright | 6½ |
| Wood screws, flat, brass | 5 |
| Wood screws, O. & R., brass | 5½ |
| Wood screws, flat, bronze | 5 |
| Wood screws, O. & R., bronze | 4½ |

## MILLED PRODUCTS

(Prices on unbroken packages)

| | Per C |
|---|---|
| Set screws | Less 4 |
| Square and hexagon head cap screws | Less 3 |
| Round head cap screws | Plus 1 |
| Fillister head cap screws | Less 1 |
| Flat head cap screws | Net |
| Button head cap screws | Plus 1 |
| Studs | Less 2 |
| Semi-finished nuts up to and including 1-in. | Less 3 |
| Semi-finished nuts 1⅛ to 1½" | Less 3 |
| Semi-finished nuts 1⅝ to 2 in. | Net |
| Coupling bolts | Plus 1 |
| Taper pins | Less 4 |
| Planer bolts without fillet | Plus 4 |
| Planer bolts with fillet | Pus 5 |
| Patch bolts | Plus 8 |
| Hollow set screws | Plus 2 |
| Thumb screws | Less 3 |
| Thumb nuts | Less 6 |

## BILLETS

F.O.B. Pittsburgh.

| | Per gross |
|---|---|
| Bessemer billets | $43 |
| Open-hearth billets | 43 |
| O.H. sheet bars | 39 |
| Forging billets | 48 |
| Wire rods | 48 |

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails, base | $4 |
| Cut nails, base | 5 |
| Miscellaneous wire nails | 5 |

## ROPE AND PACKING

| | |
|---|---|
| Plumbers' oakum, per lb. | 0 1 |
| Packing, square braided | 0 3 |
| Packing, No. 1 Italian | 0 4 |
| Packing, No. 2 Italian | 0 3 |
| Pure Manila rope | 0 2 |
| British Manila rope | 0 2 |
| New Zealand hemp | 0 2 |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | Net |



# Gould & Eberhardt

## High-duty SHAPERS

16" - 20" - 24" and 28" size

Ask for Catalog and details describing the exclusive features.

*We can give early delivery.*

**The A. R. Williams Machinery Co., Limited**

Halifax, St. John, Montreal
Winnipeg, Vancouver

*If it's Machinery--Write "Williams"*

64 Front St. West
TORONTO



# FOR SALE

## Factory Building

**364-370 Richmond St. W.**
**TORONTO**

61 ft. frontage by 134 ft. depth; five stories high. Especially constructed for manufacturing purposes.

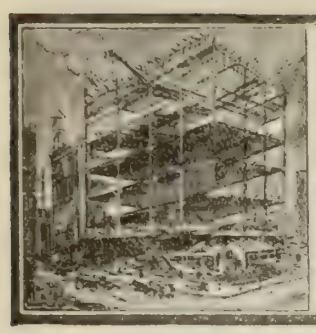
Slow-burning construction; equipped throughout with automatic sprinklers.

**Write or 'phone Main 7066 for terms.**

**Aikenhead Hardware,**
LIMITED

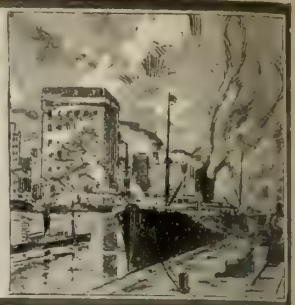
17 Temperance Street
TORONTO, ONT.


*If interested tear out this page and place with letters to be answered.*



# INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES



## UNITED STATES STEEL CORPORATION HAS CUT 20 PER CENT. ON ITS WAGES

THE long deferred action of the United States Steel Corporation in regard to the reduction of wages was taken Tuesday, May 3, when late in the afternoon it was announced that a decrease of about 20 per cent. had been agreed upon. A meeting of presidents of the Steel Corporation subsidiaries was held Monday and on Tuesday a meeting of the finance committee of the corporation was held. Shortly before five o'clock, the following statement was made by Judge Gary:

"The wage rates of day labor at the manufacturing plants of the Steel Corporation have been decreased about 20 per cent. to become effective May 16 instant. Other rates, including salaries, will be equitably adjusted.

"After long and painstaking effort, we have not been able to find a practicable basis for the entire abandonment of the twelve-hour day or turn in the immediate future. However we have already eliminated the twelve-hour day in certain departments and shall continue our eflorts in this direction with the hope and expectation of making the elimination of the twelve-hour day complete during the next year. We do not believe we can satisfy our employees with any shorter limit."

Reductions of wages of 20 per cent. were made by independent steel companies, effective Feb. 16, 1921, and independent coke operators reduced wages from 22 to 23 per cent. effective April 1.

The Steel Corporation had adhered to its schedule, which had not been changed since the announcement of Feb. 1, 1920, of the ninth advance in wages made since Jan. 1 1916. The wage advance since 1914 amounted to about 140 per cent. The following are the dates and percentages of advances of the Steel Corporation since Feb. 1916: Feb. 1, 1916, 10 per cent.; May 1, 1916, 10 per cent.; Dec. 15, 1916, 10 per cent.; May 1, 1917, 10 per cent.; Oct. 1, 1917, 10 per cent.; April 15, 1918, 15 per cent.; Aug. 1, 1918, 10 per cent.; Oct. 1, 1918, 10 to 16 2-3 per cent. (through reduction of working hours); Feb. 1, 1920, 10 per cent. The last reduction in wages was made in January, 1904, but wages were restored April 1, 1905, to the schedule which had prevailed previous to Jan. 1, 1904.

The average salary or wage per employee per day of all employees, exclusive of general administrative and selling force has been; 1912, $2.68; 1913, $2.85; 1914, $2.88; 1915, $2.92; 1916, $3.29; 1917, $4.10; 1918, $5.33; 1919, $6.12; 1920, $6.96.

## Engineering

The Nukol Fuel Co., Ltd., 88 Bay Street, Toronto, are contemplating the erection of a factory.

Plans are prepared for a garage to cost $20.000 for A. Clancy, c.o. P. L. Davis, architect, 157 Danforth Avenue.

The erection of a woodworking factory costing $10,000 is planned by McCulloch Bros., at Derbert, N.S.

The Special Auto Service Co., Hamilton, Canada, will alter building for garage at a cost of $10,000 and will also erect a garage on Dundurn St. N.

Feather and Roadhouse, 11 Foster Place, have received the sheet metal contract for alterations and additions to building for offices costing $50,000 for the Consumers' Gas. Co., 19 Toronto Street, Toronto.

## Trade Gossip

**Wants Shop Equipment.**—Harry M. Bell, R. R. No. 2, Wallenstein, Ont., wants to secure a complete emery grinder and some general shop equipment.

**Wants Equipment.**—P. E. Nesseth, of Mattawa. Ont., wants to secure the following, used or new: vise, 4 to 6 in. jaw, swivel or rigid; drill press, to take square or round shank up to ⅝ in.; double emery cylinder head to take 10 x 1 in. wheels.

**Wants Equipment.**—C. R. Wright, 190 West 101 street, New York City, wants to secure the following used equipment: Air compressor, size 9 x 8; ball mill, 4 x 5; filter press, 30 in. x 30 in.; (Shriver or similar type) 48 wooden frames and plates, open delivery. This equipment is to be used in Canada.

**Opening Office.**—In charge of Morri P. Shea, the Dominion Steel Product Limited, Brantford, have opened an of fice at 416 St. James St., Montreal. The are installing a stock of lighting sets an accessories as well as Darling valves an hydrants and other products.

**Change Management.**—As the resu of a recent re-organization, Wellan Machine & Foundries, Limited, Wellan will operate under the management c Wm. Edestrand, at one time with th Dain Manufacturing Co., and an exper enced foundryman.

**Will Change Foundry.**—Hillis & Son Halifax, N.S., are still operating in temporary foundry, following the explo sion of December, 1917. The new four dry will be of brick or concrete, an much larger than at present. As soo as conditions warrant they will be adc ing to the plant and equipment in dif ferent directions.

## CONDITIONS IN BRITISH FIELI

C. W. Field, representative in thi district of the British Overseas Trad Organization, has returned from a extended visit to the Old Country, dur ing which he called on a great man firms there that had been doing busines in Canada. In many cases the busines had been carried on in a half-hearte way, the firms there not realizing th importance of the Canadian market, no appreciating as they should the purchas ing power, per capita, of the Canadia people.

"I found," remarked Mr. Field, "tha the large amounts of left-over war ma terial that were still in the land had depressing effect on trade in these par ticular lines. There are, for instance great piles of wool, and immense store of wheat, as well as considerable heav machinery."

The labor situation, he thought, a though far from what it should be, wa improving. Many employees were offer ing to accept lower wages and other were more inclined to listen to reason able arguments of manufacturers as t the vital necessity of reducing costs i order to compete in the world's markets "I have great faith in the triumph o moderate opinion in the Old Land," sai Mr. Field. "This year will probably b another one of readjustment but cond

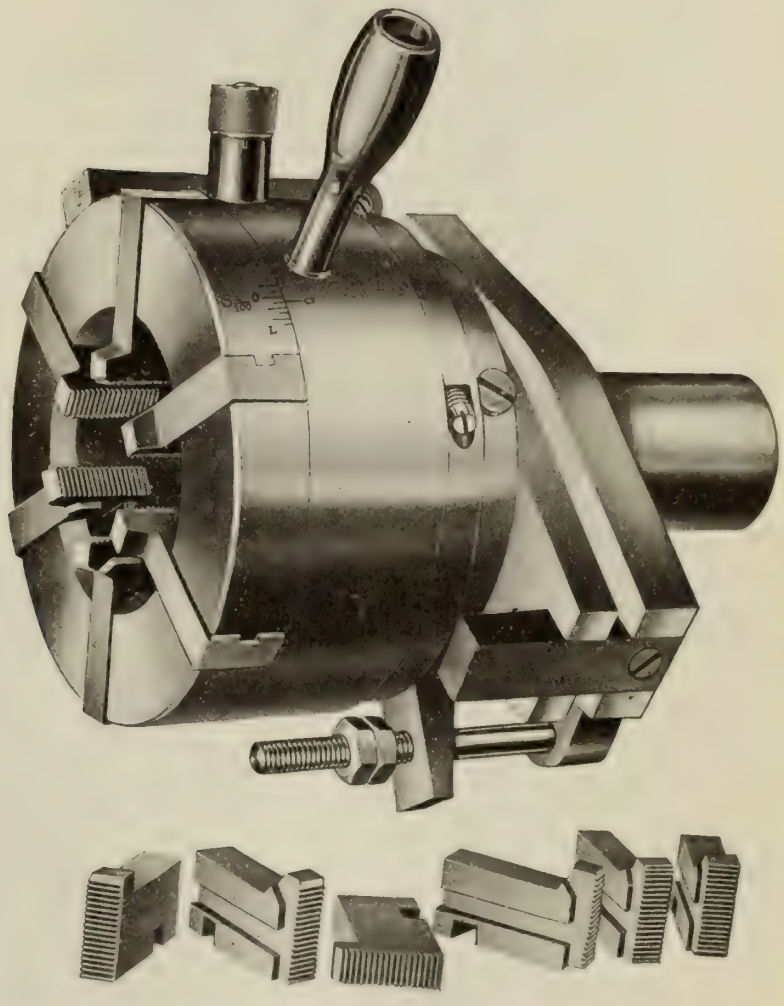
GEO MET RIC

*Right on the Lead*

# DIE HEADS THAT SHOULDER THE WORK

**Shop Men tell us they get Wonderful Service from Geometric Die Heads**

*It is the User who decides the Merits of a Tool*



2-Inch Diameter Brass Compression Plugs Threaded in less than one minute each with a Geometric Die Head on a 5-A Potter & Johnston Automatic

**With the Best of Results**

The Geometric Die Head illustrated is arranged for the Potter & Johnston Automatics. Note the Floating Shank, which makes close camming unnecessary and also prevents inaccuracies caused by either forcing or holding back the turret.

**Geometric Die Heads can be fitted with chasers for cutting close to a shoulder, when required**

## THE GEOMETRIC TOOL COMPANY
**NEW HAVEN** **CONNECTICUT**

*Canadian Agents:*

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, St. John, N.B., Halifax, N.S.

tions are gradually improving and we may expect to see John Bull take a much more intimate interest in the Canadian market.

The coal strike, he admitted, would probably set things back for at least another three months.

"I visited the principal industrial centres overseas and my outstanding impression is that the United Kingdom is again approaching a strong position for the conduct of export trade. Machinery and equipment are modern, office and works systems are satisfactory, and there is a keen desire to extend overseas trade. Given better conditions in the supply of raw materials and steadier labor conditions, the United Kingdom will, I believe, again assume in the world's markets its important role of the past.

"The present business depression is apparently helping to bring the readjustment which is necessary for the revival of trade. During this period, employers and labor appear to be making efforts to ensure that fair wages shall be paid and the proper output obtained.

The poor habit that some Canadian firms had formed during recent months of cancelling orders without any good reason other than that they desired to escape a falling market had left a bad impression at certain places in England. Mr. Field told of one firm that had dyed a $60,000 order especially for a Canadian customer, and the whole thing was cancelled when it was boxed for shipping. It was a dead loss, and the Canadian customer had refused to make any settlement.

## HOW STRIKES GO ACROSS THE LINE

**Reports of Various Wage Disputes and the Nature of Their Settlement**

New York.—The opposition of union molders employed in machinery foundries to the wage reductions that have been announced since the opening of the year has been disintegrating rapidly since the acceptance by the International Molders' Union of a 15 per cent. reduction of wages in stove foundries. It has been estimated recently that 60 per cent. of the members of the union have been out of work, and a considerable portion of the remaining 40 per cent. have been working part time. On April 1, molders' strikes were in progress in one or more shops in 109 cities. Among the settlements already made, some of which antedated the settlement between the molders and the stove founders, are the following:

On April 5 the union foundries in Pittsburgh gave notice of a readjustment of wages and the local union arranged for a reduction from $7.50 to $6.75 for eight hours. It was provided that this should be effective for 90 days from April 1.

At Detroit a reduction from $8.50 to $7.20 for eight hours was put in effect April 11, and was accepted by the union. On April 1 a large union foundry in Detroit which had been shut down for some time offered a wage rate of 85c per hour and this was accepted by the employees.

A reduction from 90c to 80c per hour was put in effect by the union foundries of Ansonia and Derby, Conn., on April 18, and was accepted by the molders' union.

Union molders at Baltimore who have been on strike against a reduction from $8 to $7 for eight hours have called off the strike and are seeking employment on the $7 basis. A number of foundries there, however, expect to maintain the open shop and are only employing men as individuals without any agreement with the union.

# The Week's Events in Montreal Industry

Thos. McMillan, first vice-president of the Canadian Fairbanks-Morse Company, was in Chicago last week attending the funeral of Charles Hosmer Morse, late president of the Fairbanks, Morse Company.

* * *

O. H. Willison, of the Lyman Tube and Supply Company, Montreal, has just returned from a six weeks' trip to England, where he spent a month at the plant of the Hoffmann Manufacturing Company, the largest manufacturers of ball and roller bearings in the British Empire. The Lyman Tube and Supply Company were representatives of this firm prior to the war, but for the past five or six years it has been impossible to obtain shipments from England. The Hoffman bearings are made in a large variety of styles and sizes to meet every industrial requirement. The radial ball bearings are made in both the "gap" and the "no gap" type. The Lyman Tube and Supply Company will carry a large stock of Hoffman equipment in their various Canadian warehouses.

* * *

The launch of the Norwegian cargo vessel "Topdalsfjord" from the yard of the Canadian Vickers last Thursday marks the cessation of operations at this plant for some time, at least in the nature of new work. Repairs to vessels afloat will be continued throughout the season, but unless new contracts are received the construction of new vessels will cease. There is a slight possibility that this company may be the successful tenderers for the ice-breaker that the government proposes building this year, but no definite announcement regarding this has yet been made. This last launching was attended by the members of the Federal Parliament in a body, and on the occasion of their visit to Montreal they were given a trip around the harbor as guests of the Harbor Commissioners, during which the new steel sheds of the Commissioners were officially opened.

* * *

C. E. Simon, of London, England, sales manager for the Swedish Machine Tool Makers Export Company, Limited, Stockholm, Sweden, has recently arrived in Canada for the purpose of studying industrial conditions and the advisability of establishing agencies in Canada and the United States for the different Swedish and English firms he represents. After spending a week or so in Montreal and Toronto Mr. Simon will visit the principal machine tool centers in the United States with the same object in view. It is possible that arrangements may be made for the manufacture of some of the lines in Canada or the States. The fundamental plan of the Swedish Machine Tool Makers Export Company is to facilitate the development of the specialties of each work. For this purpose a number of Swedish manufacturers made up an agreement between themselves regarding the machine types to be built and to unify the separate sales organizations in a joint sales office. The Export Company is no reseller, but an integral part of the different firms represented. The organization will handle the product of the following firms: Swenska Maskinverken, manufacturers of engine and screw cutting lathes, capstan and hexagon turret lathes, automatic machines, cutting off machines, milling and gear hobbing machines and drill presses; Kopings Mek. Verkstad, builders of engine gap, and face plate lathes, centering machines, hand and power milling machines (plain and universal), horizontal boring machines, sensitive and column drilling machines, open side planing machines, cutter and tool grinders; Munktells Mek. Verkstad, manufacturers of lathes, power presses, forging and drawing presses, screw presses, belt driven drop and pneumatic hammers; Lidkopings Mek. Verkstad, makers of lathes, boring mills, drill presses, planers and grinding machines; Atlas Diesel, manufacturers of vertical boring and turning machines, vertical milling machines and steam hammers. In addition to the Swedish lines here mentioned, Mr. Simon will represent the English firm of Thos. Ryder and Sons, Limited, of Bolton, manufacturers of multiple forging hammers; special machine tools for making piston rings and crankshafts for automobile, gas and oil engines, and shaker cranks for agricultural machinery, and high speed all-geared engine lathes.

# ATKINS
## METAL CUTTING SAWS




Solve your Metal Cutting problems, easily, quickly and economically, by adopting the products made by

# ATKINS

We make Kwik-Kut Power Hack Saw Machines which use practically the full cutting edge of the Hack Saw Blade at each stroke; Metal Cutting Band Saw Machines for general shop work, cutting all classes of metal up to 12 x 14 inches.

Your requirements for Metal Cutting Circular Saws can be supplied promptly and we solicit a trial of our "AAA" Non-Breakable and Power Hack Saw Blades and Frames.

*"A Better Saw for Every Use"*

## E. C. Atkins & Co.

Established 1857

*"The Sterling Quality Saw People"*

*Factory:* HAMILTON, ONT. *Branch:* VANCOUVER, B.C.

## THE FINEST ON EARTH




THE "FLU" Stayed out of this PLANT

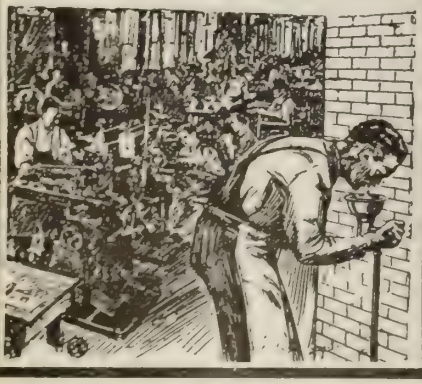
PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)

The only fountain with a bowl that prevents lips touching the bubbler paid its moderate cost over and over in all those well-ordered plants whose precautionary measures successfully barred the Spanish influenza. PURO saves lives, time and water. Write

**Puro Sanitary Drinking Fountain Co.**

888 F. St. Andre St., Montreal, P.Q., Canada



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Rubber Mill Machinery

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**Brantford Oven & Rack Co. Ltd.**

*Brantford, Canada*


## TURRET LATHE PRACTICE

"Turret Lathe Practice," by Joseph G. Horner, is the title of a recent book published by Emmott & Co., Ltd., 65 King street, Manchester, England. The English price of this book is 12s. 6d., and following are the chapters embodied in the book:

Chapter 1 is devoted to cycle of operations, tools, bar lathes, lathes for chuck work, and economy of turret work. Chapter 2 discusses such operations as centering, facing, pointing, box tools, steadies, hollow mills, solid and adjustable box tools, roller steadies, examples of taper turning, tools and appliances, and swing tools.

Chapter 3 takes up the selection of drills, methods of holding, holders and chucks, forms of drills, oil grooves, and flat drills. Chapter 4 discusses reaming, the causes of variations in size, floating reamer holders, use of pilots, clearances, grinding, expanding reamers, etc. Chapter 5 shows sample boring tools, boring bars, boring heads, and examples of work performed, this including taper work.

Chapter 6 covers the subject of screw cutting, methods employed, types of holders and die heads, taper threading dies, examples of work, etc. The next chapter shows varieties of cross slides and work accomplished on the cross slide, such as knurling, profiling, forming, necking and so on. Chapter 8 illustrates examples of tool equipment, while the next section is devoted to the capstan and turret details.

Chapter 10 covers the design of headstocks, going into adjustments of certain portions. The last chapter discusses collet chucks and wire feeds, this covering the functions and operations of such chucks, the use of false jaws, the air-operated collet, work held by interior , special designed jaws, roller feeds, geared feeds, etc., etc.

This book is carefully written, well illustrated by line drawings, showing considerable detail in the construction of the various parts, and should prove of value to those interested in turret lathe work.

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# Trade Gossip

**Rail Order.**—The Algoma Steel Corporation has received an order from the Dominion Government for 50,000 tons of rails for the Canadian National Railways. It will require about two months to complete the work and the plant at Sault Ste. Marie is in full operation on the contract. Two thousand men are at work.

**A Big Undertaking.**—Charles Evans Fowler, engineer in charge of the proposed international bridge connecting Windsor and Detroit, stated that he is now preparing to award contracts, and he expects actual work will begin within six months. Operations will be started on Detroit side first. The Windsor terminal will be located at the extreme easterly end of the town of Sandwich. The construction, which is expected to take six years to build, and an amount of money bordering on fifty million dollars, will be of cable suspension type with a single span 1,800 feet long stretching from shore to shore, with a clearance of 110 feet for vessels.

**Secure United States Work.**—In competition with eight other elevator companies, the Fegles Construction Co., the only Canadian firm tendering, received the contract for the construction of an eighteen hundred thousand bushel elevator in Brooklyn, N.Y. The elevator will be known as the Barge Canal Terminals at Gowanus Bay, Borough of Brooklyn, the contract being $1,500,000. The terminals are to consist of fifty-four concrete tanks, a boiler house and power house, together with installation of machinery, the whole to be completed in every detail and ready for occupation by September 1, 1922.

**That Wage Cut.**—With reference to the 20 per cent. wage cut by the United States Steel Corporation, Ben I. Davis, journal manager of the union, stated that the wages of the men were based entirely on the selling price of products Several wage reductions, the manager said, have been experienced during the past six months by reason of a falling market and the consequent decline in the selling price of iron, steel and sheet metal goods. He spoke of how steel puddlers a few months ago received $18 per ton, whereas recent wage cuts had reduced that figure to $13.67 per ton This is the first time since 1904 that the wages have been cut and the second time in its history.

**Build in Canada.**—The English Electric Co. has announced its intention of extending operations to Canada, and it is understood that they will erect factories in Toronto for the manufacture of electrical machinery and equipment The company, which is said to be the largest firm of its kind in the British Empire, and one of the most powerful industrial enterprises in the world, includes among its directorate Sir John Mansell, Lord Meston and representatives of John Brown & Co., Cammell Laird & Co., Thomas Firth & Sons, and Harland and Wolff. M. Gordon F. Perry president of the National Iron Corporation, Toronto, has been appointed chairman of the Canadian board.

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The Anglin-Norcross, Ltd., of Montreal, have received the contract for the construction of the live stock arena at the Exhibition Grounds, Toronto. The firm's tender was for $892,000, which was the lowest tender received. The building must be finished by November 1, 1921.

### NEW CATALOGUES

Those interested in any of the catalogues described below can procure a copy of the same by writing direct to these firms. Mention that you noticed this in Canadian Machinery.

### BOOK ON CONCRETE

The Truscon Laboratories, Detroit, Michigan, have issued a technical booklet, to be known as their pamphlet No. 8. In this booklet is a discussion of why concrete requires waterproofing, and the properties that an integral waterproofing must possess to operate effectively with the natural properties of concrete. To anyone handling concrete this book should be of interest.

### NEW BULLETIN

The Wayne Oil Tank and Pump Co., Fort Wayne, Indiana, have issued their bulletin No. 2500, which contains some very interesting information regarding the burning of fuel oil and the equipment necessary to burn various oils. The advantages of fuel oil are given, also comparative costs with other fuels. Labor costs are also stated, and a general summary completes the first portion of the bulletin.

From then on the oil burning system, its installation, equipment necessary, etc., etc., are given, a table being included showing the types of furnaces used for various kinds of work. Numerous other tables are also given, and the bulletin should be of special interest to manufacturers in general.

### METAL STATISTICS

The American Metal Market and Daily Iron and Steel Report, 81 Fulton St., New York, have placed on the market their 1921 edition of Metal Statistics, one of the handiest records of market tendencies and prices that could be secured. The information is put together in the form of tables that are easily followed. The book is generally accepted as the standard for market references. It is a valuable help to one who has cause to refer frequently to prices current in any line of iron, steel, or non-ferrous metals.

### SAFETY PANELS AND CABINETS

The Crouse Hinds Co., of Canada, Ltd., Toronto, have a bulletin No. 1D. which covers their line of safety panels and cabinets. This takes up the general specifications, the steel trims, and various types of safety panels. To those interested this booklet should prove of service.

### RADIAL DRILL CATALOGUE

The Western Machine Tool Works, Holland, Mich., have issued their catalogue No. 21 dealing with their line of low hung drive plain and universal radial drills. This book includes both the plain and full universal type of drills, and the various units going to make up these machines are discussed in detail. Specifications on all machines are included.

### OIL ENGINE CATALOGUE

The Ker & Goodwin Machinery Co., Brantford, Ont., have issued a booklet on their Hvid type of oil engines. A detailed description of these engines is given, also instructions on how they are operated. Instructions for adjusting the engine are also given, in fact the book is a regular operator's guide as well as a general bulletin on the engine itself.

### WRENCH BOOK

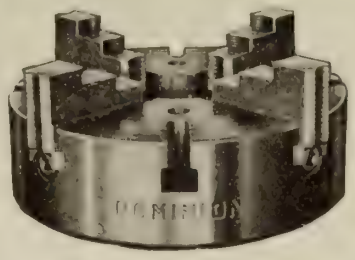
J. H. Williams & Co., Brooklyn, have issued a booklet taken in part from their seventeenth catalogue edition. This booklet covers various styles of wrenches for engineers, textile workers, and machinists in general. Socket wrenches, "S" wrenches, and pin and face spanners are included. Various complete wrench sets are also shown.

### TRANSACTIONS AND YEAR BOOK

The University of Toronto Engineering Society have again issued their transactions and year book. This is the first publication of the society since the last issue of applied science in 1916, and the volume now issued contains many items of interest. Various papers in all branches of engineering are reproduced, and the latter portion of the book deals with University matters.

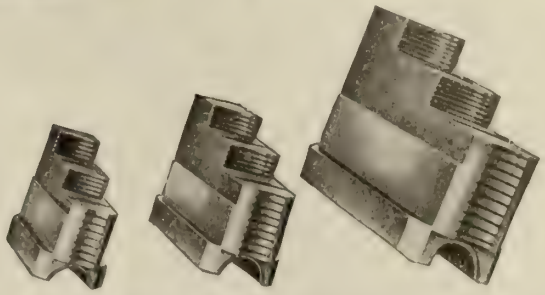
### BOOK ON COUNTING MACHINES

The Root Co., Bristol, Conn., have compiled and issued a book called "The Census Takers of Industry." It covers various suggestions and illustrates the versatility of automatic counting machines, showing how they remove the human element from counting operations.

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BUILT FOR HEAVY DUTY



The Jaws Are Extra Strong

THEY are drop forgings, made of best quality steel, heat-treated and hardened. The threaded portion of jaws form a half nut for the setting-up screws. Have stood the test of heavy duty work in our own shops where accuracy was the only accepted standard.

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*Engineers • Manufacturers*
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3

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*Consulting and Designing* Tools, Jigs, Fixtures and Special Machinery. Let us shoulder your problems.
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WANTED — DRAUGHTSMEN HAVING EXperience on transformers and motors. Apply, stating qualifications and salary expected, to Canadian Crocker-Wheeler Co., Ltd., St. Catharines, Ont. (cfm)

WANTED — EXPERIENCED OPERATOR FOR Brown hoist locomotive crane. York Sand & Gravel, Gerrard and Victoria Park Ave., Toronto. (cfm)

WANTED—FIRST-CLASS ENGRAVER—STEEL die and copper plate; send samples. Stovel Company, Ltd., Winnipeg. (cfm)

WANTED GOOD MAN FOR AUTOMOBILE repair shop; must be experienced in all lines and able to turn out good work; steady job to the right man. Box 710G, Canadian Machinery. (cfm)

WANTED—TWO LATHE HANDS AND ONE general machinist; single men preferred. Apply by mail only, giving references and wages expected. Barnard Machinery Company, Brighton, Ont. (cfm)

## MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

## MACHINE WORK WANTED

We are equipped to handle all kinds of general or special machine work. All operations in our plant are done under the most careful supervision and we can satisfy you as to price. Always available for consultation.

**PERFECT MACHINE COMPANY. GALT**
Builders of Reliable Machinery.

## Modern Marine Machinery

Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

PARTIAL LIST

## Machine Shop Equipment

*At Extremely Low Prices*

LATHES—All sizes and lengths of bed. Special price quoted on rebuilt 20 in. x 8 ft. C.M.C.

AIR COMPRESSOR—8 in. x 8 in. Chicago Pneumatic.

TANKS—10 Tanks 10 ft. 6 in. diam. x 29 ft. 6 in. long. 19,000 gals.
3 Tanks, 10 ft. 0 in. diam. x 39 ft. 0 in. long, 3/8 in. Heads. 22,893 gals.
Full line of other Steel Storage Tanks, open and closed, all sizes.

PUMPS—1 Triplex Power Pump, 11½ in. x 6 in. Hydraulic Machy. Co. Also 1 in. x 5 in. West Tire Setter.
1—Centrifugal Pump, 2½ in. x 1½ in. Gould.
1—Gould Triplex Power Pump, 2 in. x 3 in.

Milling Cutters and Reamers, full assortment, all sizes and shapes, at less than half price. Send us your enquiries.

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Main 2286 MONTREAL
(20)

Phone Park. 3550

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GENERAL MACHINE WORK
Turret Lathe and Automatic Screw Machine a Specialty. Let us quote on your work.
*With:* Garlock, Walker Machinery Co.
163 Dufferin Street.

## Used Belting, Pulleys, Etc.

We carry right in stock a large quantity of used Belting, Pulleys, Hangers, Shafting, etc., in good condition, which we sell at half the price of new. Inquiries solicited. In writing mention sizes wanted. L. S. Tarshis & Sons, 92 Wellington St., Montreal.

## ANNOUNCEMENT

The Electric Motor and Machinery Co., Ltd., 64 Wellington Street West, Toronto, Ontario, wish to announce the commencement of their sales agency for the
**Howell Red-Band Motors Ltd.,**
makers of **"the Guaranteed Motor."**
(c19m)

## CLOSING TIME

Condensed advertisements for this section must be in our composing room Tuesday morning prior to day of issue. Display advertisements for this section must be in Monday afternoon.

In order that the announcements of your wants, machinery for sale, etc., etc., shall not be delayed, please try to have them in our office with the Tuesday morning mail.

**Canadian Machinery**

## Grey Iron Castings

Light and Medium-Bench and Floor Repetition Castings; Capacity 15 tons per day.
Expert Metal and Wood Pattern Work. Our advice and estimates will save you money.
Semi-finishing operations on Lathe or Grill on Castings supplied if required.
ASK US.
**THE KATIE FOUNDRY, GALT, ONT.**

## REGO WELDING *and* CUTTING APPARATUS

Oxygen, Acetylene, and a complete line of Welding and Cutting Supplies.

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of Toronto, Limited
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TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (otfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

## BUSINESS CHANCES

WANTED—BY AN ESTABLISHED CONCERN. Twelve to fifteen thousand dollars for a period of from one to three years, to take care of business expansion. This concern will stand the fullest investigation. 8% is offered with ample security to principals only, with an opportunity of becoming permanent associates with the partners, if mutually satisfied. Box 767, Canadian Machinery. (ctfm)

## FOR SALE

ELECTRIC STORAGE BATTERY LOCOMOtives for sale. Two. 36-inch gauge. Complete and in good condition. R. T. Gilman & Company, Dept. "E," 211 McGill Street, Montreal. (ctfm)

## Used Machinery For Sale

1—No. 11 Brown & Sharpe Plain Grinder.
1—No. 70 Heald Internal Grinder.
1—No. 2A Warner & Swasey Turret Lathe.
1—18″ x 8′ Mueller Lathe.
1—24″ x 48″ x 19′ C.M.C. Gap Lathe.
1—26″ x 48″ x 12′ McCabe Double Spindle Lathe.
**CHARLES P. ARCHIBALD & CO.,**
285 Beaver Hall Hill - - MONTREAL
(52)

Machine Shop and Foundry for sale, St. Catharines, Ont. In the centre of the Welland Ship Canal and Hydro activities. Going concern capable of handling all classes of work. Turnover $60,000 a year. Good reasons for selling. Box 777, Canadian Machinery. (c5m)

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**COTTON WASTE**
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*Prices on application*

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We have for sale the following

## Small Sized A.C. Generators

### 3 Phase, 60 Cycle

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| 15 | 2300 | Ft. Wayne | .... |
| KVA 20 | 2300 | Fairbanks-Morse | 1800 |
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| KVA 30 | 2300 | Fairbanks-Morse | 1200 |
| KVA 35 | 2300 | Allis-Chalmers | 1200 |
| 37½ | 2300 | Westinghouse | 1200 |
| 42 | 2300 | Electrical Machinery | 1200 |
| 45 | 1150 | General Electric | 1200 |
| 50 | 550 | Crocker-Wheeler | 1200 |
| 50 | 2300 | Fairbanks-Morse | 300 |
| 50 | 2300 | General Electric | 900 |
| 60 | 2200 | Warren | 600 |
| KVA 60 | 2300 | Electrical Machinery | 900 |

**MacGOVERN & COMPANY, INC.**

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Offices: New York, Pittsburgh, Seattle. Plant: Linden, N.J.

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## MOTORS FOR SALE

60 Cycles, 1 Phase, 110 Volts, Second-hand.

3—½ h.p. 1200 rev., clutch type, T.H.E.
1—1 h.p. 1800 rev., split phase, Peerless.
1—Electric Hoist, 550 volt, 25 cycle, 3 phase, 1,000 lbs. capacity. New.

NEW SINGLE PHASE MOTORS IN STOCK

**Repulsion.**

2—2 h.p. Peerless, 110/220 volt, 25 cycle, 1500 rev.
2—2 h.p. Wagner, 110/220 volt, 25 cycle, 1500 rev.
3—1 h.p. Peerless, 110/220 volt, 25 cycle, 1500 rev.
3—1 h.p. Wagner, 110/220 volt, 25 cycle, 1500 rev.
7—½ h.p. Peerless, 110/220 volt, 25 cycle, 1500 rev.
5—½ h.p. Wagner, 110/220 volt, 25 cycle, 1500 rev.
1—1 h.p. Wagner, 110/220 volt, 60 cycle, 1800 rev.
1—1 h.p. Westinghouse, 110/220 volt, 60 cycle, 1800 rev.
4—½ h.p. Wagner, 110/220 volt, 60 cycle, 1800 rev.

**Split Phase**

2—1 h.p. St. Louis, 110 volt, 60 cycle, 1800 rev.
2—½ h.p. Menominee, 110 volt, 60 cycle, 1800 rev.
4—¼ h.p. Menominee, 110 volt, 60 cycle, 1800 rev.
4—¼ h.p. Ohio, 110 volt, 60 cycle, 1800 rev.
4—⅛ h.p. Menominee, 110 volt, 25 cycle, 1500 rev.

**Box 778N, Canadian Machinery**

## STOP

I am offering this exceptional selection of high-grade re-built tools at special prices. They are all equal to new machines and are priced low enough to warrant your sending me your inquiries for any of them that you are in the market for at the present time or expect to be.

**26 x 12 C.M.C., 3-step cone, D.B.G., Q.C.G.**
**24 x 12 Rahn Larmon, 3-step cone, S.B.G., S.Q.C.**
**22 x 10 Devenport, 3-step cone, D.B.G., Q.C.G.**
**22 x 10 Reed, 3-step cone, S.B.G., S.Q.C.**
**22 x 10 Hamilton, 3-step cone, D.B.G., S.Q.C.**
**22 x 10 Milwaukee, 3-step cone, D.B.G., S.Q.C.**
**21 x 10 Sidney, 3-step cone, D.B.G., Q.C.G.**
**21 x 8 LeBlond, 3-step cone, D.B.G., Q.C.G.**
**20 x 10 Walcott, 3-step cone, D.B.G., Q.C.G.**
**16 x 10 Greaves Klausman, 3-step cone, D.B.G., Q.C.G.**
**18 x 8 Mueller, 3-step cone, D.B.G., Q.C.G.**
**17 x 8 Sidney, 3-step cone, D.B.G., Q.C.G.**
**No. 2 Garvin Milling Machine, complete.**
**No. 4 Greenard Arbor Press.**
**24″ Cincinnati Shaper.**
**16″ Walcott, back geared, complete.**

The above is only a partial list, let me have your inquiries. Anything not listed ask for it. I have it.

I am offering a full line of British make new milling machines, plain and universal. They are equal to number two's and are complete with dividing heads, vertical attachments and pump. Let me tell you about them because you cannot beat them at the price.

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6 ft. used Bertram Plain Radial Drill with Speed Box.

42 x 36 x 14 ft. used Bertram Planer arranged for Motor Drive.

24 x 14 x 20 ft. C.M.C. used Gap Lathe.

**Machines in first-class condition, at greatly reduced prices, subject to prior sale.**

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**Prospective buyers of machine tools will find in our list of slightly used and rebuilt machines many items that will interest them.**

**Our present stock for immediate delivery is one of the largest in Canada.**

**Send us your enquiries.**

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1—30" x 12' "Blaisdell" (used).
1—30" x 14' "Niles-Bement-Pond" (used).
1—26" x 14' Niles-Bement-Pond, 2 C.G., (used.
1—24" x 10' "Milwaukee" (new).
1—18" x 8' Rae, Q.C.G. (new).
1—16" x 6' Reed, Q.C.G. (used).
1—12" x 8' "LeBlond" Tool Room (used).
1—12" x 6' Worcester, Q.C.G. (used).
1—8" "Rivett" with Cabinet, several attachments, (used).
1—7" Cataract Precision, several attachments (used).

### GAP LATHES

1—38" x 54" x 12' Bertram (used).
1—22" x 40" x 16' McDougall (used).
1—21" x 30" x 7' South Bend.
1—20" x 38" x 12' C.M.C. (used).

### TURRET LATHES

No. 4 Millhollands, capacity 1⅝" (used). Several Davis and other makes. Various capacities.

### SHAPERS

1—16" "MacKenzie" B.G. Crank Shaper, (new).
1—16" "Rae" B.G. Crank Shaper (slightly used).
1—24" "McGregor-Gurley" B.G. Crank Shaper (used).

### PLANERS

1—42" x 42" x 20' Putnam, 1 head (used).
1—30" x 30" x 10' Pond, 1 head (used).
1—24" x 24" x 6' Powell, 1 head (new).

### MILLING MACHINES

1—Briggs High Duty, Type "A," 22" Traverse (new).
1—Briggs High Duty, Type "B," 42" Traverse (new).
1—Whitney Hand Miller, 18" x 6" table (used).
1—No. 3 Ford-Smith Plain (used).
1—No. 3 Ford-Smith Universal (used).
1—No. 4 Cincinnati Plain (used).

### DRILLS

1—10" Burke Sensitive (Bench type) (new)
1—16" No. 2B Edlund H.S. Sensitive (new)
20" "Sibley," "Champions," "Rockwell" and "Silver" (new) and (used).
1—36" C.M.C. Heavy Duty (used).
1—3-spindle 20" Silver Gang Drill (used).
3—4-spindle W. & R. Sensitive (cap. ½") (used).

### BORING MACHINES

1—66" Bement-Niles Vertical, 2 heads, 24" under rail (used).
1—Universal No. 2½ Horizontal Table, 42" x 22" (used).
1—Bullard "New Era" Vertical Turret, 36", complete equipment (new).

### POWER HACK SAWS

1—No. 10 Racine 8" x 8" Cap. (new).
1—No. 7 Watkins 9" Cap., 18" Blade (used).
1—No. 1, 6" x 6" Racine (used).
1—No. 3 Robertson 6" x 6" (used).

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1—8" x 8" Sullivan, Class W.G.-3, Belt driven (used).
1—8 x 10 x 8 Bury, Steam driven (used).
1—12" x 18" Ingersoll-Sargent, belt drive (used).
1—12" x 12" Can. Ingersoll Rand NE-1 (used).

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1—Landis No. 4 Universal (used).
1—Landis Plain, self-contained, 36" x 12" (used).
1—Fitchburg Cylindrical, 8" x 36" (new).
Several Tool and Cutter Grinders (new) and (used). "Globe," "Stevens," "LeBlond" and "Cincinnati."

### MISCELLANEOUS

2—No. 4 Jno. Hall Pipe Machines (1 used) (1 new).
1—Lennox Rotary Bevel Shear, 1" Cap. (new).
1—"High Speed" Riveting Hammer, No. 3A (used).
1—Beaudry Champion Power Hammer, No. 9 (used).
1—"Grant" Rivet Spinning Machine, No. 80A, (new).
1—"Grant" Rivet Spinning Machine, No. 80B, (used).
1—Arbor Press, No. 4 "Greenerd" (new).

**ALSO EVERYTHING IN WOODWORKING MACHINERY.**

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### VERTICAL BORING MILLS

2—36" London Machine Tool
1—42" Bullard
1—44" Bertram

### HORIZONTAL BORING MILLS

1—4" Bar, Beaman & Smith, Floor Type
2—4" Bar, Bertram, Elevating Table
1—8" Bar, Barnett, Cylinder Boring
1—8" x 7' Canada Foundry Co. Boring Bar

### BOLT AND NUT MACHINERY

1—2-Spindle Nut Tapper, ½"
1—½ to 2" Bolt Cutter
1—¾" National Nut Forging Machine
1—1½" Acme Bolt Header and Forging Machine
1—4 Spindle Bertram Nut Tapper
1—Blake & Johnson Thread Rolling Machine
1—¼ x ½" Pawtucket Cold Nut Press

### BLOWERS

1—No. 4 Roots Pressure Blower
2—57 Cu. Ft. Connersville Blowers
1—No. 10 Canadian Blower & Forge Co. Blower
1—No. 6 Sturtevant Blower

### DRILLING MACHINES

1—12" Perfect Sensitive
1—14" Excelsior Sensitive
1—0 to ½" Cap. Universal Sensitive
1—20" Prentice Geared Plain, Lever Feed
1—20" Bertram, Swing Head, B.G., P.F.
1—25" Barnes, Standard Head, B.G., P.F.
2—20" Style F, Belt
1—" Gang Radial
1—" Western Radial
1—" Western Radial
1—" Bickford Plain Universal Radial
1—" London Steel Universal Radial
1—2" MacGregor Geared Plain Radial
1—" MacGregor Gang-Head Radial
1—" Sensitive Gang Multiple Spindle
1—" MacGregor Gang Multiple Spindle Countersinking

### GRINDERS

1—" MacGregor Plain Universal Grinder, Bench Type, Wet Stone
1—" London Plain Universal Grinder
1—6" London Pedal Rear Center Magazine Type
1—10" Cincinnati Universal Tool Room Grinder
1—12" Pratt & Whitney Vise
1—" Universal Tool Grinder
1—" Walker Universal Tool and Cutter Grinder

### LATHES

1—Brown & Sharpe Bench Lathe
2—12 x 5 W. F. Davis
2—14" x 5' Berring
1—14" x 6' Morgan
2—14" x 6' Porter
2—15" x 8' Le Blond
2—16" x 6' Canada Office
1—16" x 6' MacGregor Gourlay
1—16" x 6' F. E. Reed
1—16" x 6' Le Blond
1—16" x 8' Cleveland
1—16" x 8' Lodge & Shipley
1—18" x 6' Cincinnati
1—18" x 12' Porter
1—18" x 12' Bertram
1—18" x 8' Bertram
1—18" x 10' Stevens Hamilton
1—20" x 8' MacGregor-Gourlay
1—20" x 10' MacGregor-Gourlay
1—20" x 10' Canada Machinery Corporation
1—20" x 10' Bertram
1—20" x 10' London
1—20" x 10' Boye & Emmes
1—20" x 10' Whitcomb-Blaisdell
1—22" x 8' Bertram
1—24" x 10' Bertram
1—24" x 12' London
1—24" x 12' Schumacher & Boye
1—24" x 20' Stevens Hamilton
1—26" x 12' Fitchburg
1—26" x 16' Bertram
1—26" x 18' Bullard
1—28" x 10' Pond
1—40" x 18' London
1—20" x 34" x 10' London Gap
1—18" London Fox Turret
1—14" Bertram Fox Turret
6—1½" Wood Tilted Turrets
3—No. 4 Bardons & Oliver Turrets
3—1¾" National Acme Turrets
1—1" Pratt & Whitney Turret
8—6A Potter & Johnson
5—16" Bawden Single Purpose
1—106" Bertram Locomotive Wheel
1—Bertram Axle Turning

### MILLING MACHINES

1—No. 00 Brown & Sharpe, Bench
1—No. 3 Hendey Universal
1—No. 2 London Plain
1—No. 13 Brainard Universal
1—No. 3 Bertram Plain
1—Brown & Sharpe Plain
1—24" Bertram Slab Miller, Planer Type
1—40" Bertram Slab
1—42" Newton Vertical
1—54" Newton Slab

### METAL PLANERS

1—24" x 24" x 6' London
1—30" x 30" x 10' London
1—30" x 36" x 8' Bertram
1—48" x 48" x 14' Stark
1—87" x 90" x 16' London
1—106" x 84" x 28' Bertram
1—40" x 40" x 10' Bertram

### SHAPERS

1—14" Bertram Traverse, Double Table
1—16" T. W. Hand Traverse
1—16" Broadbent Traverse
1—15" Smith & Mills Plain
1—20" Hendey
1—24" Morton Draw Cut
1—30" Morton Draw Cut

### STEEL PLATE MACHINERY

1—18' Niles Plate Planer
1—40" Bertram Rotary Planer on Turntable
1—27" Allis-Chalmers Bending Rolls, Capacity 1¼" Plate
1—9' 6" Bertram Straightening Rolls, Capacity 1" Plate
1—8' Smith Bros. Straightening Rolls, Capacity 1" Plate
1—7' Rushworth, Straightening Rolls, Capacity ½" Plate

### PUNCHES AND SHEARS AND BENDERS

1—Cleveland Beam Punch and Coping Machine, 24" Beams
1—Bertram Double End, 32" Throat, Capacity 1" x 1"
1—Long & Alstatter Bending Machine, Capacity 15" Beams and Channels
1—Bertram Beam Coping Punch, Capacity 24" Beams
1—No. 2 Bertram, Double End, 30" Throat, Capacity 1" x ⅜"
1—Corbett, Double End, 24" Throat, Capacity ½" x ½"
1—Long & Alstatter, Double End, 18" Throat, Capacity ¾" x 1"
1—Smith Bros. Double End, 30" Throat, Capacity 1" x 1"
1—Canada Machinery Corporation, Single End, 50" Throat, Cap. 1" x 1"
1—Bertram Angle Shear, Capacity 8" x 8"
1—Hilles & Jones Splitting Shear, Capacity 1"
1—Pells T40 Beam Shear, Capacity 15" Beam and Channels
1—Canada Machinery Corporation, 60" Gate Shear, Capacity 1"
1—Wangler Rotary Shear, Capacity ¾"
1—No. 2 Cleveland Bending Machine, Capacity 24" Beams
1—Cleveland Horizontal Punch, Capacity 1¼" x 1"

### PRESSES

4—No. 666 Toledo Knuckle Joint
5—No. 855 Toledo Rack and Pinion
8—No. 857 Toledo Rack and Pinion
2—No. 114 Toledo Semi-Auto. Reducing
1—No. 45 Bliss, Straight Side, Geared
1—No. 68N Bliss
1—No. 57½ Toledo
1—No. 166 Pawtucket
1—No. 172 Pawtucket
1—200-Ton Pneumatic Forcing Press, 36" x 36" Platen

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**King and Simcoe Sts., TORONTO, ONT.**

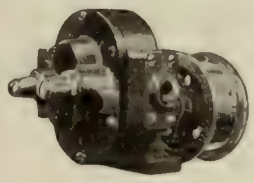
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TRAHERN
REG. U. S. PAT. OFF.



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Throw heavy, non-pulsating streams of water, oil or compound against 100 lbs. pressure if necessary. They reverse automatically with machines and supply is controlled at discharge. Will attach to any machine. No loss of prime.

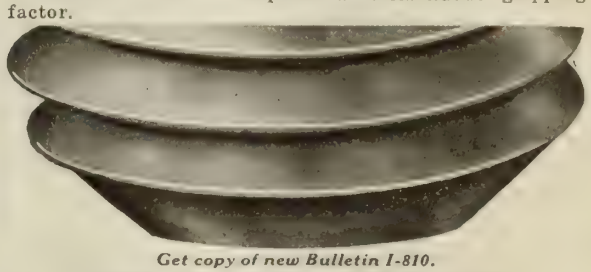
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The distinctive dove-tail slots or flutes of the "Bristo" safety set screw are one of the features which put "Bristo" in a class by itself. "Mushrooming," for instance, is impossible, and splitting or cracking have been removed from the list of your manufacturing worries. As the wrench turns, the unique "Bristo" design contracts the screw; on releasing the pressure the screw tends to expand—a tremendous gripping factor.



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Modern plant and thorough knowledge of requirements of belting guarantees perfect satisfaction to all buyers. Our belts are the result of using best leather, and our 57 year's experience.

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Limited
Montreal Toronto Winnipeg



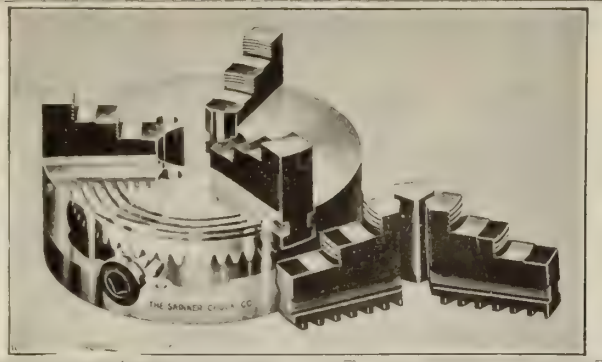

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T.M.



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**Geared Scroll Type**

The ideal chuck for repetition work. It insures a powerful grip. The jaws operating universally can be tightened by applying the wrench to any single pinion. For general manufacturing purposes the Skinner Geared Scroll Chuck has no equal.

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Made in Canada

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*QUALITY GUARANTEED*

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ESTABLISHED 1860



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## PRODUCTION MANAGERS

**The following advantages are secured by the Continuous Method of Heat-Treatment :**

Increased production per unit of floor space.
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Oxy-acetylene welding and cutting equipment and apparatus.

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Drillers and Auxiliary Drilling Heads
Produce exact work in record time.

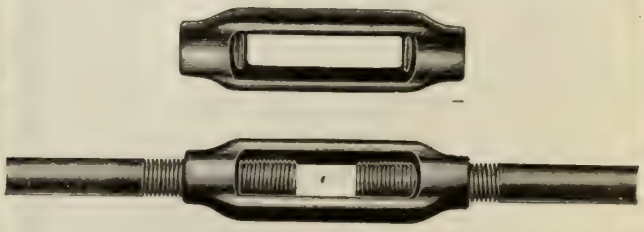
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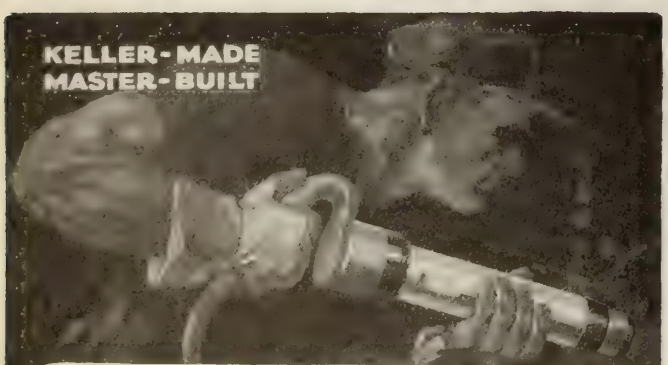
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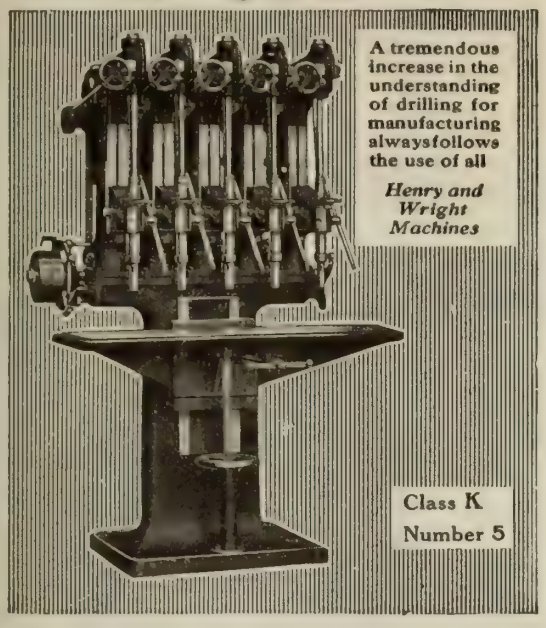




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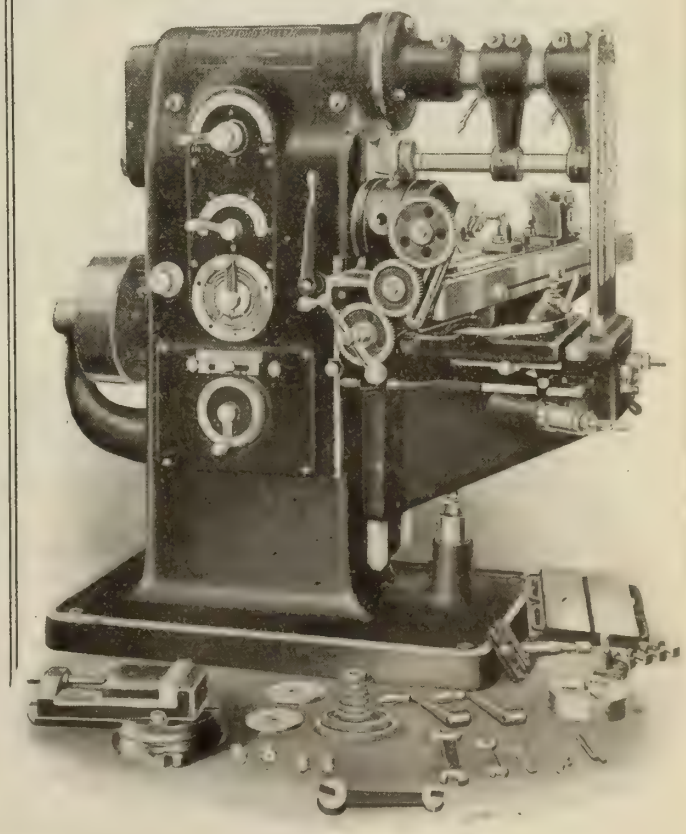
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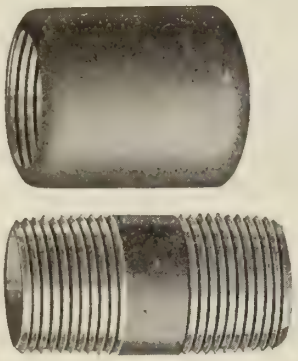
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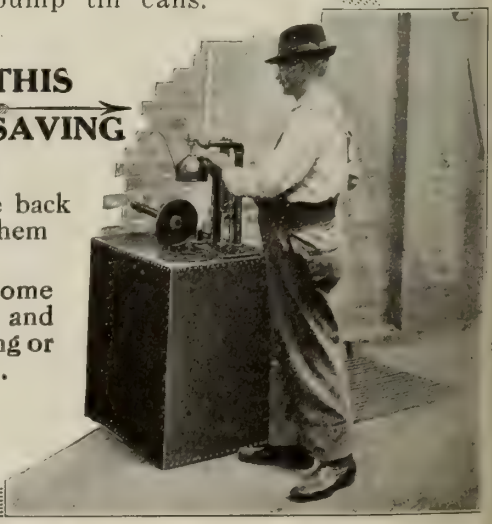
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**Bars, Steel**
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Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
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Steel Co. of Canada, Ltd., Hamilton, Ont.
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Federal Eng'r'ng Co., Ltd., Toronto, Ont
Graton & Knight Mfg. Co., Worcester, Mass.
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**Belt Lacing, Steel**
Flexible Steel Lacing Co., Chicago, Ill.

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Can. Fairbanks-Morse Co., Ltd., Montreal
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Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
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McLaren Belting Co., J. C., Montreal, Que.
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Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Smith Belting Co., Toronto, Ont.
Sumner & Co., New York City.
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Gutta Percha & Rubber, Toronto, Ont.
Quaker City Rubber Co., Philadelphia, Pa.

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**Benches, Work**
Aikenhead Hardware Ltd., Toronto, Ont.

**Bending Machines, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bertrams Ltd., Edinburgh, Scotland.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co Toronto, Ont
Williams Machinery Co., A. R., Toronto, Ont.

**Bins, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Blocks**
Ford Chain Block Co., Philadelphia, Pa
Wright Mfg. Co., Lisbon, Ohio

**Blocks, Chain (See Hoists, Hand)**
Aikenhead Hardware Ltd., Toronto, Ont
Can. Fairbanks-Morse Co., Ltd., Montreal.
Ford Chain Block Co., Philadelphia, Pa.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio

**Blocks, Die**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dom Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont
Swedish Crucible Steel Co of Canada, Ltd., Windsor, Ont.

**Blocks, Pillow**
Can. Link-Belt Co., Toronto, Ont.

**Blowers**
Can. Blower & Forge Co., Ltd., Kitchener.
General Combustion Co. of Can., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Sturtevant Co., B. F., Boston, Mass

**Bolt and Nut Machinery**
Acme Machinery Co., Cleveland, Ohio
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Bolt and Nut Machinery, Automatic**
National Acme Co., Cleveland, Ohio.

**Bolts and Nuts**
London Bolt & Hinge Works, London, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio
N. S. Steel Co., Ltd., New Glasgow, N.S.
Petrie, Ltd., H. W., Toronto, Ont
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Bolt Threading Die Heads**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa

**Boosters**
Sturtevant Co., B. F., Boston, Mass

**Boring and Turning Mills, Vertical**
Armstrong-Whitworth of Canada, Ltd Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.

**Boring, Drilling and Milling Machines, Horizontal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy. Co., Toronto, Ont
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa

**Boring, Drilling and Milling Mach., Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy. Co., Toronto, Ont
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich
Petrie, Ltd., H. W., Toronto, Ont

**Boring Heads**
Aikenhead Hardware Ltd., Toronto, Ont

**Boring Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill
Gisholt Machine Co., Madison, Wis.

**Brakes, Magnetic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Brass**
Brown's Copper & Brass Rolling Mills Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Brass Valves**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass

**Brass Pipe Fittings**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass

**Bricks, Fire**
Elk Firebrick Co of Can., Ltd., Hamilton, Ont.

**Bridges**
Hamilton Bridge Works Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que

**Broaching Machines**
Bilton Machine Co., Bridgeport, Conn
Garlock-Walker Mchy. Co., Toronto, Ont

**Bronze**
Brown's Copper & Brass Rolling Mills Ltd., Toronto, Ont
Walker & Sons Metal Products, Ltd Hiram, Walkerville, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bronze, Phosphor**
British Smelting & Refining Co Ltd Montreal, Que
Canada Metal Co., Ltd., Toronto, Ont
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bucket Carriers, Pivoted**
Can Link-Belt Co., Toronto, Ont

**Buffing or Polishing Machines (See Polishing and Buffing Machines)**
Blount Co., J. G., Everett, Mass
Carr Hanson & Van Winkle Co., Ltd., Toronto, Ont
Ford-Smith Machine Co., Hamilton, Ont
Petrie Ltd., H. W., Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O

**Bulldozers**
Bertram & Son Co., Ltd., The John Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont

**Burners, Oil and Gas**
General Combustion Co. of Can., Ltd., Montreal, Que.
Bu[illegible] Co., W. S., New York City

**Bushings**
Fisher Motor Co., Ltd., Orillia, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Cabinets, Oil**
S. F. Bowser & Co., Ltd., Toronto, Ont.

**Calipers**
Brown & Sharpe Mfg. Co., Providence, R.I
Starrett Co., L. S., Athol, Mass

**Cams**
Canada Foundries & Forgings Co., Welland, Ont

**Can-Making Machinery (See Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y
Brown, Boggs & Co., Ltd., Hamilton, Ont
MacKinnon Steel Co., Sherbrooke, Que.

# BUYERS' DIRECTORY

Union Carbide Co. of Can., Ltd., Welland, Ont.

**Cars, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Castings, Aluminum**
Canada Electric Castings Co., Ltd., Orillia
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Brass and Bronze**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Copper**
Can. Hanson & Van Winkle Co., Toronto, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Marine**
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Castings, Die Molded**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Ferro-Alloy**
Can. Steel Foundries, Montreal, Que

**Castings, Iron**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Hyd. Press**
Can. Steel Foundries, Montreal, Que.

**Castings, Monel Metal**
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

**Castings, Naval Bronze**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Nichrome**
Can. Driver-Harris Co., Walkerville, Ont.

**Castings, Nickel**
Can. Hanson & Van Winkle Co., Toronto, Ont.

**Castings, Semi-Steel**
Davidson Mfg. Co., Thos., Montreal, Que.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

**Castings, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

**Cements, Iron**
Smooth Mfg. Co., Jersey City, N.J.

**Centering Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Chains (See Sprockets and Chains)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chains, Driving**
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chasers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chemists**
Toronto Testing Laboratory, Toronto, Ont.

**Chucking Machines**
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Chucks, Drill**
Jacobs Mfg. Co., Hartford, Conn.

**Chucks, Drill and Tap**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Lathe**
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Dom Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo F., Montreal, Que
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Magnetic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**
Columbia Hdwe. Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

**Cleaners, Metal, Waste, General**
Oakley Chemical Co., New York, N.Y.

**Clocks, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Clutches, Friction**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**
Can. Link-Belt Co., Toronto, Ont

**Cocks and Faucets**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Collars, Shaft or Set**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

**Collets**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compressors, Air**
Curtis Pneumatic Machinery Co., St Louis, Mo.

**Compressors, Air and Gas**
Can. Fairbanks-Morse Co., Ltd., Montreal
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**
Ford-Smith Machine Co., Hamilton, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Conveyor Belt Joiners**
Flexible Steel Lacing Co., Chicago, Ill.

**Copper**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Cored Bronze Bars**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Cotter Pins**
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Counterbores**
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Countershafts**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Couplers, Car and Locomotive**
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Couplings, Flexible**
Holden Co., Ltd., Montreal, Que.

**Couplings, Rigid**
Bernard Industrial Co., A., Fortierville, Que.

**Couplings, Shaft**
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

**Cranes, Electric**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.

**Cranes, Hand (See Hoists, Hand)**
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

**Cranes, Locomotive**
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Cranes, Traveling**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Crank Pin Turning Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont
Underwood Corp., H. B., Philadelphia, Pa.

**Cutters, Flue**
Holden Co., Ltd., Montreal, Que.

**Cutters, Gear**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Milling**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Machine Co., Cleveland.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.

**Cutters, Stay Bolt**
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Thread**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa

**Cutting-Off Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Cutting-Off Machines, Pipe (See Pipe Cutting and Threading Machines)**
Landis Machine Co., Inc., Waynesboro, Pa.
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Cutting-Off Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Pilot Steel & Tool Co., Montreal, Que.

**Cutting Oil Filters (See Oil Filtering Systems)**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Cataract Refining Co., Toronto, Ont.

**Cutting, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

**Cutting, Oxy-Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Dealers, Machinery (See Searchlight Section)**
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Deckle Straps**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Diamonds, Black and Rough**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond, Carbon and Bortz**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Desmond-Stephan Co., Hamilton, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Wheel Trueing Tool Co., Detroit, Mich.

**Diamond Crossings**
Can. Steel Foundries, Montreal, Que.

**Die-Castings**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Dies, Pipe-Threading**
Jones & Lamson Machine Co., Springfield, Vt.

**Die Sinking Machines, Automatic**
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

**Die Sinkers**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Screw and Thread Cutting**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

# BUYERS' DIRECTORY

**Dies, Forging**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

**Dies, Hammer**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Self-Opening, Adjustable**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Dies, Threading-Opening**
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt
Landis Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Disc Cement**
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Dividing Heads**
Ackworthie, Ltd., John, Birmingham, Eng.
Dickow, Fred. C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Hendes Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Dogs, Lathe and Milling Machine**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drafting Boards and Tables**
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Drafting Materials**
American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Dressers, Grinding Wheel**
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont
Ford-Smith Machine Co., Hamilton, Ont.
Jones Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Drill Holders**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drill Rods**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Drill Speeders**
Canada Machinery Corp., Galt, Ont.

**Drilling Machine Heads**
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati Ohio.

**Drilling Machines, Automatic**
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind

**Drilling Machines, Bench**
Beacon Engineering Co., Tipton, England.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
Tool Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Electric and Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Foss Machinery & Supply Co., Geo. F., Montreal Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Gang**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drilling Machines, Heavy Duty**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hooster Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Multiple Spindle**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

**Drilling Machines, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Drilling Machines, Portable**
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Radial**
Bertram & Son Co., Ltd., The John, Dundas, Ont
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Drilling Machines, Sensitive**
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Hooster Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Turret**
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

**Drilling Machines, Vertical**
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng.
Wanger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Drills, Center**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drills, High Speed Twist**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Drills, Twist and Flat**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.

**Dust Handling Equipment**
Can. Blower & Forge Co., Ltd., Kitchener.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Electrical Instruments**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Electrical Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O.

**Elevating Trucks (See Trucks)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Elevators and Conveyors**
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Emery Wheels (See Grinding Wheels)**
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Hart Products, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Engines, Capstan**
Kennedy & Sons, Wm., Owen Sound, Ont

**Engineers, Mechanical**
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.

**Expanders, Tube**
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Eyeglasses, Safety (See Goggles, Safety)**
Prest-O-Lite Co. of Can., Toronto, Ont.
Willson Goggles, Inc., Reading, Pa.

**Fans, Electric**
Can. Blower & Forge Co., Ltd., Kitchener
Can. Fairbanks-Morse Co., Ltd., Montreal
Northern Electric Co., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Exhaust**
Can. Blower & Forge Co., Ltd., Kitchener.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Ventilating**
Can. Blower & Forge Co., Ltd., Kitchener
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**File Handles**
Ingersoll File Co., Ltd., Ingersoll, Ont.

**Files and Rasps**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Filing Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Filler, Iron (See Cements, Iron)**
Smooth Mfg. Co., Jersey City, N.J.

**Fire Extinguishers**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Fittings, Pipe**
International Malleable Iron Co., Guelph, Ont.

**Flexible Shafts**
Aikenhead Hardware Ltd., Toronto, Ont.

**Flux, Galvanizing**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Fluxes, Welding**
L'Air Liquide Society, Toronto, Ont.

**Forging Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.

**Forgings, Drop**
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd Toronto, Ont.

**Forgings, Hammer**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Foundry Equipment**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Foundry Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Frogs, Spring or Rigid**
Can. Steel Foundries, Montreal, Que.

**Fuel Oil Burning System**
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Coal**
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Oil and Gas**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bellevue Industrial Furnace Co., Detroit.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces and Ovens, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd Hiram, Walkerville, Ont.

**Furnaces, Tempering and Annealing**
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furniture, Machine Shop**
Garlock-Walker Mchy. Co., Toronto, Ont.

**Gages, Comparator**
Jones & Lamson Machine Co., Springfield, Vt.
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont.
Perdue, W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass.

**Gages, Measuring (See Tool Work)**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Q.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont
Starrett Co., L. S., Athol, Mass.

**Gages, Recording**
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.

# BUYERS' DIRECTORY

**Gages, Snap, Thread and Cylindrical**
Ackworthie, Ltd., John, Birmingham, Eng.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Standard**
Armstrong Whitworth Co. of Can., Lt Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis.
Johansson Inc., C. E., Windsor, Ont.

**Gages, Thread**
Ackworthie, Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Garnet, Emery and Flint Paper and Cloth**
Ritchey Supply Co., Toronto, Ont.

**Gas, Coal Compressed**
L'Air Liquide Society, Toronto, Ont.

**Gas, Compressed**
Prest-O-Lite Co. of Can., Toronto, Ont.

**Gaskets**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

**Gear Blanks**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear-Cutting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

**Gear Testing Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.

**Gears, Cast**
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que

**Gears, Cut**
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hamilton Gear & Machine Co., Toronto, Ontario
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Gears, Dressed**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Gears, Forged**
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Gears, Herringbone**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

**Gears, Machine Moulded**
Can. Steel Foundries, Montreal, Que.

**Gears, Rawhide (See Gears, Cut)**
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa

**Gear, Silent Chain**
Gardner & Son, Robt., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Can. Link-Belt Co., Ltd., Toronto, Can.
Hans Renold of Canada, Ltd., Montreal, Quebec

**Gears, Worm**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.

**Generators, Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Generators, Electric**
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Goggles, Safety**
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

**Grab Buckets**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Grease Cups, Pressed Steel and Brass**
Can. Winkley Co., Ltd., Windsor, Ont.

**Greases, Lubricating**
Canadian SKF Co., Toronto, Ont.
Caleract Refining Co., Toronto, Ont.

**Grinding Discs**
Ritchey Supply Co., Toronto, Ont.

**Grinding Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**Grinding Machines, Abrasive Belt**
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Automatic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Bench**
Aikenhead Hardware Ltd., Toronto, Ont.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Grinding Machines, Center**
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines Chaser**
Jones & Lamson Machine Co., Springfield, Vt.

**Grinding Machines, Cutter and Reamer**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Cylindrical**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Die**
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

**Grinding Machines, Disc**
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Drill**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Face**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Floor and Tool**
Beacon Engineering Co., Tipton, England.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Grinding Machines, Internal**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que

**Grinding Machines, Portable**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Power Oscillating Tool**
Herbert Ltd., Alfred, Toronto, Ont.

**Grinding Machines, Ring Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Snagging**
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Surface**
Garlock-Walker Mchy. Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machinery, Tool Post**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Universal**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.

**Grinding Wheels**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Guards, Emery Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Guards, Machinery and Window**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Guards, Electric Lamp**
Flexible Steel Lacing Co., Chicago, Ill.

**Gun-Barrel Machinery**
Steinle Turret Machine Co., Madison, Wis.

**Hack Saws, Power**
Ackworthie, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Hamilton, Canada.
Garlock-Walker Mchy. Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hammers, Chipping**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hammers, Drop**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

**Hammers, Electric**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Hammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Hammers, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hammers, Riveting**
Cleveland Pneumatic Tool Co., Toront Ont.

**Hangers, Shafting**
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, O
Foss Machinery & Supply Co., Geo. F Montreal, Que.
Terry & Co., John C., Birmingham, E
Williams Machinery & Supply Co., A. R Montreal, Que.

**Hardening, Case-Hardening and Tempering**
Hamilton Gear & Machine Co., Toron Ont.

**Hardness Testing Apparatus**
Shore Instrument Co., Jamaica, N.Y.

**Heating**
Skinner Bros. Mfg. Co., Inc., St. Lou Mo.

**Hobbing Machines**
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hobs**
Armstrong-Whitworth of Canada, L Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R
Greenfield Tap & Die Corp., Galt, On
Pratt & Whitney Co., of Canada, L Dundas, Ont.

**Hoists, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbro Que.
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Monti
Garlock-Walker Mchy. Co., Toronto,
Morris Crane & Hoist Co., Ltd., Nia Falls, Ont.
Northern Crane Works, Walkerville,
Shepard Electric Crane & Hoist Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

**Hoists, Hand**
Lyman Tube & Supply Co., Montreal,
Morris Crane & Hoist Co., Ltd., Nia Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Hoists, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbro Que.
Curtis Pneumatic Machinery Co., Louis, Mo.
Garlock-Walker Mchy. Co., Toronto,
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago,
Morris Crane & Hoist Co., Ltd., Nia Falls, Ont.
Northern Crane Works, Walkerville,

**Holders-On, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbro Que.
Cleveland Pneumatic Tool Co., Tor Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago

**Hose, Flexible Steel**
Can. Fairbanks-Morse Co., Ltd., Mon
Ontario Metal Products Co., Ltd., onto, Ont.

**Hose, Industrial**
Dunlop Tire & Rubber Goods Co., Toronto, Ont.
Goodyear Tire & Rubber Co. of Ltd., Toronto, Ont.

**Hose, Rubber**
Can. Consolidated Rubber Co., Ltd Montreal, Que.
Can. Foamite Firefoam Co., Ham Ont.

**Hydraulic Leather**
Graton & Knight Mfg. Co., Wor Mass.

**Hydraulic Machinery**
Bertram & Son Co., Ltd., The Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherb Que.
Garlock-Walker Mchy. Co., Toronto,
Stewart & Co., Duncan, Glasgow,

**Hydrogen**
National Electro Products, Ltd., To Ont.

**Index Centers**
Dickow, Fred. C., Machinery Co., cago, Ill.

**Igniters, Gas Engine**
Canada Foundries & Forgings Co., land, Ont.

**Indicators, Speed and Test**
Aikenhead Hardware Ltd., Toronto,
Atkins & Co., Inc., E. C., Indianap
Brown & Sharpe Mfg. Co., Providenc

**Insulation**
Diamond State Fibre Co. of Can., Toronto, Ont.

**Iron Valves**
Puro Sanitary Drinking Fountain Haydenville, Mass.

**Jacks, Hydraulic**
Norton, A. O., Boston, Mass.

**Jacks, Planer**
Armstrong Bros. Tool Co., Chicag
Starrett Co., L. S., Athol, Mass.
Bilton Machine Co., Bridgeport, Co
Burgess & Marchand, Montreal, Qu
Crescent Machine Co., Ltd., Montre

# BUYERS' DIRECTORY

**Jigs and Fixtures (See Tool Work)**
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Keyseating Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Keys, Machine**
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

**Knives, Machine**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Simonds Canada Saw Co., Montreal, Que.

**Knurl Holders**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lacing Leather**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

**Lamps, Electric**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**Lathe Attachments**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.

**Lathe Pans, Portable**
Canada Machinery Corp., Galt, Ont.

**Lathe Tools**
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

**Lathes, Automatic and Semi-Automatic**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Bench**
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lathes, Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
McDougall Co., Ltd., R., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Engine**
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Sidney Machine Tool Co., Sidney, Ohio.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Extension and Gap**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Lathes, Heavy Duty Projectile Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blaskill Wire Machy. Co., Ltd., Montreal.
Sidney Machine Tool Co., Sidney, Ohio.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio.
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Polishing (See Polishing and Buffing Machines)**
Ford-Smith Machine Co., Hamilton, Ont.

**Lathes, Relieving**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Lathe, Universal Hand**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Lathes, Screw-Cutting**
Jones & Lamson Machine Co., Springfield, Vt.

**Lathe, Speed and Hand**
Blount Co., J. G., Everett, Mass.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich

**Lathes, Spinning**
Terry & Co., John C., Birmingham, Eng.

**Lathes, Threading**
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

**Lathes, Vertical Turret**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

**Lathes, Wood Turning**
Blount Co., J. G., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Lead Pipe**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Lighting Fixtures**
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont

**Linoleum Mill Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Liquid Air Plants**
L'Air Liquide Society, Toronto, Ont.

**Lockers, Clothes**
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

**Lubricants**
Cateract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Lubricating Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Machinists' Small Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Mandrels, Expanding**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Mandrels, Solid**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Measuring Machines**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Metals, Alloy**
British Smelting & Refining Co., Ltd. Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont
Magnolia Metal Co., Montreal, Que.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Tallman Brass & Metal, Ltd., Hamilton, Ontario.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Metalite Cloth**
Ritchey Supply Co., Toronto, Ont.

**Micrometer Calipers**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Milling Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio
Ford-Smith Machine Co., Hamilton, Ont
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Milling Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**Milling Machines, Automatic**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Bench**
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Hand**
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

**Milling Machines, Horizontal and Planer Type**
Bertram & Son Co., Ltd., The John, Dundas, Ont
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Milling Machine Co., Cleveland
Ford-Smith Machine Co., Hamilton, Ont
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Rockford Milling Machine Co., Rockford, Ill
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Milling Machines, Plain**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio
Cleveland Milling Machine Co., Cleveland
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Milling Machines, Universal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Mchy. Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Milling Machines, Vertical**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford Ill.
Williams Machinery Co., A. R., Toronto, Ont.

**Monel Metal**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Motors, Electric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis

**Moulded Rubber Goods**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Nail Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Nails and Staples**
Steel Co. of Canada, Ltd., Hamilton, Ont

**Nickel, Bars, Sheets, Wire, Etc.**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Nickel Plating Outfits**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Nickel Silver**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Nitrogen**
L'Air Liquide Society, Toronto, Ont.

**Nut Tappers (See Bolt and Nut Machinery)**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

**Nuts, Finished and Semi-finished**
Galt Machine Screw Co., Galt, Ont.

**Nuts, Machine Screw**
Torrington Company, Ltd., Upper Bedford, Que.

**Nuts, S.A.E., Plain and Castellated**
Galt Machine Screw Co., Galt, Ont.

**Oil Cocks and Burners**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass

**Oil Filtering and Storage Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can

**Oil Storage Engineers**
Bowser, S. F., & Co., Ltd., Toronto, Can

**Oils**
Canadian Oil Companies, Ltd., Toronto, Ont
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont

**Oil Hole Covers**
Can. Winkley Co., Ltd., Windsor, Ont

**Oils, Soluble**
Cateract Refining Co., Toronto, Ont
Imperial Oil Ltd., Toronto, Ont

**Oxygen**
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont
L'Air Liquide Society, Toronto, Ont.

**Oxy-Acetylene Apparatus**
L'Air Liquide Society, Toronto, Ont.

**Packing, Hydraulic**
Can. Consolidated Rubber Co., Ltd., Montreal, Que
Graton & Knight Mfg. Co., Worcester, Mass
Guildford & Sons, Ltd., Halifax, N.S.

**Packing, Steam**
Can. Consolidated Rubber Co., Ltd., Montreal Que
Can. Fairbanks-Morse Co., Ltd., Montreal.
Graton & Knight Mfg. Co., Worcester Mass
Guildford & Sons, Ltd., Halifax, N.S

**Paper Mill Conveyors**
Bertrams Ltd., Edinburgh, Scotland

**Patents**
Fetherstonhaugh & Co., Ottawa, Ont.
Marion & Marion, Montreal, Que

**Pans, Wet and Dry**
Frost Mfg. Co., Chicago, Ill.

**Pattern-Shop Machinery (See Woodworking Machinery)**
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich

**Patterns, Wood and Metal**
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont
Wraggis Pattern Works, Galt, Ont.

**Penstocks, Steel**
MacKinnon Steel Co., Sherbrooke, Que

# BUYERS' DIRECTORY

**Phosphor Tin**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Photographic Duplicating Machines**
Commercial Camera Co., Providence, R.I.

**Pig Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Bending Machines**
American Pipe Bending Machine Co., Boston, Mass
Can. Fairbanks-Morse Co., Ltd., Montreal.
Underwood Corp., H. B., Philadelphia, Pa
Williams Machinery Co., A. R., Toronto, Ont.

**Pipe Couplings**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Cutting and Threading Machines**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa
Murchey Machine & Tool Co., Detroit, Mich
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**
Landis Machine Co., Inc., Waynesboro, Pa.

**Pipe Fitters' Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa.

**Piston-Ring Machines**
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Planers, Parallels**
L. & P. Mfg. Co., Niagara Falls, Ont.

**Planing Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Planing Machines, Rotary**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Plumbers' Brass Goods**
Haws Sanitary Drinking Fountain Co., Hardwicke, Mass

**Pneumatic Tools**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**
Ackworthie, Ltd., John, Birmingham, Eng
Archibald & Co., Chas. P., Montreal, Q.
Blount Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng

**Pots, Steel**
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Pressed Steel Parts**
Ackworthie, Ltd., John, Birmingham, Eng
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich.
Can. Fairbanks-Morse Co., Ltd., Montreal
L. & P. Manufacturing Company, Ltd., Niagara Falls, Ont.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strellinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Presses, Drop and Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Toledo Machine & Tool Co., Toledo, Ohio

**Presses, Foot and Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng

**Presses, Forcing**
Atlas Press Co., Kalamazoo, Mich.
Stewart & Co., Duncan, Glasgow, Scot.

**Presses, Hydraulic**
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

**Presses, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Protractors**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Propellers**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Pulleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal and Fibre**
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Pulp and Paper Mill Equipment**
MacKinnon Steel Co., Sherbrooke, Que.

**Pumps, Automobile Tire**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Pumps, Barrel and Boiler-feed**
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coalant**
Trahern Pump Co., Rockford, Ill.

**Pumps, Geared and Hand**
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**
Can. Fairbanks-Morse Co., Ltd., Montreal
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

**Pumps, Lubricant and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Jardine & Co., A. B., Hespeler, Ont.

**Punches, Power**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

**Punching Machines, Horizontal**
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Racks, Cut**
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**
Holden Co., Ltd., Montreal, Que.

**Reamer Holders**
Cleveland Twist Drill Co., Cleveland, O
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

**Reamers, Expanding**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Reamers, Solid**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Reamers, Taper**
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Recorders, Temperature**
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Recorders, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Rheostats**
Northern Electric Co., Montreal, Que.

**Resistance Materials**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Respirators**
Willson Goggles, Inc., Reading, Pa.

**Rivets**
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

**Rivet Heaters**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.

**Riveting Machines**
Bilton Machine Co., Bridgeport, Conn.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**
Stewart & Co., Duncan, Glasgow, Scot.

**Rolls (Rubber Covered)**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rudder Frames, Steel**
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Rubber Goods, Mechanical**
Quaker City Rubber Co., Philadelphia, Pa.

**Rules, Steel**
Chesterman & Co., Ltd., J., Sheffield, Eng.

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Rust Preventatives**
Oakley Chemical Co., New York, N.Y.

**Sand Equipment**
Can. Link-Belt Co., Toronto, Ont.

**Sand Mills**
Frost Mfg. Co. Chicago, Ill.

**Sanding Machinery**
Oliver Machy. Co., Grand Rapids, Mich

**Sand Rammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Saw Frames and Blades, Hack**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que

**Sawing Machines, Metal**
Atkins & Co., Inc., E. C., Indianapolis, I
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que

**Sawing Machines, Power Hack**
Ackworthie, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I
Can. Fairbanks-Morse Co., Ltd., Montreal
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Saw Sharpening Machines**
Atkins & Co., Inc., E. C., Indianapolis, I
Oliver Machinery Co., Grand Rapids, Mich.

**Saw Tables, Universal**
Atkins & Co., Inc., E. C., Indianapolis, I
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**
Atkins & Co., Inc., E. C., Indianapolis, I
Simonds Canada Saw Co., Montreal, Que
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I
Simonds Canada Saw Co., Montreal, Que

**Saws, Hot and Cold**
Atkins & Co., Inc., E. C., Indianapolis, I
Simonds Canada Saw Co., Montreal, Que
Stewart & Co., Duncan, Glasgow, Scot

**Saws, High Speed Steel**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Metal Band**
Atkins & Co., Inc., E. C., Indianapolis, I
Oliver Machinery Co., Grand Rapids, Mich

**Saws, Metal, Power**
Clemson Bros., Inc., Hamilton, Ont.

**Saws, Metal Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

**Saws, Milling**
Atkins & Co., Inc., E. C., Indianapolis, I
Butterfield & Co., Inc., Rock Island, Que
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Saws, Screw Slotting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Swing Cut-off**
Oliver Machinery Co., Grand Rapids, Mich

**Scales**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal Q

**Screens**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Screw Drivers, Optical, Jewelry and Novelty**
Torrington Co., Ltd., Upper Bedford, Que.

**Screw Driving Machine**
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill

**Screw Extractors**
Cleveland Twist Drill Co., Cleveland, O

**Screw Machine Work**
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
Tallman Brass & Metal Co., Hamilton, Ont.

# BUYERS' DIRECTORY

**Screw Machinery, Wood and Lag**
Cook Co., Asa S., Hartford, Conn.

**Screw Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Screw Machines, Automatic**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

**Screw Machines, Plain or Hand**
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio.

**Screw Machine Products**
Torrington Company, Ltd., Upper Bedford, Que.

**Screw Plates**
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

**Screws, Cap and Set**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Lock Cap**
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Machine**
Barnes Co., Wallace, Bristol, Conn.
Screw Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Safety Set**
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Screws, Side Knob**
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Thumb**
Torrington Company, Ltd., Upper Bedford, Que.

**Second-Hand Machinery**
**(See Searchlight Section)**
Petrie, Ltd., H. W., Toronto, Ont.

**Separators, Moisture and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Separators, Oil and Waste**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Shafting**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Shapes, Cold-Drawn Special Steel**
Can. Drawn Steel Co., Hamilton, Ont.

**Shaping Machines**
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Hobbs, R. S., Toronto, Ont.
Monarch Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Rockford Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Warner & Swasey Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Shapers, Wood**
Oliver Machinery Co., Grand Rapids, Mich.

**Shears, Hand**
Can. Blower & Forge Co., Ltd., Kitchener.

**Shears, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., Duncan, Glasgow, Scot.
Toledo Machine & Tool Co., Toledo, Ohio
Williams Machinery Co., A. R., Toronto, Ont.

**Shearing Machines, Angle, Iron Bar and Gate**
Bertrams Ltd., Edinburgh, Scotland.

**Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Garlock-Walker Mchy. Co., Toronto, Ont
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng
Toledo Machine & Tool Co., Toledo, Ohio

**Sheets, Nickel, Resist, Alloy**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Sheets, Nickel, Monel and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont

**Side Frames, Locomotive**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Slotting Attachments**
Ford-Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

**Slotting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

**Solders**
British Smelting & Refining Co., Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Canada.

**Snap Flasks**
Oliver Machy. Co., Grand Rapids, Mich

**Special Machinery and Tools**
Brown Engineering Corp., Ltd., Toronto.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Specialties, Swaged and Headed Work**
Torrington Company, Ltd., Upper Bedford, Que.

**Spectacles, Industrial**
Willson Goggles, Inc., Reading, Pa.

**Springs**
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

**Spring-making Machinery**
Sleeper & Hartley, Inc., Worcester, Mass

**Sprockets and Chains**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Squares**
Brown & Sharpe Mfg Co., Providence, R.I.

**Stamping, Metal**
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Stamps, Steel**
Diamond Saw & Stamping Works, Buffalo, N.Y.

**Stairways, Wrought Iron**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Steam Specialties**
Crane Ltd., Montreal, Que

**Steel Plate**
Dom. Foundries & Steel, Hamilton, Ont.

**Steels, Tool**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel Blooms and Billets**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steel, Cold-Rolled Strip**
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Steel Castings**
Dom. Foundries & Steel, Hamilton, Ont

**Steel Forgings**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Steel, Shafting and Free Cutting Screw**
Barnes Co., Wallace, Bristol, Conn
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

**Steel, Sheet**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q
Ontario Metal Products Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont
Toronto Iron Works, Toronto, Ont

**Steel, Tanks**
Can. John Wood Mfg. Co., Toronto, Ont

**Steel, Stainless**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel Wire Rods**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steels, Alloy, Open Hearth and Electric**
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
United Alloy Steel Corp., Canton, Ohio

**Steels, Alloy and Carbon**
Algoma Steel Corp., Ltd., Sault Ste Marie, Ont.
Andrew Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steels, High-Speed**
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel, Magnet**
Can. Atlas Crucible Steel Co., Toronto, Ont
Vanadium Alloys Steel, Latrobe, Pa.

**Steel, Structural**
MacKinnon Steel Co., Sherbrooke, Que.

**Steel Tubing, Close Joint and Welded**
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

**Stern Frames, Cast Steel**
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Straightening Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Studs**
Galt Machine Screw Co., Galt, Ont.

**Surface Plates**
Bilton Machine Co., Bridgeport, Conn

**Swaging Machines**
Atkins & Co., Inc., E. C., Indianapolis, I

**Switches, Railway**
Can. Steel Foundries, Montreal, Que

**Switches and Switchboards**
Northern Electric Co., Montreal, Que

**Tablets, Bronze, Memorial**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Tachometers**
Aikenhead Hardware Ltd., Toronto, Ont
Bristol Co., Waterbury, Conn.

**Tanks, Steel**
MacKinnon Steel Co., Sherbrooke, Que

**Tanks and Pumps, Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

**Taper Cutting Dies**
Jones & Lamson Machine Co., Springfield, Vt.

**Tap Holders**
Greenfield Tap & Die Corp., Galt, Ont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taper Pins**
Galt Machine Screw Co., Galt, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Tapes, Measuring**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass.

**Tapping Machines and Attachments**
Ackworthle, Ltd., John, Birmingham, Eng
Archibald & Co., Chas. P., Montreal, Q
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont
Jardine & Co., A. B., Hespeler, Ont
National Acme Co., Cleveland, Ohio
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Taps and Dies**
Ackworthle, Ltd., John, Birmingham, Eng
Butterfield & Co., Inc., Rock Island, Que
Can. Fairbanks-Morse Co., Ltd., Montreal.
Geometric Tool Co., New Haven, Conn
Greenfield Tap & Die Corp., Galt, Ont.
International Machinery & Supply Co., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taps, Collapsing**
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Teeth, Dredge Bucket**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Testing Metals and Materials**
Toronto Testing Laboratory, Toronto, Ont.

**Thermometers**
Bristol Co., Waterbury, Conn.

**Thread-Cutting Tools**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Thread Cutting Machines**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa

**Threaded Wires**
Torrington Company, Ltd., Upper Bedford, Que.

**Threading Machines**
Acme Machinery Co., Cleveland, Ohio.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Thread Lead Testing Machines**
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Thread-Rolling Machines**
Bliss Co., E. W., Brooklyn, N.Y.

**Tongs**
Hepburn Ltd., John T., Toronto, Ont.

**Tool Cases**
Rice Lewis & Son, Ltd., Toronto, Ont.

**Tool Holders**
Armstrong Bros. Tool Co., Chicago, Ill.
Bilton Machine Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Markers, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Tool Posts, Lathe**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Steels for all Purposes**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Tools, Small (See Machinists' Small Tools)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Bertrams Ltd., Edinburgh, Scotland
Burgess & Marchand, Montreal, Que
Can. Fairbanks-Morse Co., Ltd., Montreal
Chesterman & Co., Ltd., J., Sheffield, Eng.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven Conn.
Greenfield Tap & Die Corp., Galt, Ont
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich
Kimber & Hillier Mfg. Co., St. Catharines, Ont.
National Machine Tool Co., Racine, Wis
Rapid Tool & Machine Co., Lachine, Que
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass
**Strelinger Co. of Can., Ltd., Chas. A. Windsor, Ont.**
Wheel Trueing Tool Co., Detroit, Mich
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Tool Work**
Brown Engineering Corp., Ltd., Toronto
Crescent Machine Co., Ltd., Montreal, Q
Ford-Smith Machine Co., Hamilton, Ont

# BUYERS' DIRECTORY

**Torches, Blow**
National Electro Products, Ltd., Toronto Ont
Perdue, W B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Trackwork, Railway**
Can Steel Foundries, Montreal, Que.

**Trackwork, Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Transformers**
Northern Electric Co., Montreal, Que.

**Transmission Machinery**
Bernard Industrial Co., A., Fortierville Que
Can Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Jones & Glassco, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Toronto, Ont.
Renold (Hans) of Canada, Ltd., Montreal Que.

**Transportation Systems (See Trucks)**
Mathews Gravity Carrier Co., Port Hope, Ont.

**Treated Bits**
Can. Atlas Crucible Steel Co., Toronto Ont
Vanadium Alloys Steel, Latrobe, Pa.

**Trolleys and Tramways**
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Wright Mfg. Co., Lisbon, Ohio.

**Trucks**
Can. Fairbanks-Morse Ltd., Montreal Q
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Maple Leaf Mfg. Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Trucks, Industrial Motor**
Maple Leaf Mfg. Co., Montreal, Que.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Tube, Products**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Electric Welded or Oxy-Acetylene Welded**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Flexible**
Dunlop Tire & Rubber Goods Co., Ltd Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Tubing, Seamless Steel**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Seamless Steel, Brass and Copper and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Steel Products Co., Brantford, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Tubing, Welded**
International Nickel Co. of Can., Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Tubing, Welded Steel**
Tube Co. of Canada, Toronto, Ont.

**Turbines, Water**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Turret Heads**
Ackworthie, Ltd., John, Birmingham, Eng
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Turret Machines (See Lathes, Horizontal Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Cook Co., Asa S., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis
Warner & Swasey Co., Cleveland, Ohio

**Turrets, Tool Post**
Gisholt Machine Co., Madison, Wis.

**Unions, Pipe**
Crane Ltd., Montreal, Que.

**Universal Joints**
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Valves**
Can. Fairbanks-Morse Ltd., Montreal Q.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Crane Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd. Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Vises, Drilling Machine**
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.

**Vises, Metal Workers'**
Aikenhead Hardware, Ltd., Toronto, Ont.
Columbia Hdwe. Division, Cleveland, O.

**Vises, Milling Machine**
Brown & Sharpe Mfg. Co., Providence, R I.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Victor Tool Co., Waynesboro, Pa.
Parmenter & Bulloch Co., Gananoque, Ont.

**Voltmeters**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Wagon Loaders**
Can. Link-Belt Co., Toronto, Ont.

**Washers**
Barnes Co., Wallace, Bristol, Conn.
Diamond State Fibre Co., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

**Welding Machines, Oxy-Acetylene**
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

**Welding, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
Lincoln Electric Co., Toronto, Ont
National Electro Products, Toronto, Ont
Prest-O-Lite Co. of Can., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

**Welding Rod, Tobin, Manganese Bronze and Aluminum**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Welding Supplies**
British Smelting & Refining Co., Ltd., Montreal, Que.
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Perdue, W. B., San Francisco, Calif
Prest-O-Lite Co. of Canada, Ltd., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

**Wheels, Cast, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Wheels, Industrial**
American Pulley Co., Philadelphia, Pa.
Hull Iron & Steel Foundries, Hull, Que.
Kennedy & Sons, Wm., Owen Sound, Ont

**Winches, Electric**
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

**Winches, Headgate**
Kennedy & Sons, Wm., Owen Sound, Ont

**Winches, Stoplog**
Kennedy & Sons, Wm., Owen Sound, Ont

**Wire**
Barnes Co., Wallace, Bristol, Conn.
Canada Metal Co., Ltd., Toronto, Ont.
Dennis Wire & Iron Works, London, Ont
Greening Wire Co., B., Hamilton, Ont.
Northern Electric Co., Montreal, Que.

**Wire Cloth**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Wire Coiling Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Wire Rope**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Wire Straightening and Cutting Machinery**
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Schuster Co., F. B., New Haven, Conn
Sleeper & Hartley, Inc., Worcester, Mass.

**Wire, Welding**
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Wires, Special**
Dennis Wire & Iron Works, London, Ont.
Greening Wire Co., B., Hamilton, Ont.
Walker & Sons Metal Products, Ltd. Hiram, Walkerville, Ont.

**Woodworking Machinery**
Canada Machinery Corp., Galt, Ont
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy. Co., Toronto, Ont
Oliver Machinery Co., Grand Rapids, Mich
Williams Machinery Co., A. R., Toronto, Ont.

**Wrenches, Drop Forged**
Armstrong Bros. Tool Co., Chicago, Ill
Canada Foundries & Forgings Co Welland, Ont.

**Wrenches, Machinists'**
Armstrong Bros. Tool Co., Chicago, Ill
Canada Foundries & Forgings Co Welland, Ont.

**Wrenches, Pipe**
Canada Foundries & Forgings Co. Welland, Ont.
Crane Ltd., Montreal, Que
Greenfield Tap & Die Corp., Galt, Ont

**Wrenches, Tap**
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Galt, Ont

**Wrought Iron Pipe**
Steel Co. of Canada, Ltd., Hamilton, Ont.

## DIRECTORY OF DEALERS

THE Buyers' Directory of CANADIAN MACHINERY was originally intended to contain information regarding lines actually manufactured by our advertisers. We now carry the advertising of leading machinery dealers, some of whom represent scores of manufacturers in addition to being manufacturers themselves in some cases. This necessarily widened the scope of our Directory, but it would be impracticable to list all the lines handled by all the dealers. We recommend, therefore, if our subscribers cannot find what they want in our Directory that they communicate with the dealers whose names appear herewith.

### MACHINE TOOLS AND METAL WORKING EQUIPMENT

Chas. P. Archibald & Co., Montreal Que.
The Canadian Fairbanks-Morse Co Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
H. W. Petrie Limited, Toronto, Ont.
The Standard Equipment & Tool Co., Montreal, Que.
Chas. A. Strelinger Co. of Canada Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Wilson-McGovern Limited, Toronto Ont.
Yeates Machinery Co., London, Ont.

### MACHINE SHOP AND FACTORY SUPPLIES

Chas. P. Archibald & Co., Montreal Que.
The Canadian Fairbanks-Morse Co Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
H. W. Petrie Limited, Toronto, Ont
The Standard Equipment & Tool Co., Montreal, Que.
Chas. A. Strelinger Co. of Canada Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Wilson-McGovern Limited, Toronto Ont.
Yeates Machinery Co., London, Ont

### POWER EQUIPMENT AND SUPPLIES

The Canadian Fairbanks-Morse Co Montreal, Que.
MacGovern & Co., Montreal, Que.
H. W. Petrie Limited, Toronto, Ont.
The Standard Equipment & Tool Co Montreal, Que.
Wilson-McGovern Limited, Toronto Ont.
A. R. Williams Machinery Co., Montreal, Que.

### WOODWORKING MACHINERY

Chas. P. Archibald & Co., Montreal, Que.
The Canadian Fairbanks-Morse Co., Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
H. W. Petrie Limited, Toronto, Ont.
Chas. A. Strelinger Co. of Canada Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Yeates Machinery Co., London, Ont

**Vises, Pipe**
Columbia Hdwe. Division, Cleveland, O
Greenfield Tap & Die Corp., Galt, Ont.

**Vises, Planer and Shaper**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Superior Machine Co., London, Ont.

**Vises, Wood Workers'**
Columbia Hdwe. Division, Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Oliver Machy. Co., Grand Rapids, Mich

**Washers, Rubber**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Welding Apparatus, Oxy-Acetylene**
L'Air Liquide Society, Toronto, Ont.

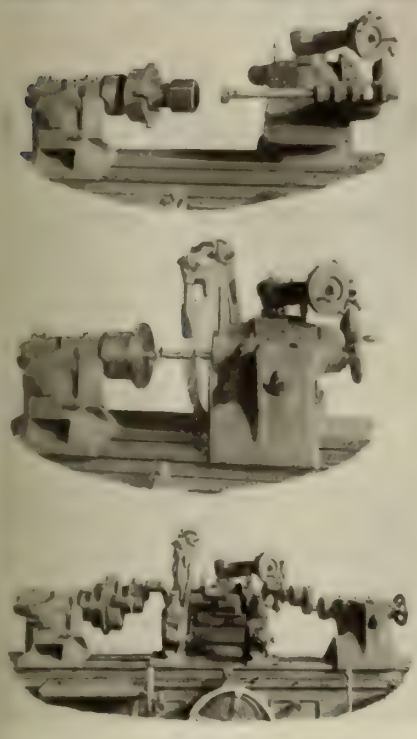
**Welding, Electric**
All-Weld Company, Toronto, Ont.
Carter Welding Co., Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.

**Welding Filler Rods**
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.


## CANADIAN MACHINERY AND MANUFACTURING NEWS
143 UNIVERSITY AVE., TORONTO, CANADA

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GREAT BRITAIN—London, The MacLean Publishing Company of Great Britain, Limited, 88 Fleet St., E. C., E. J. Dodd, Director, Telephone Central 12960. Cable Address: Atabek, London, Eng.
UNITED STATES—New York, J. J. Gillen, 1606 St. James Bldg., 1133 Broadway, Phone Watkins 5869. Boston, C. L. Morton, Room 734, Old South Bldg., Phone Main 1024. Chicago, A. H. Byrne, 405-6 Transportation Bldg., 608 S. Dearborn St., Phone Wabash 9430. Cleveland, W. L. Gifford, 1261 East 99th Street.

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# *And Now—*
# Toronto Printers May Strike

THE present agreement between printers in book and job offices and employers in Toronto expires May 31. The minimum wage paid is $35.20 per week (increased voluntarily a year ago by the employers from $32.00, although the agreement had a year then to run). This wage covers a 48-hour week.

The International Union is demanding a week of 44 hours as the basis for all wage scales, and the Toronto unions are demanding a wage of $44.00 per week of 44 hours, $8.80 more per week for 4 hours less work.

This means an increase of from 73 cents per hour to $1.00 per hour, or over 36%.

Publishers and other employing printers feel that under present conditions of business and the admitted decreasing cost of living, the increased wages and shorter hours demanded by the International Union are unreasonable.

This is acknowledged by many of the thoughtful and loyal printers employed in the Toronto offices, who believe that the International Union has blundered in its demand that local unions shall not sign new agreements except on the basis of the 44-hour week.

The position, however, may be that these local men may not be able to make the International officers in Indianapolis see, that to force a strike now on these unreasonable demands would be an act of folly—and a strike may be called on June 1st.

The facts of the case are presented here, for the information of the sections of the public—subscriber and advertiser—reached by this publication.

The attitude of the employing printers is shown by their voluntary action in giving a 10 per cent. increase last year while the agreement calling for the minimum wage of $32.00 a week had still a year to run.

They feel strongly now, however, that this is not a time when an increase of 36 per cent. in the labor cost of production should be permitted.

If publishers are forced to pay $44.00 a week instead of $35.20 and get only 44 hours of work instead of 48, it is inevitable that subscription and advertising rates must advance. No business can stand an increase in its wage bill of 36 per cent. and absorb that increase. The extra cost will have to be added to the sale price of the product.

Publishers sincerely hope that the great body of sane opinion among the local printers may prevail and that the Indianapolis officials will be induced to withdraw their unreasonable demands so that Toronto printers may continue to find well-paid, congenial employment.

If this sane, thoughtful opinion does not prevail, a strike seems inevitable, with its equally inevitable result of loss to the printers and publishers, and inconvenience and loss to the public.

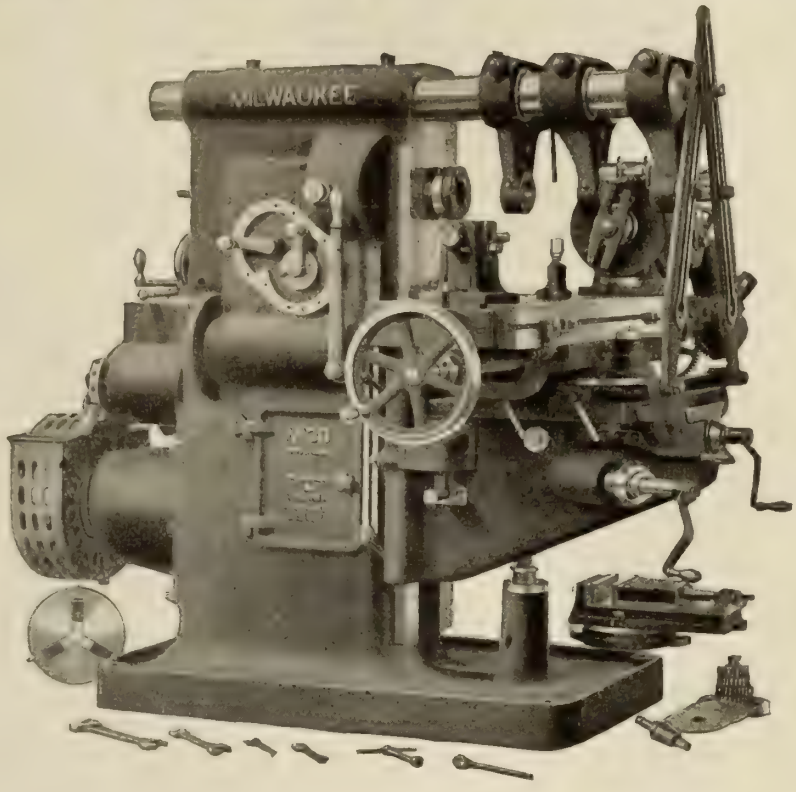
An expression of the opinion of readers of this paper on the Union's proposals, involving an increase of 36% in the labor cost of printed matter, is asked. Will you not write a letter to the editor (not for publication) telling him your view of the situation?

*This statement is published by and has received the endorsation of the Toronto publishers who are members of the*

**Canadian National Newspapers and Periodicals Association**

*Including* CANADIAN MACHINERY AND MANUFACTURING NEWS

# MILWAUKEE MILLING MACHINES



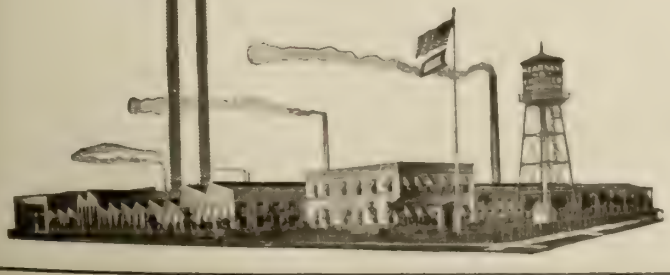

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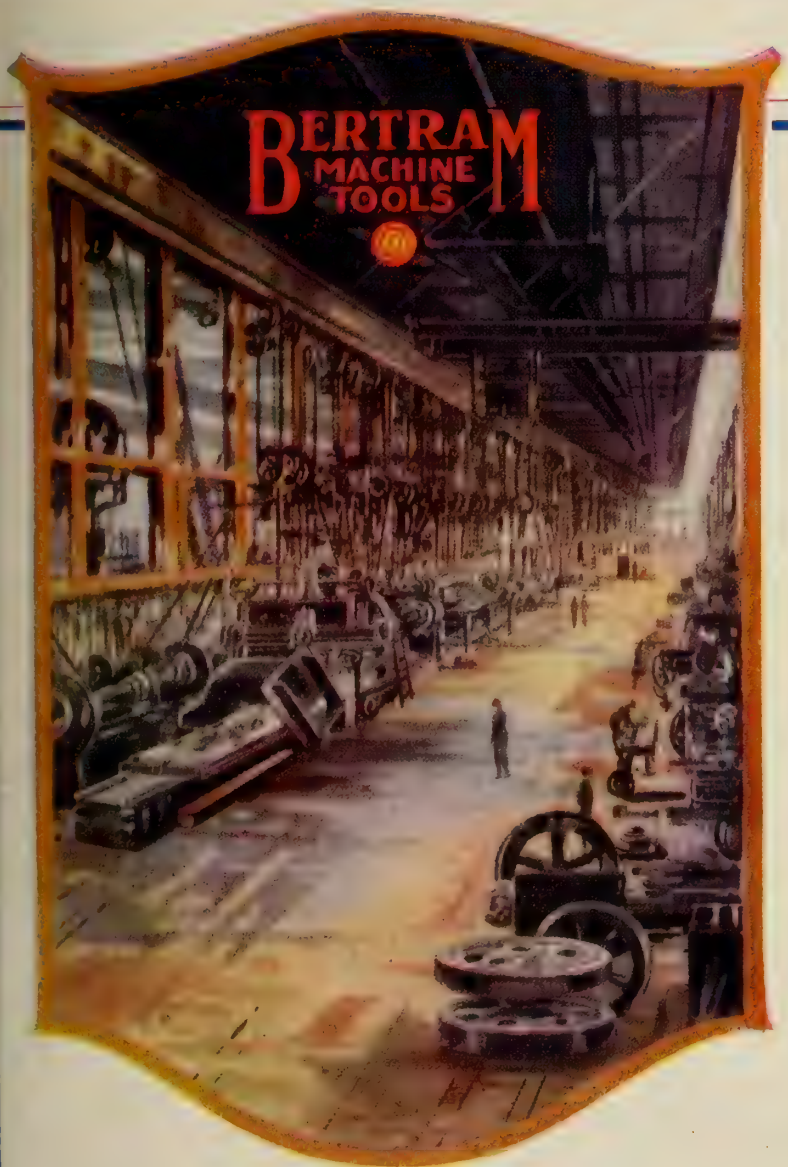
## THE NATIONAL ACME COMPANY
## MONTREAL, P. Q.

De Courcelles G.T.R.R.

# CANADIAN MACHINERY AND MANUFACTURING NEWS

Vol. XXV., No. 21 | Published by the MacLean Publishing Company, Limited, Toronto | May 26, 1921 | $4.00 a Year Subscription Price


| READ AND PASS TO | Check | See Page | READ AND PASS TO | Check | See Page |
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have carried Canada through many crucial periods of history. These Anglo-Saxon qualities should be uppermost to-day. They are needed to revive Canadian industry. To avoid a crisis more smoke must issue from Canadian chimneys; more wheels must turn, and the wage-earner now out of work must be employed.

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Roy Building

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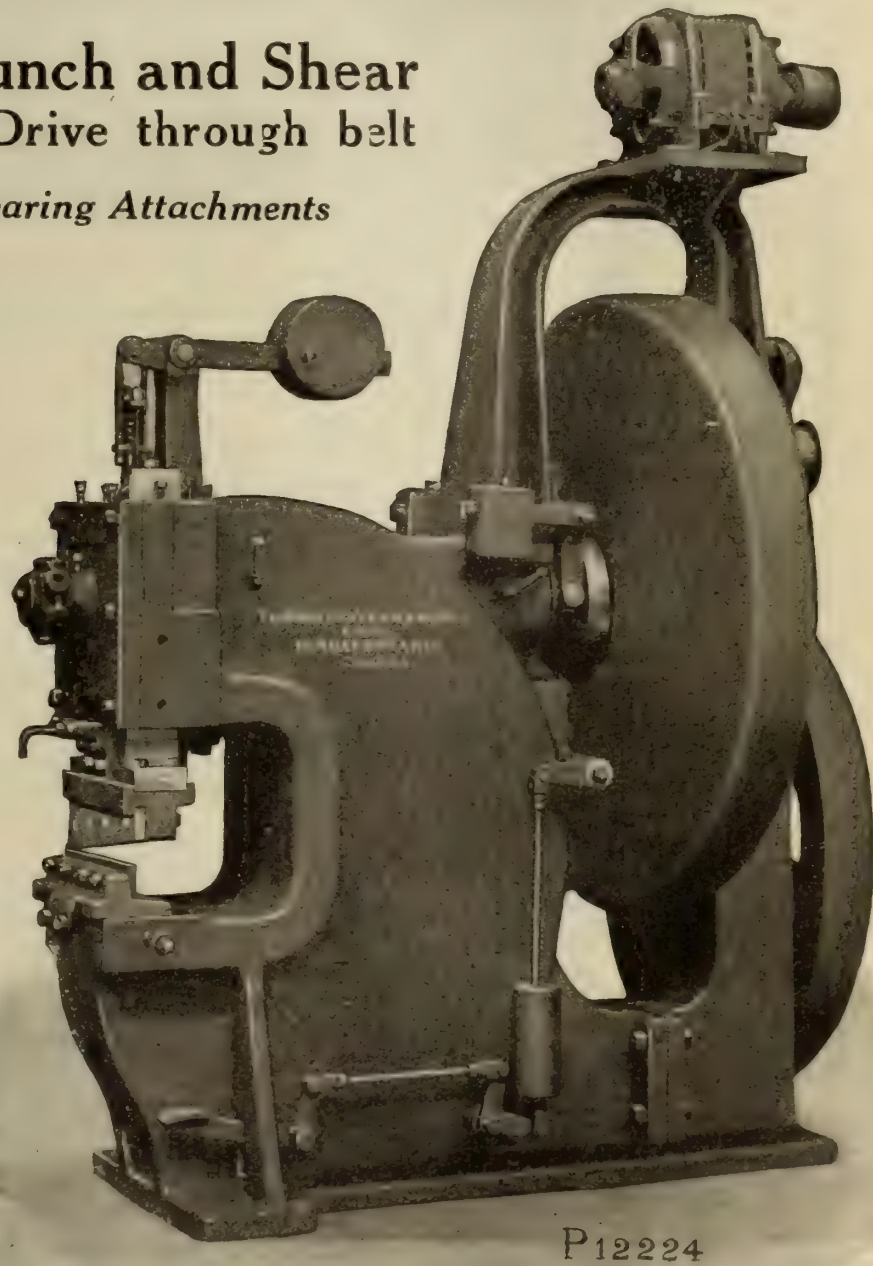
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# The BERTRAM Page

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### 12" Throat Motor Drive through belt

*Fitted with Plate Shearing Attachments*



P12224

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To shear 1" Plates
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To " 4x4x⅜" Angles

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103½ Sandwich Street

WINNIPEG
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HALIFAX
Roy Building

*If interested tear out this page and place with letters to be answered.*

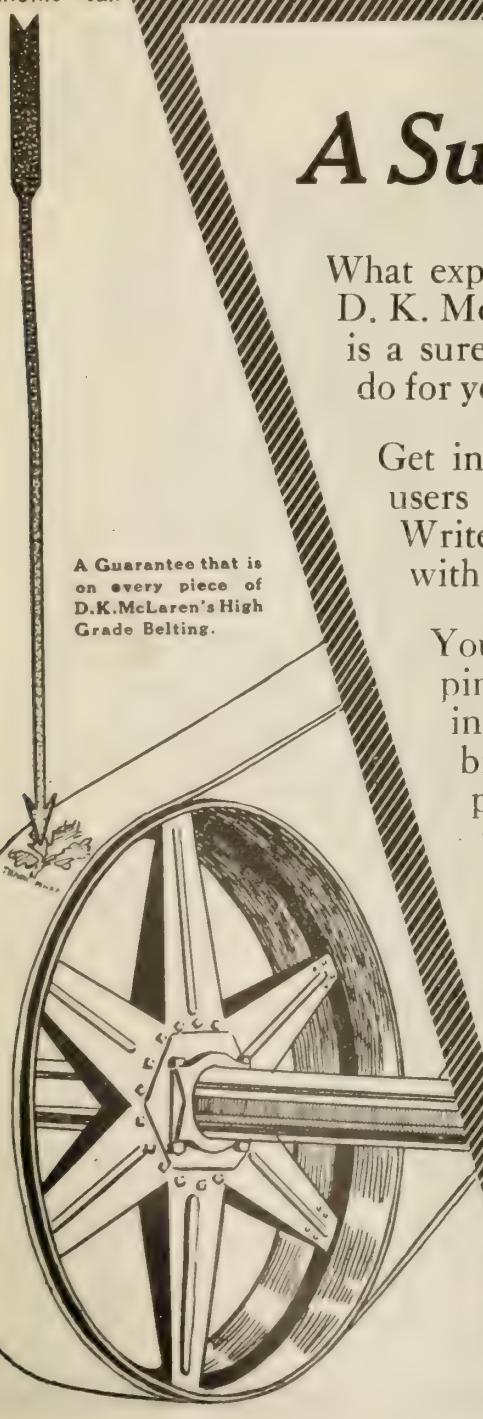
# D.K.McLaren's

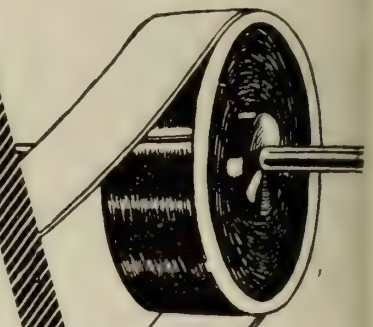
**Genuine British Oak Tanned**

## Leather Belting

Genuine Oak

Genuine Oak





## *A Sure Guide*

What experienced users think of D. K. McLaren's Leather Belting is a sure guide as to what it will do for you.

Get in touch with some of these users and find out their opinions. Write us; we'll gladly furnish you with some names and addresses.

You'll hear that it is a non-slipping, practically stretchless belting; that it insures you against breakdowns and undue loss of power. Altogether, in so far as the opinions of other people *can* convince you, you will *be* convinced that it is positively the best belting you can buy.

Why not write us to-day?

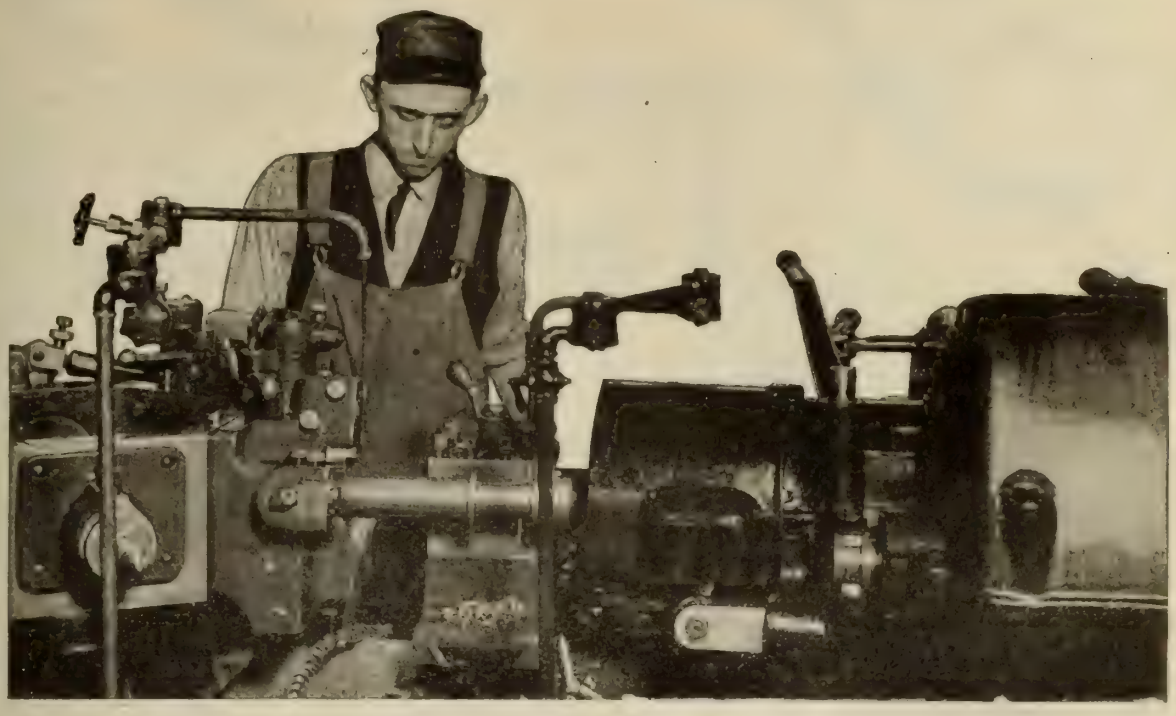
A Guarantee that is on every piece of D.K.McLaren's High Grade Belting.

**D. K. McLaren, Limited**

Head Office and Factory:

**351 St. James Street, MONTREAL, P.Q.**

TORONTO, ONT., 194 King St. West
ST. JOHN, N.B., 90 Germain St.
VANCOUVER, B.C., 334 Cordova St. W.



# To Decrease Operating Costs

The side carriage is an important part of the W. & S. turret lathe. It reduces operating costs, often by as much as one-half. It operates simultaneously with the turret and independently of it. The side carriage has a separate feed rod.

Take some of the simplest bar jobs; by cutting off with the side carriage while the turret tools are finishing their work, you save most of the cutting off time.

Here is the picture of a W. & S. 2-A. in a railroad shop. This machine makes bolts, pins, oil cups, valve parts, piston rods, and many other parts used in the repair of locomotives and cars.

On all these parts both turrets operate together.

Take this feature and the fact that the machine operates easily and accurately, and you know why the machine is popular with the shop men. It delivers the goods.

Send us blue prints of your parts and we'll tell you how long it will take to do your work the W. & S. Way.

## The Warner & Swasey Company

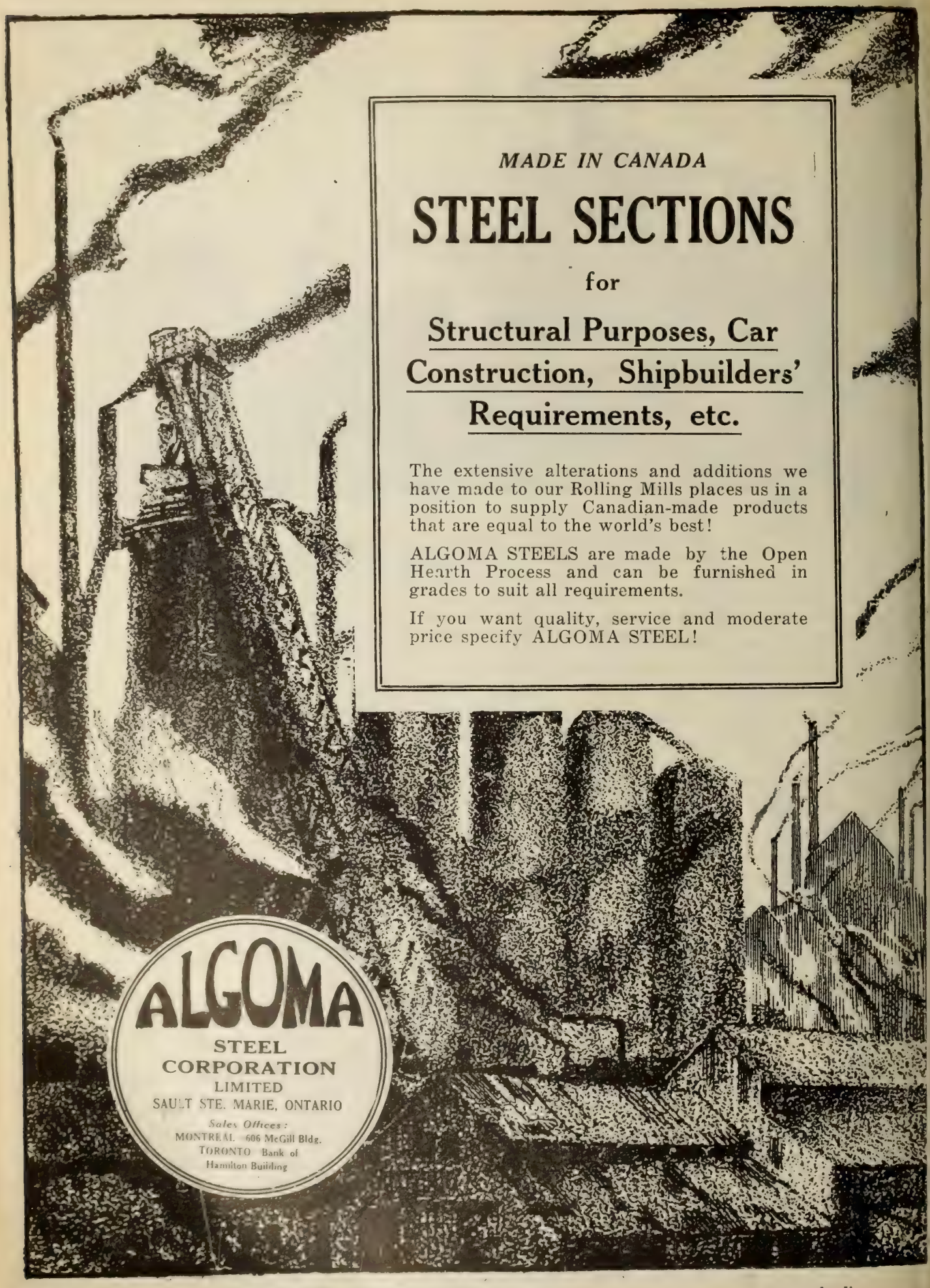
### Cleveland, U.S.A.

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A. R. Williams Machinery Company, Ltd., Toronto, Winnipeg, Vancouver, St. John.
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**FOREIGN AGENTS—**
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*If interested tear out this page and place with letters to be answered.*


MADE IN CANADA
STEEL SECTIONS
for
Structural Purposes, Car Construction, Shipbuilders' Requirements, etc.
The extensive alterations and additions we have made to our Rolling Mills places us in a position to supply Canadian-made products that are equal to the world's best!
ALGOMA STEELS are made by the Open Hearth Process and can be furnished in grades to suit all requirements.
If you want quality, service and moderate price specify ALGOMA STEEL!
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CORPORATION
LIMITED
SAULT STE. MARIE, ONTARIO
Sales Offices:
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# SHEFFIELD ENGINEERING SUPPLIES
LIMITED

228 CRAIG ST. WEST

MONTREAL CANADA




*REPRESENTING*

**Sheffield Twist Drill & Steel Co.**
LIMITED

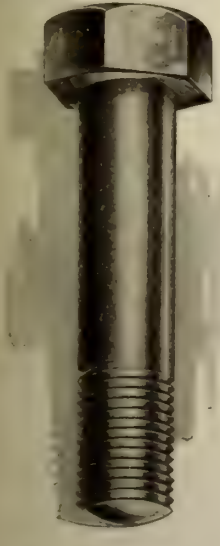
SHEFFIELD ENGLAND

"DORMER" BRAND High Speed Twist Drills
"DORMER" BRAND High Speed REAMERS

**Michael & Joseph Wing**
LIMITED

SHEFFIELD ENGLAND

"DOMINANT" High Speed Files
M.J.W. Tool Steel, Saws, Etc.



# ACCURACY

Just now all jobbers should have a complete stock of SAE Cap Screws, Plain and Castellated Nuts and Taper Pins to meet the automobile repair trade requirements.

Your rush orders filled promptly by



## The Galt Machine Screw Co., Limited

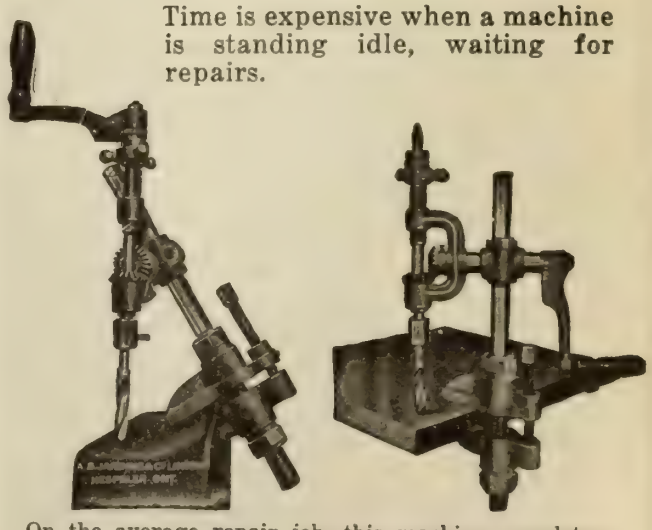
GALT, ONTARIO

*Eastern Representatives:*
Messrs. F. BACON & COMPANY
131 St. Paul Street West, Montreal, Que.

*Western Representative:*
Mr. D. PHILIP
138 Portage Avenue, Winnipeg, Man.

# Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

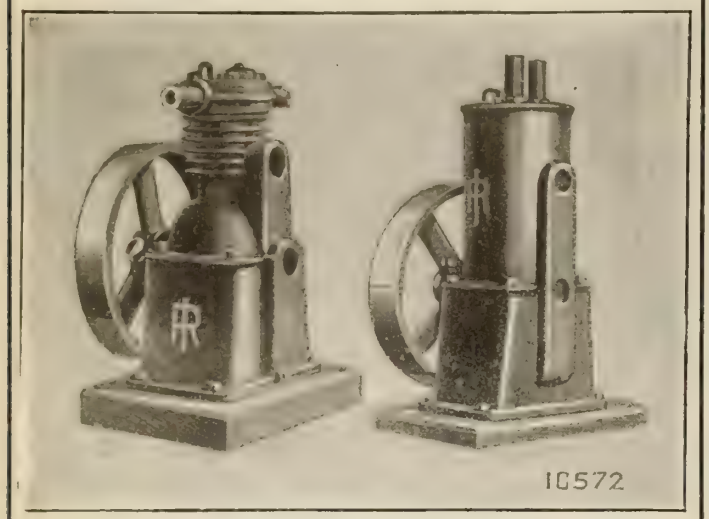
**Weight, 40 lbs. Price, $26.50 net.**
**Sold by all Machinery and Supply Houses.**

## A. B. JARDINE & CO., Limited
HESPELER, ONTARIO


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# Why Not Do It With Air?

***A Message of Interest to the Small Shop Owner***




**"Imperial 14's," one of the many styles of Canadian Ingersoll-Rand Compressors, are made in a wide range of sizes for Stationary and Portable Service and for Gasoline, Electric or Belt Drive. Bulletins 3039 Stationary Type or 3215 Portable Type sent on request.**

There are a hundred and one places around your shop where compressed air will cut down time and expense.

Take painting for instance. The air brush will do a quicker and a far better job—and one man can handle it.

And cleaning—how much time do you lose brushing off the top of machine tools, cleaning motors and brushing in the little corners behind a stack of material? This can all be done with the air jet and the job is finished before you know it.

There is no longer any doubt about the saving made by portable pneumatic hoists, riveting and chipping hammers, drills, and wood borers. This has been definitely proven in the large automobile factories and you can benefit by their knowledge and experience. These portable pneumatic tools can be taken to the work and both the odd jobs and the steady work become paying propositions.

In our extensive line of air machinery you will find Compressors, Hoists, Blow Guns and "Little David" Pneumatic Tools. We will gladly send you bulletins describing these machines.

## CANADIAN INGERSOLL-RAND COMPANY, LIMITED

| | | | |
|---|---|---|---|
| Sydney | Sherbrooke | Montreal | Toronto |
| Cobalt | Winnipeg | Nelson | Vancouver |





# Be Sure Your Files Cut Clean

As soon as a file ceases to cut keenly at every stroke, it has outlived its usefulness.

You will actually save money by throwing it away and buying a new file, because files cost less than workmen's time.

Long, efficient service is ensured by specifying one of these brands when ordering:

**KEARNEY & FOOT**
**GREAT WESTERN**
**AMERICAN**
**ARCADE**
**GLOBE**

## *FILES AND RASPS*

***Made in Canada by***

## Nicholson File Company

**Port Hope, Ontario**

# 1/3 to 1/2 Reduction in Milling Cost

This will be the result of taking small milling jobs from your big millers and putting them up to



## The U.S. MILLER

*The Miller for Small Work*

A small machine takes up less space, requires less power, is easier to operate and is more accurate.

The Paramount Miller of its size. Drop us a line for full details.

**United States Machine Tool Company**
Cincinnati, Ohio, U.S.A.

# WHY EXPERIMENT ?
## WE DID IT FOR YOU YEARS AGO



**IMPERIAL GENUINE**




For Heavy Engines and Extraordinary Hard Work

**HARRIS HEAVY PRESSURE**

THE COPPER COATED CAKE

For Donkey Engines, Saw Carriages, Small Motors, Transmission Line Shafting and all steady heavy pressure duty.




**Matchless**

Suitable For Slow-Moving Bearings

Write For Prices

**THE CANADA METAL CO., LIMITED**
TORONTO HAMILTON MONTREAL
WINNIPEG VANCOUVER

# *AN OUNCE OF PREVENTION*



Evans' "Almetl" — The Reliable, Enduring Firedoor

EVANS' "ALMETL" Fire Doors are the "ounce of prevention" against the spreading of fire in factory, warehouse, mill or commercial building. Wherever there is a door, it should be an "ALMETL." Stoutly built of heavy corrugated steel, galvanized, and interlined with asbestos roll board, they make an impassable barrier to the most intense fire.

The frame of the "ALMETL" is 3-16" x 2½" Bar Steel, reinforced on all edges by an extra heavy binder of galvanized steel which forms a box for the panel and prevents damage to the door by trucks, etc.

Approved by the underwriters.

Write us for descriptive literature, specifications and prices.



Cross Section. Note Rigid Construction

SOLE CANADIAN MANUFACTURERS

**Geo. W. Reed & Co., Limited, Montreal**


*If interested tear out this page and place with letters to be answered.*

# THE JOHNSON FRICTION CLUTCH

## The Case Against the Countershaft

The old familiar countershaft drive, through cross belts and tight and loose pulleys, stands accused of the following offences against efficiency:

1. Involves needless equipment.
2. Costs too much to set up.
3. Prevents economical and systematic use of space.
4. Operates sluggishly.
5. Multiplies belt troubles and the resultant cost of upkeep.

Modern practice has discarded the antiquated countershaft for the simplicity and efficiency of the clutch drive direct from lineshaft..

**Adopt the Johnson Lineshaft Drive**

The economical, efficient and durable method of power transmission through friction control.

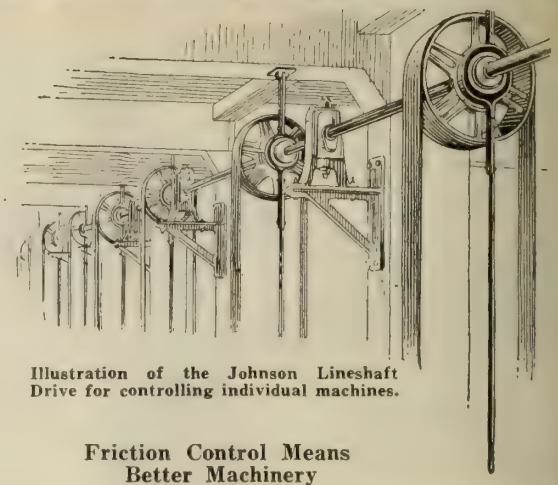
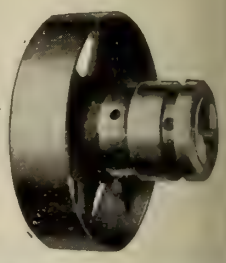


Illustration of the Johnson Lineshaft Drive for controlling individual machines.

**Friction Control Means Better Machinery**

Whether it is applied overhead or in the machine itself.



Write for our Booklet "Clutches as Applied to Machine Building" and our Yellow Catalog.

CANADIAN AGENTS:
WILLIAMS & WILSON, LTD., 84 Inspector Street, Montreal
CANADIAN FAIRBANKS-MORSE CO., LTD., Montreal, Toronto, Winnipeg

**THE CARLYLE JOHNSON MACHINE CO.** MANCHESTER, CONN.

# Open a Bank Account in Canada

The present abnormal exchange situation between Canada and the United States is affecting trade relations between the two countries. Exporters in the United States can meet this by opening Bank Accounts in Canada.

**This Bank has 730 Branches, of which 626 are located in Canada from the Atlantic to the Pacific Coast. Write for a complete list of Branches and for terms respecting a Canadian account.**

# THE ROYAL BANK OF CANADA

**Capital and Reserves $40,000,000** **Total Resources $544,000,000**

*Head Office:* MONTREAL

# CANADIAN STEEL FOUNDRIES LIMITED

## AMONG OUR PRODUCTS

**O. H. STEEL**
- Bolsters
- Couplers
- Draft Arms
- Locomotive Side Frames
- Machinery Castings
- Marine Castings
- Rolling Mill Rolls
- Wheel Centres

**FERRO-ALLOYS**

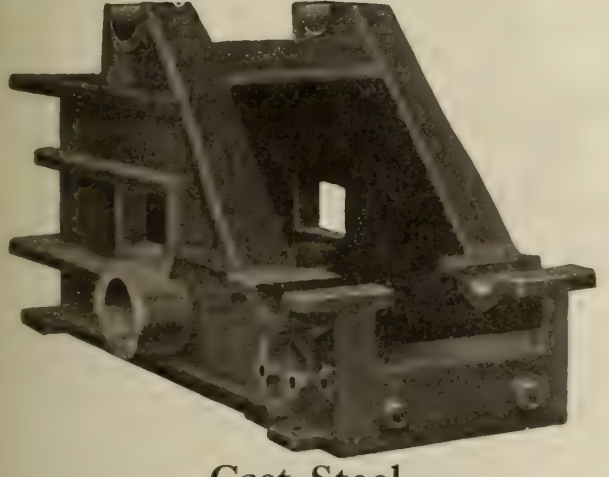
**MANGANESE-STEEL**
- Bucket Lips
- Crusher Jaws
- Dipper Teeth
- Mixer Teeth
- Special Trackwork

**OTHER ALLOYS**
- Crank Pins
- Crank Shafts
- Locomotive Frames
- Rolls
- Roll Shells

**TRACKWORK**
- Diamond Crossings
- Crosses
- Frogs
- Mates
- Switches
- Rail Braces
- Guard Rail Clamps
- Complete Intersection

This list is merely an indication

General Offices:
Transportation Building, Montreal



Cast Steel
Stone Crusher Frame

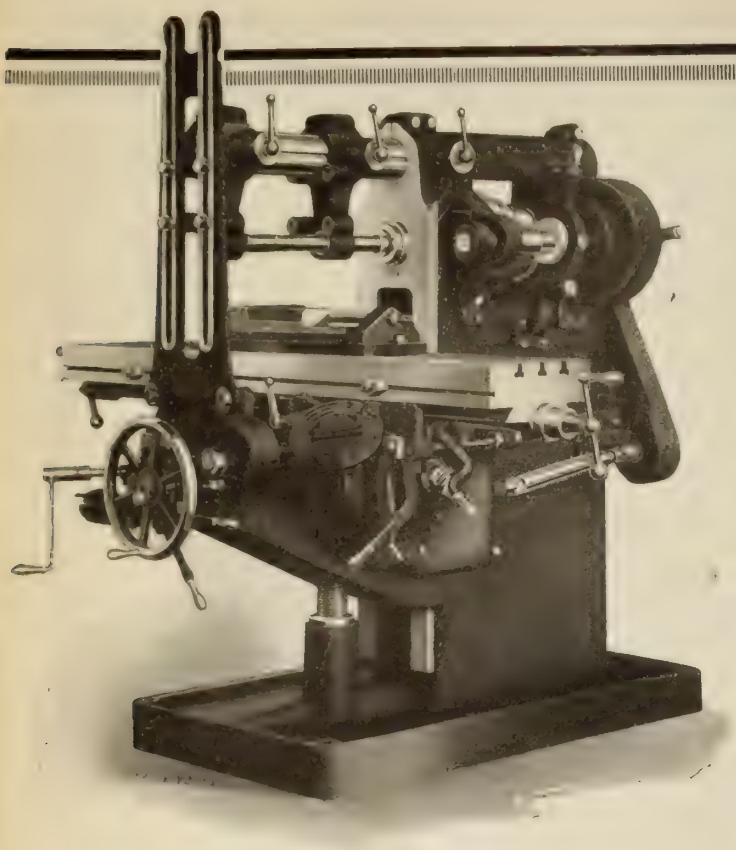
# Machinery Parts
of every description
in
# Cast Steel

# Chrome-Nickel
and other forged gear blanks

# Forged Shafts

## Dominion Foundries & Steel Limited
Hamilton, Canada


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New Design No. 4 Plain Miller

# FORD-SMITH

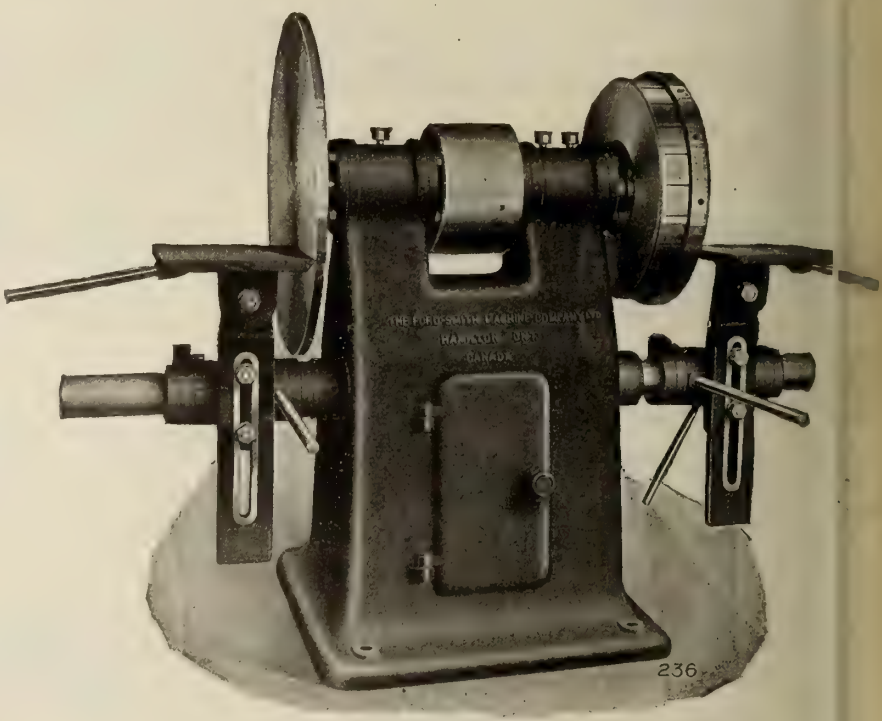
## Milling Machines and Disc Grinders

Ford-Smith Milling Machines are correct in design, built to last and insure rapid, quality production. Look in any of the best shops. You'll find Ford-Smith Millers boosting production.

Ford-Smith Disc Grinders are an efficient link in lowering production costs. These dependable machines are almost indispensable for handling work that calls for machines of strength, accuracy and durability.

THERE is one thing you expect from every Miller or Disc Grinder purchased. That is **satisfaction.** You can get no more, for satisfaction is an incorporation of every desirable quality—accuracy, speed, dependability—everything that goes to make a profitable investment.

In buying Milling Machines or Disc Grinders bearing the Ford-Smith trademark you are assured of perfect satisfaction. Every Ford-Smith Machine is subjected to the most exacting tests before leaving the factory and is guaranteed to give the best of service. That's why there are so many in use.




24-inch Disc Grinder (Ball Bearing) with Ring Wheel Chuck

**PUT your milling and grinding problems before our engineering staff. Competent advice promptly furnished.**

*FOREIGN AGENTS:*
W. E. Storey, London, England
McLeod & Co., Calcutta, India

## THE FORD-SMITH MACHINE Company, Limited

HAMILTON ONTARIO CANADA

# Wood-Working Machinery

*For Making Patterns Right*

Progressive firms find in the "Oliver" line of Saw Benches, Wood-Turning Lathes, Band Saws and Sanders the right kind of equipment for getting "quality work on time."




# "OLIVER"



## A Band Saw that has proved a big Production Booster

THIS No. 16 Band Saw is a machine you can depend on to work all day and every day without coaxing and jockeying. It is a machine that has given satisfaction wherever used.

"Oliver Band Saws are strong, convenient, steady and safe. No. 16 is a medium size machine which carries 36-inch wheels, will take 18 inches under the guide and saw 36 inches between blade and column; tilts 45° to the right and 10° to the left.

### The "Oliver" Universal Saw Bench

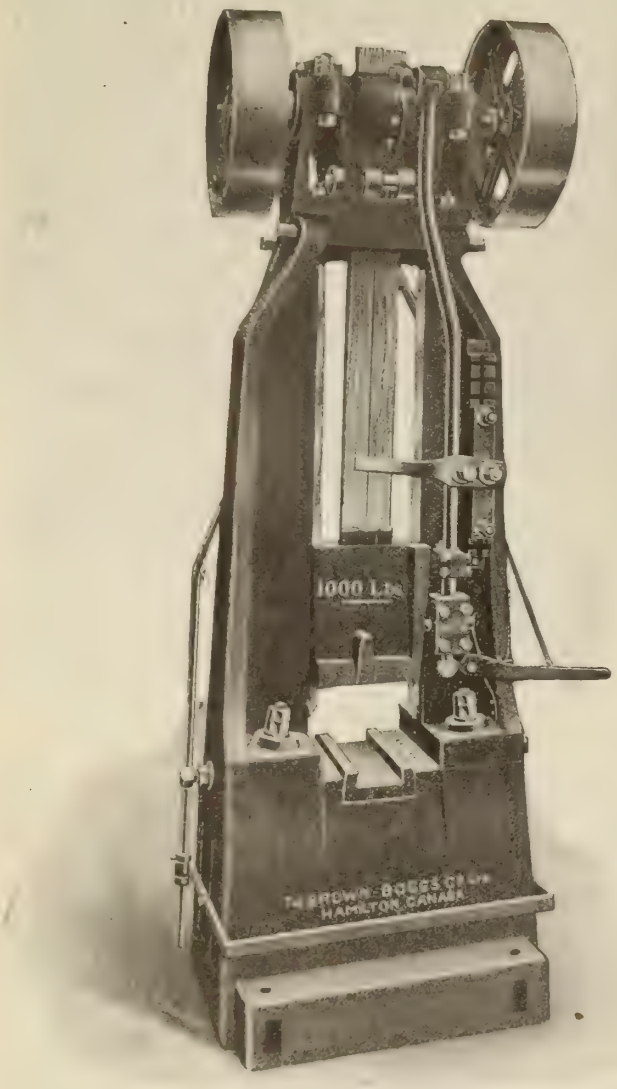
The upper illustration shows the "Oliver" Universal Saw Bench in operation. Designed to save lumber, this machine turned out a big time-saver as well. Well provided with safety guards that eliminate danger to the operator, it has been extensively installed and is always in demand.

**Full description complete line of "Oliver" Woodworking Machines on request.**

**OLIVER MACHINERY CO.**
Grand Rapids, Michigan

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# Bro Sheet

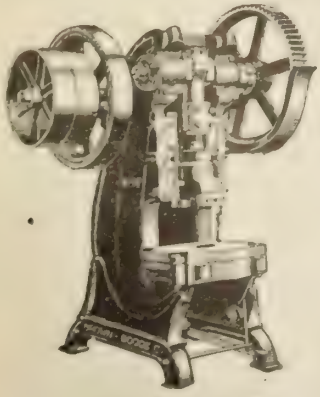



1,000-Lb. Board Lift Drop Hammer

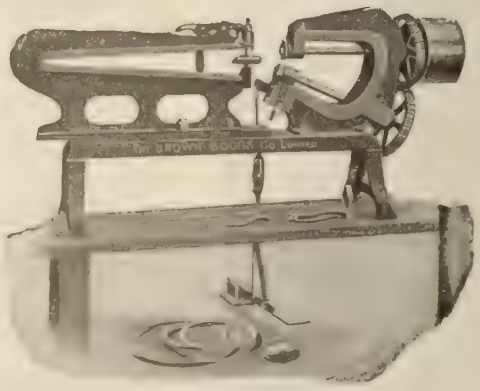
B B Co Ltd.

## A Complete Line

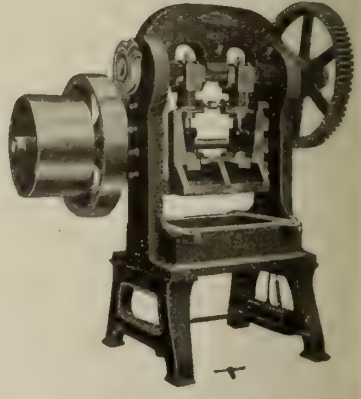
Tinsmiths' tools and sheet metal working machines of every description, also canners' and evaporators' machinery, shears of all kinds, power press for punching, forming, embossing, blanking, etc.



No. 17—Power Press



No. 36—Ring and Circular Shear



No. 20½—Power Press

*If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.*

# wn-Boggs

## Metal Workers' Tools

### Tools that Ensure Speed and Economy in Production

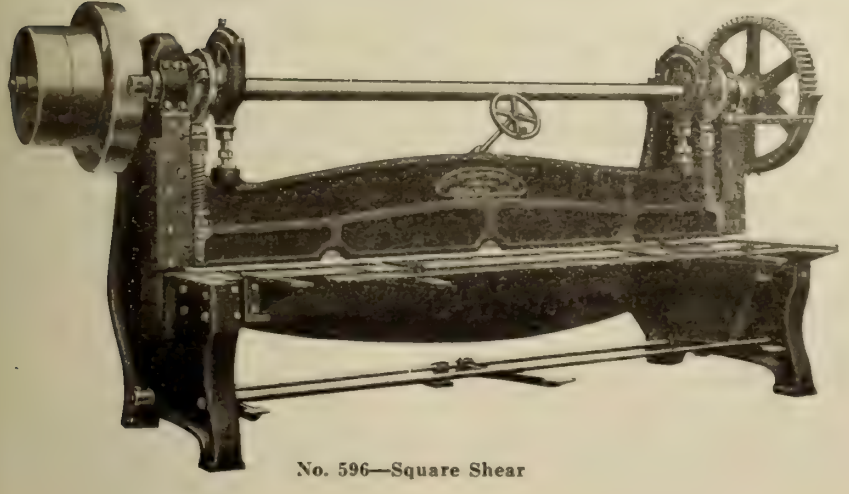
PRESENT day business and industrial conditions demand SPEED in production in practically all commodities. This is especially true with respect to those industries whose business is obtained upon a competitive basis. The tinsmith or sheet-metal worker who equips his plant with "B-B" tools is on safe ground. They are designed to save labor and speed up production—and are easy and convenient to operate; sure in their performance; sure of freedom from trouble; sure in every detail which makes for accurate and easy output of work.

Let us know the machine you are interested in and complete information will be promptly supplied. If you wish advice consult us freely.

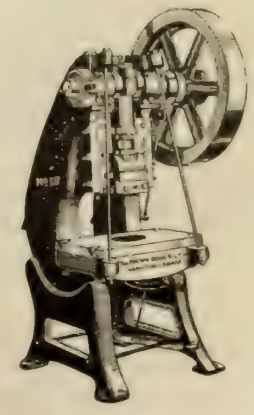
*Orders for Export Receive Careful Attention*

## The Brown, Boggs Co., Limited

### Hamilton, Canada



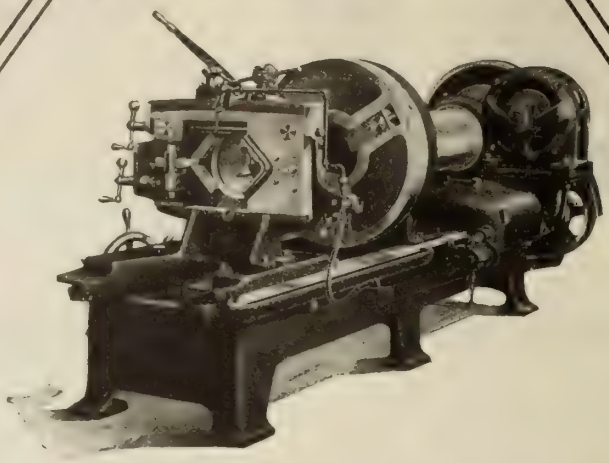
No. 596—Square Shear



No. 15—Power Press

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# WILLIAMS



# PIPE MACHINES

***Outstanding Features:***

1—Single Pulley Drive, through.
2—Dodge Friction Clutch, on machine.
3—Clutch Lever at operator's left hand.
4—Rigid Bearing Bracket on drive shaft.
5—Gear Box Drive away from operator.
6—Individual Adjustment for each bearing.
7—Large Spindle Bearings are ring oiling.
8—Compact Control Levers on operator's side.
9—Large Die Cabinet and Tool Tray.
10—Substantial Oil Trough around top of ways.
11—Specially constructed Reservoir and Filterer.
12—Low-down Sliding Head.
13—Rotary Geared Pump reversible for left-hand thread.
14—Specially designed Carriage to drain off oil and cuttings.
15—All Gears amply protected.

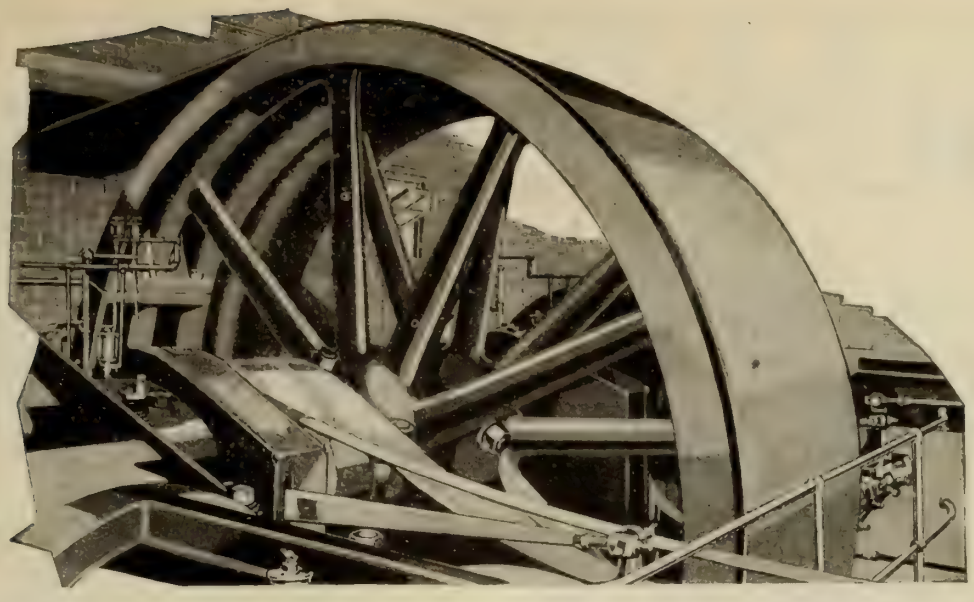
*Send for Catalog of Various Styles*

## WILLIAMS TOOL CORPORATION

of Canada, Limited - Brantford, Ontario

*Successors to*

JOHN H. HALL & SONS, LIMITED



# Inbuilt Belting Strength

Transmission troubles due to stretch and slipping are eliminated by Dominion Friction Surface Belting. "Plus Service" construction and exceptional pulley gripping power make it unrivalled for reliability and economy on all drives. Every Dominion Friction Surface Belt installed means so much more power conserved.

Without any obligation to you, our nearest Service Branch will send an experienced belting man to study your transmission requirements and submit recommendations for your approval.

# Dominion Rubber System

## Service Branches:

| | | | | |
|---|---|---|---|---|
| Halifax | Ottawa | Kitchener | Brandon | Calgary |
| St. John | Toronto | North Bay | Regina | Lethbridge |
| Quebec | Hamilton | Fort William | Saskatoon | Vancouver |
| Montreal | London | Winnipeg | Edmonton | Victoria |

## DOMINION RUBBER SYSTEM PRODUCTS

### Belting

**Transmission:** "Dominion," "Keewatin," "Para."
**Conveyor:** "Rockproof," "Canadian," "Hiheat"
**Elevator:** "Dominion," "Rockproof."
**Agricultural:** "Dominion," "Star."
**Grain Elevator:** "Metcalf Standard," "Grain King."

### Hose

**Air:** "Kushion Kover," "4810 Airtite," "Star."
**Steam:** "Indestructible," "Rockproof," "Para."
**Water:** "Indestructible," "Para," "Kushion Kover," "Star."
**Suction:** "Para," "Star," "Trade."
**Garden:** "Canadian," "Dominion,"

### Packing

**Sheet:** "Join-Tite," "Star," "Importers."
**Rod:** "Cabestos," "Valve-Bestos," "Canadian."
**Valves:** "Montreal," "Commercial" "Canadian."

### Miscellaneous

**Mats,** Matting and Flooring.
**Moulded** Goods.
**Plumbers'** Specialties.
**Hard** Rubber Goods, Tubing.
**Rubber** Covered Rolls, Deckle Straps.
**Friction Tape,** Splicing Compound.

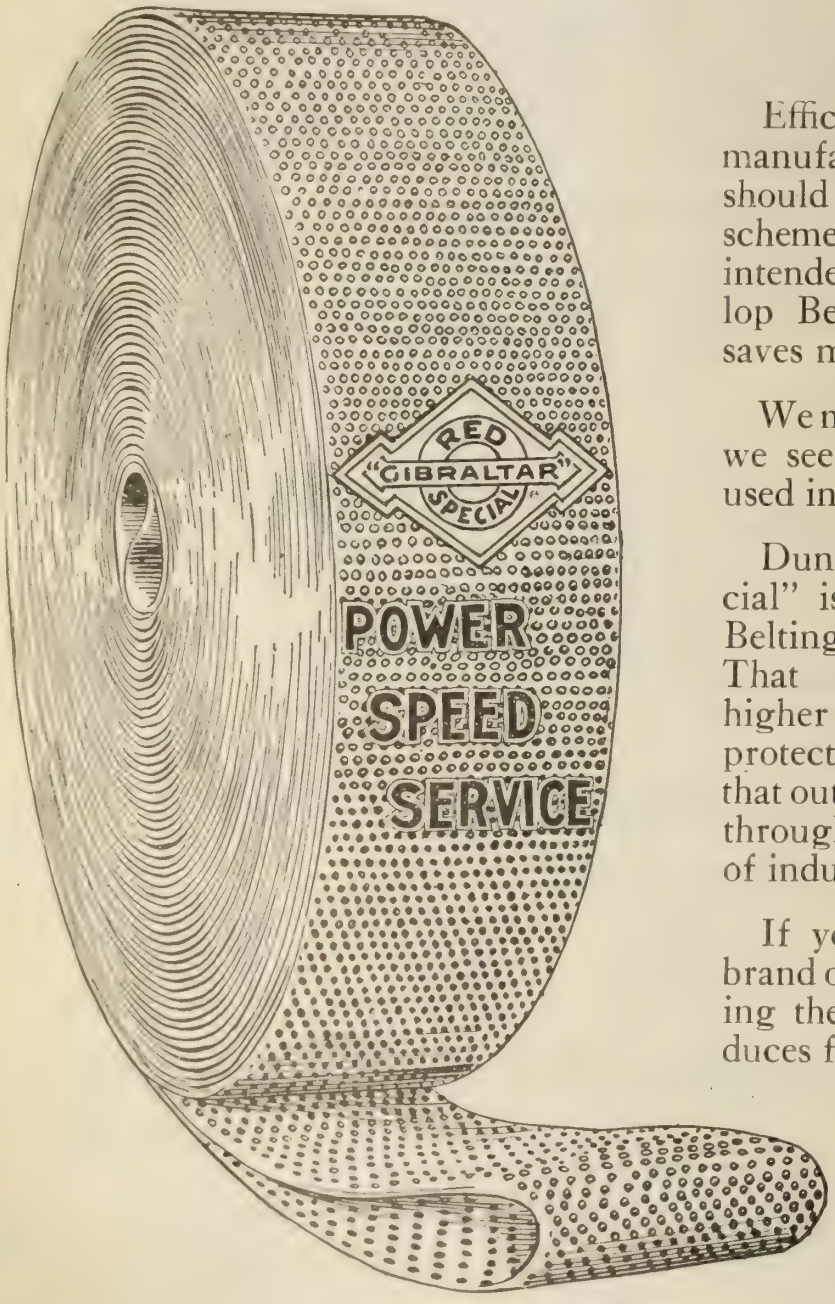
DOMINION RUBBER SYSTEM AND ASSOCIATED COMPANIES

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# DUNLOP

*Makes a Belt to Suit Your Every Need—*

*Economically and Efficiently*




SEAL OF QUALITY
DUNLOP
RUBBER PRODUCTS

Efficiency in a belt rests with its manufacturer, because no belt should be sold unless it fits into the scheme of things for which it was intended. That is where the Dunlop Belting Service Department saves money for Belt users.

We make Belts for every use, but we see that the proper belts are used in the proper places.

Dunlop "Gibraltar RedSpecial" is the standard in Dunlop Belting construction and quality. That standard is considerably higher than the average—for your protection. This Belt is proving that out on hundreds of hard drives throughout many different kinds of industries.

If you are not yet using this brand of belting you are not realizing the benefits such a belt produces for its user.

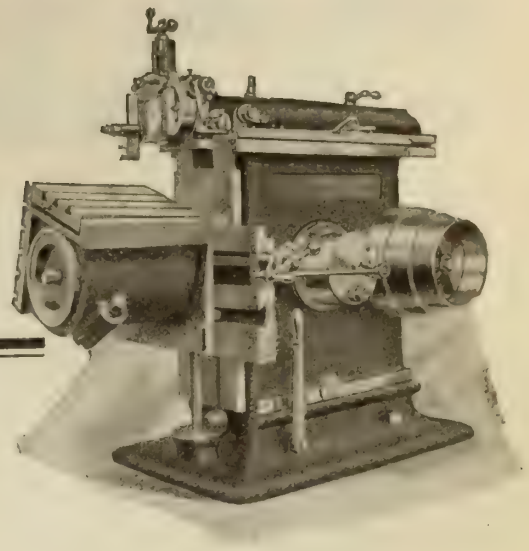
*The Dunlop Belting Service Department will be glad to discuss your belting problems with you, or a salesman will call when you say the word.*

## Dunlop Tire & Rubber Goods Co., Limited

**Head Office and Factories: TORONTO** **Branches in the Leading Cities**

# UNIVERSAL

## SHAPING MACHINES



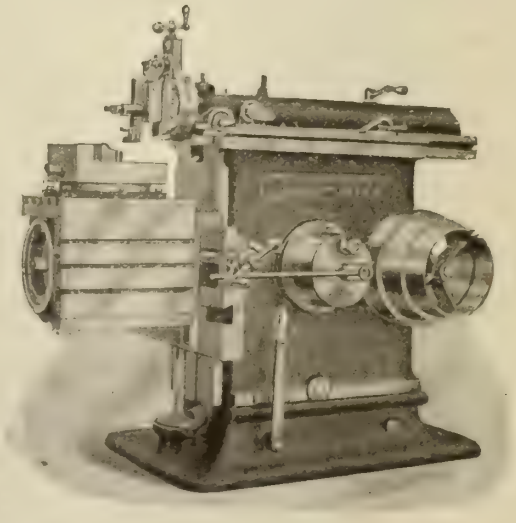
No special vises or fixtures needed ; the Universal features of these machines take care of everything, making them particularly adapted to—

Die Work
Tool Making and
General Manufacturing.

Machines regularly furnished with—

Swivelling Graduated Table
Auxiliary Tilting Side for Compound Angles
Power Down Feed on any angle, with any variation of feed
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Swivel Vise and Graduated Base
Table raised and lowered by power on 24-in. size.

We carry large stocks of our 15-inch and 24-inch shapers in our Toronto show rooms—all ready for immediate shipment.



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## ROELOFSON MACHINE & TOOL CO., LIMITED

*Head Office and Show Rooms:*
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# A Quick and Easy Means of Tapping Square or Hexagon Nuts

MODERN manufacture and industrial readjustments demand a machine tool, which, besides being a high-speed producer, is capable of precision work under the most severe service.

Of such nature are Acme Nut-Tapping Machines. These easily-operated tools are limited to speed only by the endurance of the taps. For this reason Acme Machines most profitably meet to-day's demands.

One plant has been using two Acme Tappers for eight years. They have subjected them to the most strenuous service, yet to-day each averages 10,000 threaded nuts per nine hour day with a spindle speed of 100 r.p.m., the limit of tap endurance on the tough material used.

This concrete example of Acme performance is being emulated in hundreds of other shops.

If you want, then, a convenient tool, a fast and accurate tool, a tool that will stand up indefinitely—look for the name "Acme."

In every respect Acme ability clearly reflects the years of building experience.

**Write for illustrated catalogue of Bolt, Nut, Rivet, Upsetting and Forging Machinery.**



# ACME Nut Tapping Machines

Acme Six-Spindle, Semi-Automatic Nut Tappers have many important features which facilitate operation and increase speed. Each spindle is equipped with automatic lifting device which permits automatic feed to place nut under tap. Every action has been carefully developed and proved correct in practice. Write for further details.

## The Acme Machinery Company

4530 St. Clair Avenue, Cleveland

*Canadian Agents:* The John Bertram & Sons Co., Limited, Dundas

# ROYLITE CLEANER

## Promotes Economy in Toronto Plant

ROYLITE cleans steel quicker, with less expense, and in every way gives better satisfaction than any other cleaner ever used. This is the experience of the Chapman Double Ball-Bearing Co., Limited, Toronto.

The illustration shown here is drawn from an actual photograph taken in the Chapman plant. The man in the picture is dipping Ford Front Wheel Axle Bearings in a vat of Roylite Cleaner. About 140 bearings are placed in each tray and then submerged in the boiling solution for three seconds only. When removed the bearings are thoroughly clean — the dirt and oil collected during assembling operations are entirely removed.

ONE OF THE CHIEF CHARACTERISTICS OF ROYLITE IS THAT IT PREVENTS RUST; it is the only cleaner yet tried out by this firm that gives entire satisfaction in this particular.

All exacting work of this nature is [illegible]ped in Roylite in the Chapman plant—distinctive proof of Roylite's efficiency.

*We will send an expert with sample to your plant to give a free demonstration on request.*

*Try a Barrel of*

*ROYLITE*

*Lasts Longer---Works Quicker*
*Costs Less*

*Manufactured by*



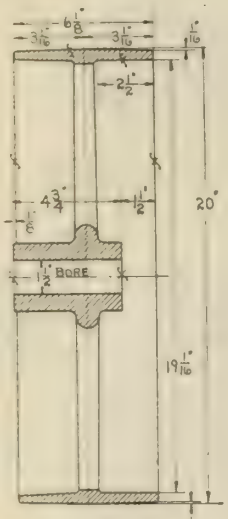
CANADIAN HANSON & VAN WINKLE CO. LTD.
TORONTO, ONTARIO

*A Canadian Product Manufactured by Canadian Workmen*

CLEANS ALL METALS

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# STEINLE TURRET LATHES
ON
# PULLEY PRODUCTION



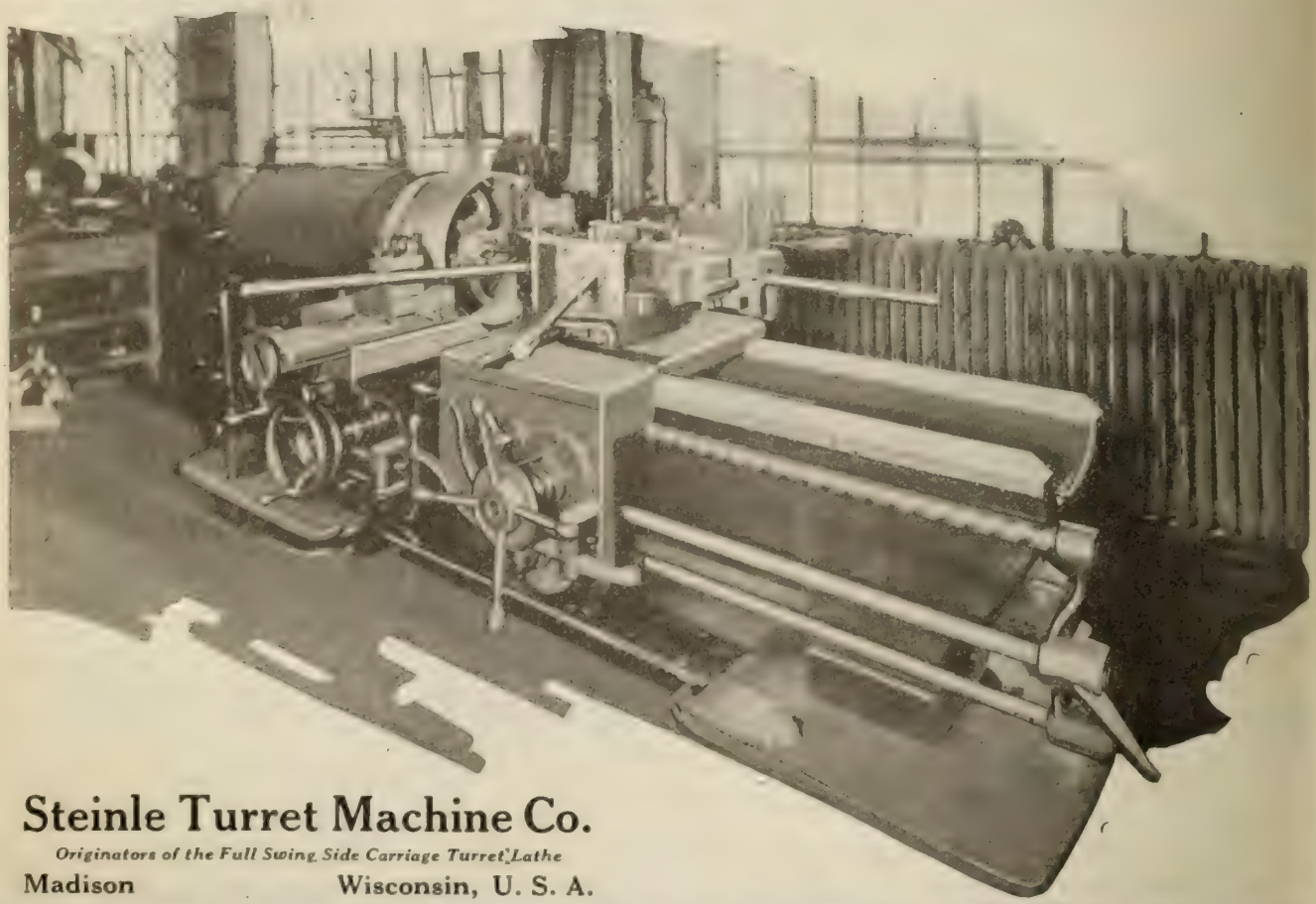

Material—Cast Iron.
Finish—As Indicated.
Time—20 minutes.

## The Job and The Machine

The photograph below was taken in the plant of the J. G. Cherry Company, manufacturers of creamery and dairy machinery and supplies at Cedar Rapids, Iowa, and shows a 24-inch Steinle Full Swing Slide Carriage Turret Lathe turning out a 20-inch diameter crown face pulley. This is only one of many jobs produced with absolute satisfaction on this machine.

In view of present manufacturing conditions it is invariable performance that counts, and the Steinle qualities of accuracy, speed, ease of operation, power, reliability and economy of upkeep are guarantees of satisfactory performance on your own work.

***Why not send us your blueprints for our recommendations?***



**Steinle Turret Machine Co.**

*Originators of the Full Swing Side Carriage Turret Lathe*

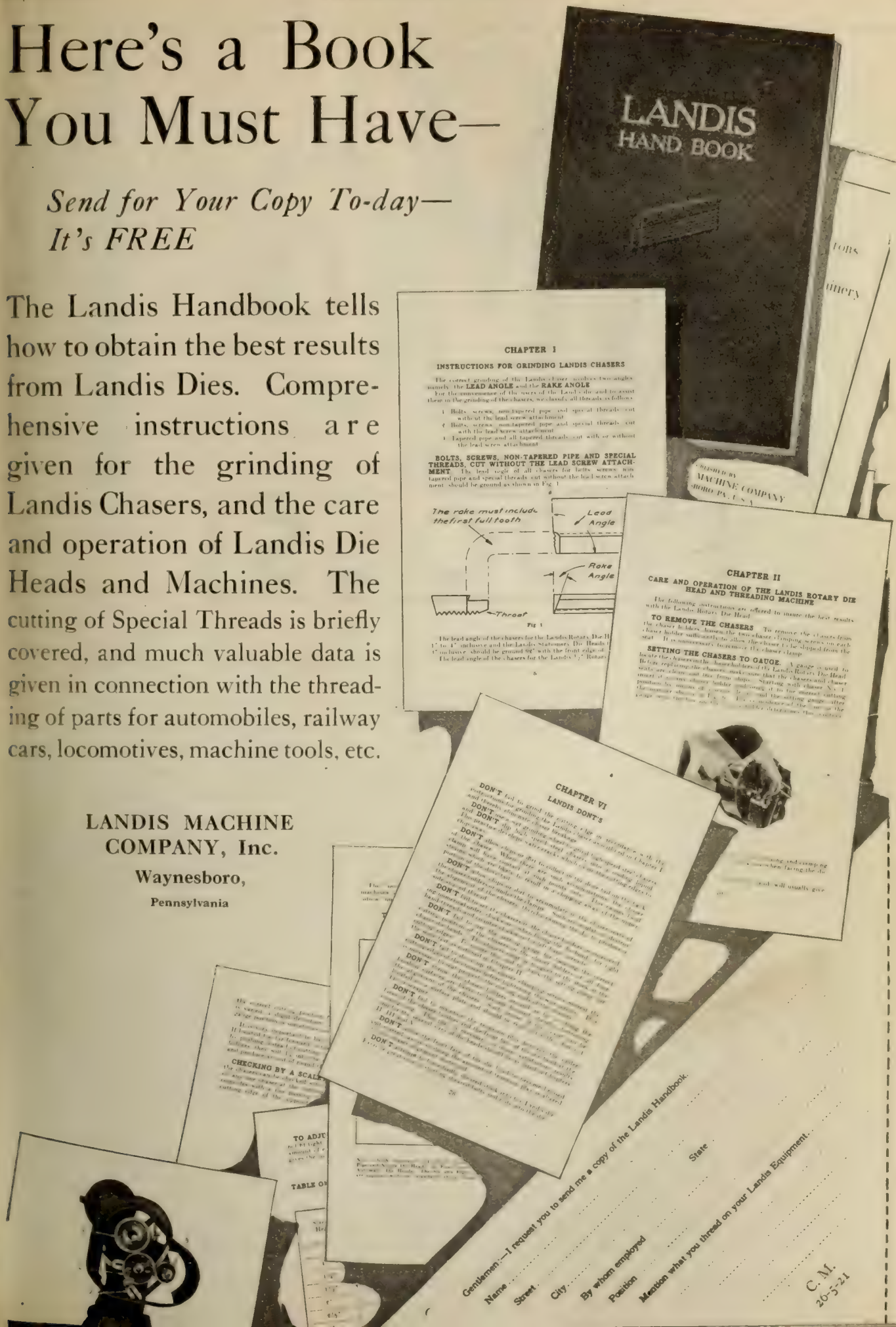
**Madison Wisconsin, U. S. A.**

AGENTS Machine Tool Engineering Company, Singer Building, New York City; Cadillac Tool Company, Dodge Power Building, Detroit, Michigan; L. G. Henes, 75 Fremont Street, San Francisco, California, and Tile Insurance Building, Los Angeles, California. FOREIGN—Leo. C. Steinle, 53 Victoria Street, London, England.

# Here's a Book You Must Have—

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The Landis Handbook tells how to obtain the best results from Landis Dies. Comprehensive instructions are given for the grinding of Landis Chasers, and the care and operation of Landis Die Heads and Machines. The cutting of Special Threads is briefly covered, and much valuable data is given in connection with the threading of parts for automobiles, railway cars, locomotives, machine tools, etc.




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Waynesboro,
Pennsylvania

Gentlemen:—I request you to send me a copy of the Landis Handbook.

Name .....
Street .....
City ..... State .....
By whom employed .....
Position .....
Mention what you thread on your Landis Equipment.

C. M.
26-5-21



IMCO TOOLS



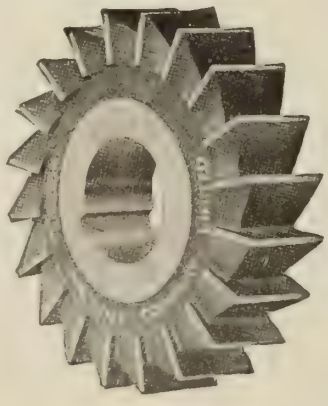
# The "Brain" Margin in Machine Tools

YES, Sir, it's the "brain" margin that makes or breaks a machine tool.

Why does one apparently good tool fail while another succeeds? Why does one speedily finds its way to the scrap heap while another is a "production booster?"

It's in the size of the "brain" margin; the knowing how that determines the extent of a tool's efficiency.

IMCO three and four lip drills, reamers, cutters, and mill ends are built by an organization which spent years in "finding out." IMCO Tools cut more metal in less time; last longer; are more accurate, because of the extra margin that comes from "knowing how."



**When you want a precision tool choose "Imco." Imco reamers are milled twice as deep as ordinary reamers.**

The most complete of modern machine shop facilities enables us to expertly handle any kind of machine tool or machine construction. Consult us on your engineering problems.

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# NAMCO
## COLLAPSING
# TAPS

*Rigidly Held Chasers*
*Positive Collapsing*
*Withdrawal of Tap without injuring threads*
*Positive Resetting*

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**CLEVELAND, OHIO**

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# MORSE DRIVES

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The Sign of Durability

Positive as Gears

Flexible as a Belt

Longer Life

## A Preferred Investment

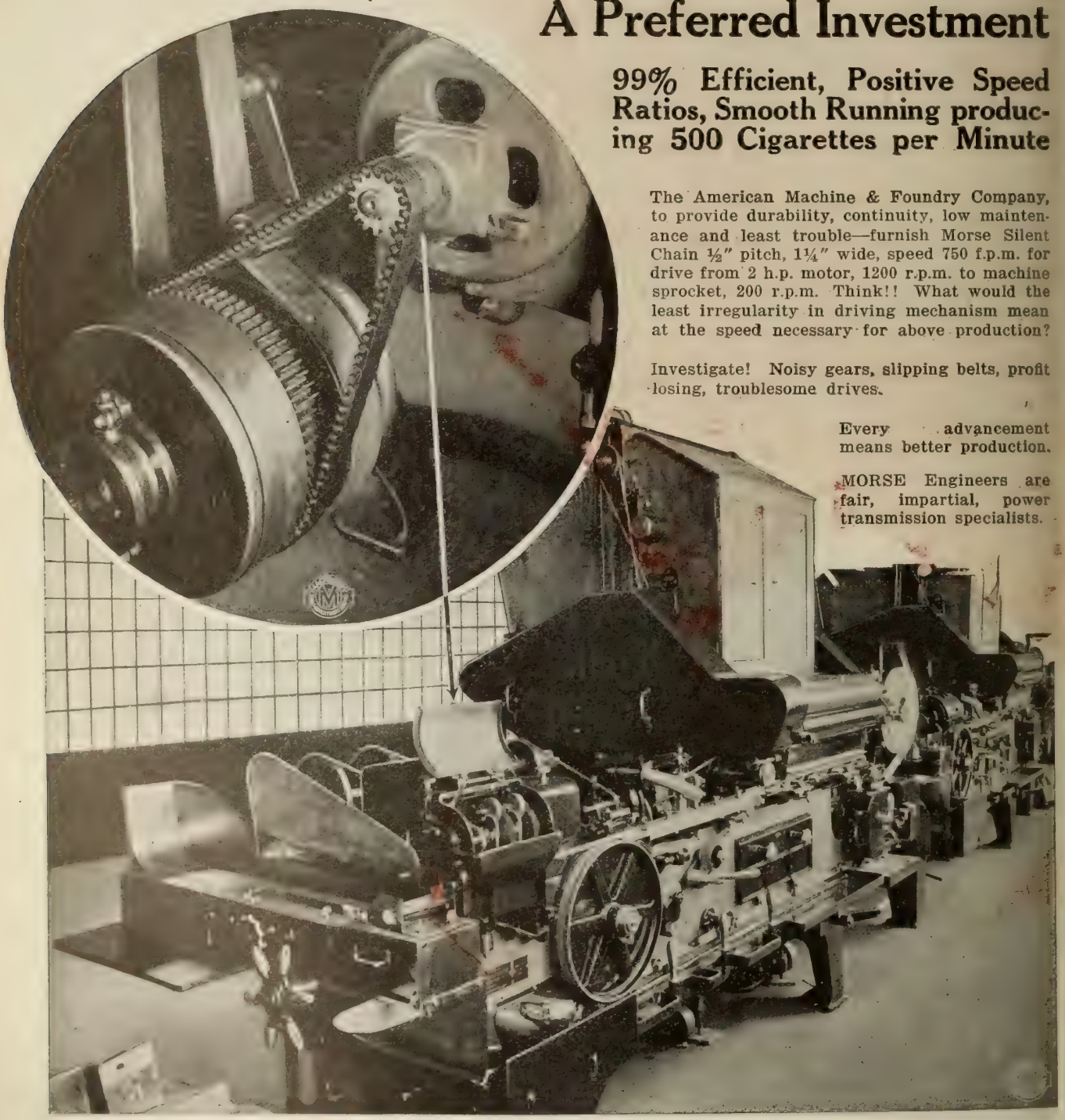
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The American Machine & Foundry Company, to provide durability, continuity, low maintenance and least trouble—furnish Morse Silent Chain ½" pitch, 1¼" wide, speed 750 f.p.m. for drive from 2 h.p. motor, 1200 r.p.m. to machine sprocket, 200 r.p.m. Think!! What would the least irregularity in driving mechanism mean at the speed necessary for above production?

Investigate! Noisy gears, slipping belts, profit losing, troublesome drives.

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*Write for Booklet*

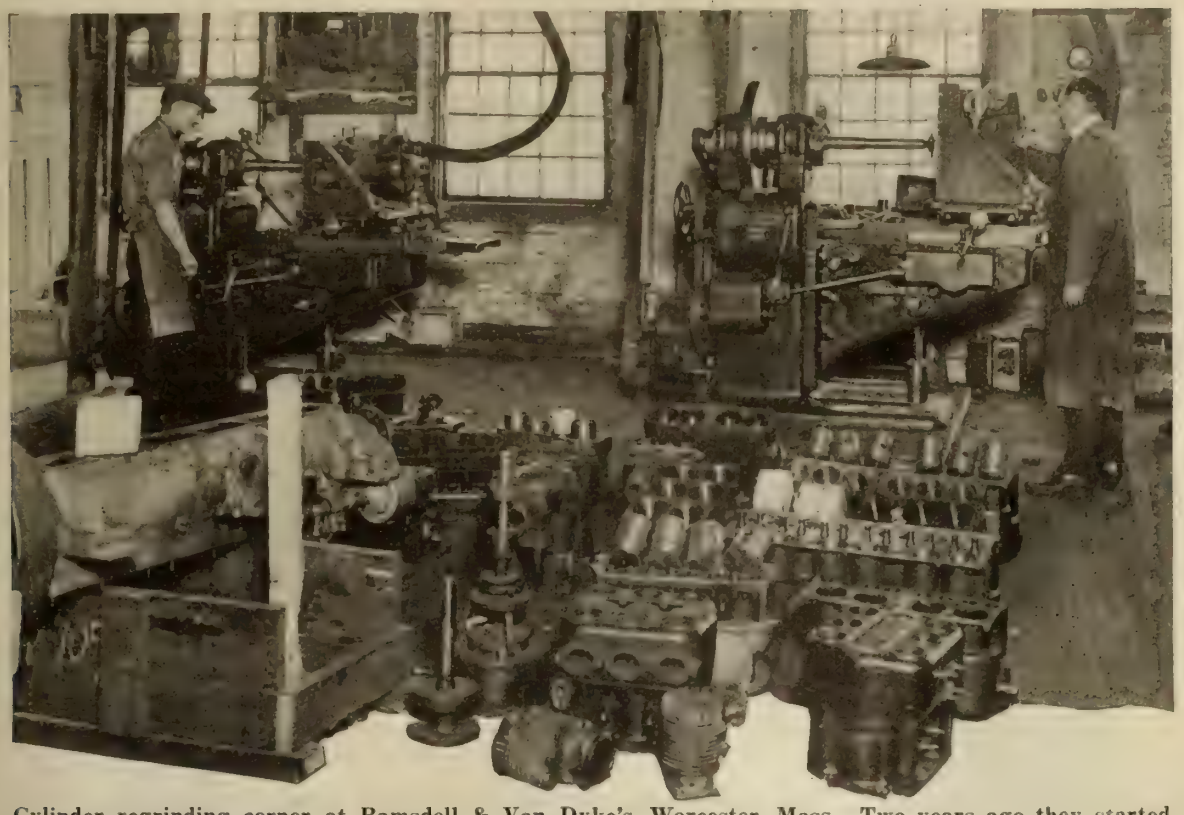
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Our Guarantee Always Behind the Efficiency, Durability and Service

HEALD

# Heald Employees Enter Regrinding Business



Cylinder regrinding corner at Ramsdell & Van Dyke's, Worcester, Mass. Two years ago they started on practically nothing. Now, six men are required to take care of the blocks that arrive each day.

A man that practices what he preaches, or a doctor that will take his own medicine, is usually thoroughly convinced of its advantages and merits.

So enthusiastic are the Heald employees over the possibilities and profits of cylinder regrinding that many have gone into the business themselves.

Above is the regrinding corner at Ramsdell & Van Dyke's shop in Worcester, Mass. Van Dyke was formerly demonstrator for The Heald Machine Company and started in two years ago with Ramsdell, who also worked at Heald's. "We had blocks ahead of us from the very first," is the way Van Dyke defines his business that has grown by leaps and bounds in two years' time.

Just recently Oliver Johnson, demonstrator and salesman in the Chicago territory, has heard the call and gone into cylinder grinding.

These boys know the returns of shops equipped with Heald machines. They are getting into the game while the getting is good.

Since the first appearance of the self-contained Style No. 55 with its large capacity and wide range, its simplicity and moderate price, the whole Heald organization from the office boy to the general manager has been filled with enthusiasm over the possibilities of regrinding. Every employee is sold on the proposition.

**Let us give you facts and figures on the possibilities and profits of regrinding. Wire, phone or write.**

## The Heald Machine Company

**51 New Bond St. - - Worcester, Mass.**

*If interested tear out this page and place with letters to be answered.*



# Cutting Commercially Accurate Threads in Monel with GTD *"Gun"* Taps and *"Acorn"* Dies

NO ordinary tap or die can thread Monel metal—a fact which up to now has limited its use in many plants, where its great strength and non-corrosive properties would otherwise strongly recommend it.

The GTD staff, however, recently made a series of tests with Monel and to the great satisfaction of the officials of The International Nickel Company, who produce this popular metal, proved that it can be tapped and threaded to any degree of commercial accuracy required in spite of its toughness and ductility.

Instead of
—cutting over size —clogging
—breaking —dulling
the GTD *"Gun"* Taps did their work as cleanly and with as little difficulty as they would in steel, and when thread after thread had been cut with the chips shooting ahead, in true "Gun" Tap style, the threads were gaged—the first and last in each hole measuring to size without perceptible variation.

With samples of threaded Monel and a report of the tests before them, the International Nickel Company sent in this letter, which we are proud to quote:

> "We have received and examined samples of Monel Metal threaded and tapped with your *"Acorn"* Die and *"Gun"* Tap. The fact that there are no indications of torn surfaces or of split threads is evidence of the efficiency of your tools.
>
> "You are to be congratulated that so successful a piece of work could be done using your stock tools, and by operators unfamiliar with threading Monel Metal."

If you have a threading problem which involves Monel or any other metal, which has previously been difficult to thread, try the *"Gun"* Tap and *"Acorn"* Die—specially designed exclusive GTD products. Or if you wish the experimenting done for you, write us stating kind of metal used, or sending sample—and our engineering department will demonstrate quickly and thoroughly how the *"Gun"* Tap and *"Acorn"* Die work. We will be pleased to send you circulars descriptive of the *"Gun"* Tap and *"Acorn"* Die. Just fill out and mail the attached coupon.

GREENFIELD TAP AND DIE CORPORATION
OF CANADA, LIMITED GALT, ONTARIO

Successors to Wells Bros. Co. of Canada, Ltd., Galt, Ontario

GTD Screw Plates, Taps, Dies, Reamers, Gages, Pipe Wrenches

GTD
Corporation of Canada, Ltd.
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Send me circulars describing the *"Gun"* Tap and *"Acorn"* Die.

Name metals to be threaded

Name Position

Firm or Company

Address CM 206

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## AMERICA'S OLDEST AND HIGHEST GRADE VISES

### Pioneers in 1842—Leaders Ever Since

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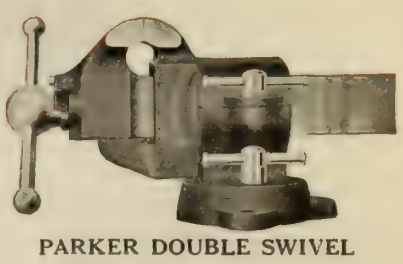
PARKER VICTOR



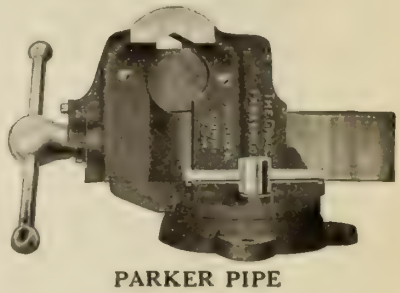
PARKER ECLIPSE

### *Reasons Why:*

1. Semi-Steel Casting made in our own foundries.
2. Patented swivel base.
3. Solid Steel-Bar Slide Strengthener.
4. Renewable, milled and fitted tool steel jaws.
5. Saddle, taking up lost motion and allowing screw to be easily removed for lubrication, also making solid under portion to slide.
6. Set screw and spring tension in handle.
7. Extra strong screw and nut.



PARKER DOUBLE SWIVEL



PARKER PIPE



PARKER WOOD WORKER

BACKED BY 79 YEARS OF SATISFACTORY SERVICE
STOCKS CARRIED BY LEADING CANADIAN JOBBERS

***Can You Afford to Be Without Them?***

## THE CHARLES PARKER CO.

Meriden, Conn. ***Master Vise Makers*** U. S. A.

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# Where failure of the smallest part may cause the greatest loss

WHERE continuous service is necessary, but where acids, alkalies and steam tend to destroy, see that essential parts are made of Monel.

Where a part has failed due to a lack of strength, corrosion or rust—replace it with Monel.

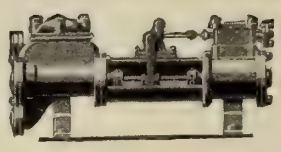
Monel resists corrosive and erosive action, is as strong as steel and has practically steel's co-efficient of expansion. There are hundreds of places in your plant where Monel will save you money and uncertainty.

# Monel metal

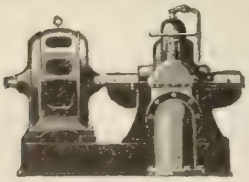
**VALVES**—Use Monel for seats, rings, guide stems, clappers, wedges, spindles, dash pots and pistons. You are assured that none of the parts will fail under any conditions for which the valve was designed. Chapman, Crane, Jenkins, Lunkenheimer, Nelson, Walworth, Pratt & Cady and others use Monel in these parts. *Make it of Monel.*



**PUMPS**—See that Monel is used for liners, runners, valve seats, trim, hand hole covers, plunger rods, stuffing boxes and plungers. Strong as steel, uncorrodible and proof against superheat, it makes any pump the ideal towards which its designer worked. *Make it of Monel.*



**TURBINES**—Monel blading and poppet valves are necessary for perfect turbine operation. At least the United States Navy thinks so. Monel is unaffected by high pressures and the eroding impact of superheated steam. *Make it of Monel.*



**BLOWERS**—If the blading of your blower is made of Monel, it will stand up under the corroding action of nearly all gases and dusts. Very few acids or alkalies affect Monel and it simply won't rust. *Make it of Monel.*



**GAS AND OIL ENGINES**—Specify Monel for valves, ignition chambers, ignition tubes, fuel filters and scavenger valves. It has practically the same co-efficient of expansion as iron and therefore can be readily combined in design. It is as strong as steel, never rusts and resists high heat and corrosion. *Make it of Monel.*



**METERS**—Monel cylinders, bushing, valves, valve parts, spindles, screws, gear and wheels, assure the accurate and continuous work demanded of these instruments. *Make it of Monel.*



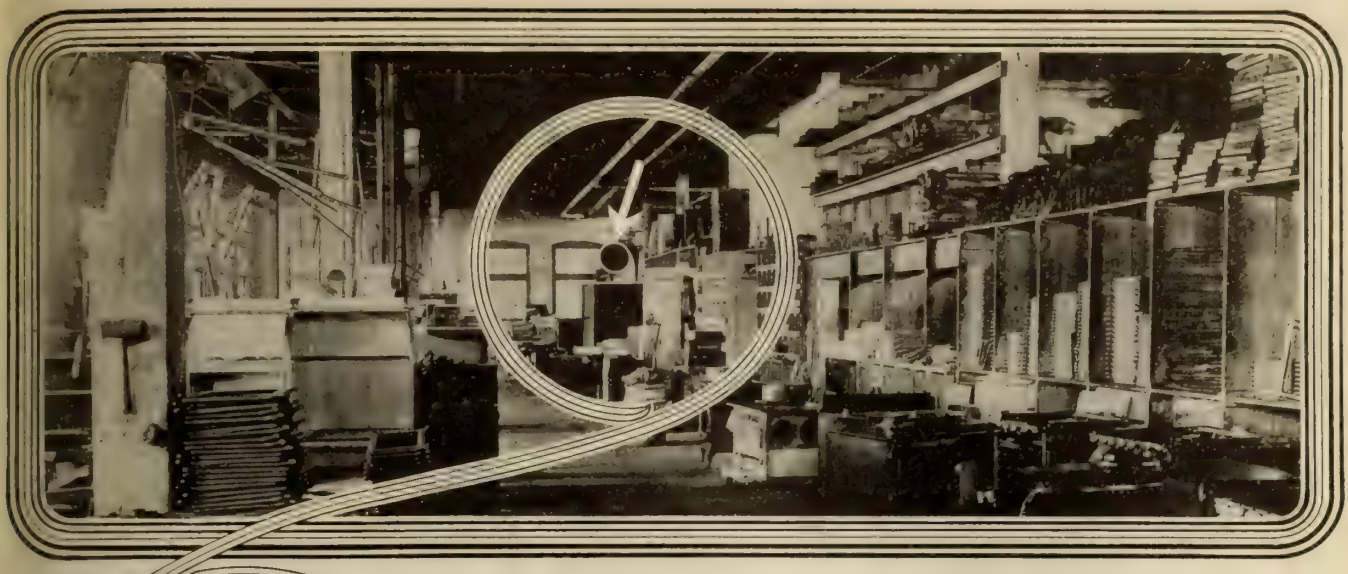
The name Monel identifies the natural nickel alloy—67% nickel, 28% copper and 5% other metals—produced by The International Nickel Company. Monel products include Monel blocks, Monel rods, Monel castings, Monel sheet, Monel wire, Monel strip stock, etc.

## The International Nickel Company of Canada, Limited

**Harbor Commission Building**

**Toronto** **Ontario**

*Producers of* METALLIC NICKEL *in the forms of* Ingot, Shot, Electrolytic Cathodes—99 8-10% Malleable Nickel, NICKEL SALTS, Oxides, Carbonates, Sulphates, Sulphides, Acetates, Formates—MONEL METAL, Ingot, Shot, Blocks.





# Why Heat Your Factory Only in Spots?

The Skinner Bros. (Baetz Patent) Heating System will heat all of the open space in your factory all of the time—there will be no places continually too warm while others are too cold, as is usually the case with old-time heating systems.

## Simple and Economical

Skinner Bros. (Baetz Patent) Heaters operate without outside pipes or ducts. They are portable and require no foundations—cost of installation is 15% to 50% less than any other system—operating cost is equally low. The mild, constant circulation of warm air does not cause drafts or air blasts, raise floor dust or create other conditions injurious to the health of employees.

### Mechanical Details

Built as an individual enclosed unit with a series of pipe coils compactly mounted above a powerful fan-wheel. Coils are heated by exhaust or live steam. Cold air is drawn into the heater by the fan, impelled upward and around the coils, and, after being heated, is diffused through outlet hoods to every part of the open area. No pipes or ducts used. The fan is operated by any power available.



### Direct-Fired Type

Where steam is not available, we supply our direct-fired type DF, which burns coal, coke or wood. Built on the same scientific principle as type SC. The fan is operated by any power available.

## Get Further Details

The principle of operation of Skinner Bros. (Baetz Patent) Heaters is briefly described at the left. Performance is guaranteed on a strictly money-refund basis. Complete detailed information and list of users will be sent on request. Please use the coupon.

**Skinner Bros. Mfg. Co., Inc.**

**1438 South Vandeventer Ave.** **St. Louis, Mo.**

Boston.....449 Little Bldg.
Buffalo.....706 Morgan Bldg.
Cleveland.....616 Marshall Bldg.
Chicago.....1508 Fisher Bldg.
Indianapolis....330 Occidental Bldg.
New York.....1706 Flatiron Bldg.
Minneapolis...806 Metropolitan Life Bldg.

# Skinner Bros.
## Baetz Patent HEATING SYSTEM

Skinner Bros. Mfg. Co., Inc.
1438 S. Vandeventer Avenue, St. Louis, Mo.

Please send complete details on Skinner Bros. (Baetz Patent) Heaters to

Firm .....

Address .....

Building used for.....

We can / cannot use steam.

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THE "DAVON" PATENT

# MICRO-TELESCOPE AND SUPER-MICROSCOPE

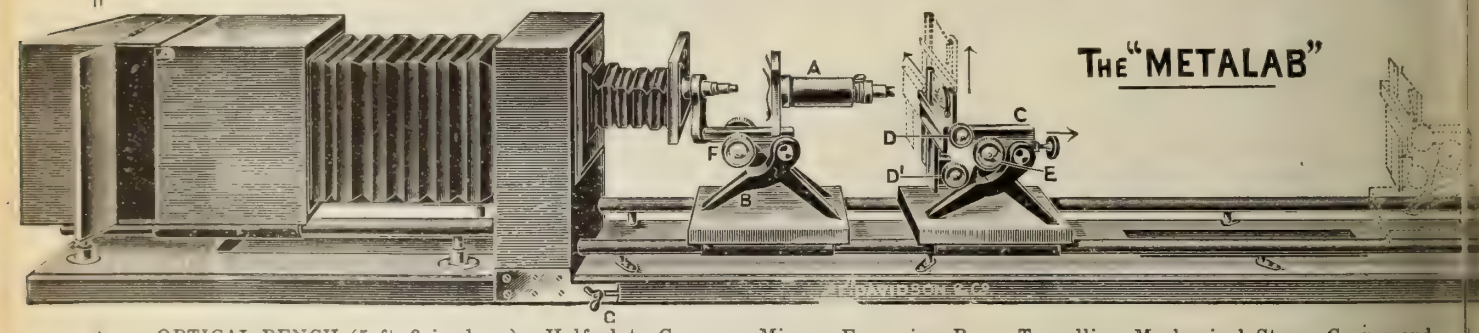
**Combining the functions of the Microscope, Telescope, Camera, and Projection Lantern for Industrial, Laboratory, and Educational Purposes.**

**A NEW FIELD OF OBSERVATION IS OPENED UP**

**The Gap Between the Microscope and Telescope is Bridged.**

## For Observation & Photography of Metal Fractures, Minerals, &c.

WITH LARGE "FIELD," LONG WORKING DISTANCE AND GREAT "DEPTH OF FOCUS"




OPTICAL BENCH (5 ft. 3 in. long). Half-plate Camera. Mirror Focussing Box. Travelling Mechanical Stage, Coarse and Fine Focussing (C), Vertical Illuminator, 4 in., 1½ in., 1 in., 2-3 in., 1-6 in., and 1-12 in. in immersion. "DAVON" Photo-Micro Objectives, "DAVON" Pat. Super-Microscope and Short Focus attachments, etc. Camera detachable. Body tube of Microscope to be replaced for observation.

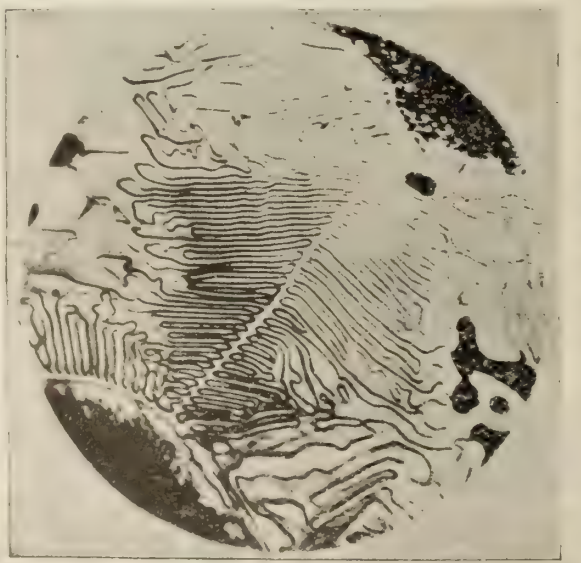
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HIGH SPEED STEEL AS CAST. Mag. x 1400. Objectives 1-12" and 1". Exposure 70 seconds. 500 c.p. Arc Light.



**No long extension camera is necessary.**

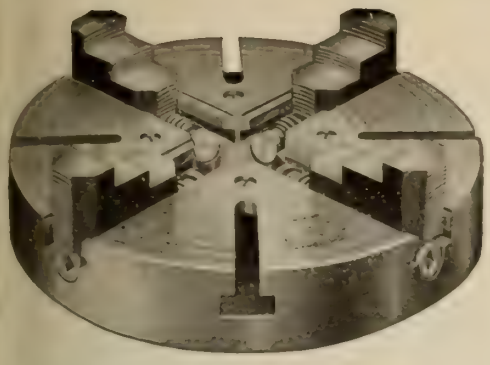
**Focussing is simplified by manipulating the mechanism E, D, D1 and C, while watching the image forming on the mirror through the door at the side.**

**More than one observer can watch the operation.**

M385

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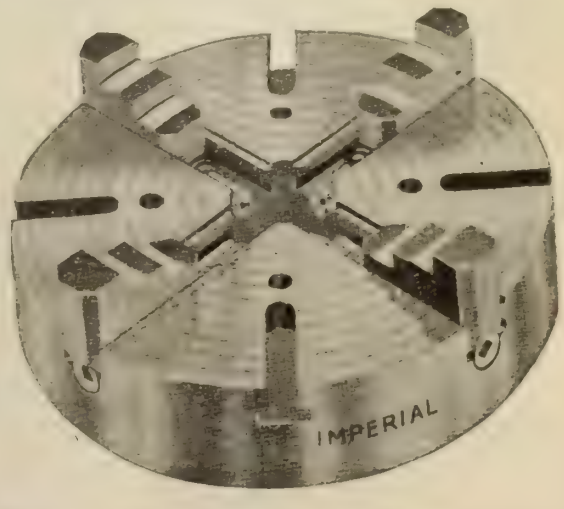
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**Asbestos**—Asbestos felt also completely covers the steel. It cannot rot or decay. Acids and alkalies do not affect it.

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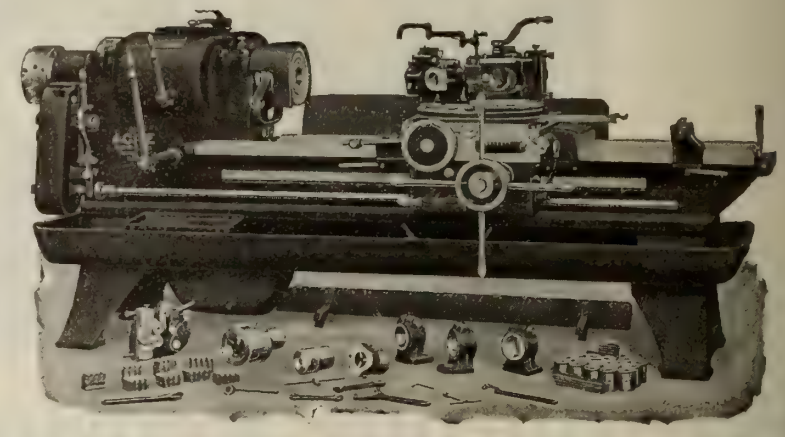
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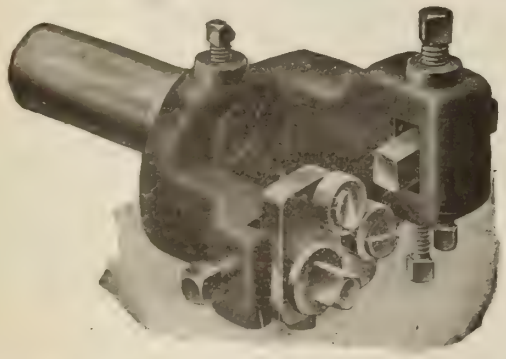
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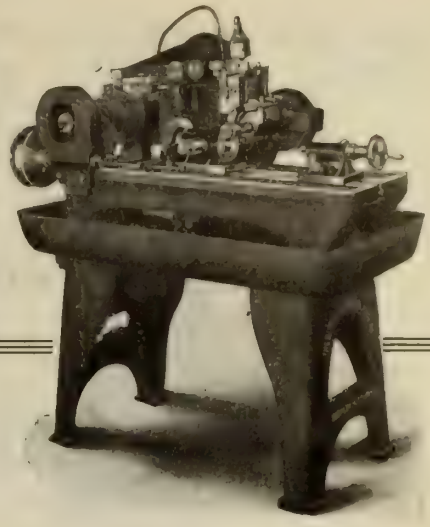
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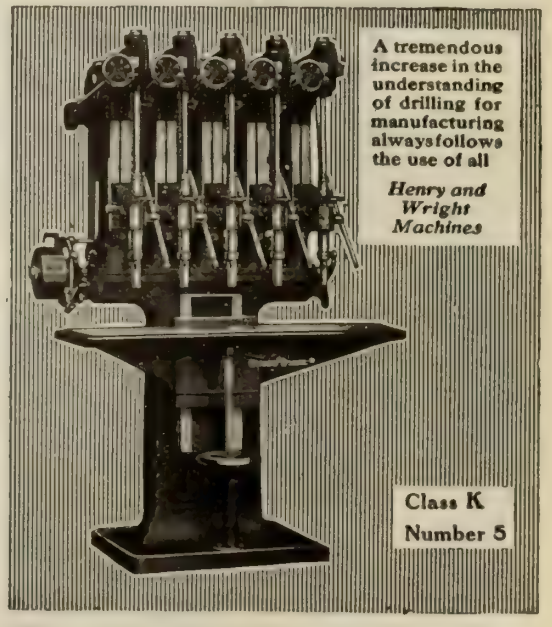
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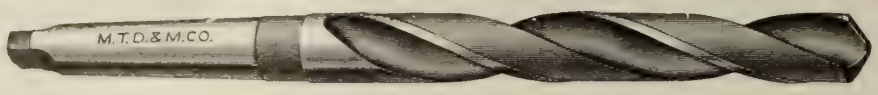
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## Because of their Absolute Reliability

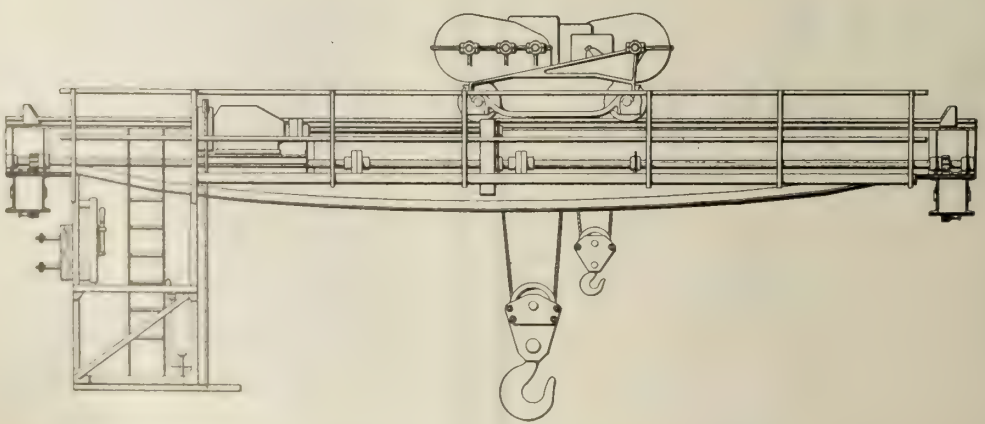
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## will prove a valuable aid in this direction.

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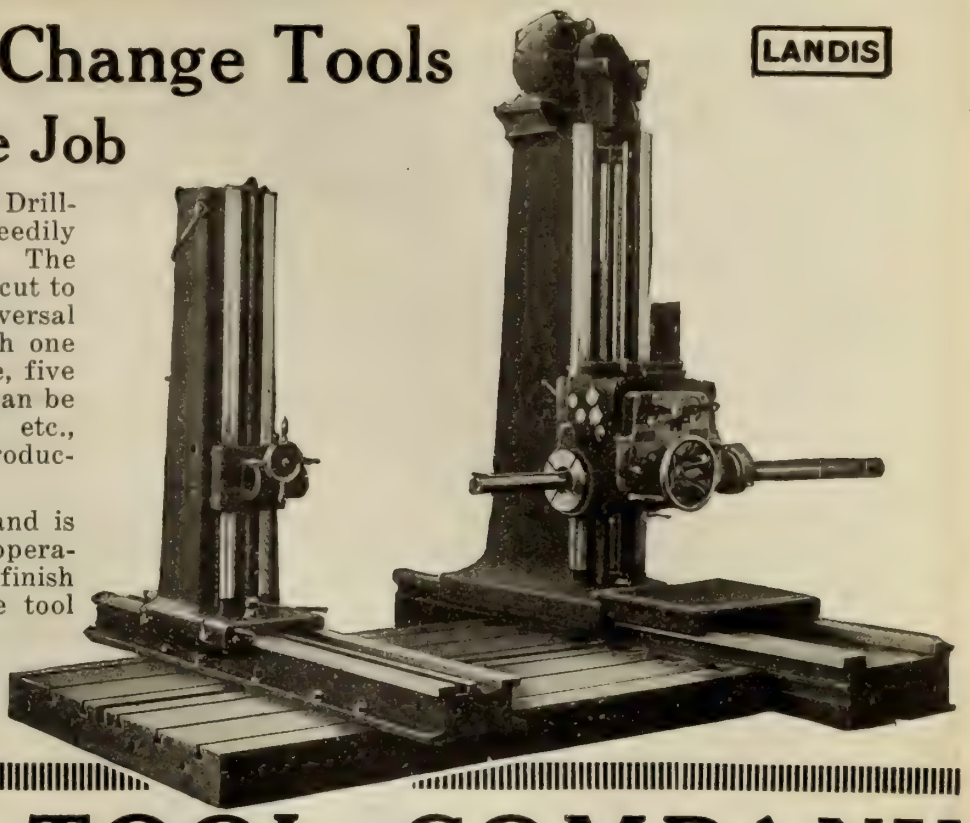
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LANDIS

The Landis Boring, Milling and Drilling Machine accurately and speedily machines the heaviest castings. The usual expense of set-up time is "cut to the quick" by the use of the Universal Tilting and Rotary Table. With one set up of the work on this table, five sides or any angle of the piece can be bored, milled, drilled, tapped, etc., making a decided cut in non-productive time.

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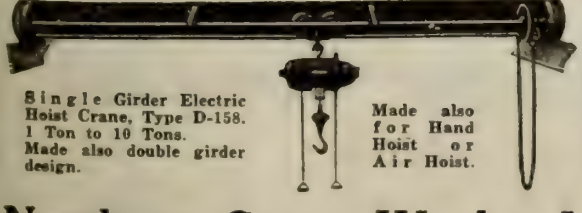


Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada.

We make a wide range of CRANE and HOIST designs. All sizes and capacities, 1 ton to 100 tons.







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Made also for Hand Hoist or Air Hoist.

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Type D Electric Hoists—½ to 10 Tons.

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## Northern Crane Works, Limited

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# Gear Cutting With the "IFS" Left Out

## The Gear Shaper Way

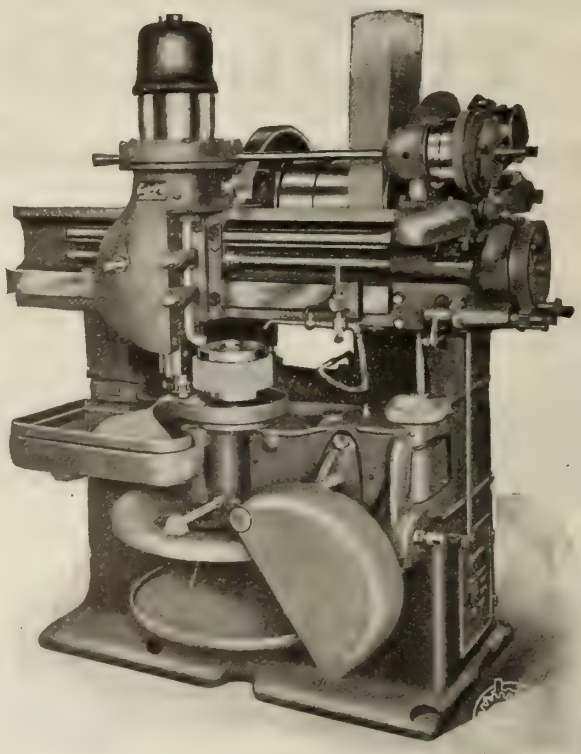
A production manufacturer knows that he will secure good gears IF he has an accurate cutter, an accurate machine and a machine working on the correct principle. The whole question of good gears is resolved in this one little word "IF."

When the Gear Shaper was originally designed, the question of "IF" was taken into consideration and every possible means known to mechanical engineering was employed to eliminate the "IFS" from gear cutting.

That we have been successful in solving the problem is evidenced by the fact that each ensuing year sees a larger number of manufacturers adopting the Gear Shaper method.

How the Gear Shaper has accomplished this is clearly explained in our general catalog "Commercial Gear Cutting," which is a treatise on the subject of:—
Gear Cutting with the "IFS" Left Out.

**Send for your copy to-day.**



The Fellows Gear Shaper—the machine which has taken the "IFS" out of gear cutting.

# The Fellows Gear Shaper Company

## Springfield, Vermont, U.S.A.

FOREIGN AGENTS:—Alfred Herbert, Limited, Coventry, England; Societe Anonyme Alfred Herbert, Paris, France; Societa Anonima Italiana Alfred Herbert, Milan, Italy; Alfred Herbert, Limited, Yokohama, Japan; Societe Anonyme Alfred Herbert, Barcelona, Spain; Societe Anonyme Belge Alfred Herbert, Brussels, Belgium; Alfred Herbert (India), Limited, Calcutta, India.


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There is some outstanding feature of all La Salle Grinding Machines that lends it exceptional productive ability.
The American Drill Grinder is especially adaptable for grinding twist, flat and three-lipped drills, because it has automatic lip rest and caliper jaw device, which assures proper clearance on all sizes of drills automatically. Send for descriptive matter covering our entire line of grinding machinery.



American Drill Grinder
For Wet or Dry Drill Grinding 1/8" to 2¼". Also 1/8" to 3½" dia.

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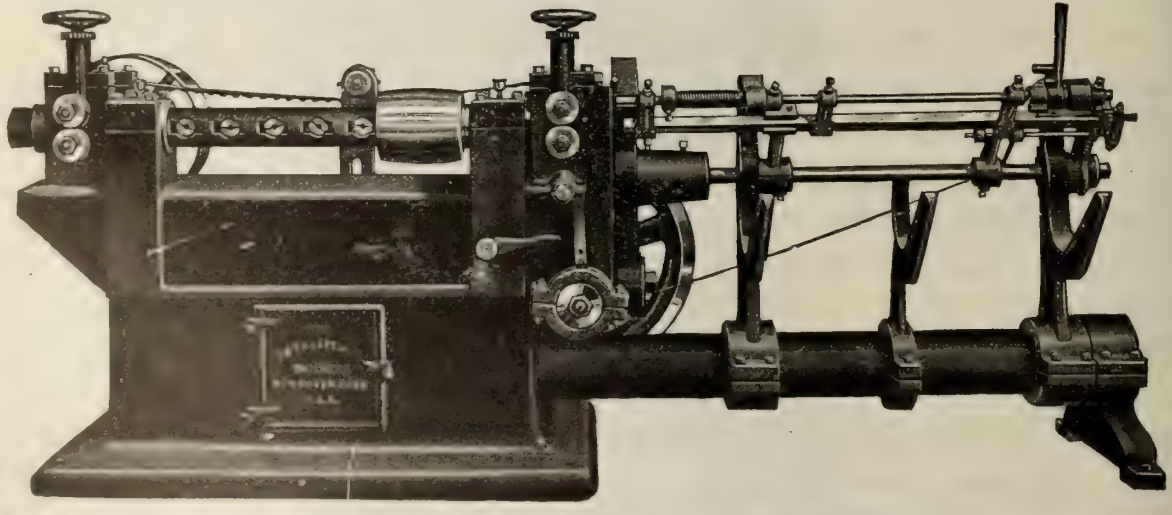
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# Automatic Wire Straightening and Cutting Machine

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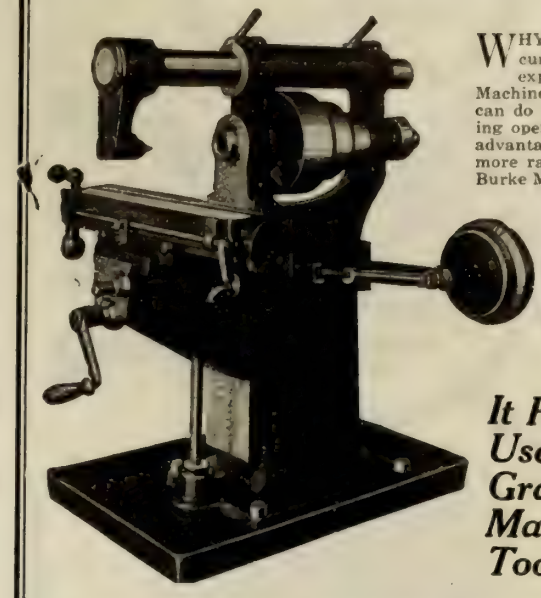
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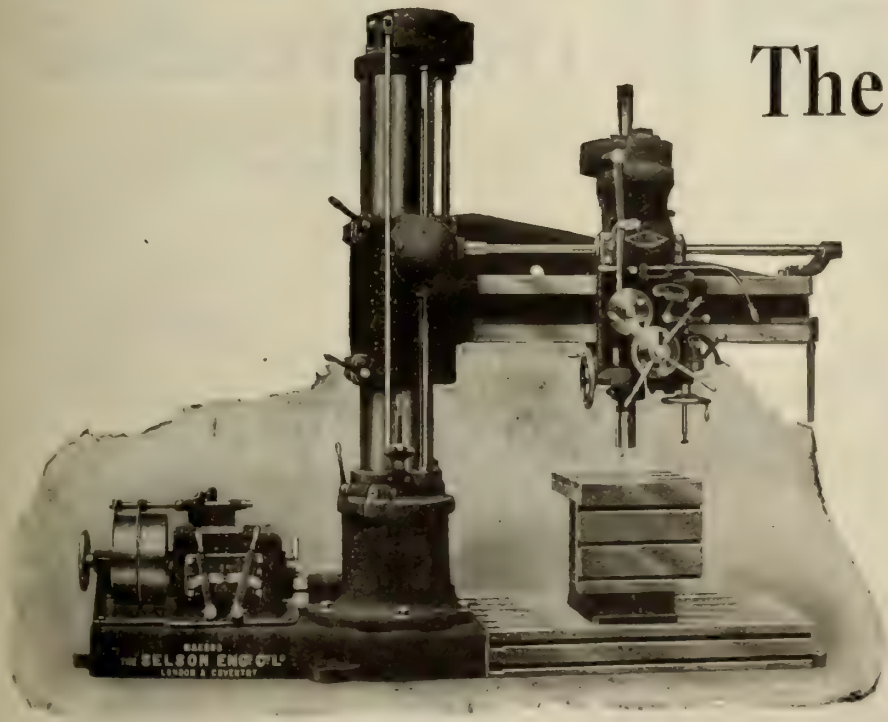
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Central Thrust Radial Drilling Machine

The Selson form of Central Thrust is considered best for the Arm of Radial Drilling Machines.

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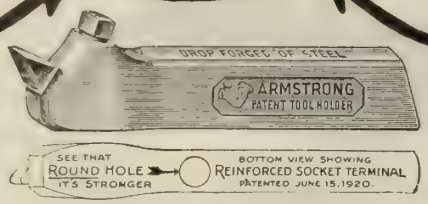
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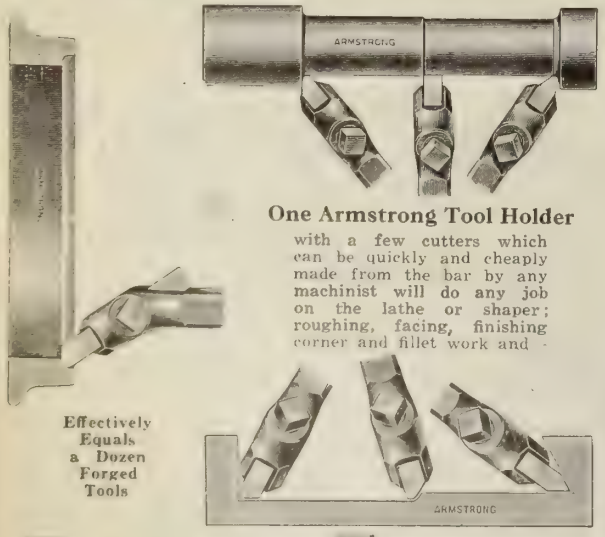




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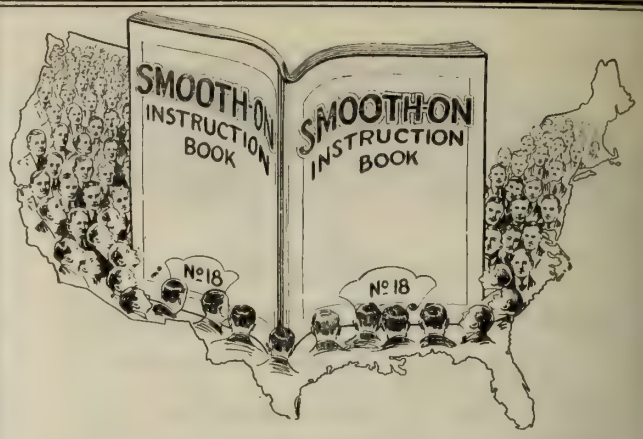
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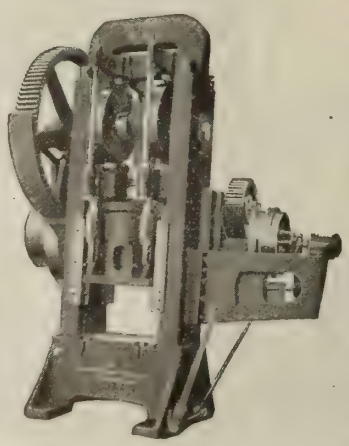
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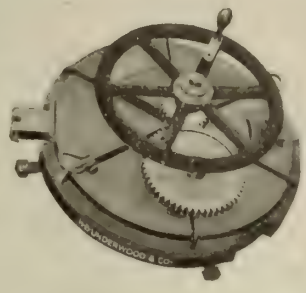
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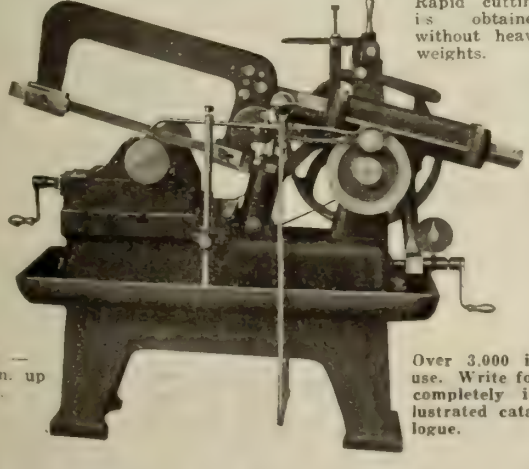
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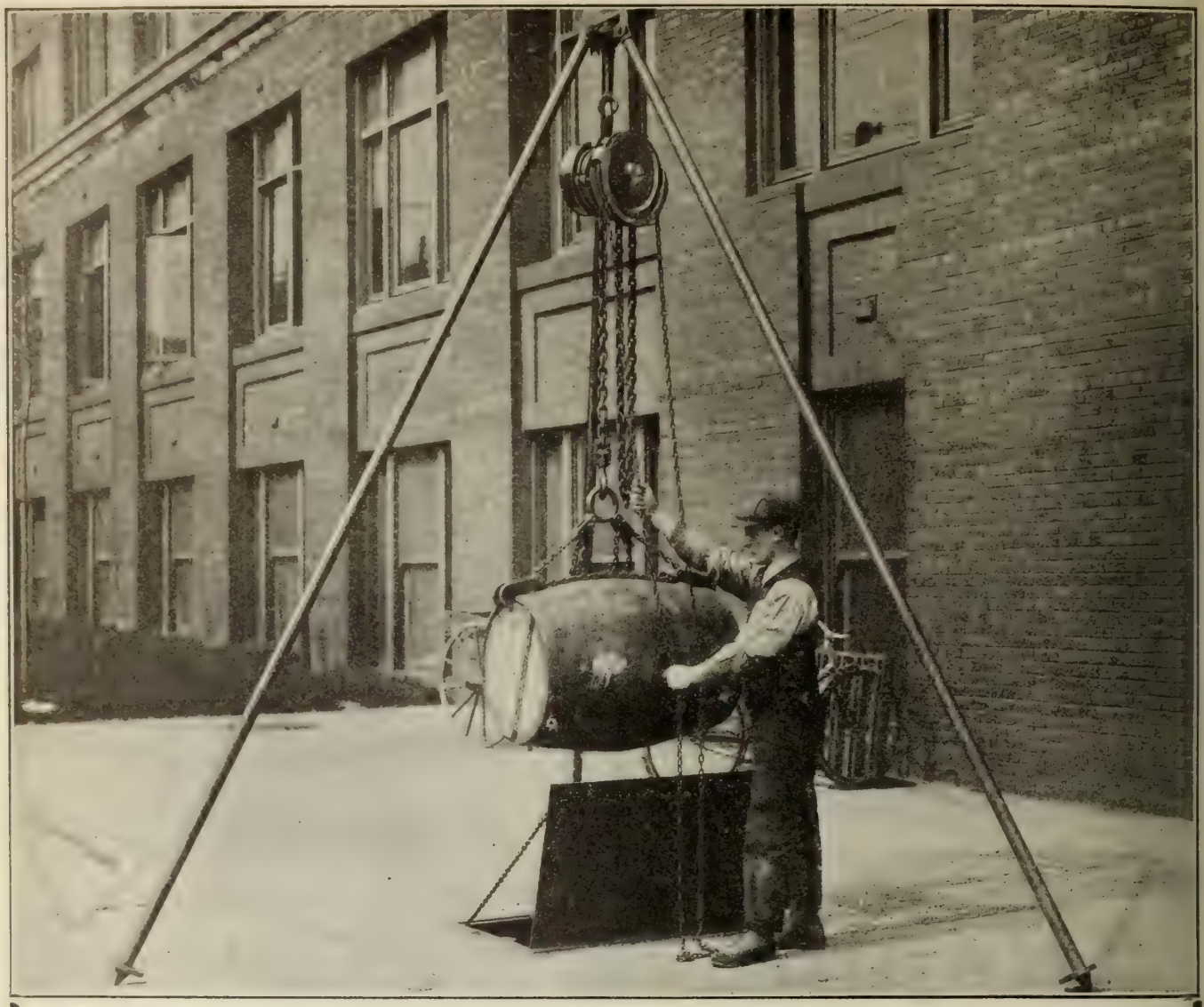
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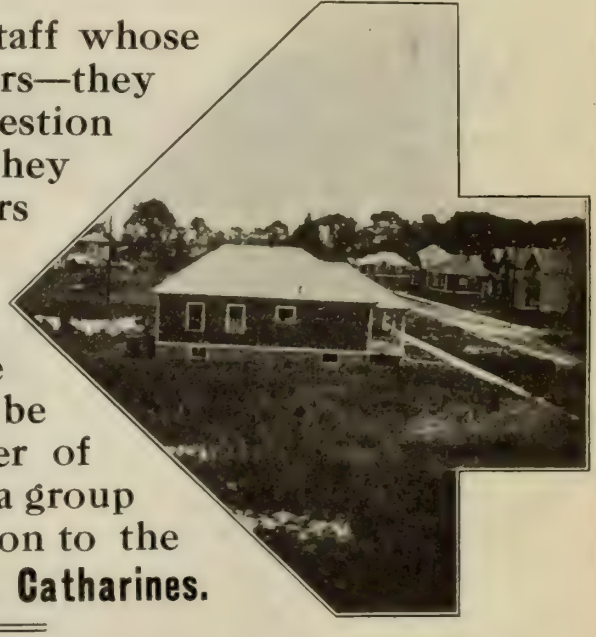
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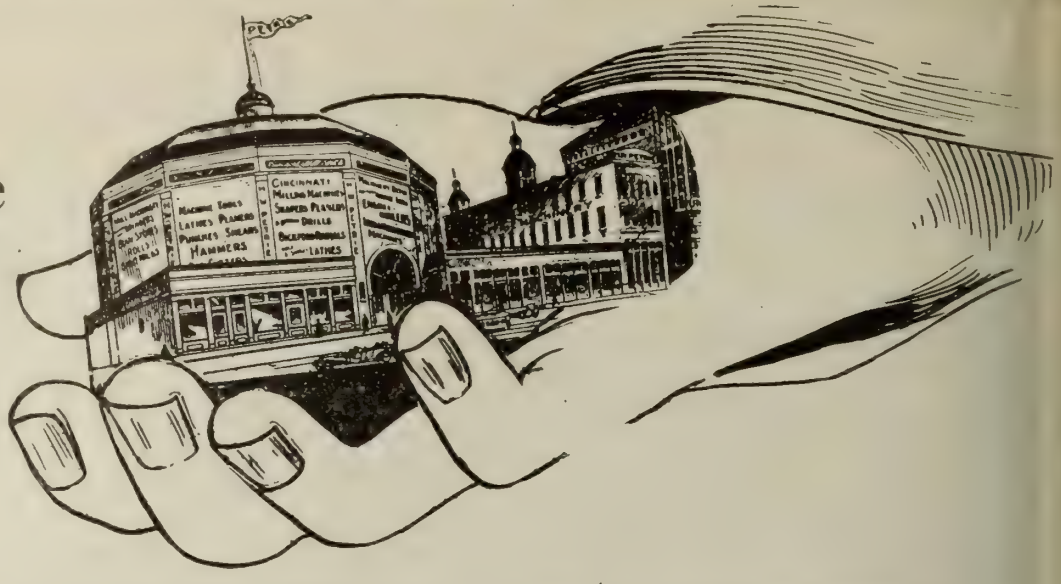
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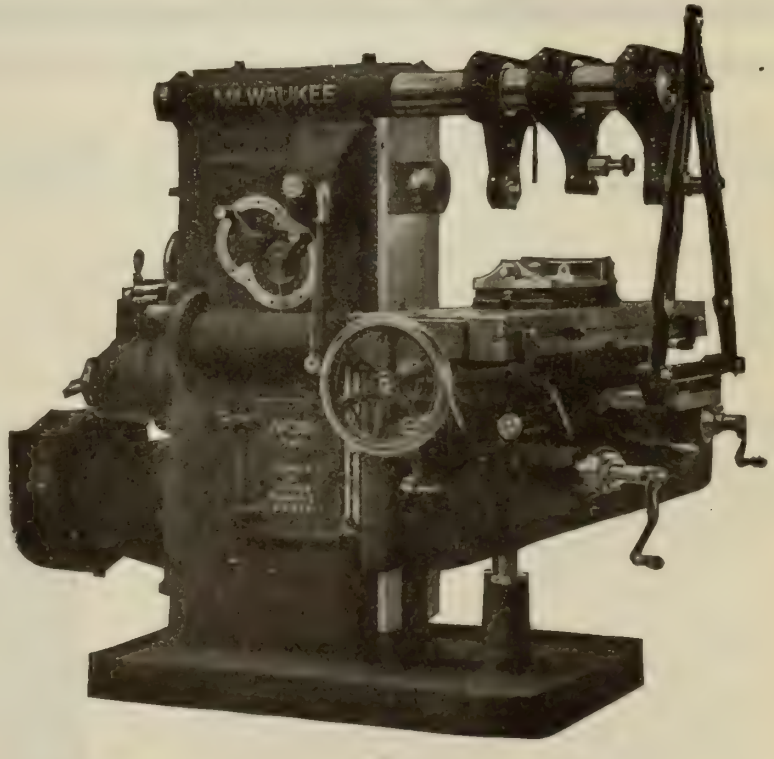
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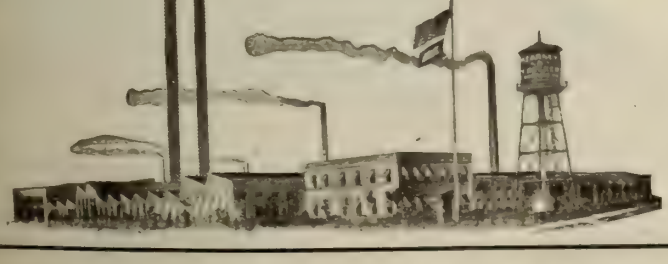
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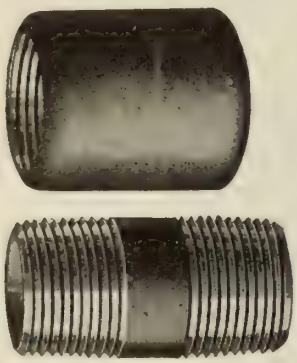
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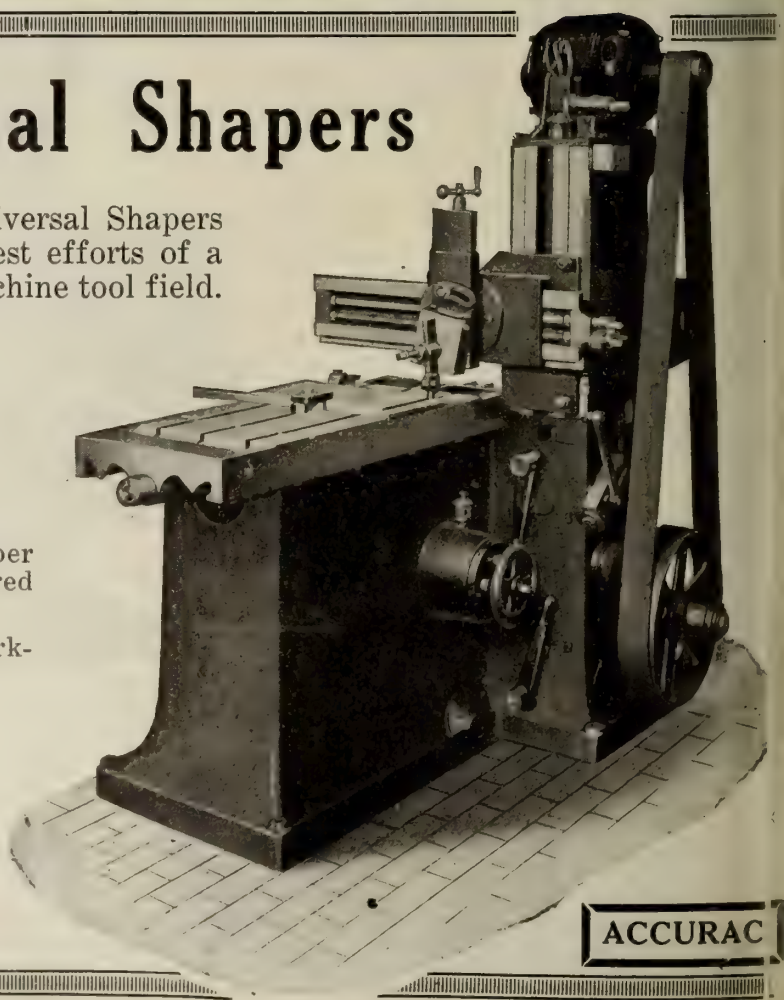
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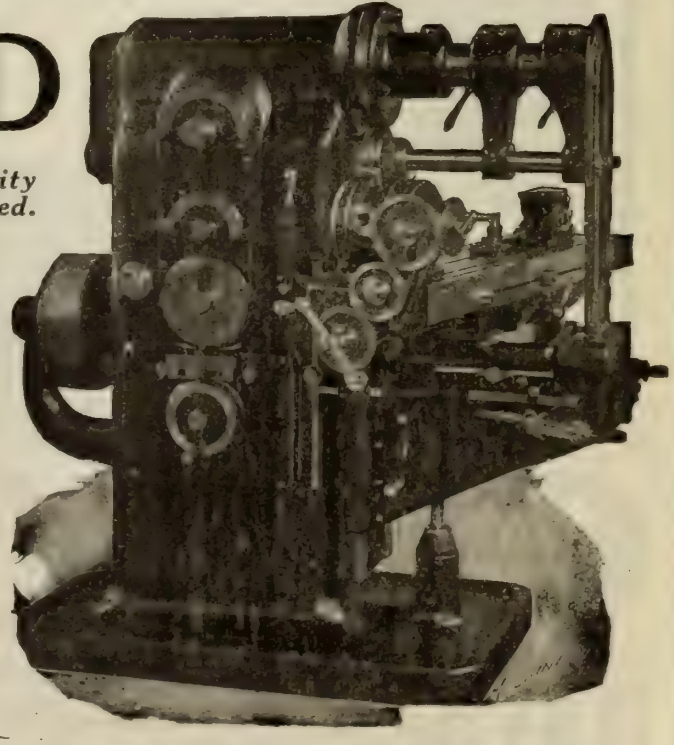
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Saves Time, Labor, Expedites Production

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*Its speed, simplicity of operation and great utility Assures Big Profits in whatever work it is used.*



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In the tool room, in the shop, in the manufacturing or jobbing establishment this "Miller" is beyond comparison.

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Put the power of the "Rockford" to the severest tests. It's built to more than meet the demands likely to be made upon it. It is the pace-maker of the machine shop.

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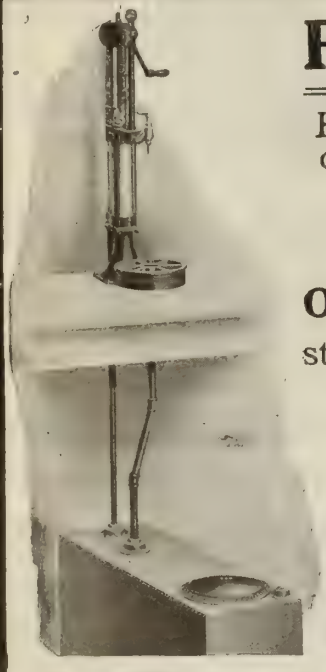
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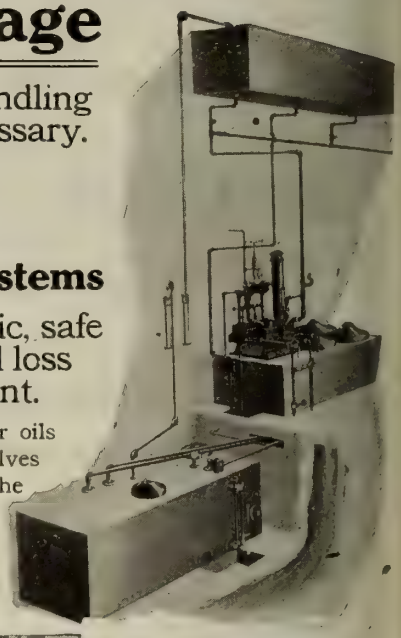
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Light, Strong, Compact, Inexpensive, Quick-Acting.

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Heavy, Cumbersome, Expensive, Slow-Acting.



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*Are Dust-Proof* *Easy To Hold* *Easy To Control*

**A Remarkable Tool for Fast Chipping**

Made in "Seventeen" sizes with "Open" or "Enclosed" handles—Outside or Inside Latch.

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**For Floor - Flask - Bench or Core Work**

**Run Fast Hit Hard**



**Have No Vibration**

*Cleveland Rammers Are "Dust-Proof"*



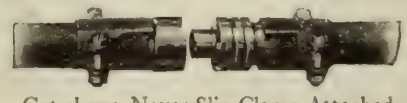
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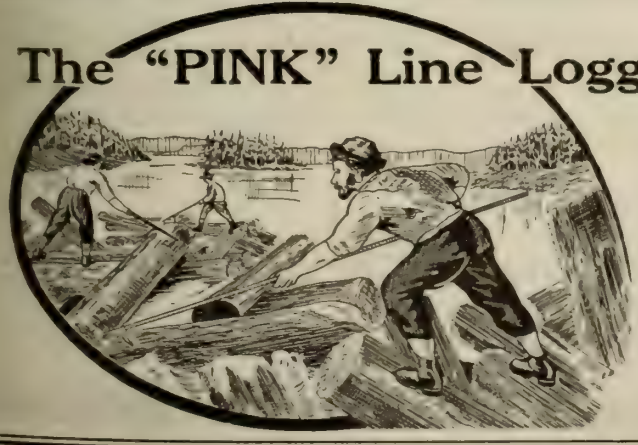
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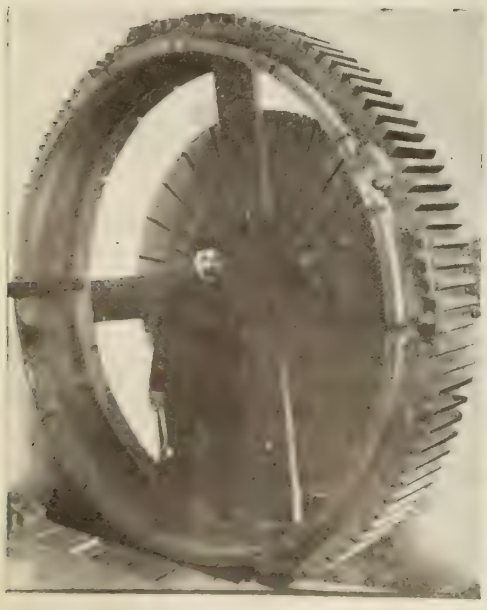
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We export the same good quality of lumbering tools that have made PINK'S TOOLS a by-word in the matter of good tools in all Canadian lumber camps. Enquiries cordially solicited.

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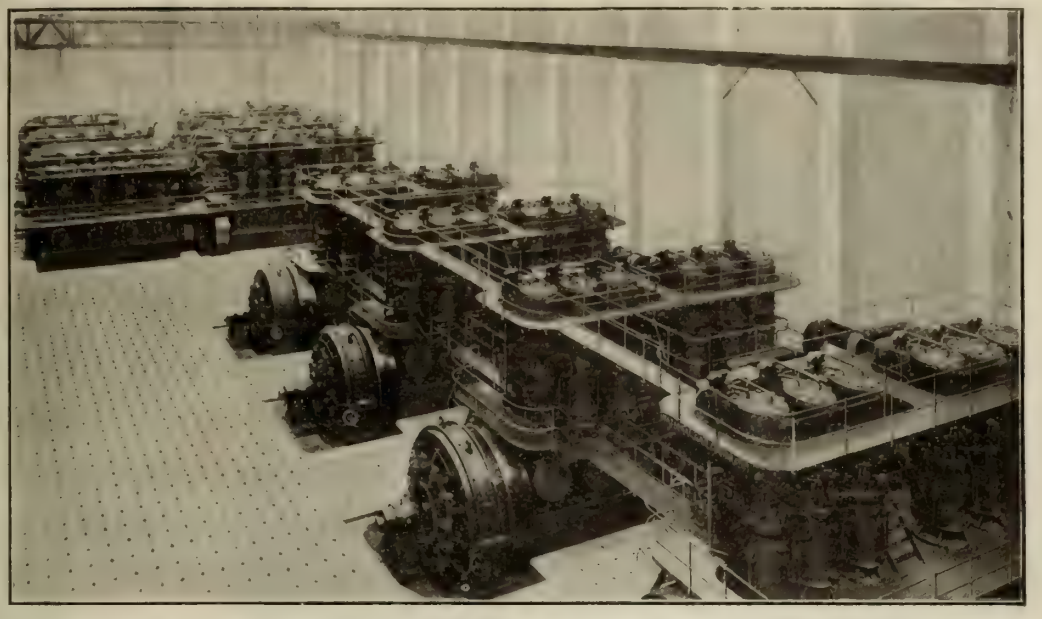
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**LIMITED**
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Made in Sizes from 300 to 2,000 B.H.P. Adapted for All Kinds of Work and All Kinds of Gases.

*We solicit your enquiries.*

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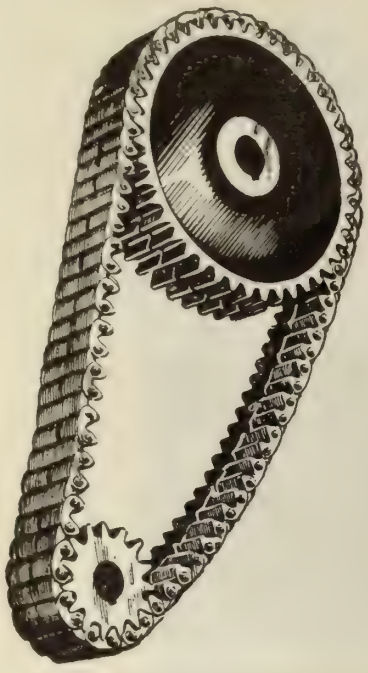
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## The National Gas Engine Co., Ltd.

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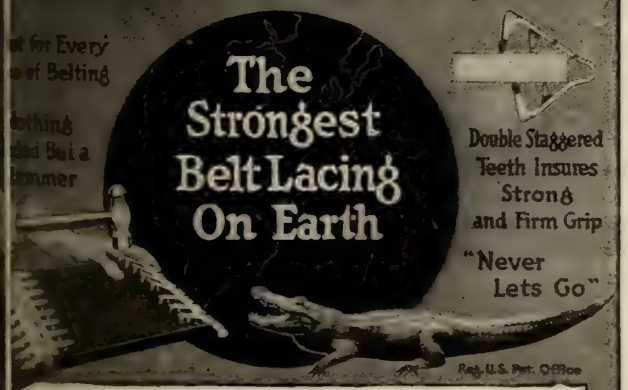
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Steel Ingots
*by the*
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Liquid Process

# ALLIGATOR
TRADE MARK REG. U.S. PAT. OFFICE
## STEEL BELT LACING



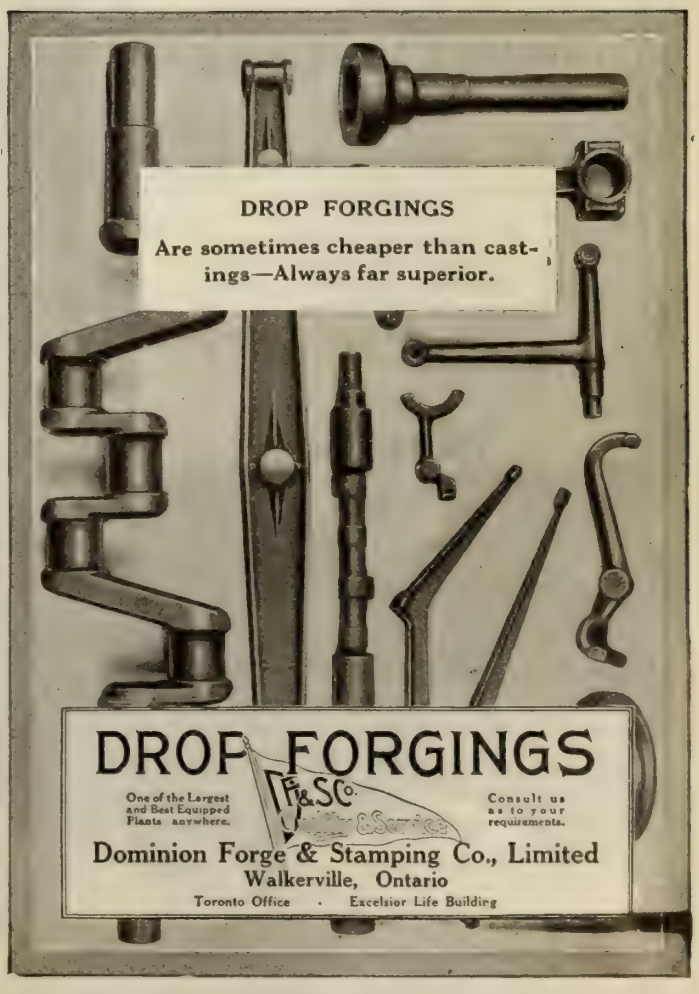

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THERE is as much difference in the various makes of High Speed Steel as there is in men—

The practice and methods of manufacturers differ widely in every mill and anyone who is at all familiar with the manufacture of High Speed Steel thoroughly understands this

"Red Cut Superior"

*The Nationally Known—First Quality*

HIGH SPEED STEEL

is the best for all Machine Work

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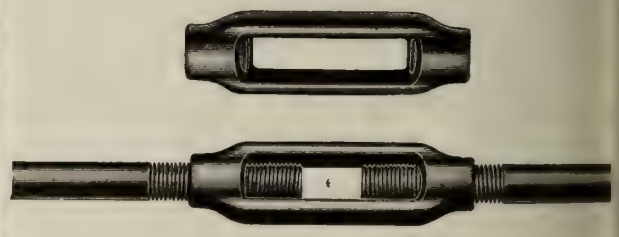
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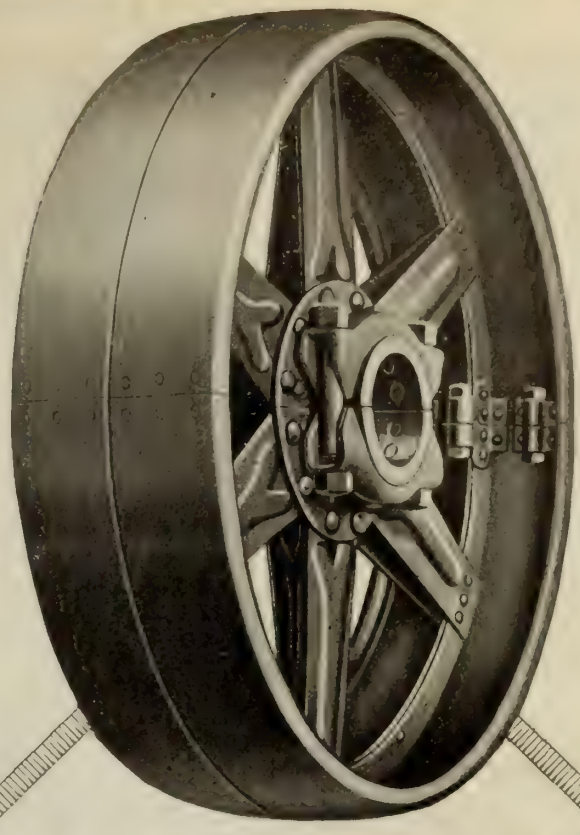
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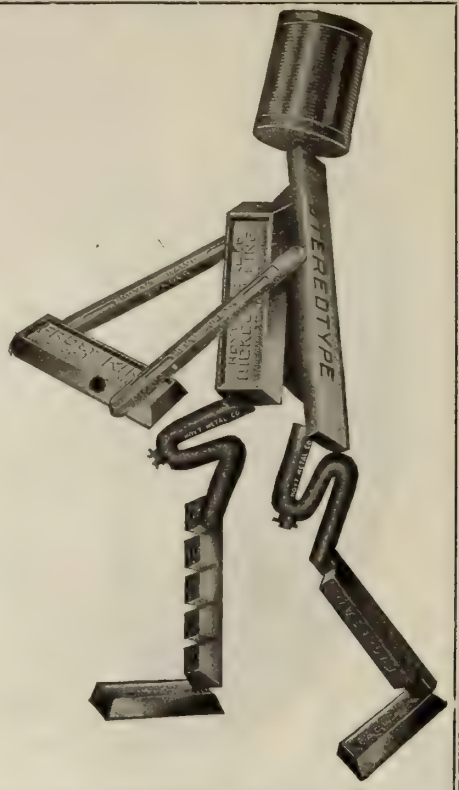

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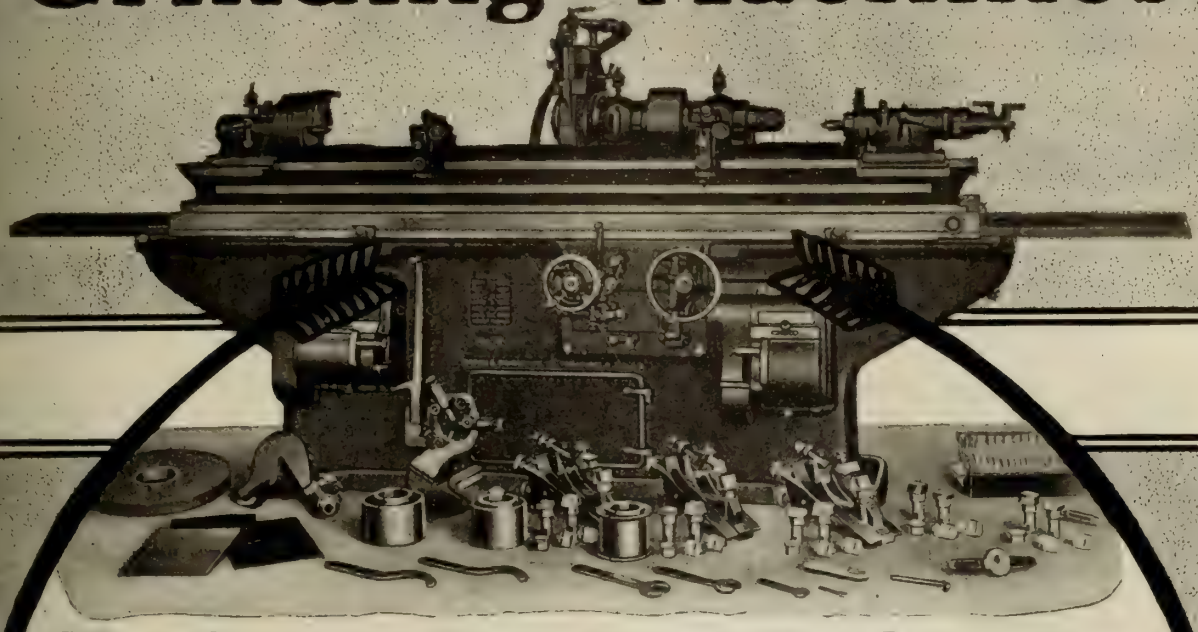
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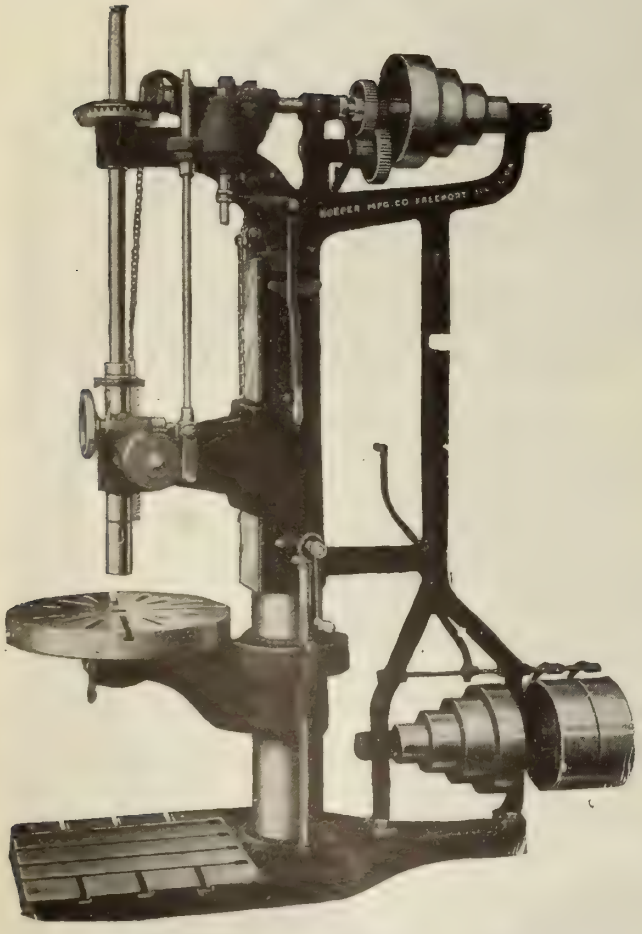
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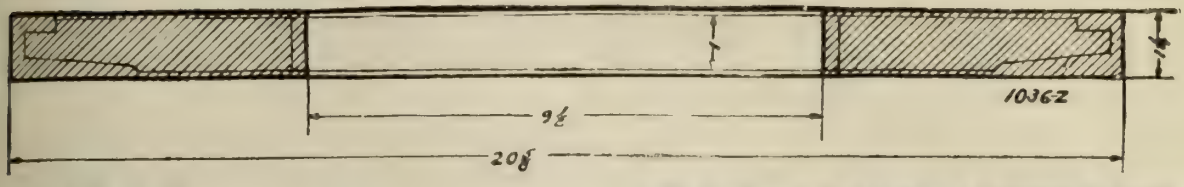
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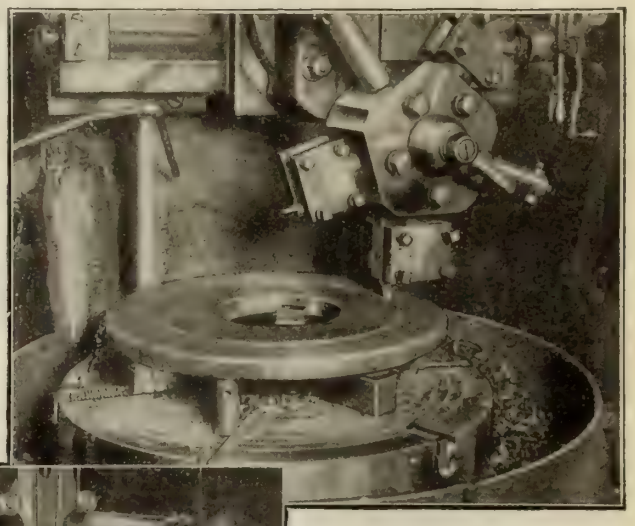
The workman shown at the right is interested in the job.

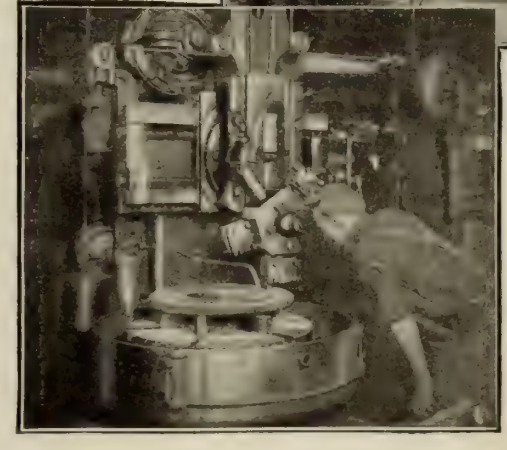
You are interested in the time it takes to do it.

The workman appreciates the ease with which the job is handled and the confidence he has in the machine.

You appreciate what these qualities mean to the cost of handling this, and similar work.

The part shown is a Scroll Plate for Chuck. Material, steel forging. Finished all over in two operations on the Gisholt Vertical Boring Mill.





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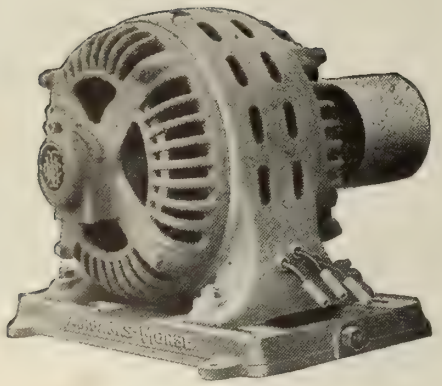
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# Fairbanks-Morse



CANADIAN MACHINERY
AND
MANUFACTURING NEWS

VOL. XXV. No. 21 May 26, 1921

# You Have Come Through the Worst of It

WE are passing through that period of readjustment that hurts. For a long time we turned that word over as something that was to come. It would affect every business house except our own and touch every income except our own.

For over two years after the war we went through a period of poisonous and alluring fallacy. We came almost to the point of believing that for the benefit of this particular day and generation history was not going to repeat itself.

Every man who had anything to say started with the solemn declaration that pre-war conditions would never be repeated—that we had arrived at a new stage where we had a few more dollars and each dollar was worth a little less.

It is all very well when you have a sick man to give him a jab of some stimulant to brace him up.

**It is the course of sanity to have the disease removed rather than the patient doped beyond the point where it is possible for him to permanently rally.**

Some months ago we had a much-advertised campaign showing that prices went up a step at a time and would not come down on the bannister. A gradual ease-off on prices may be quite desirable but it makes a long declining market, and a declining market is the best thing in the world to kill business.

Where is our Canadian courage that went through the crisis of 1914—that rallied to a buying movement in the face of a world war—that tackled, solved, and mastered the making of war munitions?

**It is time it showed itself again in placing business that has been hanging fire month after month.**

When any one section of the business community decides it is going to get out of the markets and stay out of the market, and that it will sell and not buy, it sets in motion a dangerous and undesirable movement that will come back upon that section just as surely as day will follow night.

There are too many men and there are too many firms in the country with the one object of seeing how much they can take out of the business world to-day.

They have not yet grasped the fact that if they keep on taking out more than they are putting in the world is going to be poorer by reason of their existence.

**If you can place business at the present time, it is your duty, as a citizen of this country, to do it.**

If you are not prepared to do your share in combating the sleeping sickness that seems to have seized the business community, you may be called upon to contribute more handsomely in an effort to rescue it from a more serious condition later on.

If you are still nursing memories of the time when you were making $12 a day in a shell shop, and when there were a dozen jobs to you all the time—forget it.

Remember there were hundreds of thousands standing in a trench in France at $1.10 per day at the same time.

**This country is better off than any country under the sun at this time. There are many firms doing 60 per cent. of their 1920 business.**

It is not fair to count the last part of 1919 and 1920 as normal years. They were abnormal. A more just comparison is with 1913 and 1914.

Weed out your wasteful habits. Spend a little less than you earn.

If you have weathered the storm this far you have gone through the worst.

# Business Conditions in the Canadian Centres

## Trade Has Been Rather Dull in All Centres—West Shows Substantial Industrial Expansion—U. S. Branches Continue to Look to Canadian Cities as Locations For Branch Factories

### AMERICAN FIRMS LOOKING FOR LOCATIONS IN CANADA

#### Hamilton Reports That Conditions Are Better Than In Early Part of the Year—Many Inquiries Are Being Made by U.S. Firms Regarding Locations

By C. W. KIRKPATRICK,
Industrial Commissioner, Hamilton.

HAMILTON—Although industrial and employment conditions are still far from being normal, there has unquestionably been a very noticeable improvement during the month of April and the early part of May, with better prospects that by the fall of the current year things will have reached a more normal level and conditions have become more satisfactory for both employer and employee.

During the past month there have also been unmistakable signs of considerable industrial development in the near, if not immediate future. Many American manufacturers are again turning their eyes towards Canada and are apparently not only gathering information by correspondence, but also making personal investigation to acquaint themselves with the Canadian market and its possibilities. Owing to the abnormal conditions that have existed since last fall, there has been less industrial expansion than usual this spring, but the local Industrial Department has been kept fairly busy supplying information to, and otherwise assisting prospective locators, and indications are that once they are satisfied that the period of depression or inactivity, through which nearly all countries have passed, is drawing to a close, there will be a rush of American capital and American industries to Canada and more especially to the province of Ontario.

While times have not been as good as during the two years following the close of the great war, locally, at least, there is little cause to worry about the future. Manufacturers, wholesalers and retailers have been busy for several months now readjusting their business methods to meet the changed conditions. This work is now either completed or nearing completion and there are good reasons for hoping and believing that before long business will be on a firmer foundation.

* * *

### CALGARY PASSING PERIOD OF READJUSTMENT WITHOUT TROUBLE

#### Government Guarantee of Irrigation Bonds is Likely to Have a Very Beneficial Effect And Provide Work—Building Shows Decided Increase

By J. H. HANNA,
Secretary Calgary Board of Trade.

CALGARY—Calgary is passing through the readjustment period without serious difficulty and while conditions are not, of course, as bright as we would like to see them, still there is no reason for pessimism.

There has been some unemployment this spring and there is still a surplus of labor. The recent decision of the Alberta government to guarantee irrigation bonds will result in work on the Lethbridge Northern Irrigation District project being undertaken at once, and tenders have been called for. As soon as this work is started it will, no doubt, give employment to a large number of men.

Crop conditions were probably never better in this part of Alberta than at the present time.

Considerable attention is being given to bonafide oil development and a number of wells are being drilled in southern Alberta and other parts of the province. Reliable men, who are familiar with the situation, are confident as to results in the near future.

So far as building construction is concerned, Calgary building permits for the first four months in the year show a total of $1,267,800 as compared with $809,000 for the first four months of last year, an increase of $458,800.

Several big conventions are coming to Calgary this year and American auto tourist travel from California, Oregon, Washington and other States to the Canadian Rockies via Calgary, together with the usual tourist travel by train, will bring large numbers of visitors during the next few months.

* * *

### WINNIPEG HAS LESS UNEMPLOYED THAN ANY OTHER CITY OF ITS SIZE

#### Bank Clearings Considered Very Satisfactory—General Prospects Are Very Bright And Building Operations are Being Carried Out at Good Rate

By W. E. MILNER,
Managing Secretary Winnipeg Board of Trade.

WINNIPEG—Winnipeg is in a very flourishing condition at the present time. The bank clearings which were published at April 30th, read as follows:

| | |
|---|---|
| Month of April, 1919 | $153,888,003 |
| Month of April, 1920 | 188,183,383 |
| Month of April, 1921 | 206,396,710 |

You will therefore see that our bank clearings for the month of April exceeded those of 1919 by $52,000,000 and surpassed 1920 by $18,000,000. Our bank clearings for the month of January, February, March and April, the first four months of the year 1921, amounted to $785,893,623, while in 1920 they amounted to $755,536,193, surpassing 1920 by $30,357,43 and 1920 was the banner year for bank clearings in the city of Winnipeg.

I am quite safe in saying that we have less unemployment than in any other city of a similar size on the North American continent. It is true that we have had a serious drop in the price of wheat, which has been somewhat disappointing to the farmers, but this is not a provincial or a local condition. This is a world-wide condition. Wheat dropped in Chicago, Minneapolis, Omaha, Kansas City and New York markets. These are the leading markets of the United States, and prices have declined to a much greater extent than they have in the Winnipeg market. Wheat has depreciated in value in Australia, England and the Argentine, and we must sooner or later conform to world values.

The prospects at the present time are very bright and the farmers of Western Canada are looking for a good full crop. The reports of the different provincial governments and the agricultural agent of the Canadian Pacific Railway and all the Federal departments of agriculture show most clearly that there has been more land prepared for seeding this year than last. There is no scarcity of seed. There is no demand from the farmers of Western Canada to provide them with seed to sow. Every farmer is well supplied. Labor is plentiful and climatic conditions were never better.

The movement of grain on the railways to the head of the lakes is greater by 1,850,000 tons than it was in 1920, and the C.P.R. and the C.N.R. never operated a season in Western Canada more successfully than the one that has just passed

There are several divisions along the railways where a snow plow has not appeared on their tracks this year. The equipment has been used to its fullest extent with the result as stated above, in the very greatly increased tonnage.

Our manufacturing establishments have not shut down, not a single one of them. There is more or less of a boom in building operations and there is every reason to believe that the building permits issued by the building inspector will be far in excess of last year.

We are free to admit that in the rural districts in Western Canada that business is not quite so good as it was in 1920, but we regard this as a good omen. It proves to the thoughtful mind that the farmer is economizing and saving to meet his obligations and to have sufficient means to carry on his agricultural operations for the next four months.

* * *

## RECOVERY OF TRADE HAS BEEN SLOW AROUND ST. JOHN, N.B.

### Believe There Must be Greater Co-operation on the Part of Labor Before Progress Can be Made —Some Factories are Increasing Working Hours

By R. E. ARMSTRONG,
Secretary St. John Board of Trade.

SAINT JOHN, N.B.—A survey of St. John business conditions at the present moment shows a feeling among business men that the anticipated upward leap of trade and production is still some distance away. This feeling may be traceable in large measure to strikes and other labor difficulties in Great Britain and the United States and to the general fear on the part of labor that their organizations are imperilled.

This condition is reducing the demand for lumber and other kinds of building material, although it has not wholly put construction work off the map. In St. John, for example, the pressing demand for more school buildings, for hospital expansion, water extension and street improvements, has led to the promotion of construction in these lines, but outside of public works of this character there is little in the way of private building going on. A great deal of repair work that was deferred during the war is being made and this in a way is helping out the general situation. But until labor reaches a better understanding and is prepared to extend more co-operative action, progress in construction and other lines is going to be slow.

Here and there is a rift in the cloud through which a ray of sunshine appears. For example, export demands have caused greater activity in the sugar refining business and the local refinery is now working full time.

One of the cotton mills that was operating on short time is extending its employment hours this week, but the second mill is still on short time. The outlook is reported to be improving.

The nail business is trying to get on its feet and is making some progress in that respect.

The sales tax increases as recently imposed have provoked some criticism, chiefly in the grocery line, but this will doubtless adjust itself later on. While the outlook is becoming a little brighter here and there and buying is on the increase, the general business situation is still depressed to a degree and calls for careful handling.

* * *

## FIVE U.S. FIRMS HAVE GONE TO BORDER CITIES IN THREE WEEKS

### Depression Not as Severe in This District as in Many Other Centres—Bank Clearings Show Increases—Must Get Down to First Principles

By F. MACLURE SCLANDERS,
Commissioner Border Chamber of Commerce.

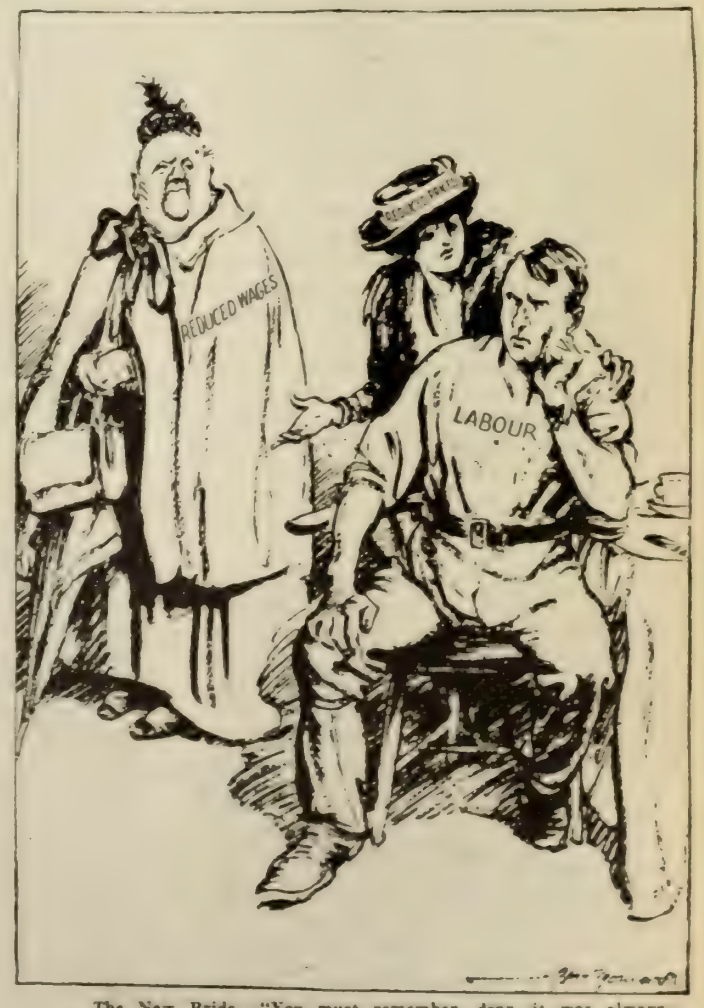
WINDSOR.—So far as concerns these Border Cities, we are exceedingly fortunate. The depression does not seem to have affected us in any noticeable way. Quite a percentage of our large retailers recently interviewed by me report a bigger business for last month than they did in April 1920.

Most of our manufacturers who had closed down have again resumed, some of them on full time. On the whole, we have no reason to complain down here at this southermost corner of Canada. But, we have much reason for gratitude.

It may interest to add that the Americans have certainly not lost confidence in Canada and her industrial possibilities, for within the past three weeks no fewer than five American branch factories have located with us which now gives us upwards of two hundred-and-twenty of such—and they are all doing well.

According to the "FINANCIAL POST," issue 13th inst., the Windsor bank clearings were the only ones in all Canada which indicated an increase. (These do not include the bank clearings for the other border municipalities.) We are apparently less affected by the present depression than any other point.

If in 1913, for instance, we had enjoyed the volume of business that is ours to-day, we should have deemed ourselves wonderfully busy. The trouble with so many of us is that the hysterical activity of the war and the post-war period has implanted in us false conceptions of what is really meant by being normally busy, and has always meant prior to the war. In fact, our present conception of normal standards is really abnormal, and not normal at all. The war is over—a circumstance which, somehow or other, seems to be exceedingly difficult for many to realize; and, in my opinion, things will not be right until we have become reconciled once more to old-fashioned hours, wages and profits—until we have got away from the silk-shirt, patent-boot period, and returned heartily and sincerely to our work. This consummation so devoutly




The New Bride.—"You must remember, dear, it was always understood that mother should come and live with us when we were married."

—Thomas in "World Wide."

to be wished is not, I am respectfully convinced, so remote as many now anticipate.

Automatic law operating through economic exigencies cannot be effectively or permenently impeded by the creation of artificial obstacles.

The operation of this law is as immutable as the rising and setting of the sun; the ebb and flow of the tide. Therefore, our effort should be to strive with all our intelligence to escape as much as possible of the tribulation through which the automatic law in question invariably works; and to this end the exercise of common sense is absolutely imperative.

To revert to the Border Cities—it would almost seem that we are here in a little kingdom of our own and to some extent apart and away from the outer world; and from that outer world, there comes to us, as from a distance, the murmur of things that are so much duller and more disquieting than we here are conscious of.

* * *

## CONDITIONS ARE IMPROVING IN INDUSTRIES ON PACIFIC COAST

### Metal Trades Are Down Owing to the Falling Off in Lumber Industry—Other Lines Are Looking Forward to a Better Season

By W. E. PAYNE,
Secretary Vancouver Board of Trade.

VANCOUVER.—We have it on the authority of a prominent business man of this city, who went East in March last, that he came to the conclusion as the result of his observations, that at no time during the recent slump have business conditions been so depressed here as in other parts of Canada, and some parts of the United States.

Now, referring more particularly to the line which your journal represents, we have to report that the metal trades are at present only working 50 per cent of the capacity of the plants. This is largely accounted for by the fact that the lumber mills, on which the metal trades are dependent for the greater part of their business, are very slack, neither are they having their plants overhauled as is usual in the early part of the year.

However, last year the first five months were very quiet in the lumber industry, and afterwards business picked up to such an extent that the year's total was very large.

As regards fruit canning, although large stocks of jams, etc., are still held, put up when the price paid for fruit was very high, it is probable that as fruit will be obtainable at a much lower figure this year, more than ever before will be canned, as this will enable the canners to average up.

As to salmon canning, only sockeye will be put up this year, and the outlook for that branch of the industry is good.

Mining, of course, is quiet, as it is all over the world, and will be until prices improve owing to increased demand.

The pulp and paper industry is very flourishing and all plants working up to capacity.

* * *

## CONDITIONS IN GUELPH REMAIN GOOD—FACTORIES NEARLY ALL BUSY

### Only Two of the Shops Are Closed Down—Diversity of Industry Makes it Possible to Provide Employment—Merchants Have No Complaints to Make

By H. WESTOBY,
Secretary Guelph Chamber of Commerce.

GUELPH—There are 126 manufacturers in Guelph and of this number only two have been closed down because of lack of orders, and one of those only in part, the foundry portion still being in operation. Several of the local factories are running on short time, but against this we have a number who are working overtime, so that as a whole, the manufacturing conditions in Guelph are exceptional when one takes everything into consideration.

The merchants of Guelph appear to be all busy and I have heard of no complaints from any of these as to any general slackening up in business activities. The building trade, which is often like a barometer, is unusually active at the present time and a large number of new houses in the city and several important buildings are being erected at the Ontario Agricultural College.

Guelph is exceedingly fortunate, inasmuch as its industries are very diversified in their character and therefore any general slump in business does not very materially affect the business life of this city itself. It is expected that one of the local industries will erect a large, modern foundry some time during the current year, and another industry, if a certain site can be secured, is expected to erect a new factory in this city.

The manufacturers and merchants are hopeful for the future and the general expectations are that business will expand during the late summer and possibly grow into volume again.

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## Steel Direct from Iron Ore

AN article published in "The Matin," Paris, by Charles Nordman, presents the claims of M. Basset, who holds that he can produce steel direct from iron ore, eliminating the costly pig iron process.

"At present steel metallurgy all over the world," writes Nordman, "consists in mixing in strong blast furnaces alternate layers of oxide, iron and coke. From the blast furnace at the end of its work we get the pig iron, brittle and unusable because it is loaded with carbon. It is then necessary to squeeze pig iron from its carbon by a second operation—that of converters—which at last gives forth real steel.

"All efforts to produce steel direct in one single operation have, up to the present, failed. When carbon burns in the oxygen of air or iron ore it emits some 2,500 calories of heat per kilogram. When this oxide carbon burns, in turn forming carbonic acid, it emits 5,500 additional calories. But carbonic acid at high temperature, as with air, burns iron, giving the iron part of its oxygen, and it is for this reason that into the blast furnaces must be placed an excess of carbon which will take up more quickly the iron oxygen that the carbonic acid emits in formation, and that is the reason why when one seeks to turn all the mineral in the blast furnace into iron one gets only pig iron.

**Dilemma of Makers**

"There is, therefore, this dilemma: To put in the furnace much coal and little air, which gives only pig iron, or to put in much air and little coal, in which case the major part of the iron is reoxidized. For these reasons experts have said that the economical production of steel was a Utopia which could not be realized.

"But Basset has made this dream a reality. Basset reduces the iron oxide by using exactly the amount of carbon needed. This operation takes place—and this is the original idea of Basset—in a chamber having a high temperature, into which is blown powdered carbon and air already raised to a temperature between 700 and 1,000 degrees. This powdered carbon is admitted in quantity to produce in burning, in the heated air, only oxide carbon, but the heat thus emitted, the air being previously at a high temperature, is nevertheless very high, sufficient to assure the rapid and almost complete reduction of the mineral and the production of steel direct.

**Five-hour Operation**

"By this system there is realized, in five hours' operation, what takes six times as long in blast furnaces, and its result is that one obtains from the chamber direct a stream of steel formed without an appreciable loss of mineral."

# Machining a Large Gear Blank on the Automatic

## Principle of Design—Various Attachments Used—Tooling For Large Gear Blank—Set-up For Long Shaft—Making Bearings Out of Tubing—Tool Layouts For Hubs and Spark Plug Shells

By J. H. MOORE

HAVE you ever had the opportunity of looking at any woodcuts of old-time machinery? If you have, then ten chances to one you muttered to yourself something along the same trend as the writer, viz., "How on earth did they ever turn out work with such crude and clumsy machinery?"

In those days, however, the demand for production was not quite so pronounced. In fact it is questionable if they held the word in the same respect as we do in this present era. Automobiles were unknown; there was no need for haste; and in every way conditions were opposite to those now existent. To-day production costs must be kept as low as possible if we are to successfully compete with other similar lines. Hand work, or even slow machine operations are practically a thing of the past. True, assembling is still accomplished by hand, but even there, mechanical moving devices speed up the work. The development of machinery has been nothing short of marvelous. This holds especially true regarding automatic machines. In practically every branch of industry we have machines which have been gradually developed up to the point where every possible movement is completed automatically. Enter a textile manufacturing plant, view the modern equipment used, and you will come out convinced that we live in a marvelous age. Go through an up-to-date manufacturing plant, note the row upon row of different types of automatic machinery, and you will become still more convinced that our machine tool designers have much to be proud of.

In the April 14 issue of Canadian Machinery we presented an article on automatic machine operations as performed on one type of machine, and through the courtesy of the National Acme Manufacturing Co., Cleveland, Ohio, we are now able to present examples of work produced on some of their types of automatics.

### Principle of Design

Both the Gridley and Acme type of automatic, produced by this concern, have four work spindles, these being held in a spindle carrier which is rotated by gears. The carrier is so indexed that the work is brought consecutively into position for the various tools. As all the turret tools are at work on different bars at the same time, it is obvious that the time required to produce one piece is only that necessary for performing the longest single operation, plus the time required for moving the turret, revolving the cylinder one-quarter revolution, and moving the turret slide forward again until the tools are in the cutting position. In some cases, however, the longest single operation is accomplished from the cross slide, and in such case the time required for the cutting off, or forming operation, plus the idle movements mentioned above would be the total production time.

In many cases it is possible to complete a piece in less time than the time required for the longest cut. Take, for example, a long milling cut, which can be divided between the box tools in the first and second positions. In that case the time for the completion of the piece is considerably less than the usual time for box turning, being slightly more than half.

In drilling, three tools are frequently used in this manner, so that only a trifle over one-third of the time necessary for drilling the hole is required to complete the piece. The feeding of the bar takes place between the first and fourth positions, when the cylinder is indexing (on the smaller machines) and in the first position on the larger machines, the stop swinging out of the way before the tools approach the work.

These machines have eight standard tool positions, namely, four end working tools, two horizontal forming and cut-off slides, and two stop slides working in the second and third positions. With this arrangement it is possible to have two tools working on each of the four bars at one time. This is, of course a great advantage from production standpoint. The only idle or non-productive moments in the style of machines under discussion are the withdrawing of tools, and indexing the cylinder carrying the work spindles. These moments occur at the completion of each piece.

No general rule can be stated as to tooling, or the use of same, as that depends entirely on the nature of the piece. As a general rule the operations performed at first position are forming (with a tool held on forming side), turning, drilling, facing, counterboring, etc., with tools working from the end and held in the main tool slide.

The second position is sometimes as follows: From the end we might have turning with box tools, drilling, reaming, countersinking, counterboring, facing, etc. We might also have such operations as shaving, light forming, burling and frequently thread rolling can be performed at this position.

In the third station, such operations

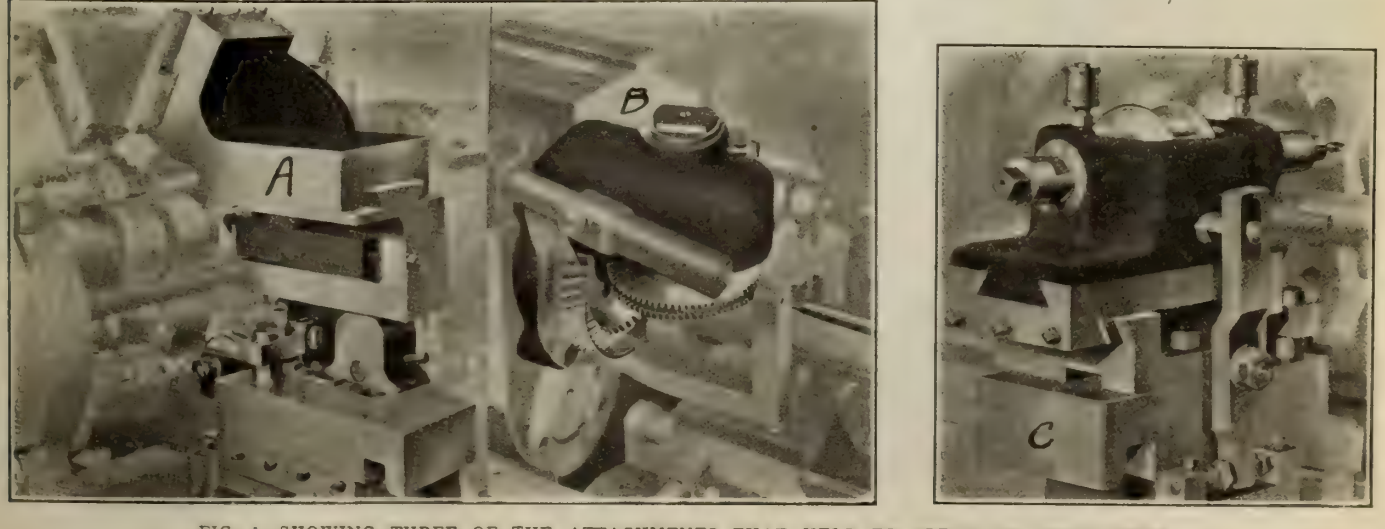



FIG. 1—SHOWING THREE OF THE ATTACHMENTS THAT HELP TO SPEED UP PRODUCTION.

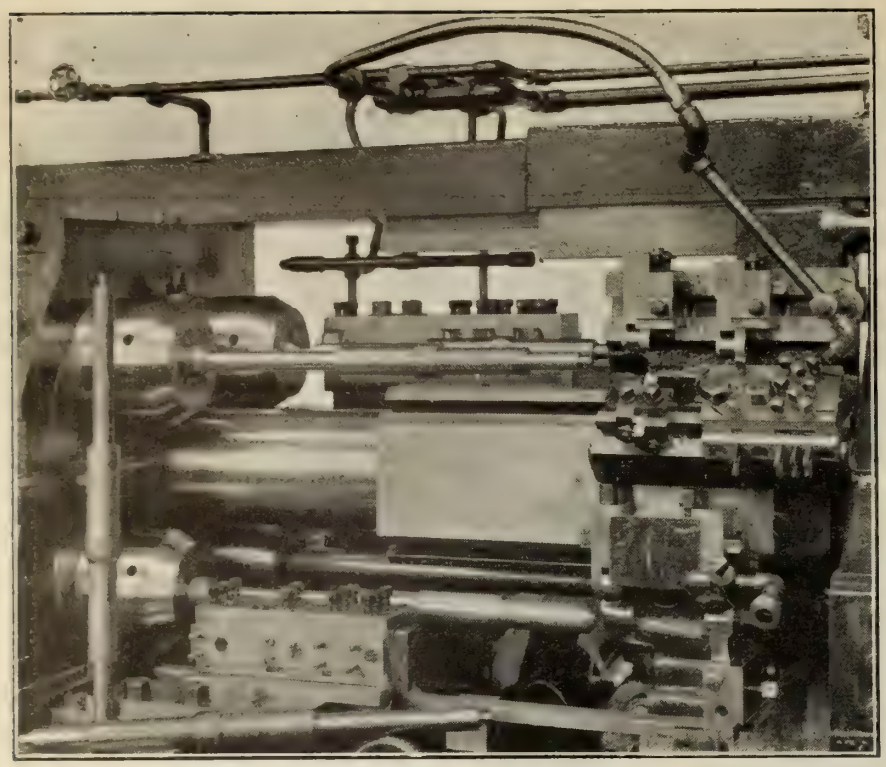


FIG. 4—MACHINING A LONG SHAFT ON A MULTIPLE SPINDLE AUTOMATIC.

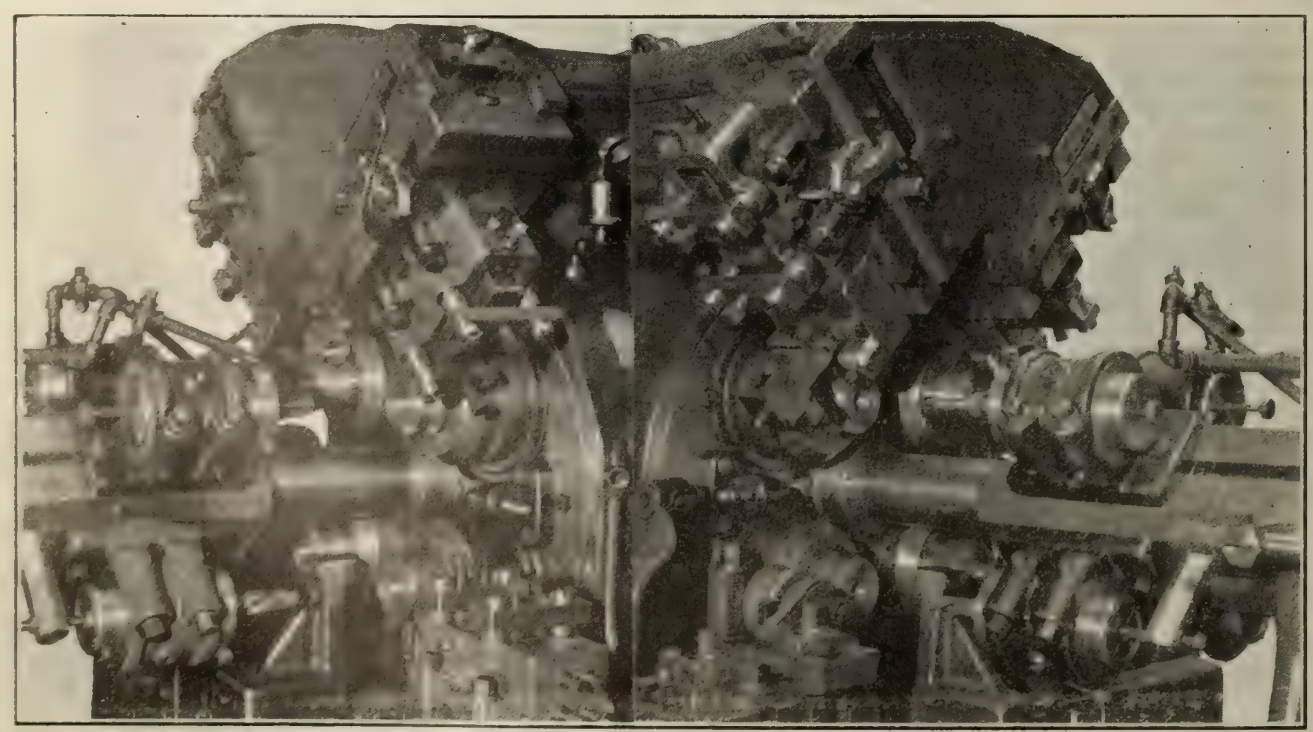
as threading (with dies, taps or chasers), drilling, reaming, counterboring, etc., can be performed, while turning with a box tool can be accomplished from the end. This position also lends itself admirably to the use of special attachments for milling, cross drilling, etc., their use being made possible because of the fact that the rotation of work spindle can be stopped in this position for the threading operation. Shaving, thread rolling and knurling operations are often performed in this position, the tools being held on the top slide, and operated in this position.

The fourth and last position is used in many ways. The slide working tool cuts the piece off, in some cases after a forming operation has been performed. Tools from the end can counterbore, countersink, ream, recess, drill or turn. In many cases a variety of these stated operations are combined, in order to still further speed up production. The study of proper tooling on any style machine is a very important one, and the same condition holds good on these machines. By a careful study of the product, maximum production tooling can be installed. In this regard, the company whose machines we are describing lend valuable aid and suggestions.

### Various Attachments

The labor saving idea embodied in these machines has been carried further, through the use of special attachments. These take the place, partly or entirely, of extra machines of standard types such as milling machines, drill presses, slotting machines, in fact in some cases take the place of special machinery. Such attachments are easily placed in position and save a large amount on the labor cost as they can be used without adding to the production time which would be required, even if the attachment were not used.

These additional production getters cover quite a field, including cross-drilling, reaming, countersinking, counterboring from the side, milling, slabbing, slotting, etc., from both side and end. Fig. 1 depicts three of these attachments. At A is shown an auxiliary forming attachment. When forming cuts are especially heavy, either very wide or deep, it is wise policy to use two or more forming tools. On the Acme type of machine additional forming tools can be used while the first one is cutting, to shorten the total forming time. This method has another advantage insomuch that the last tool leaves a better finish than a single tool for all forming operations could be expected to give. The attachment shown permits of the use of two or three forming tools, and, when



FIGS. 2 AND 3 SHOWING THE FIRST TO FOURTH POSITIONS IN THE MACHINING OF A LARGE GEAR BLANK.

used, the stock is fed on the cut-off side of machine in the bottom position, which is the usual cut-off position; and the first forming tool is used in the regular cross tool slide. The bar is then indexed to what is usually referred to as the first position, that is the lower one on the forming side of machine, where the second forming tool, in the regular forming slide, completes the rough forming of the piece.

A shaving tool is used for finishing in the position just above the second forming tool; and a special cross slide for cutting off is attached to the top bracket and used in the third (the threading) position. It is supported and operated from the regular side working tool slide on the cutting off side of machine.

One advantage of such an arrangement is the distribution of the strain of heavy forming cuts, but of course the most important advantage is the gain in both production and quality of finish.

Then there is the attachment for slabbing and slotting. This is shown at B, Fig. 1. One, two or three slitting saws or milling cutters can be used on this style of attachment, and they can be set horizontally, vertically, or can be swung to any desired angle in between.

Many parts which are made on screw machines are drilled from the side after being completed on the automatics. On these machines most of the work can be finished, including the drilling, during the making of the part, without adding to the production time.

When the bar is stopped for threading in the third position, the drill performs its work as shown at C, Fig. 1. The drilling tool is held in an auxiliary spindle as shown, and the attachment itself is mounted on the cross slide just above the cut-off tool. The attachment is advanced by the same cam that operates the cut-off slide, and when it is necessary to pass the drill clean through the piece, the attachment is arranged to feed farther and faster than the cutting off slide. The drill spindle is driven from a belt from a special countershaft, or by being coupled to the spindle driving gear in the main tool slide. By the use of this attachment operations such as counterboring, straight or taper reaming, countersinking, from one or both sides, and the drilling of two holes, either of the same or different sizes, can be accomplished. Other similar operations of which there is no need to enter in detail can be likewise performed.

Frequently it becomes possible to combine two of these special operations and to perform both of them at the same time, while the other operations on the piece are proceeding. Where necessary, it is possible to use at the same time two milling attachments, one from the side and one from the end; or a milling attachment from the end, and a drill from the side; or a combined mill and drill from the side, a mill from the side and a drill from the top. Two drilling attachments, one from the side, and one from the top, can be used, in fact it is not an infrequent arrangement. In addition to the above there are special threading attachments, self-opening dies, various milling fixtures, reaming attachments, special tools, etc. In many cases the use of one or more of such attachments has increased production to such an extent that the original cost has been absorbed in very little time. The chief point to watch is this. Do as much as you can to the piece before it leaves the machine, as quite often small additional operations cost as much, if not more, than the automatic work on the piece. It is a wise policy to study the problem yourself, then put it up to the makers of the machine, letting their engineering staff, who are specially trained on such work, give you the benefit of their opinion. Leaving the subject of the machines and their attachments, we will next consider examples of work performed.

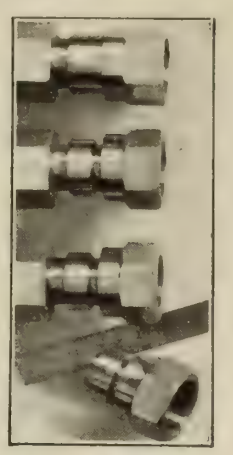


FIG. 6—STEPS IN THE MAKING OF A SPARK PLUG SHELL.

**Examples of Work**

Fig. 2 illustrates the tooling on the first and second positions of a large gear

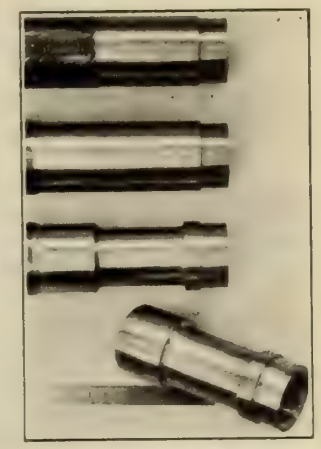
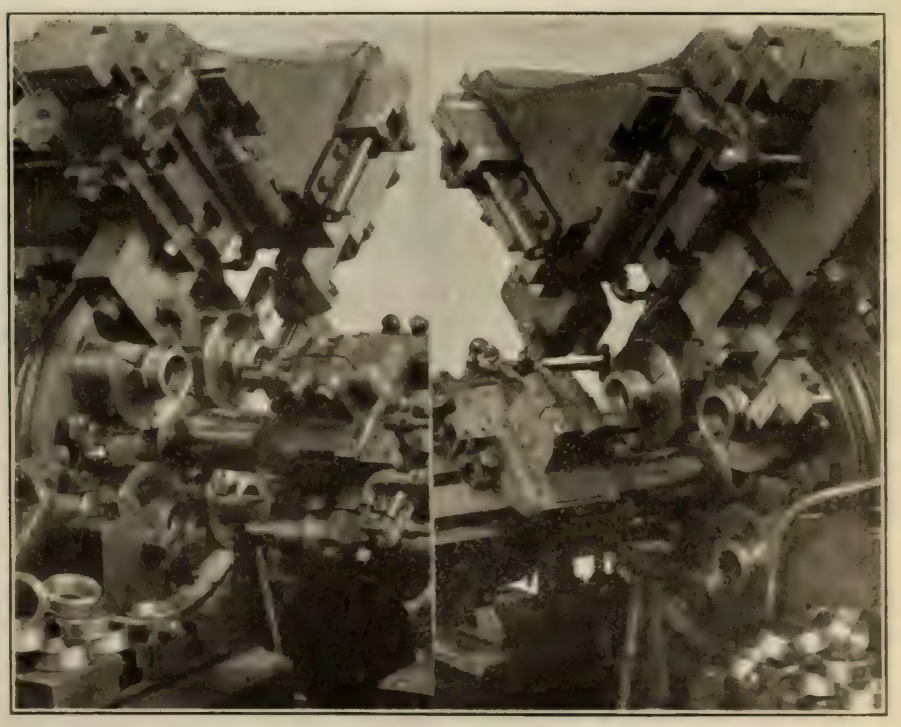


FIG. 7—VARIOUS STEPS IN PRODUCTION OF A MASTER PUSHER.

blank. This photograph also affords a splendid view of the top slide. The opposite picture, Fig. 3, shows the third and fourth positions on the same piece. By glancing at both these views the complete tooling is seen. This blank was completed on a 3¾-inch Acme multiple spindle automatic screw machine of the latest type. Unfortunately we have no production figures on this or any of the pieces to follow.

The next view, Fig. 4, depicts the machining of a long shaft on a Gridley multiple spindle automatic. The photograph shows the tool set up from the forming slide side of the machine, and pieces of this sort are formed, nicked, turned, recessed and cut off simultaneously; as many as 15 or 16 dimensions having been machined on one shaft, all



PRODUCING A BEARING FROM TUBING ON A NEW STYLE ACME MULTIPLE SPINDLE AUTOMATIC.

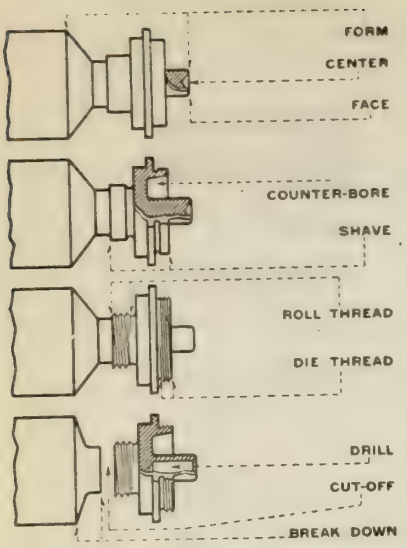



FIG. 5 SHOWING HOW THE PART IS COMPLETED.

at one time. The completed shaft can be noted in the photograph, and when we state that it is about 16 inches long and 1½ inches diameter at its largest point, readers can form the rest of the proportions quite easily. Following is the mode of procedure in machining.

First position—form and turn; second position—finish and turn; third position—finish form and recess; and last position—cut off.

Fig. 5 depicts an interesting job on the new style Acme multiple spindle automatic. This is a bearing job, and tubing is used for the work. First, the part is rough formed, rough bored and faced. In the second position the work is finish formed, rough taper bored, and a radius completed. Third, the part is finish taper bored, shaved and faced. The last position, as usual, is cutting off. Both right and left hand views are taken of the same piece and some of the finished product can be noticed resting on the tool slide.

At Fig. 6 are shown the steps in the making of a spark plug shell. First, the part is rough formed and drilled part way. Secondly, it is finish formed, drilled and chamfered. The third position is devoted to tapping, while the last position completes the drilling, also cuts off.

Fig. 7 illustrates the steps in the making of a master pusher. First, the piece is rough turned and partially drilled. Next comes the finish turning, and finish drilling. At the third position the part is formed and reamed, while at the fourth and last position it is cut off.

Fig. 8 shows in diagram form an interesting piece of work. It will be noted that the first position is taken up with forming, centering, and facing, while the second shaves and counterbores. One thread is rolled, and the other cut with a die at the third position, and the piece is drilled, broken down, and cut off in the fourth position.

The piece shown at Fig. 9 is completed as follows: First position—forming and drilling of large hole. Second, the small hole is drilled, and the outside shaved. The third position is used for tapping, while the small hole is reamed, and the part cut off in the last position.

Fig. 10 depicts a hub which is an interesting part to complete. First a hole is drilled half way, and the part is rough formed. Next comes the completing of the hole, and the finish forming of the piece. Third, the part is shaved and counterbored, while in the last position two different diameters are reamed and the piece cut off.

The example shown at Fig. 11 is centered, faced and rough formed in the first position; drilled and shaved in the second; tapped and the thread rolled in the third; while a small hole is drilled and the piece cut off in the fourth position.

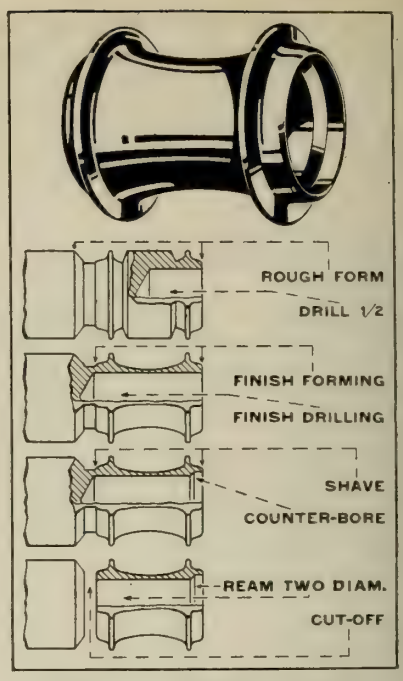



FIG. 10—COMPLETING A HUB.

Fig. 12 is first formed and milled on the end, after which it is formed at another portion, and pointed in the second position. In the third position the part is threaded and milled, while in the fourth position the usual cut off operation is performed.

### Miscellaneous

On parts which cannot profitably be made from bars because of irregularity of shape, or amount of valuable material cut away, the magazine feed is usually used. The parts in such cases are fed down the magazines, or loaders if one cares to call them that, where they are automatically fed into the spindles and chucked in place. After the pieces are completed they are extracted automatically by means of plungers in the spindles.

In some instances the shape of the piece makes it impossible to feed by use of the magazine. In such cases they are inserted by hand, but when this occurs

(Continued on page 82)

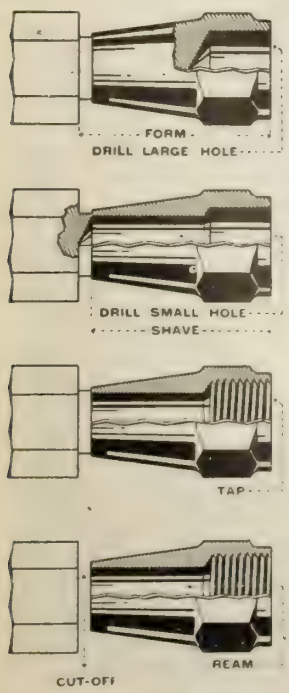



FIG. 9.

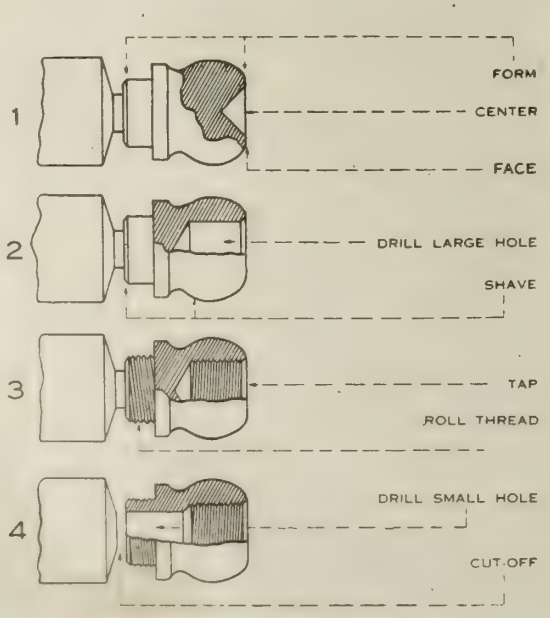



FIG. 11.

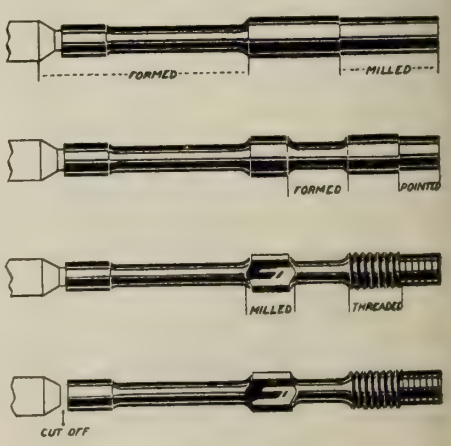



FIG. 12.

# Review of Canadian Machinery Drafting Course

## Mechanical Drawing Defined—T-Square Practice—Use of Various Instruments—Triangle Exercise—Compass and Ruling Pen Hints—Practice Plates—Uses of the Triangle—Lettering

By J. H. MOORE

SOME time ago Canadian Machinery commenced a series of articles on mechanical drawing. It was our intention at that time to continue these lessons, but other plans prevented. Numerous requests have been received suggesting that we take up these lessons once more, so, for the benefit of those who did not have an opportunity of starting the previous articles, we have decided to review in as brief a manner as possible, the data embodied in the former lessons. From that point on, we shall go further into the subject, taking up later questions in design.

We will endeavor to touch only on the essential points, as we intend making the lessons especially suitable to apprentices and mechanics who desire a grounding in the principles of mechanical drawing. Close study of these articles, should, in an indirect manner, increase your earning power.

### Mechanical Drawing

Briefly, mechanical drawing is the art of showing graphically details of machinery. It is the language by which the draftsman speaks to the workman. A brief study of a well prepared drawing should explain fully the idea of the designer, and if a mechanic understands the principles of mechanical drawing he not only makes his own task easier, but is a help to the designer, in so far as the carrying out of the drawing is concerned. Not only should apprentices and mechanics learn to grasp the principles involved in mechanical drawing, but they should practise at home, and in the technical school, some simple drawing, leading up later to more intricate work.

Any good grade of paper can be used to draw on, and at Fig. 1 is shown the chief instruments required in drawing work. A shows the drawing-board; B, the T-square; C, two triangles, both 45 degree, and 60-30 degree, while at D is depicted the regular style of triangular scale adopted. E shows a simple style of protractor, while F illustrates some of the instruments used. G depicts the irregular curve and its uses, while H shows the usual method of sharpening drawing pencils. In addition to the above, thumb tacks are used to fasten down the paper. Lead pencils graded from H to 4H are best suited for drawing, and the pencils should be sharpened with a chisel edge as shown at H. In drawing, the student should place the chisel edge against the T-spare, or triangle, this enabling him to draw a clean-cut fine line through any points.

The T-square gets its name from its appearance. To illustrate the use of the T-square we have prepared Fig. 2. Always keep the head A up against the left hand edge of the board, otherwise the various lines drawn will not be parallel. For practice proceed as follows: Fasten a sheet of paper to the board and draw a line B, making this line 6 inches long. Next, lower your T-square a distance of 5 inches and draw another line. Without moving your T-square, project down from the extremities of the first 6-inch line, the two lines, C and D. Use your scale at this point, measuring down a distance of 1 inch each time as shown on sketch. Having done this, use your T-square to produce the lines E, F, G and H. This may seem an extremely simple exercise, but its chief object is to give you control. At first you will find you want to run all over the lines, but keep on until you have perfect control over the hand, making sure that every parallel line touches, but does not run over the vertical lines C and D.

At Fig. 3 is shown an easy method of holding the compass; the correct and incorrect method of holding the ruling pen; also a view of how the hand would appear if held in the proper position. Study these views carefully, keeping the following points in mind. Make sure when using the ruling pen that both blades bear evenly on the paper. If they do, the resulting line will be smooth and even. A common danger is shown at A and B. First there is a tendency to get too great a slope outward, then second, there is a like possibility of coming too far inward. If good work is to be obtained you must hold your pen upright as shown at C. If you follow out this advice, your hand will take the position

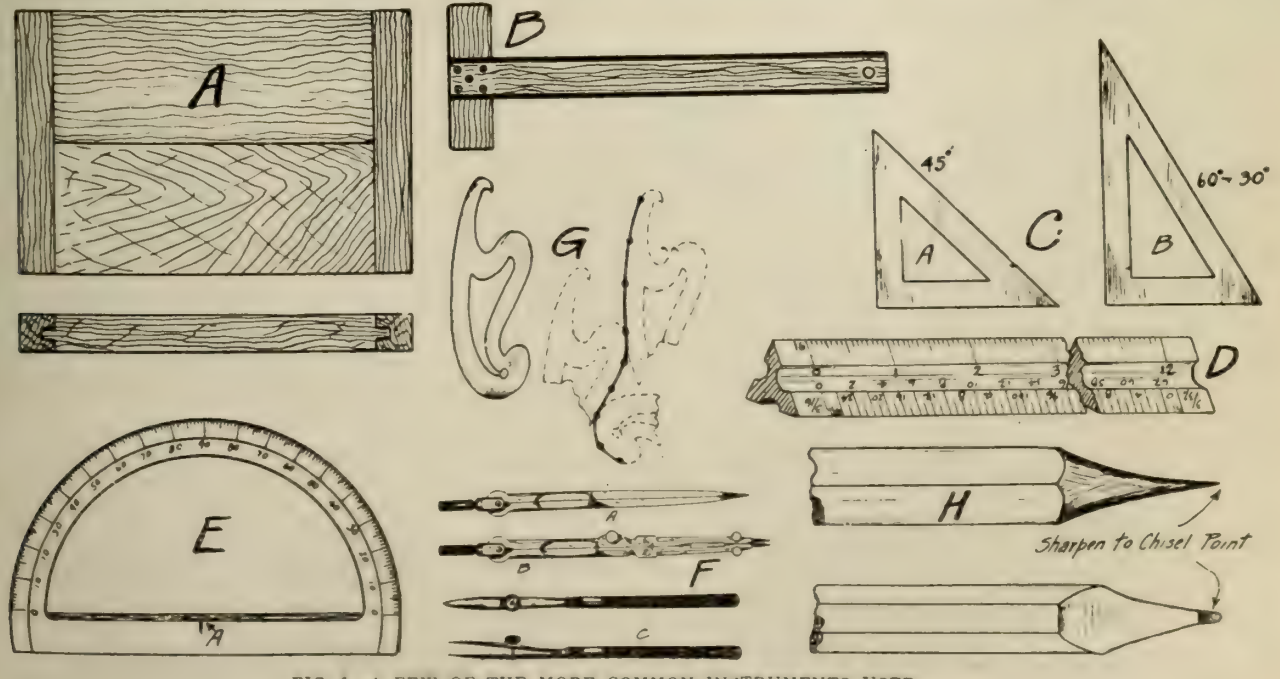



FIG. 1—A FEW OF THE MORE COMMON INSTRUMENTS USED.

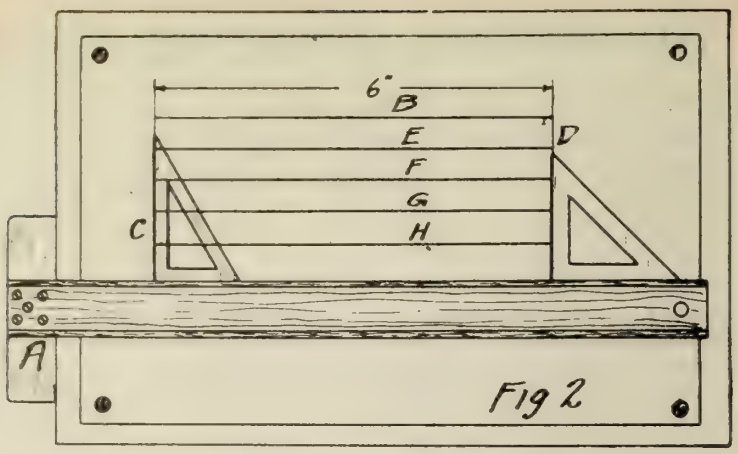



FIG. 2 A SIMPLE LESSON IN THE USE OF THE T-SQUARE.

shown at D. Should you blot quite a bit at the start do not get discouraged. The writer made many a blot before he was able to make a drawing. In fact many a drawing he spoiled in the earlier days. Use only a good grade of India ink.

When you feel you are proficient at exercise No. 2, and you have practised drawing ink lines with the ruling pen, start on the lesson shown at Fig. 4. Work to the dimensions shown; lay out the four sections one by one; draw the various lines; but keep in mind that control of both the hand and instruments is what you are striving for. Stay at the work until you can turn out a neat exercise.

On completing Fig. 4, start on Fig. 5. This plate will give you both pen and compass practice. Another good practice sheet is shown at Fig. 6. This exercise covers various uses of the triangle. Section 1 illustrates a very common use, viz., drawing parallel lines at an angle to the horizontal by means of the T-square and triangle. Section 2 depicts the use of triangles only and illustrates the method of drawing a line parallel to a given line. First place triangle A with one edge conciding with the line B C. Next take triangle D and place one of its edges in contact with the bottom edge of triangle A. Hold the triangle D firmly with the left hand and slide the set square A to the right or left as desired, until you reach the point through which you wish to draw the line E F. It will be noted that we used the term set square. This is another expression for the word triangle.

At section 3 is shown the method of combining the use of the 45 and 60-30 triangles with the T-square, in this way procuring an angle of 15 or 75 degrees. Section 4 illustrates the drawing of a rectangle by means of the triangle and T-square. First draw with the T-square the lines A B and C D. Use your triangle at this point, drawing the vertical lines C A and D B. This completes the rectangle.

At section 5 is shown another method of drawing a rectangle by means of triangles only. Place your 60-30 degree triangle A at whatever angle you desire, then place the 45 degree set square B on top as shown. In the dotted position you can draw in the short sides of the rectangle, while in the heavy position you can finish up the longer sides.

The remaining section No. 6 shows the method of drawing perpendicular lines to any given line by means of the T-square and triangle. From these little hints students can form some idea of the possibilities of such instruments and by practice will find these tools more useful as time goes on.

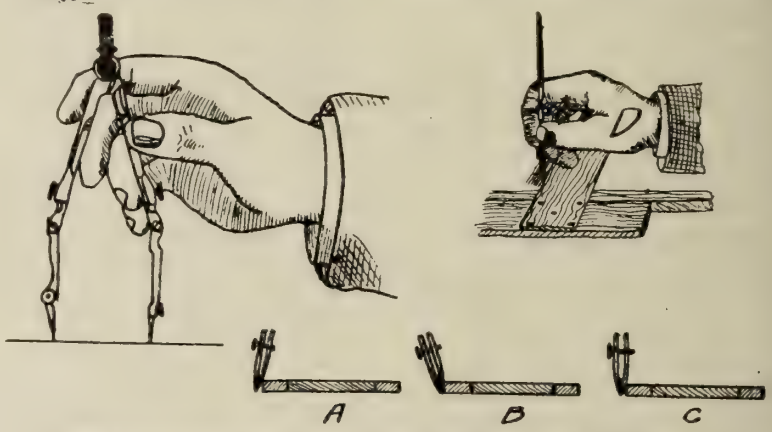



FIG. 3 THE CORRECT METHOD OF HOLDING THE COMPASS AND THE RULING PEN.

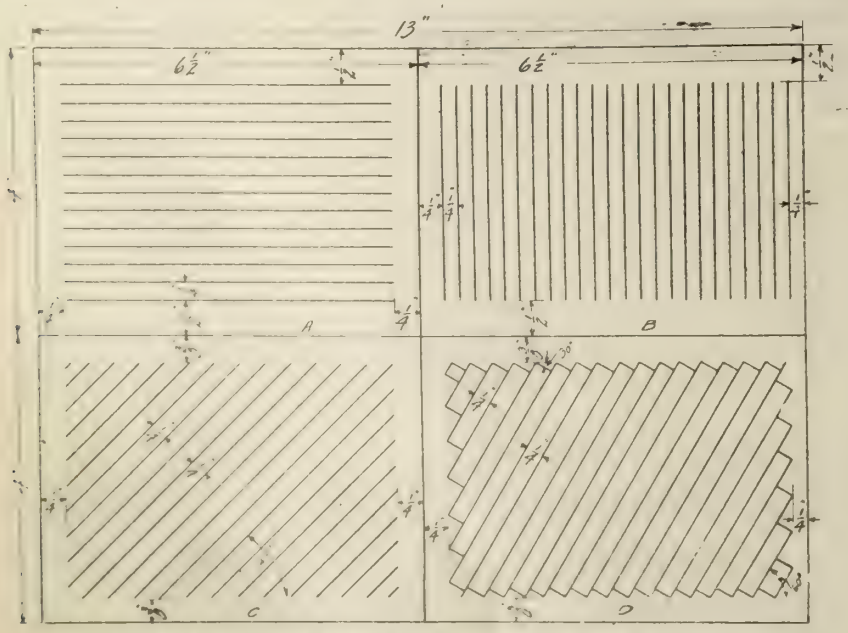



FIG. 4 A PRACTICE PLATE FOR CONTROL OF THE RULING PEN.

### Lettering

When you speak of lettering to the average student studying drawing, if you watch closely you will see his nose curl slightly as he remarks, "Gee whiz—lettering to my mind is a waste of time." But is it? We believe that lettering is as important as the drawing itself, and although we would not suggest that students spend a great deal of time on this subject alone, we do believe that a short period spent in practising lettering will be time well spent.

Fig. 7 illustrates how students can practice what is known as the plain Gothic style of lettering, with the aid of the T-square and triangle. To start with, use only a good pen nib. A Gillott No. 303 is ideal for such work. For illustrative purposes we have shown a few dimensions that can be followed. Make capital letters 5-32 in. high,, and the smaller, or lower case letters as they

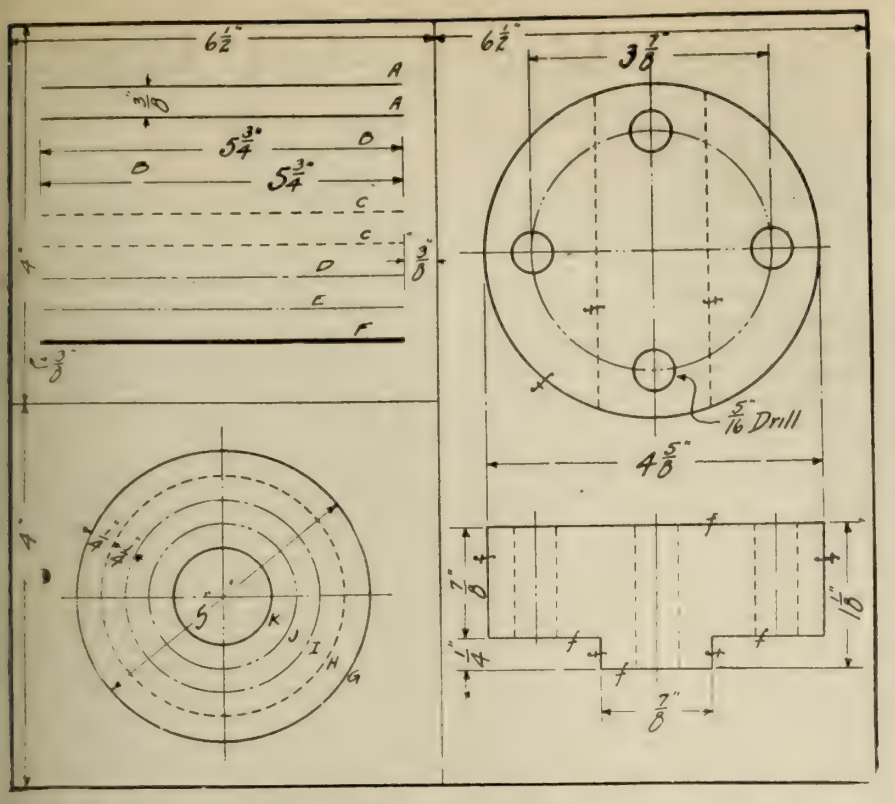



FIG. 5—THIS PLATE WILL GIVE YOU BOTH PEN AND COMPASS PRACTICE.

alternately placed at various angles, with the result that the appearance is very uneven. Some of the letters have also been prepared to illustrate the importance of touching both top and bottom guide lines.

To secure the regular slope, use the T-square and 60 degree triangle as shown in sketch. In lettering, make the backs and sides of the letters parallel with the sloping lines produced by the triangle. Here are a few hints regarding lettering. Never be over hasty. On line three, Fig. 7, are shown a few letters enlarged twice the actual size. To produce the letter A, draw the center line at the regular slope. From the apex draw a line almost perpendicular as shown, making the distance across the bottom of the letter about 3-16 inch. Regarding the other letters illustrated, by studying the same, students can easily grasp the style and proportion. Folow the copy closely, keep on practising, for you can learn more about lettering by actual practice than by any written instructions. The latter part of Fig. 7 shows the complete alphabet, both capitals and lower case together with a set of numerals 1 to 0. In our next lessons we will go further into lettering, section lining, and other subjects.

are called, ⅛ in. high. No definite rule can be given as to the spacing horizontally, but practice soon makes you more proficient in judging what is good spacing. What would perhaps help more than anything would be to remember that W is the widest letter, M and T the next widest, then A and B. The narrowest letters are I and J, after which all the rest are about equal.

Before beginning to letter, draw horizontal guide lines with the T-square to serve as a guide for the tops and bottoms of the letters; see lines A, B, C and D. The various letters should be made to extend fully up to the top, and down to the bottom. They should not fall short of the lines, for if they do the lettering will appear rough and uneven. It is also important that the letters have the same inclination. For example, in the first line of lettering in Fig. 7, the letters A, B, C, D and E have the same inclination. F, G, H, etc., are

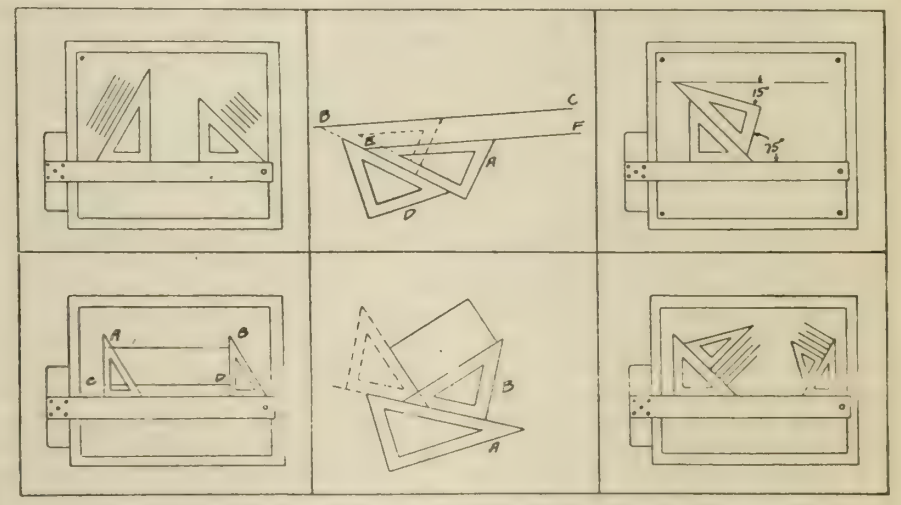
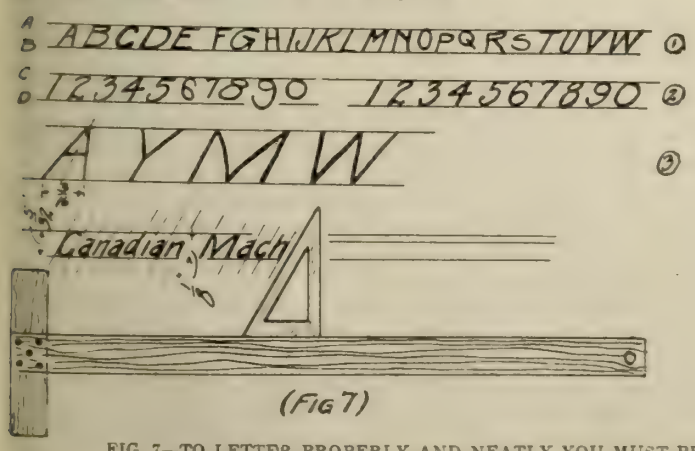


FIG. 6—AN EXERCISE COVERING VARIOUS USES FOR THE TRIANGLE



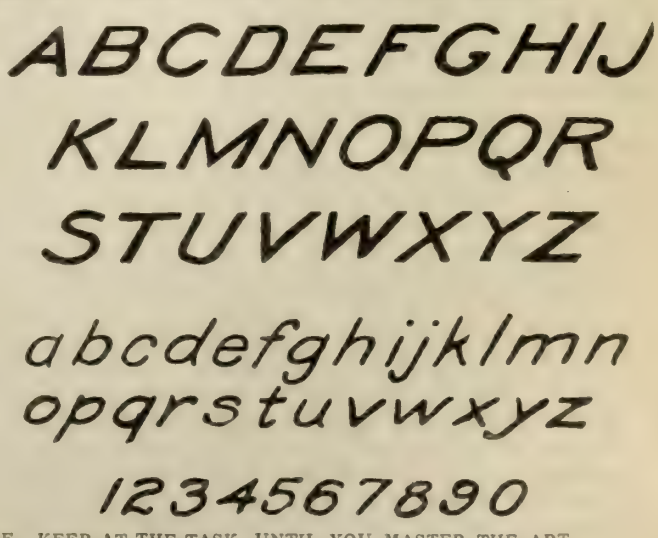




FIG. 7—TO LETTER PROPERLY AND NEATLY YOU MUST PRACTISE. KEEP AT THE TASK UNTIL YOU MASTER THE ART.

# Making It Harder for a Man to Get Injured

## Carelessness is the Hardest Thing to Eliminate—Prompt Attention Given to Minor Injuries is Sure to Cut Down the Off-Work List—What Some Firms Are Doing in This Line

By JOHN T. ORR, Assistant to Superintendent, Toronto Works

THE chief point to watch in any safety device is to actually make it harder for the man to get injured. In speaking on the subject of "Safe-guarding Machinery," Mr. Orr brings this point out nicely, for in the final analysis it is the employee who is safeguarded, and it will be to his benefit more than to the company, where installations of safety guards are effected. But let the author tell his story in his own way.

Our company for many years has been working with the definite purpose of eliminating all hazardous work, and where a mechanical device is the cause of the hazard, a guard is promptly installed. The effort applies not only to safety attachments on machinery, but a protection to hazardous areas, open spaces, stairways, strong chemical gases, smoke, heat and dust.

Let us divide the types of safety devices into three classes, or let us consider three types of hazards that have to be met in a plant of this nature.

First is the hazard of defective material, overstrain, or wear.

Second, carelessness on the part of the operator, which might be due to sheer carelessness, fatigue, or illness.

Third, carelessness of other people, or purely dangerous conditions where a slip or misjudgment would result in accident.

Referring to hazards of the first type, these would likely come from belting or transmission machinery, elevators, hoists and equipment of a like nature. Belts are guarded by steel troughs or cases made strong enough to retain the belt in case of breakage. Emery wheel belts, lathe belts, belts to drill presses, wherever in an exposed position are protected in this way. All drive chains, sprockets, gears and other moving parts which are in any way likely to be a source of danger in their ordinary operating position or in case of their breakdown are encased in metal guards.

The guarding of emery wheels also would fall under this classification. These are guarded by a metal casing covering as much as is practical of the wheel, according to the different uses to which the wheel is subjected. In a general way, however, cast iron guards are used for guarding wheels to no greater than 14 inches in diameter, beyond which diameter, steel guards are used. All guards are sufficiently strong to retain a wheel in case of bursting.

The second cause of accidents is possibly one that requires the most careful consideration, and the greatest amount of thought. The chief danger to operators from this source is to be found in the design of the tool that they are expected to use. Jigs and fixtures should be made as far as possible fool proof from a safety standpoint, as much as they should be made fool-proof from the standpoint of the inspector. We can generally find in studying the design of simple tools that some are quite safe to handle, whereas others performing the same work are the very opposite; this is particularly true of punches and dies. We might surround our punch presses with patent safety devices, be as careful as we can in training our operators, but the greatest amount of safety lies in toolage which itself is not dangerous.

We cannot always, however, design our machine toolage so that it is so safe it is impossible for a person, no matter what foolish thing he may do, to get hurt, hence we must have in addition to carefully designed tools, other means of preventing a careless or inexperienced operator from being injured, and we put safety attachments of various sorts on our presses, guards, shields, safety sliding blocks, etc., etc., in combination with our tools to make them as much as possible fool-proof.

Accidents from the third source, while not so common, still always present a certain amount of danger, and in consequence must be guarded against. Rubber or cork matting in front of woodworking machines, posts and steel fencing to prevent truckers from coming in contact with operators, proper lighting and shielding of the steps, and floor openings; proper overhead protection, when there is any possibility of danger in that direction, and what is perhaps one of the best safeguards against a large number of accidents is a good general lighting system, in addition to the individual lights required at each machine.

In consequence of this work on the part of the company, the number of serious accidents is encouragingly small. In a plant with at times as high as three thousand employees, there is a very heavy turnover, with a consequent large number of "green" men. Our statistics show that it is the new man who is the cause of our greatest accident expense, and it is to him we direct all attention and educational effort.

On his signing up for employment, the new man is handed printed matter comprising our factory rules, industrial council constitution, employees' benefit society by-laws, and special literature directing his attention particularly to the necessity of safety to himself and to his fellow employees. Suggestions are given how this safety idea may be advanced by him to his own benefit, as well as making him acquainted with the fact that we have a medical director in charge of the first aid and fully equipped factory hospital, together with nurses for outside visiting service.

In addition to this, all men at the time they first come on the job are instructed in the hazards of their work and are warned of possible dangers by the foreman, gang boss or set-up man.

With a plant having its machinery and dangerous places guarded, there is no assurance that accidents will be entirely eliminated, as our records inform us that the larger portion of the injuries attended to by our medical department are the result of carelessness or thoughtlessness on the part of the individual, and only a very small percentage of the compensation cases recorded can be avoided by mechanical safety devices.

### Skilled Trades

The diversified nature of the work in our plant calls for skilled men in a large number of distinct trades, such as moulders, core makers, foundry men, smithy drop forge and furnace men, punch press and heavy duty, die and punch work, machine tool and all kinds of wood-working operations, skilled metal trades, machine and bench work and painters.

All of these men are subject to hazards peculiar to their trade class, and so that we may have the best thought on the subject, we have not only our master machanics' department, which is responsible for the installation and moving of all machinery, as well as the erection of safety guards, but we also have a safety representative in each shop who reports conditions to the employees' elected representative for his division which leads up to a safety and sanitation committee of our industrial council, consisting of four members, which puts into effect direct and indirect recommendations.

In our foundry constant effort is put forth to insure sound practical shoes worn by the moulders, and to facilitate this, we have on sale at cost price, a supple of these shoes for our men. We also are establishing the use of canvas leggings for men pouring iron, together with the use of goggles by men at the cupola.

In machine shops, all pulleys, belts, shifting levers, etc., are guarded and projecting set screws are eliminated or covered with safety collars.

### Education

Our experience is that education is the greatest influence in the factor of safety.

We begin with the employee on his becoming associated in our work and continue it through to the foreman. A good live foreman, appreciative of safety, will take a personal interest in his department with the view of eliminating as much as possible all accidents charged up to his work. Where there is a safety hazard, he will immediately have it guarded; where he has a careless employee, he will take corrective measures. In addition to personal literature, we have special safety notice boards placed at the main factory entrance, as well as at strategic points in many of the departments. We find these boards are read constantly by our employees, and as the printed matter is changed in every department every week, the interest in safety and personal health work is sustained.

### Fire Hazard

As many of you know, a considerable portion of the machines manufactured by our company are comprised largely of wood, in the handling of which not only in our outside lumber yards, but in the various primary, assembling, and finishing departments there is an acute fire hazard. It has been the policy of our management for a great many years to spend considerable sums in fire prevention devices, such as sprinkler and hose systems in order that there will be no possible chance of the plant being destroyed by fire. Notwithstanding all of these precautions, there is hardly a day goes by but a fire is reported, but it is usually in one place, namely, shavings distributed at the mouth of the furnaces heating our boilers. In the plant which has been in Toronto for over forty years, and working under these conditions, and not having a fire other than that which has been referred to, this is considered a splendid record. We are quite proud of this record, but are not letting up at any time in our protective measures, as our fire chief or his assistant is on duty day and night. We have day and night watchmen and a specially trained fire-fighting crew who are located in our fire hall quarters, on the factory premises.

### Shop Cleanliness

For a shop handling the class of work which we do, a very presentable appearance is shown and while we know there are plants with straight line production and less variety of work going through than we have, they as a consequence may show a cleaner and more orderly appearance, we are always striving to not only eliminate waste, but to get rid of waste and keep our grounds and buildings in a clean and orderly manner, and have all work in process move along naturally.

### Employees' Suggestion System

In addition to our own employees' suggestion system, where we give bonuses for practical suggestions, for safety as well as mechanical improvements, we have the benefits of regular visits of the inspectors of the Industrial Accident Prevention Association, with whom our safety engineers heartily co-operate. As recommendations are made, they are installed as promptly as circumstances will permit, and anything which will be helpful to the safety and good health of the employee is welcomed.

Our business at this particular time is not as pressing as it has been during former years, but there is absolutely no let up on that account in our efforts on behalf of the employees or the installation of safety devices.

As a matter of interest, might I quote some figures showing our accident statistics for the past two years, and during the past few months.

| | Jan. 1919 | Jan. 1920 | Jan. 1921 | Mch. 1921 |
|---|---|---|---|---|
| Average attendance . | 2211 | 1686 | 1689 | 1500 |
| Total monthly attendance First Aid.. | 1618 | 1259 | 1352 | 1409 |
| Compensation lost time.. | 17 | 10 | 8 | 10 |
| No lost time . | 4 | 3 | 5 | .. |
| Days lost on all cases during month | 396 | 187 | 108 | 169 |
| Average days lost time per case in month .... | 15 | 11 | 8 | 10 |
| Total compensation Expense ..... | 1901 | 1154 | 1424 | 758 |
| Injuries per 100 employees | 27 | 13 | 8 | 21 |
| Compensation cases per 100 employees | .95 | .77 | .76 | .67 |

Where we have 13 new accidents each day of more or less minor injuries, such as cuts, burns, bruises, etc., the number of compensation cases arising therefrom in each month is very small. In all cases of injury resulting in a compensation case, an immediate investigation is made and reported upon by the foreman of the department. This report is made to our medical director covering all phases of the situation, the employee, the work, and the scene of the accident with recommendations for future preventive steps. Such a report being demanded of, and prepared by the shop foreman, brings home to him personally his individual responsibility for the safety of the employees under his care, together with the hazardous conditions in his shop.

### Policy

In closing, let me say that the Massey-Harris Co. is entirely behind the safety movement. It has always been our policy to take care of the good health and welfare of our employees without introducing any spirit of paternalism, and the results we have obtained during the past few years since the inception of an active first aid department for working employees, together with a nurse to visit employees who are ill, or their families, and the recent appointment of Dr. Herbert W. Baker as our medical director is bringing out the highest results in the way of co-operation and better feeling between the management and men.

## BIG ADVANCES HAVE BEEN MADE IN LOOKING AFTER THE EMPLOYEE

THERE have been big advances made in keeping men at their work. We do not mean by this that anything has been done to prevent them laying off, but much has been done toward making them more fit for their work every day.

A few years back and little was known of medical practice in the shops and there are only a few of the larger concerns that have gone into this matter.

When a man took a piece of bark off his finger he used to stick it in a can of turpentine and then try and forget it. If dirt and foreign matter generally got into the cut. it was all part of the day's work. If necessary, a search might be made for some chap who generally had a little piece of black, flesh and pink court plaster in his hip pocket.

There is no doubt that years and years have been worse than lost to men because their injuries were not promptly attended to. A mechanic needs the use of every joint in his hands and fingers and any move that can help him retain these faculties to the highest degree deserves commendation.

In these articles we are showing what the Massey-Harris Co. are doing in this direction. The manner in which the equipment is arranged will be of interest and value to manufacturers generally who have these problems to face and the attention given to safeguarding those who work in the premises is also commendable.

A new type of plug has been placed on the French market. It is called the Bougiver, and has a glass insulator. The glass is run into the body of the plug when the latter is at a high temperature, and the joint thus made is said to be compression-tight. The insulator is also peculiar in that it completely fills all the space right down to the plug points.

# Some Various Examples of Turret Lathe Practice

## Machining a Clutch Gear—Two Operations Required—Producing a Large 315 Pound Steel Spindle—Some Special Tools—Machining Spoked Hand Wheels—Profiling With Cross-Sliding Tool

By A. H. Lloyd, B.Sc., M.B.E.

IT will no doubt be remembered that on February 3, February 17 and March 24 we published various examples of turret lathe practice as adopted by the Alfred Herbert Ltd., Coventry, England. In this the last part of the series, we will take up other interesting work completed on this particular style of turret lathe.

A rather good piece of work which shows the ability of the modern turret lathe to rough out at a rapid rate, yet finish accurately to size, occurs in the machining of a clutch gear, which is a component part of several of the "Herbert" turet lathe headstocks. The lay-out for the first operation is shown at Fig. 1, and this operation is being done on a "Herbert" No. 9 combination turret lathe. The rough material is a drop forging of 40 tons tensile strength, the largest diameter of which when finished is 7¼ inches; the overall length being 4¾ inches. At the first operation the forging is gripped with special jaws on the boss, an end location being obtained by lengthened screws in the chuck jaws. The first tool is an inserted cutter drill with oil supply. In this drilled hole, counterbore No. 2 pilots and roughly opens out the ball race diameter. Tool No. 3 is a rough facing tool for the end, which operates simultaneously with No. 4, which is an adjustable knee turning tool carrying a counterbore for the large bore, a rough turning cutter for the outside diameter, and a chamfering cutter. By grouping all these cutters together so that they work at the same time, the most economical cutting speed can be employed. For instance, if the large counterbore had been used on station No. 2 and the small counterbore in the knee tool, it would have meant running both on the speed determined by the large diameter. No. 5 takes finishing cuts on surfaces similar to those operated on by tool 4; that is to say, finish boring the ball race, finish boring the large diameter, and finish turning. Simultaneously with this tool, No. 7 from the back of the cross slide is brought in for finish facing the end, and chamfering. No. 6, is a special tool holder in the square turret, carrying three cutters for facing the bottom of the bores and undercutting. No. 8 is a floating cutter bar for sizing the ball race diameter, and No. 9 a similar tool for the large diameter.

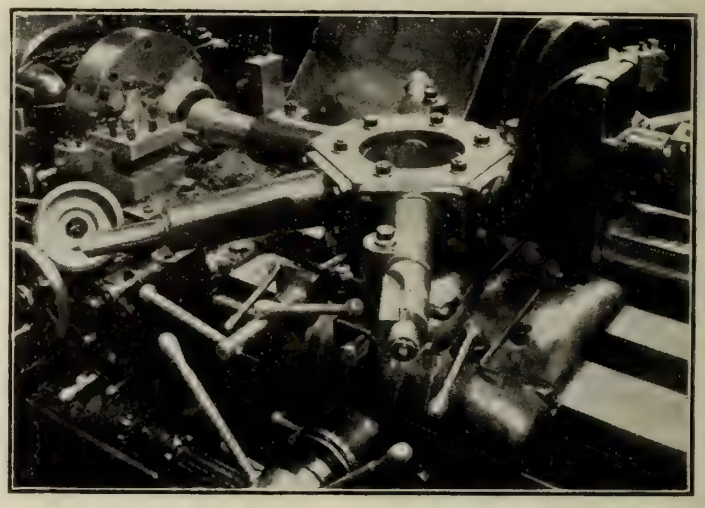


FIG. 2—PHOTOGRAPH OF THE FIRST OPERATION ON CLUTCH GEAR.

Fig. 2 shows a view of the machine set upon the first operation, and the piece as it leaves the chuck. During the operation of the large counterboring tool, the cut is very heavy just at the end of the travel, and tests the gripping qualities of the Coventry chuck very thoroughly. It will be noted that both counterbores, in addition to the drills are provided with oil tubes for conveying the lubricant to the cutting edges, thus enabling them to work under the most efficient conditions. The machining time for the first operation is minutes.

### Second Operation

In considering the second operation on this piece, we shall have an opportunity of going into a lay-out of tools for the automatic machine, known as the "Herbert" No. 5 auto lathe. This machine is in reality a turret lathe for dealing with detached pieces, on which all cutting operations proceed automatically after the work has been chucked. When the cycle is completed, the machine

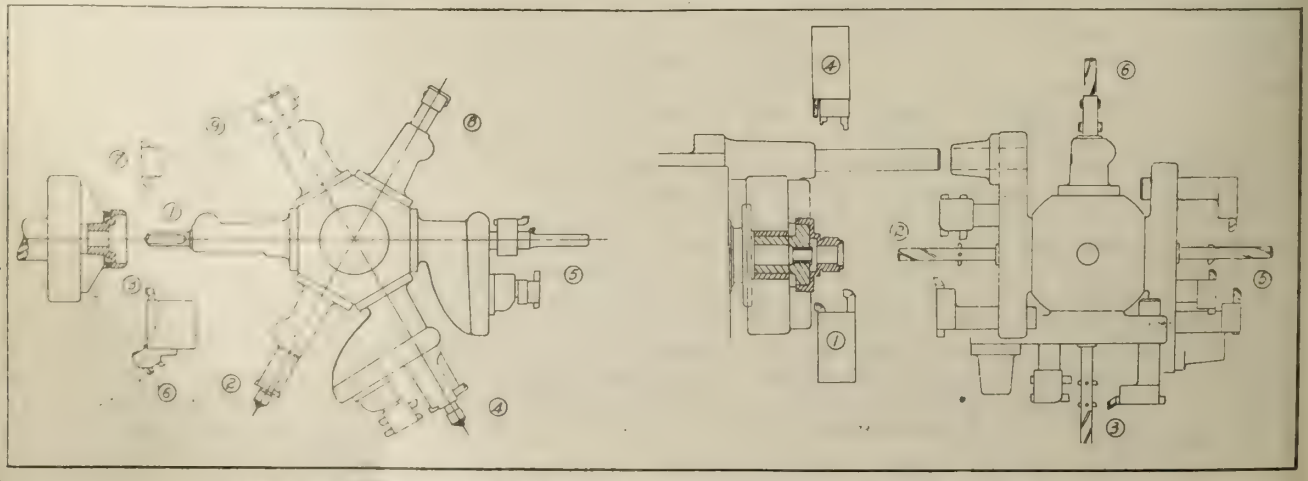


FIG. 1—LEFT HAND VIEW—SHOWING TOOL LAYOUT FOR CLUTCH GEAR.
FIG. 3—RIGHT HAND VIEW—THE SECOND OPERATION ON THE SAME PIECE.

stops automatically, a new piece is put in the chuck by the operator, and the machine is re-started. It is possible, therefore, for one operator to attend several machines, so that the labor cost per machine is very low.

Fig. 3 illustrates the lay-out for performing the second operation on the No. 5 auto lathe. The work is chucked true by a locating plug fitting in the chuck, which acts also as a steady bush for the boring bar, the work being gripped by soft jaws. No. 1, the front tool post, carries a pair of cutters for rough facing the large shoulder and the end. Simultaneously with the facing, a combination tool comes on to the work. This carries three turning cutters for the various diameters, and a boring bar with a cutter for opening out the second ball race. The tools on this turret face are timed to finish simultaneously with the facing tools. When this combination is working, it is obvious that as the cutters come on to the work successively, it is an advantage to vary the feed, in order to obtain maximum production. This particular lathe is provided with a valuable feature whereby the feed can be altered automatically during the cut, which thus enables the tools to start cutting at a coarse feed and change over progressively to finer feeds as the depth of the cut and the duty increases. No. 3 is a second combination tool, carrying finish boring and finish turning cutters. This operates simultaneously with No. 4, which is the standard back tool post in which are carried a gang of finish facing and grooving cutters. No. 5 is another combination tool, carrying a number of cutters for forming the various radii and chamfers. No. 6 is a floating cutter bar with two cutters for sizing the ball race and small bore simultaneously. The time for the second operation is 12 minutes.

At Fig. 4 you have a close-up view of the machine on the second operation, and it would be well to note the overhead support or pilot used, which is a very valuable feature on work of this

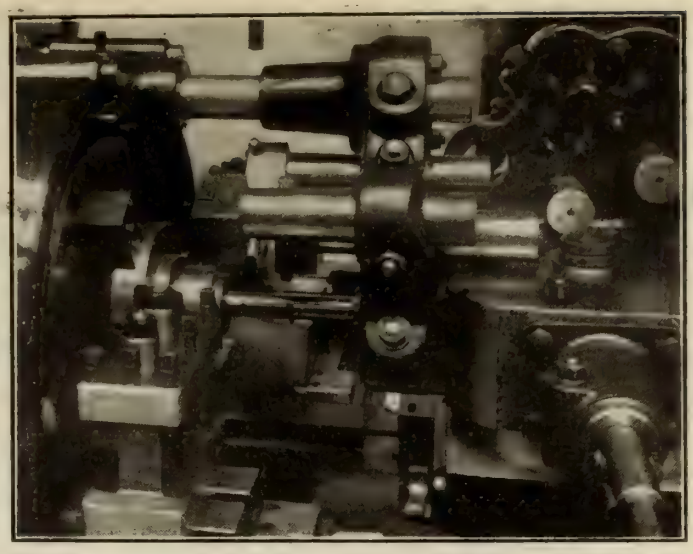


FIG. 4—CLOSE UP OF THE SECOND OPERATION ON CLUTCH GEAR.

class. It consists of a bracket bolted to the headstock which carries a steel bar 2 1-8 inches diameter. On each combination tool there is a pilot bush attached by three studs in clearance holes, so that the bush can be aligned true with the overhead bar. You will appreciate that this arrangement ties up the turret slide to the headstock very rigidly, and enables coarser feeds to be used and a greater accuracy to be obtained than would be possible without it. In many establishments large forgings are machined on ordinary lathes without considering the possibility of the turret lathe on this class of work. This lack of consideration is often attributable to a casual impression that the forgings are too large and heavy for the turret lathe, or because there might be difficulties in chucking owing to the overhang of the work.

The next photograph, Fig. 6, shows the first operation set up for machining the spindles used on a No. 9 combination lathe. This piece is machined on a No. 20 combination lathe, and is quite large, being 10 inches finished diameter on the flange, and 3 feet 2 inches overall. The forging, which is made of .5 carbon steel, weighs 315 pounds in the rough.

In order to facilitate chucking at the second operation, it is necessary to machine the flange practically right across at the first operation; the available grip, therefore, for the first operation, is exceedingly narrow, and varies from ¼ inch to 3-16 inch, the overhang from the chuck being 38 inches. Even with this overhang the work is quite rigid, as will be seen from the nature of some of the tools, which are used without a support.

The operation is commenced by starting the hole with a short drill in a combination tool, which also turns a short way up the end to start the roller steady turners. Simultaneously with this operation, the superfluous metal is cut off the end with a tool in the square turret. The roller steady turning tool is then applied to the end, this turner being mounted on a suitable extension piece. At the same time, a tool in the square turret rough turns the portion of the spindle nearer the chuck. Having turned

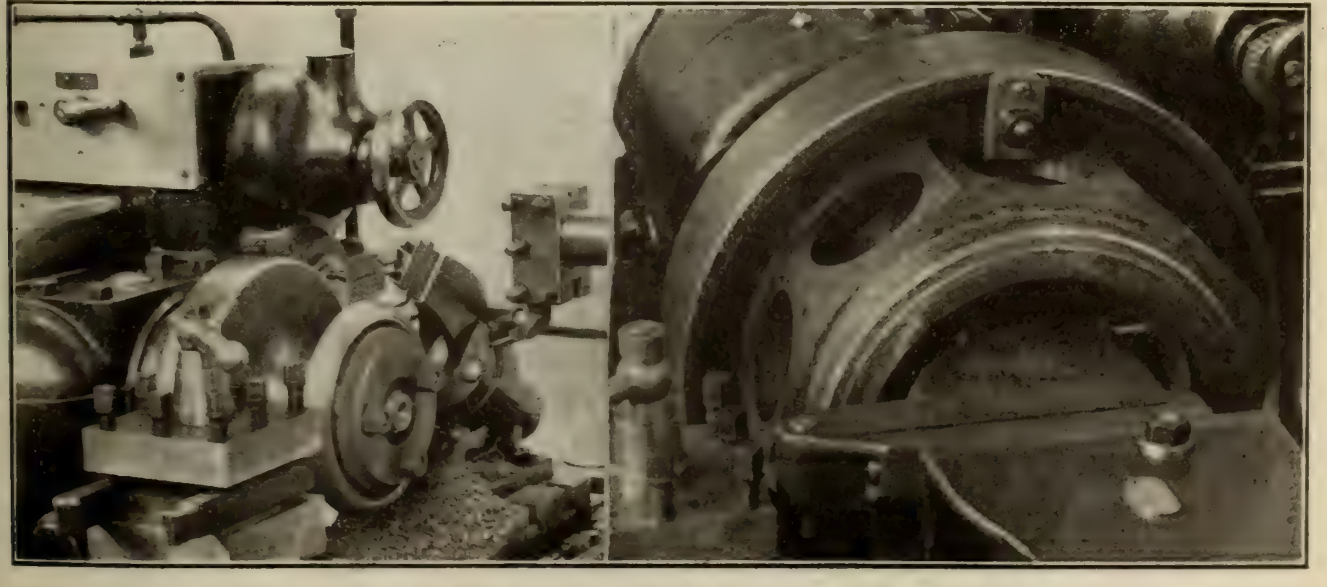


FIG. 6—MACHINING SPOKED HAND WHEELS.

FIG. 7—PROFILING BY MEANS OF A CROSS-SLIDING TOOL.

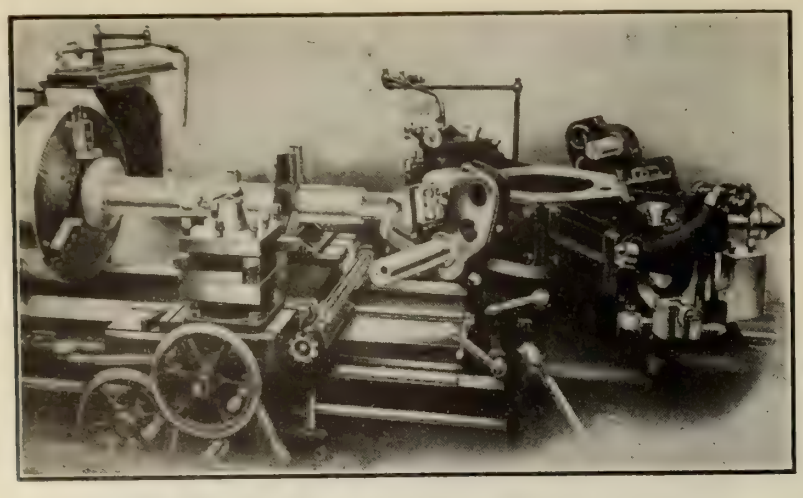


FIG. 5—FIRST OPERATION ON LARGE SPINDLE.

the end, a three point roller steady is brought into position, whilst a 3⅝ inch diameter inserted cutter drill is used. The feed of this drill is about ½ inch a minute. Other tools in the square turret are used for undercutting for grinding, and for turning and facing the flange.

The hole is not drilled right through at the first operation, and at the second, the work is gripped on the flange in soft jaws, the reduced diameter going into the spindle, where it is steadied by a bush fitting in the spindle bore. The second operation consists of drilling to meet the hole produced at the first operation, and facing. The time for the first operation is about 1¾ hours, and for the second operation three-quarters of an hour. During the two operations about 220 pounds of metal are removed.

Whilst on the subject of machining forgings, it will not be out of place to draw attention to a point which must be observed in turning forgings with the roller steady boxtool or roller steady turner. Tools of this kind cannot be brought straight on to a rough forging without a preliminary truing operation. In dealing with the spindle you possibly have observed that the roller steady turner was given a true start by having the end of the spindle turned up a short distance with a combination tool which came on to the work just after the starting drill. This is quite satisfactory where the work has a hole, but in the case of a solid article, other means have to be adopted.

### Some Special Tools

Having considered some representative lay-outs, we will next take one or two examples of quite special tools which deal with the unusual operations. The next photograph, Fig. 6, shows an arrangement used for machining spoked hand wheels for operating machine tool slides. By means of this lay-out, practically the whole of the machining is completed at one operation in very good time. The casting was held on a special fixture, being gripped between two plates under the rim. Before tightening up the three nuts, the boss is located central by bringing up a cup centre carried on the turret. The drilling, boring and reaming of the boss are straightforward operations, but for turning the radius on the rim a very interesting tool is made use of.

This machining is done with a cutter in a tool post carried at the end of a swivelling arm, fitted to a spindle mounted in a bracket on the back of the cross slide. The spindle is made to revolve by means of a pinion cut solid with it, and operated by rack teeth cut on a round bar extending from the combination tool. The cross slide is brought forward to a stop, the rack engaged with the pinion, and the automatic movement of the turret slide then imparts the feed to the tool. At the end of the forward travel, a chamfering tool finishes the edge of the rim. When not in position, the rack is carried round by the turret like a boring bar. This hand wheel is 9 inches diameter and is finished in 9½ minutes.

The method of profiling by using a cross sliding tool mounted on the turret and guided by a former on the cross slide has been described in connection with the pump body job, and an elaboration of this occurs in one of the operations on the "Le Rhone" aero-engine crankcase. The internal surface of this is spherical, and, owing to the fact that it is interrupted by the holes for the cylinders, must be machined by a single point traversing tool. The tool employed is shown in position at Fig. 7. The tool holder is lipped to provide a good support for the tool, and the moving slide has an additional support on a square swivelling block carried on the pilot bar, which fits a machined slot in the front slide. In this case you will notice that the former in the square turret is double sided; in other words, it is a curved slot in which the guiding pin travels to determine the path of the cutting tool. The reason for making this former double-sided was due to a certain amount of apprehension on the part of the tool designer, who considered that there was a possibility of the tool being dragged by the top rake into one of the cylinder holes, with a consequent nasty smash. Whether this danger was a real one is a debatable point, but the method of making the former double-sided certainly avoided the risk.

In considering these various lay-outs which have been presented, you will notice the large extent to which the standard tools are used, and the difficulty in getting good results from capstan and turret lathes is now much less than formerly, since makers of this class of lathe are in a position to furnish standard tool outfits of wide general utility, which reduce the outlay on special equipment to a minimum. Despite this, the necessity for special tools will always exist, and the ingenuity of the designer will be taxed to meet special conditions. The time has undoubtedly come when it is appreciated that turret lathe tool design and practice is a subject which is worth all the attention which can be given to it, and that the tool designing and planning engineer has a big place in the scheme of production. The success of any lay-out or combination of tools is dependent on the sound judgment of the designer, and this, in turn, can only be based on past experience and familiarity with the best shop practice.

## MACHINING A LARGE GEAR BLANK

(Continued from page 74)

the feeding and chucking can be said to be semi-automatic, while the other movements still remain fully automatic.

Where there are no threads to cut a plain machine will perform all the other operations possible on the standard type with the exception of threading, and other operations when the stock is held stationary, such as cross-drilling, slabbing, slotting, milling from the side, etc. A plain machine is usually found ideal on such work as rollers, pins, bushings, washer work, and such like parts.

Where the parts are very simple, two or three pieces can be completed at once, in other words eight or twelve pieces can be in process at one time, two or three to each bar. From this it will be readily seen that the quantity possible to be produced on such machines is very largely dependent upon the man in charge. If he is up to date and anxious to increase his production, he will study his tooling, improve it where he can, use auxiliary attachments wherever possible, and in every way try to keep his machines running to full capacity. Two operators running a battery of similar machines might secure very different results.

# The Need of Medical Service in an Industrial Plant

## The Idea is to Keep Men on the Job by Doing Away With Needless Time Losses by Reason of Neglecting Injuries—How the Idea of Safety is Being Taught

ABOUT six months ago the Massey-Harris Co. started a movement to extend the system of first aid and safety work they had been doing, and as a result they have today a much more complete medical service than they have ever attempted in the past. Dr. H. W. Baker is in charge of the medical department, spending nearly all of his time at the Toronto works. At the Weston works an experienced first aid man is in charge. At Brantford they maintain a service by a local doctor, E. A. Smith, M.B., who is at the works each day from 9.30 to 11.30. A graduate nurse and a secretary are also on the staff at Brantford, while a graduate nurse does first aid work and keeps statistics at the Verity Plow Co. in the same city. A medical officer also devotes part of his time to the work at the Bain Wagon Co., in Woodstock.

An official of the company, speaking of the work undertaken along these lines, stated that: With the reorganization, we have taken the view more strongly than ever that this is not a charity work but a good business proposition by which the employee and employer benefit. We taboo the word "welfare" because it savors of charity. We are here to give service to the employee and to do all in our power to make him more satisfied with his job.

We have established a department in each of the five factories, with a staff as charted in Fig. 1.

At the Toronto works, with about 2,000 employees, we have five rooms.

1. A small waiting room, small because it is our policy to have no one kept waiting.

2. A ward equipped with two beds and a couch. This room is used for men when they become ill or in cases where we are waiting for the ambulance to transfer them to the hospital.

3. An operating room. This is a room 14 feet x 18 feet, well lighted by six southern windows. Four electric lights for dark days do away with all shadows. This room is equipped to do all emergency work. We have two chairs raised seven or eight inches from the floor, with a glass covered arm where all hand dressings are done. Foot rests can be pulled out in front of these chairs where foot dressings can be done. Between these two chairs is a dressing drum with four compartments holding four different styles of sterile dressings. There is also a small instrument sterilizer and dressing table containing solutions and bandages. Above our wash-up basins we have a small tap from our gasoline supply which is used to remove dirt from injured hands. There is a foot bath for treatment of contusions of the feet and a cabinet for our instruments. Along one side of the room there is a cabinet 18 inches deep extending from the floor to the ceiling and equipped with sliding doors. This is quite sufficient for all supplies.



Staff of Medical Department at Massey-Harris Toronto Plant. Left to right: Miss Dempster, Miss Cooper, Dr. Baker, Miss Hill, Miss Edwards.

In one corner we have a revolving chair and an adjustable lamp for eye cases, a shelf of the cabinet at one side being equipped with all material necessary for this form of accident. A 20th Century eye test box is installed in one corner of the room with equipment 20 feet distant for the moving of the letters.

There is an alcove in one corner about five feet square for the secretary. A filing cabinet for records, a desk with typewriter, a cabinet for sorting the records into their departments and two telephones are within easy reach of the secretary's chair.

4. The laboratory is a room 5 feet x 12 feet, completely equipped for all the laboratory work that is necessary to be done. A water centrifuge, an electric incubator, a microscope, bunsen burners and other paraphernalia are conveniently arranged. In this room we have our drug cabinet and large dressing sterilizer.

5. Medical director's office. This is a room 10 feet x 18 feet and is equipped for making physical examinations of employees. There are two curtained cubicles, 3 feet square, an examining table, scales and a wash basin.

These rooms have a terrazo floor and in the operating room this has rounded corners to facilitate cleaning.

At Weston Works (tractor plant) with 200 employees, the timekeeper is a well-trained first aid man. This plant is just nine miles from Toronto works. It can be easily reached by street car, therefore, our first aid man takes no chances, an accident case, when necessary, being





Operating Room in Massey-Harris Toronto Works. Views show how the room can be adapted to treating various kinds of injuries. It is well lighted at all times, so doctors and nurses work under the best conditions.

sent to the Toronto Works medical department by automobile or street car. The medical director visits this plant each week or oftener if necessary .

At our Brantford works, where there are about 1,000 employees, we have had a nurse on duty for about two and a half years. There is a well equipped operating room which, until the recent reorganization, was sufficient. With the recent addition to our staff of a part-time medical officer and stenographer, we have acquired more room.

In one corner of the operating room a bed for emergency cases is screened off, the stenographer with her records is established in another corner. The medical officer, who puts in two hours a day at this plant, has his desk in another room where he does his consulting and makes his physical examinations.

Our graduate nurse of this plant has so won the confidence of the employees that she has increased the attendance from a dozen a day to six times that number.

At the Verity Plow Company, Brantford, with 500 employees, there has been a nurse on duty for over one year. The operating room here is also well equipped for all emergencies. At present we have no medical officers in this plant, but there is a doctor quite convenient who is called for emergency cases.

At the Bain Wagon Works, Woodstock, with about 300 employees, there is a medical officer who comes to the plant for one and a half hours three times a week for consultation. The rest of the time he is on call for emergency cases. The fire chief is a well trained first aid man who has remarkable ability in judging whether or not a case is serious enough to be sent to a doctor.

### Treat Cases Quickly

We give first aid and follow-up treatment to all accidents and we call even a scratch an accident. We classify these cases into major and minor, calling major all cases that the doctor should see or those that lose any time whatever. The accident cases are the only ones which the doctor goes outside the plant to see, these patients being attended to at their homes or in the hospitals if necessary.

Some of the simplest accidents that have happened in our works have turned out to be the most serious because of blood-poisoning. This condition can be prevented by prompt and efficient treatment of each and every wound that is deep enough to show blood. Therefore, we urge every employee to come for a dressing immediately upon receiving an injury. Last month no case treated within an hour of the accident became infected, but we had ten who came to us for treatment after the infection was present. The smallest scratch may mean death. Why play with such dangerous toys?

### Keeping Men on the Job.

We are equipped to do the very best surgery. This means that the men lose less time and have less disability when they return to work.

Our medical work consists of keeping the men on the job. We urge all employees to come to the medical department for consultation when they feel sick, such as a sore throat or when they feel a cold coming on, in order that by prompt treatment we may prevent more serious trouble. Our work does not interfere in the slightest degree with the outside doctors. Practically the only cases we treat in a medical line are those that would not go to their family physician for treatment. If the employee needs medical treatment at home we advise him to call his family doctor. If he cannot afford to pay for medical treatment, we make arrangements for him to get the very best care possible in one of the hospitals. We will always see that the employee or his family gets proper medical care. We want to make our employees feel as free as possible from the worries of family sickness.

### Examine Applicants for Work

We are now making physical examinations of all applicants for employment. We do this, not because we want to keep the man with a defect from getting a job, but rather that we should place the man with a defect on a job where he will



Corner of Laboratory in Medical Department of the Massey-Harris Co. at Toronto works.

not be injured by the work he has to do. We also make these examinations in order to keep out of the plant contagious disease. We make the examination in such a manner that no man can object to it. He steps into his cubicle in the doctor's office, strips to the waist and removes his shoes and stockings and is then inspected and examined from head to foot. He is told of any defect that he may have and advised how to take care of it. During the examination he is also instructed regarding "safety first." Applicants are categorized in one of five categories, according to their physical fitness. Employees with curable defects are instructed as to ways and means of having their condition cured, and close tab is kept on them until they get fixed up.

The sanitation, ventilation and lighting of the factories and offices are constantly under inspection and are gradually being improved.

### Bettering the System

We are constantly on the look out for ways and means of increasing the safety of the employee. When an accident occurs, a form is sent at once to the foreman for his report. He must describe how the accident happened, how long the man has been working on the job, and who instructed him in his work, and is also asked who is to blame for the accident. He is also requested to make suggestions as to how such accidents may be prevented in the future. This brings to the foreman his responsibility for all accidents in his department. We feel that if a foreman is imbued with the idea of safety that he will make his shop safe. From one of our shops there came many eye injuries, and it was soon noticed that the foreman was frequently appearing with a foreign body in his eye. We insisted that he wear goggles and, as a result, the eye injuries in this shop have been reduced at least 90 per cent.



DR. HERBERT BAKER, B.A., M.B., F.A.C.S.,

Director of Massey-Harris Medical Department. Photo taken in the Consulting Room at the Toronto works.

### A Busy Day's Work

Our service nurse at Toronto works is on the road in her car from 8.00 a.m. till 5.00 p.m. She makes from 12 to 15 calls a day. Foremen are instructed that all employees off work three days must be reported to the medical department with the reason of absence given, if possible. Cases of sickness are called on by the nurse and letters of appreciation of this work are constantly being received. We feel that this is one of the best parts of our work.

We keep accurate record of all patients that come into the department and of everything we do for the employee. At the end of the month this is chalked up against the department from which the patient comes and, in this way, we can keep tab on the accidents and sickness by departments.

It is the policy of this company to make a man satisfied with his job, and it is for that reason this department has been formed. We are trying to make the conditions under which our men work as sanitary and pleasant as can be. We want our employees to come to work free from worry and it is the duty of this department to remove these worries as much as possible.

Health is the workman's greatest asset. He cannot work without it and he can do the best work when he is in the best condition. We are here to advise him how to keep fit and we are trying to keep our plant free from conditions that would injure his health. We want every employee to know this and to feel perfectly free to come to us at any time for this advice for himself and his family.



NURSE HILL

Starting out on one of her daily visits to the homes of sick employees. This is a service that is greatly appreciated, and forms a strong tie between the homes and the company.

Appended are some figures from the March report that will give an idea of the amount of work done by the medical department:

**MASSEY-HARRIS COMPANY, LIMITED.**

**Report of Medical Department for the Month of March, 1921.**

| | Toronto. | Weston. | Brant'd. | Verity. | Bain. |
|---|---|---|---|---|---|
| Total attendance in medical department. | 1409 | 44 | 863 | 444 | 41 |
| Service visits of nurse and doctor..... | 201 | — | 3 | 2 | — |
| Number of accidents—Minor..... | 296 | 28 | 270 | 128 | 31 |
| Major..... | 25 | 3 | 9 | 14 | 4 |
| Percentage accidents to 100 worked days | .87 | .91 | 1.51 | 1.08 | .53 |
| Compensation Cases ..... | 10 | 2 | 12 | 14 | 4 |
| No lost time ..... | — | 2 | 2 | — | 1 |
| Lost time ..... | 10 | — | 10 | 14 | 3 |
| Percentage comp. cases per 100 employ'd | .66 | 1.5 | 1.24 | 2.8 | 1.6 |
| Days lost all compensation cases ..... | 169 | 5 | 131 | 145 | 52 |
| Percentage of worked days lost ..... | .46 | .15 | .70 | 1.1 | .79 |

# Season Cracking of Brass And Other Copper Alloys

IN SPEAKING before the institute of metals, H. Moore, O.B.E., B. Sc., S. Beckinsdale, B. Sc., and Clarice F. Mallison, M.B.E., B. Sc., have the following to say regarding the season cracking of brass and copper alloys.

Numerous specimens of brass in which season-cracking has occurred have been examined and an investigation made of the causes of season-cracking, the detection of liability to fail in this way, the mechanism of the process by which the cracks form and develop, the effects of variation in composition, structure and physical properties such as hardness, and the prevention of season-cracking. Among the more important conclusions are the following:—

Season-cracking occurs in a great variety of industrial brasses, differing widely in composition, degree of purity, microstructure, and physical properties, but occurs only in material which is maintained in a stress, either by external constraint or more commonly by internal stress. Corrosion of the surface and sometimes of the walls of the cracks is frequently associated with season-cracking, but corrosion effects are not always visible. Season-cracking may occur in brass coated with continuous protective layers such as lacquer, though nickel-plating is probably completely effective in preventing season-cracking, if a sufficient and continuous coat of nickel is secured.

Highly stressed articles, capable of developing season-cracking in certain conditions, may be kept for years in reasonably pure atmospheres without showing any sign of cracking, and there appears to be no reason to anticipate the development of cracks so long as the condition of the surrounding atmosphere does not change. Some agency additional to the presence of initial stress appears to be necessary for the development of season-cracks. Surface defects do not appear to contribute to the development of season-cracks in brass to any important extent, and corrosion does not necessarily favor their development. Mercury, ammonia and ammonium salts readily produce cracks in brass which is sufficiently stressed in tension. It is probable that traces of ammonia in the atmosphere are an important agency in inducing season-cracking of stressed brass.

Season-cracks almost invariably follow an inter-crystalline path and the cracks produced in stressed brass by mercury or by ammonia are of the same intercrystalline type. Ammonia appears to have a specific and selective action upon the intercrystalline material of brass, weakening it sufficiently to cause cracking if in tension. Mercury has a similar intercrystalline weakening action.

The greater the degree of hardening by cold work the less is the brass affected by the intercrystalline weakening action of ammonia or mercury, although it is probable that weakening may occur whatever the degree of hardness of the brass.

It is probable that the behaviour of a copper alloy submitted to the combined effect of tension and of ammonia or mercury is a reliable index of its liability to fail by season-cracking. This liability appears to diminish as the zinc content of the brass is reduced. Copper and zinc-copper alloys containing less than about 10 per cent. of zinc are unlikely to fail by the development of season-cracks in service.

A suitably controlled low-temperature annealing which will remove stress sufficiently to ensure freedom from season-cracking with little or no effect on the hardness appears to be the most effective safeguard against failure by season-cracking and might well be applied to all brass articles made by cold-work operations capable of inducing permanent internal stress.

The undoubtedly intercrystalline character of season-cracks in brass appears to be fully explained by the selective weakening action of a chemical substance on the intercrystalline material. The authors are unable to find in the results of their work any evidence indicating that season-cracking is the result of viscous flow of the intercrystalline cement.

# Rise and Fall in the Price of Machine Tools

## The Peak in Prices Came About August of the Year 1918—Many Machines Are Worth More Than Formerly Owing to Improved Design Following the Experiences of the War

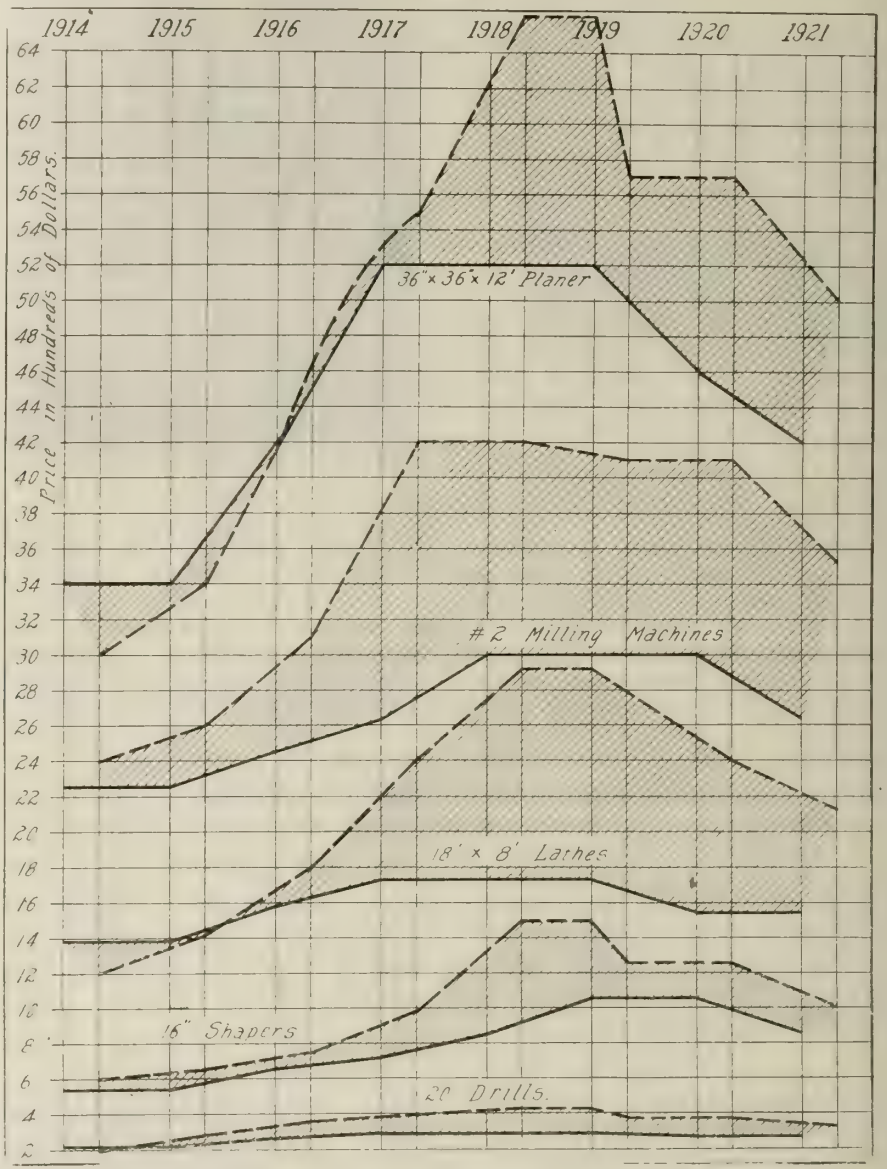
BY J. H. RODGERS

SOME appreciation of the effects of the war and the subsequent conditions arising therefrom may be gathered from the accompanying chart, which illustrates the rise and fall in the prices of a few of the principal types of machine tools over a period of seven years. The graph was developed from the records of two leading dealers in this class of equipment.

The full line represents the actual price (f.o.b. Montreal) on the particular size and type of tool designated by one dealer, while the broken line shows the rise and fall of corresponding tools on the percentage basis, the price in 1914 being taken as 100; the latter being based on the records of the second dealer. It will be seen that there is considerable range in the price of similar tools by these two individual dealers, and it may be gathered that a fair average price for said tools would lie somewhere within the shaded portion of any section.

In explanation it might be stated that the full line which has been developed from prices given for a particular make of machine of a specified size or type, will represent, very accurately, the fluctuations on that tool, while the broken line is a graphical illustration of the price movement of the different machine tools in general. It will be noted that in nearly every case the peak of prices existed in 1918, and it was about August and September of that year that the highest figures were recorded.

The present tendency is towards lower quotations on nearly all lines of standard equipment, but many factors combine in preventing a too rapid decline to what many might consider normal prices. Probably the one outstanding feature in this connection is the prevailing high cost of production, a condition that not only restricts the manufacture of machine tools, but detracts from the activity in many lines of industry that would, under normal conditions, be large consumers of metal working machinery. In this respect, however, it must not be overlooked, that no little percentage of increased cost of standard equipment might well be marked down to the improvements that have been made in design as direct result of the experience and knowledge gained by tool designers during the years of the war.




THIS CHART SHOWS YEAR BY YEAR THE CHANGE IN PRICES.

**Price Range in Per Cent. on Machine Tools from 1914 to 1921**

| | 1914 | 1915 | 1916 | 1917 | 1918 | 1919 | 1920 | 1921 |
|---|---|---|---|---|---|---|---|---|
| Planers | 100 | 114–160 | 140–190 | 180–230 | 200–230 | 170–200 | About Same | 10% less |
| Shapers | 100 | 110 | 125 | 165 | 255 | 215 | About Same | 15 to 20% |
| Lathes | 100 | 110–135 | 145–165 | 185–220 | 220–230 | 200 | About Same | 10 to 15% |
| Upright Drills | 100 | 120 | 180 | 200 | 210 | 190 | About Same | 10 to 15% |
| Milling Machines | 100 | 105–100 | 130–135 | 170–195 | 190–195 | 160–190 | About Same | 10 to 15% |

**Price Range on Machine Tools from 1914 to 1921:**

| | 1914 | 1915 | 1916 | 1917 | 1918 | 1919 | 1920 | 1921 |
|---|---|---|---|---|---|---|---|---|
| Planers, 36"x36"x12' | $3,400 | $3,400 | $4,210 | $5,187 | $5,187 | $5,187 | $4,611 | $4,210 |
| Shapers, 16" | 550 | 550 | 650 | 725 | 850 | 1,050 | 1,050 | 850 |
| Lathes, 18"x8' | 1,385 | 1,385 | 1,575 | 1,725 | 1,725 | 1,725 | 1,540 | 1,540 |
| Drills, 20" | 215 | 215 | 265 | 285 | 285 | 285 | 265 | 265 |
| Milling Machines, No. 2 | 2,250 | 2,250 | 2,450 | 2,625 | 3,000 | 3,000 | 3,000 | 2,625 |

# The Trend Toward Automatic Production

## Development of Machine Tools—Does Such a Thing as a Completely Automatic Machine Exist?—Operators Have Been Relieved of a Large Part of Their Physical Burden

*By A. L. De LEEUW, Consulting Mechanical Engineer

IT is but slight exaggeration to say that, next to the pre-war cost of living, no phase of the past is regretted so much as the gradual disappearance of the "all-around mechanic." Those who are optimistically inclined by nature merely say that they are mighty hard to get nowadays, and the pessimists believe that the species will be extinct in a few years and that the new generation will view the skeletons of the dodo and the all-around mechanic exhibited side by side in the same glass case. Hearing some of the talk and reading some of the articles written about the "decline and fall" of the all-around mechanic, one would come to the conclusion that the present high development of our mechanical equipment and processes is entirely due to his efforts, and that all we have accomplished along these lines will disappear with him. And yet it is highly probable that the same man who so earnestly bewails the scarcity of all-around mechanics would be embarrassed to know what to do with a dozen if they should apply for a job.

The fact of the case is there are so few of them wanted, and so few are wanted because only a few are needed. This does not mean that there may be a temporary shortage here and there at some time or other, but that, if we could restore the conditions of thirty years ago, we would have a lot of men who would not fit in with our present-day methods and, on the other hand, there would be a great dearth of machine operators and specialists who could turn out a fair day's output. Our manufacturing systems, methods and machinery have changed, are still changing, and like everything that isn't hopelessly dead, will continue to change forever and ever.

### Hand Versus Automatic Action

The entire development of the machine tool has been in the direction of replacing skill of hand by the automatic action of a machine, and the worker has changed with it. It is true that the mechanic made the machine tool, but, in its turn, the machine tool made the mechanic. To a certain extent, the old-time mechanic is still required for the building and development of new equipment, new tools and new methods; but he has lost his importance as a factor in production. It is sometimes claimed that our present-day mechanic is not so good a man as his predecessor of thirty years ago; but, personally, I am of opinion that the reverse is true. The man of to-day is confronted with more complicated problems than were met thirty years ago, and he solves them.

When machine tools were few and of simple construction, arranged to work at slow speed and with fine feeds, and when shop methods did not call for that high degree of accuracy which is required for interchangeable manufacture, it was not a difficult matter for a man to learn to operate all the machine tools of that time. At the present, there are so many more machines, and they are so much more complicated, and require so much more knowledge, that it is not fair to expect that any one man should know about them, and much less should be able to handle them all.

Our manufacturing systems, methods and machinery have changed, are still changing, and, like everything that isn't hopelessly dead, will continue to change for ever and ever.

It is sometimes claimed that our present-day mechanic is not so good a man as his predecessor of thirty years ago; but, personally, I am of the opinion that the reverse is true. The man of to-day is confronted with more complicated problems than were met thirty years ago, and he solves them.

It was said that the development of the machine tool consisted in adding automatic features. At one time a lathe was called an automatic lathe because it had automatic feed. Even now, we can find people who speak of an automatic milling machine, meaning merely a milling machine with automatic feed in more than one direction. Gradually more and more automatic features were added, but even to-day one cannot say that a completely automatic machine exists. In fact, such a thing would not be humanly possible. The machine must always receive some attention from an operator. Tools must be watched, adjusted or replaced; material must be renewed, and the machine itself must be watched and, if necessary, adjusted or repaired. We do not expect to be able to avoid the necessity of doing these things. We cannot hope to build a machine which will repair itself or go to the warehouse and fetch new stock for itself. On the other hand, we have done things in the last thirty years which seemed, at the beginning of that period, very far removed from realization.

Many automatic machines did exist thirty years ago, but not in the standard lines of machine tools. A Jacquard loom is a highly developed automatic machine, and so is a self-binder. Many more instances could be given of automatic machines which existed then. There were also in existence many highly developed and very ingenious automatic machine tools, but they were mostly special machines, developed by some concern which made pieces in sufficiently large quantities to make a specially developed machine economical. Outside of such cases, however, there were only two automatic machines: the screw machine and the gear cutter. In addition, practically all machine tools had some automatic feature, such as feeds.

### List Is Growing

Since that time, we have added to our list of automatic machine tools as well as to the list of automatic features contained in such machines. We now have automatic screw machines for bar work, chucking machines, chasing machines, gear cutters, hobbers, milling machines, screw slotters, nut tappers, etc. In addition, there are a number of automatic machines used for more or less special purposes, like the Mult-Au-Matic; and many machines developed by large concerns for the requirements of their business. Among these latter machines may be found instances of the highest development which the automatic machine has reached at the present time.

The automatic screw machine, as existing thirty years ago, was a single spindle machine built along the lines of the old-time turret lathe, with the same kind of turret, the same kind of cross-slides; in fact, differing from the existing turret lathe only by the fact that cam-drums were used to give the various motions to the turret and the cross-slides, and that the spindle was provided with an automatic device for advancing the stock and chucking it at the proper time. Nowadays we still have this general type of automatic screw machine, but every single part has been modified so as to make it more adaptable to an automatic machine. It has developed into our present-day machine by dif-

*From "Industrial Management."

ferentiation and specialization. Mechanical movements have been developed which make quick chucking, quick return and quick turret indexing possible. But, in addition, other screw machines have been developed of which the main features differ radically from the old type. Some have been developed for the particular purpose of making small pieces and rapidly, others for making larger pieces, much larger than was ever contemplated when the first automatic screw machines were built, and still others have been developed for large production by the introduction of the principle of the multiple spindle construction. This latter development is almost equivalent to the development of a new type, for methods had to be devised and difficulties had to be overcome which were entirely foreign to the original machine. Some machines have been designed for large production where rapidity of production is the prime requirement, but where the machine requires considerable time for resetting, other machines have been developed for smaller quantities and the setting time has been reduced to a minimum, perhaps at the expense of rapid production of the individual piece. It would seem that in the immediate future we may expect further development along these lines. It would seem probable that the single spindle screw machine will be further developed along the lines of ease in setting up, while the multiple spindle screw machine, which of necessity can only be used profitably for large production, will be still further developed as to rapidity of operation, even if the time and setting would have to be increased.

### Importance of Secondary Operation

An entirely different line of development of the screw machine is found in the attachments which have been gradually added. In a great many cases, a piece is not entirely finished when it comes off the screw machine. If it takes 20 seconds to make a piece on the screw machine, and then it takes 20 seconds for a secondary operation, there is very little advantage in reducing the original time by 1 or 2 seconds. But if it is possible to do the secondary operation on the same machine while the first operation is going on, a gain of 50 per cent. is made in the total machine time; and not only that, but all the labor of re-handling, re-inspecting, storing, and the difficulty of control, are all overcome at one time. Take, for example, a screw of which the head must be slotted. Let us imagine that it requires 20 seconds to make this screw, and that an operator handles five machines at one time. Then the cost per piece is the same as if the operator spent four seconds per piece, and four seconds will be the measure of the labor cost. After the piece is made, it must be sorted out from the chips and inspected before it can be given to the next operator for slotting the head. If this slotting can be done also in four seconds, the cost of secondary operations will easily be twice as much as the cost of making the screw. A slotting attachment on the screw machine will do the slotting while the other operations are under way, so that the entire labor cost of the piece will be four seconds. In addition, the slotting attachment deposits the screw in a little receptacle away from the chips, so that it is possible for the operator at any time to gauge his work, and if he finds that some readjustment is necessary, he will not have to throw away more than a fraction of the screws contained in this small receptacle. It may be expected that in the near future attachments or arrangements of machines will be made so that the piece will be entirely complete (up to the point of hardening, if hardening is required) when it drops off the screw machine.

> Watch the secondary operation. If you can possibly do this operation on the same machine while the first operation is going on, a gain of 50 per cent. in the total machine time is made. Not only that, but all the labor of re-handling, re-inspecting, storing, and the difficulty of control are overcome at the one time.

### Two Distinct Lines

Automatic chucking machines have, so far, developed along two distinct lines: the one is the development of the hand chucking machine, and does practically nothing except operations which can be done on a lathe; the other is a machine which might be considered as a peculiar development of the drill press; it does such operations as hollow milling, drilling, reaming, facing (such as would ordinarily be done on a drill press), threading and tapping. These machines are made either one or two end. Whereas the other type of chucking machine is mostly for round work, this type takes care of work of any shape which can be reached by the tool spindles. This class of machine is essentially a multiple spindle machine. The first type is best illustrated by the Potter and Johnson machine or the Mult-Au-Matic though the screw machine has also been used as a basis for this type. The most important recent development in this class of machines is along the lines of magazines or hopper feeds. Incidentally, these two terms are often confused. A magazine is a device in which the pieces are deposited in a certain way and which then delivers them to the spindle at the proper time and in the proper manner. A hopper feed does not require the pieces to be laid in any particular manner, but takes them from a hopper and places them automatically in the proper position to be delivered to the spindle. A great variety of magazine and hopper feeds have been developed, and many other arrangements may be expected in the near future, for the tendency nowadays is to do away to the fullest possible extent with all hand operations. Whereas the Potter and Johnson machines, or any of the screw machines arranged for chucking, are single spindle machines, the Mult-Au-Mac is a multiple spindle machine. The same two lines of development which may be expected in the screw machines may also be expected in the chucking machines.

An entirely different line of automatics is found in the automatic finishing machines. Such machines are arranged for secondary operations only. The existing types are best illustrated by the automatic chasing lathe and the Fay lathe, not because they are more representative of their types, but because they are more generally known. As a matter of fact, there are numerous machines of this type in existence, some for turning, some for grinding, some for threading or tapping only, and some for various combinations of these operations. This type of machine is still in its infancy, so far as standard machines are concerned; it has been very highly developed by individual concerns for their special work. Here, also, we may expect a future development of magazine or hopper feeds.

### If Work Is of Short Duration

Wherever the machine operation is of relatively short duration, we may expect such development of the magazine or hopper feed, because a large percentage of the total time can be saved in this manner; but where the machine time is very large as compared to the time required for placing a piece in the machine, magazine or hopper feed cannot accomplish much saving of time and will probably never be employed. Machines of this type are the gear cutter and hobbers. In a great majority of cases, the work done by a gear cutter or hobber requires a great deal of time per piece; but there are cases where the gear to be cut is so small that the time for chucking is a large percentage of the total time. In such cases we may expect magazine feeds; and, as a matter of fact, such magazine feeds are employed where very small gear or pinions have to be cut, such as for watch works.

One of the best examples to show how the world is striving for automatic machines is found in the automatic nut tapper. Here it would seem exists a difficulty which cannot be overcome. After a number of nuts are tapped, the tap will be full and must be taken out of the machine and the nuts shaken off. At a first glance it would appear that this is a condition which cannot be altered.

The tap may be made as long as possible, but finally it will be full and must be taken out. And yet the mechanic's ingenuity has overcome this seemingly insurmountable difficulty by the simple expedient of using the bent tap.

Power presses are sometimes considered as not belonging to machine tools. Whether this view is right or not, it cannot be denied that they are doing their duty in metal manufacturing shops. They, too, have responded to the necessity of obtaining the greatest possible production with the least amount of manual labor. Many devices have been developed for the purpose of making the press more or less automatic. Dial feeds, roll feeds, magazine feeds are quite common and the so-called eyelet machine is as good an example of an automatic machine as any in existence. In line with this class may be mentioned wire forming machines, nail and wood-screw making machinery, and the like.

There is left one class of machine tools which has not been developed to any extent in the direction of automatic functioning, though there seems to be no essential reason why this should be so. The milling machine, though highly developed as a machine tool, has not been made automatic in the sense that the lathe has been transformed into the automatic screw machine. However, there are two classes of milling machines which have, to a certain extent, automatic features. These are the semi-automatic milling machines and the continuous milling machines. Though provided with features which obviate, to a certain degree, manual operation, they lack those features which we instinctively connect with the idea of an automatic machine tool, and that is the presentation of various tools to the work and the automatic presentation of new work to the tool. Such features may be found in a number of special automatic machines built by various concerns for their own needs, but are not embodied in any of the standard milling machines on the market.

### Quantity the Big Feature

The one outstanding point which limits the usefulness of the automatic machine is quantity. The time required for setting up an automatic machine for a new piece of work must necessarily be relatively large and, furthermore, it is almost unavoidable that some pieces of work should be spoiled during the process of setting up. This lost time of setting up together with the lost work must be weighed against the advantages of the automatic machine. As a rule, too much emphasis is put on this unavoidable loss of time, and a great many operations which are now done on manually operated machines might be done on automatics, if a careful analysis were made of all conditions. This matter was forcibly brought to the writer's attention by the following incident:

## A HINT TO THE MANAGER

Not only has the automatic machine arrived, but it is still arriving in greater and greater numbers. Luckily many managers have wakened up to the fact that the trend of the times requires automatic machinery wherever it can be employed.

Instead of installing an automatic machine when the conditions are such that no one could possibly doubt its economic advantage, the live manager of to-day should reverse the process and take for granted that he must employ an automatic machine unless he can clearly show that it will not pay.

A certain part, intended for a clutch, about six inches in diameter and about eight inches long, was made in quantities of fifteen at a time, and only one lot of fifteen per year. Without analyzing the thing at all, it was taken for granted that the quantity was entirely too small for an automatic machine and even for such type of machine as the Gisholt, so that it was customary to make these parts on the engine lathe. The writer had this job transferred to a Gisholt machine in an experimental way, and it was found that the first piece was finished on this machine (including the time required for setting up) before one piece could be made on the engine lathe. The next lot was transferred to a Cleveland automatic, again in an experimental way, and it was found that the first piece was made on the Cleveland (again including the time required for setting up), before a single piece could be made on the Gisholt. Of course, this would not happen every time, but the incident showed how necessary it is to analyze the job carefully before concluding that it is not fit for an automatic.

Against the losses incident to the automatic machine, we must figure the advantages of it. In a broad way, these advantages are the following:

A relatively unskilled man can do the work, and this man can run a number of machines; a single highly skilled man being required for the setting up and inspecting of a number of groups of such machines.

The machines run continuously, without requiring rest periods, and without reduced energy at various times of the day.

Production is assured at a known rate, so that it is possible to plan with greater assurance than when depending on the results of manual labor.

It is quite natural that the manager should hesitate to instal automatic machinery unless the balance is very strongly in its favor. On the other hand, it is a fact that when the automatics are once installed, many jobs are found to which they are adapted, after the machines have been working for some time. It would seem that there is another type of machine needed to fill the gap between the highest developments of automatic machines and the purely hand-controlled machines. To a certain extent, some existing machines fill these requirements. The Gisholt machine, the Jones and Lamson, and a great number of hand screw machines have some of the essentials of this intermediary class; but they still require too much skill and manipulation on the part of the operator to class them among, or even close to, the automatics. A type of machine might be developed which does every single operation automatically, but on which every operation must be started by hand, thus avoiding a large portion of the complicated mechanism of the purely automatic machine, and at the same time largely reducing the time for set-up. Machines of this class might be called "programme machines," because they would have to be set up for a number of single operations and the operator would get a programme of the sequence of operations which he must follow.

### Special Automatics

Frequent mention has been made of highly developed automatic machines designed and built by concerns which are manufacturing on a large scale. In such machines, many operations may be combined which can never be combined in the standard machine. Drilling, boring, reaming, tapping, milling, slotting, key-waying, turning, all may be done on one machine. Such machines, as a rule, are of the multiple spindle type, and require the highest degree of workmanship in their construction in order to be successful. They are costly to make, and, as only one—or at the best only a few—are ever built, it is very seldom that there are not a number of "kinks" left. Consequently, such machines require a relatively large amount of repair. The fact that a large number of tools are used in one machine means stopping it every time one of the tools breaks down. Many other disadvantages could be brought up against this type of machine, and are being brought up, particularly by people who are not familiar with their operation. However, notwithstanding all the drawbacks mentioned many machines of this type have been

built, are operating successfully, and are wonderful factors in economy. It is a human tendency to make much of difficulties before they are met. The objection was raised against the early railroad that there might be a cow on the track. We all know what Stephenson said about it. It is true that since the introduction of railroads there have been many cows on the track, but we have not discarded railroads.

All the difficulties and disadvantages mentioned above exist and should be carefully weighed, and when that is done, we can express it in a simple way and say that we estimate the efficiency of the machine to be 90, or 80, or even 50 per cent. This simply means that, if we should not meet any trouble, and the machine should be capable of turning out 8,000 pieces per week, then, under the conditions as we estimate them, our output will be only 90 or 80 or 50 per cent. of 8,000 pieces. And that must be the number of pieces upon which we should base our calculations. Whether provision should be made for the amortization of the investment in two years, or five, or ten, depends very largely on the nature of the machine as well as on the stability of the product. If the machine is of such a nature that it can easily be changed over for the production of some other piece made in that factory, or if the piece has been made for many years and there is no prospect of its being discarded for many more years to come the time for amortization may be estimated as quite long. But if the machine would have to be discarded when the piece is made obsolete or when the probable life of the piece is only a few years, or both, then we must figure on a short useful life of the machine and on saving sufficient in production to pay for that machine in the estimated time. It is always a dangerous thing to build such specialized machinery for a new product, not only because the product may have a short life, but because, even if it may have a long life, it is highly probable that it will be changed in some details before it is completely standardized.

### Do Automatics Lower Standard of Workmen?

Contrary to the belief that automatic machinery tends to lower the standard of the workman, it is the writer's conviction that the general tendency is to elevate that standard. Not only that, but automatic machinery creates a training school in the shop where it is employed. The man who delivers the stock and cleans out the machine by and by becomes the man who makes minor adjustments and learns to measure accurately. If he has the necessary mental capacity it is but a short time before he is a full-fledged operator, and again, if he has a higher mental capacity, he will readily develop into a tool-setter or a foreman.

In conclusion it may be said not only that the automatic machine has arrived, but that it is still arriving in greater and greater numbers, and that only recently many managers have waked up to the fact that the trend of the times requires automatic machinery wherever it can be employed. Instead of installing an automatic machine when the conditions are such that no one could possibly doubt its economic advantage, the live manager of to-day should reverse the process and take for granted that he must employ an automatic machine unless he can clearly show that it will not pay.

## WHAT IS RADIUM?

The question is often asked, What is radium? To put it briefly, radium is a metal that is described as having a white metallic lustre. It has been isolated only once or twice, and few persons have seen it. It is ordinarily obtained from its ores in the form of sulphate, chloride or bromide, according to the United States geological survey, department of the interior, and it is in the form of these salts that it is usually sold and used. These are all white or nearly white substances, whose appearance is no more remarkable than that of common salt or baking powder. Tubes containing radium salts glow mostly because they include impurities which the radiations from the radium cause to give light. Radium minerals are very rarely, if ever, luminescent.

## SPEED IN RIVET CUTTING

What is believed to be the record to date for cutting rivets in the dismembering of steel freight cars was recently established by an operator who cut out 1,038 rivets in two hours and 46 minutes. Of this number 683 were ⅝-inch rivets, 228 were ¾-inch rivets and 127 were ⅞-inch rivets.

The cutting was done on a standard Erie car under general yard conditions, the operator taking the rivets as they came, working inside, outside and under the car. The car was one that had been retired from active service and that was in the car shop for repair, the rivets and plates being covered with heavy scale and rust, thereby rendering the cutting extremely difficult.

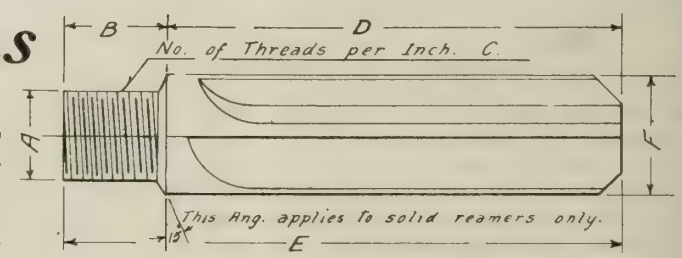
It is said that the record applies not only to the number of rivets cut in the time required, but also to the low consumption of gases used, the job taking only 384 cubic feet of oxygen and 83 cubic feet of acetylene.

# *Reamer Proportions*

Having a considerable number of holes to ream, here is how one manufacturing plant got over the difficulty. They made solid reamers of the design shown, giving certain proportions to the different sections of the reamer.

These have proved of great productive quality, and the venture has saved them considerable cash since its first being adopted.

*By J. H. Moore*




SOLID SCREW SHANK REAMERS

Sizes not less than $\frac{7}{8}$" and not over $1\frac{3}{8}$"

| A | B | C | D | E | from F to | | No. Flutes |
|---|---|---|---|---|---|---|---|
| $\frac{5}{8}$" | $\frac{3}{4}$" | 11 | 4" | $4\frac{3}{4}$" | $\frac{7}{8}$" | 1" | 4 |
| $\frac{3}{4}$" | $\frac{7}{8}$" | 10 | 4" | $4\frac{7}{8}$" | 1" | $1\frac{1}{8}$" | 4 |
| $\frac{7}{8}$" | 1 | 12 | 4" | 5" | $1\frac{1}{8}$" | $1\frac{3}{8}$" | 4 |

*Canadian Machinery.*

# Improve Your Powers of Perception—Try This Contest

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.




The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

## What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

The winner of the May 5th contest, Sam Fishman, 16 Farm St., Point St. Charles, tells us that up to this, his first attempt, he has been too busy to try the contest much as he wanted to. As he happened to be the only contestant with a correct list, it's perhaps just as well for the others that Sam has been so busy.

### CONTEST FOR MAY 26TH ISSUE

**Contestants are required to write us, stating to which advertisements we refer in this number.**

1 What to do if you require unusual precision.

2—A piece of good advice.

3 A case where it paid a certain firm to change their existing methods.

4—Something that is not a pugilist—yet can hit hard.

5—A case where a postcard, if used correctly, brings important news.

6—Something that should interest the small shop owner.

7—How to eliminate costly repair bills.

8—A case where a product can be furnished to suit any country.

9 How to secure civic co-operation.

10 Something you can withdraw without injuring the work.

11 A product said to allow a much wider scope of work, without loss of efficiency.

12 How to secure a practical time saver.

### These are Correct Answers for List from May 5th Issue:

1—International Business Machines Co.

2—Morse Chain Co.

3—Canadian Hart Products, Ltd.

4—Geo. D. Roper.

5—Geometric Tool Co.

6—Wallace Barnes Co.

7—Landis Machine Co.

8—Armstrong-Whitworth of Canada, Ltd.

9—Acme Machine Tool Co.

10—United Alloy Steel Co.

11—Greenfield Tap & Die Corporation.

12—Bellevue Industrial Furnace Co.

## Closing Date for This Contest is June 16th

# Producing a Pump Rod on the Turret Lathe

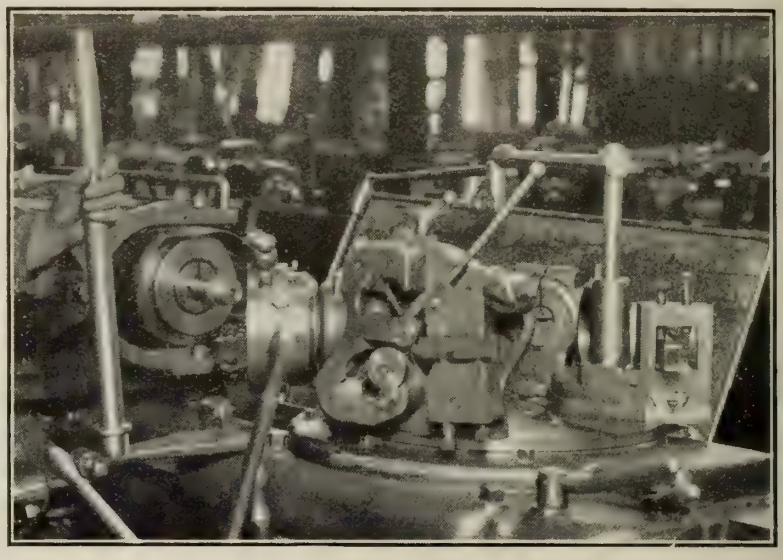
## Rod Completed in Two Settings—Material, Cold-rolled Steel Bar Stock—Standard Equipment Used—A Rod is Finished in Eleven Minutes, This Including Both Operations

ON page 76 of the April 7 issue of Canadian Machinery we published an article on the production of a pump rod. At that time we suggested that readers, or makers of machines, let us have their views on the problem, and here is how the Jones & Lamson Co., Springfield, Vt., would proceed to mahcine the part.

The piece is understood to be made from cold rolled steel bar stock, and we would finish it in two settings, using our regular standard equipment on a 3 x 36-inch Hartness flat turret lathe equipped for bar work. This machine handles bar stock 3 inches in width up to 36 inches in length.

In the first operation the piece is held in our automatic collet chuck. The automatic chuck and roller feed handle rough bars of round, square, octagon, hexagon and flat stock, presenting a new length and gripping it while the machine is running. This chuck is one of the essential features of the Hartness flat turret lathe in its equipment for turning work from full lengths of bars, as its strong and unyielding grip gives a rigid presentation of the work which is of paramount importance. The jaws are of unbreakable form and may be readily made for any size or shape of material within the spindle's capacity.

At the first position, break down the corners of the stock with a chamfering tool fitted with a bell-mouthed bushing, the taper of the bushing being the same as the taper on the chamfer of the work. This is preparatory to turning in the second position. Here the 1⅜-inch diameter is turned, using the roller back rest turner, the roller supports of the turner following the point of the cutting tool. The rolls on the roller turner run on straight headless pins hardened and ground. These pins are held by a rocker insuring an axis in parallelism with work. All adjustments are conveniently made and are the most direct and unyielding in resistance of working strains.

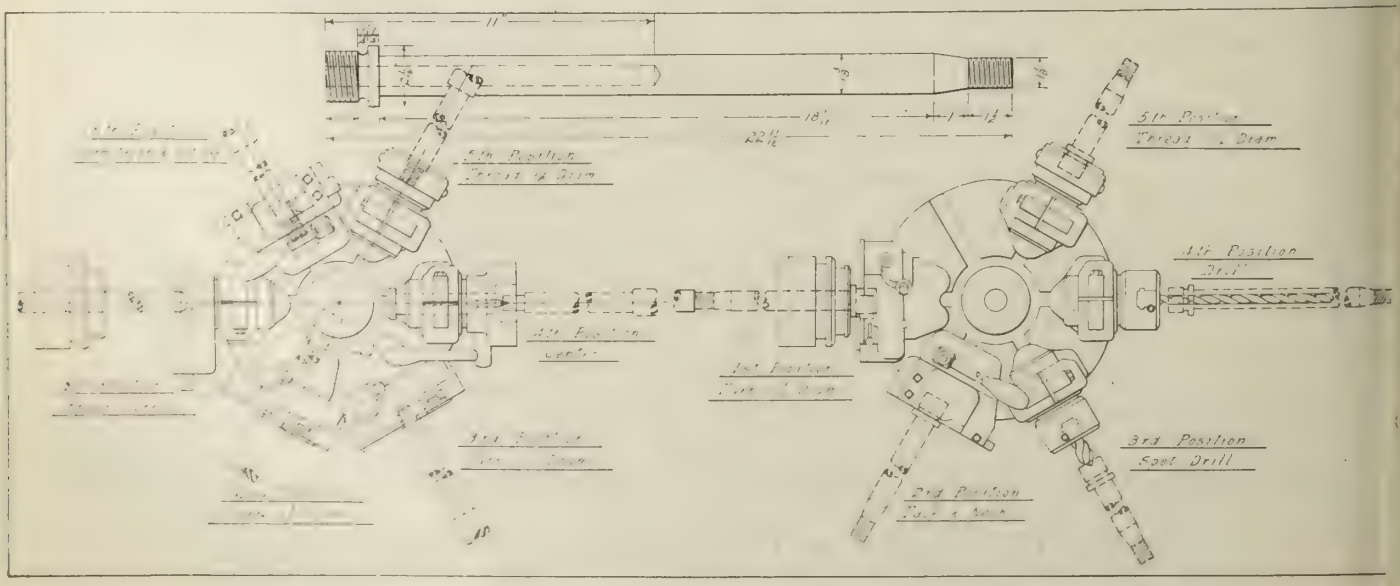


GENERAL VIEW OF THE TOOLS USED.

In the third position, the 1⅛-inch diameter is turned with a roller back rest turner, the roller back rest in this case being ahead of the point of the cutting tool, and resting on the finished 1⅜-inch diameter. By this method the 1⅛-inch diameter is brought concentric with the 1⅜-inch diameter.

In the fourth position the end is centered, using our roller back rest centering tool. Note that this is a lever operated fixture. It is customary to advance the carriage to a stop, lock it, and then by means of a lever-operated device the piece is centered by hand. We have found from experience that it is much better practice to center, using this fixture, than to center by using the star wheel, for advancing the carriage. Since the lever-operated centering tool is a very sensitive fixture to operate, it reduces the breaking centers to a minimum.

In the fifth position the 1⅛-inch diameter is fitted with a No. 4 Hartness automatic self-opening die. The automatic fixtures and the combination of the elements that determine the form




DETAIL OF THE ROD TOGETHER WITH TOOL LAYOUT FOR BOTH OPERATIONS.

ead, diameter and general dependabil-ty of the screws produced by this die re well known.

In the sixth position the taper is ormed and the piece cut off, using our ever-operated cut-off slide. The sliding ool block is closely fitted and gibbed to he base, which is bolted securely to the urret; a long lever and a small pinion urnish means for feeding the cut-off tool nto the work. While forming the taper he work is supported by means of a ushing placed at the rear of the cut-off lide bored to fit the 1⅜-inch diameter f the work. The production on this peration is 11 pieces per hour.

### Second Operation

In the second operation the piece is eversed and gripped in the automatic ollet chuck on the 1⅜-inch diameter inished in the first operation.

The work is located endwise by a stop n the spindle insuring a uniform dimen-sion in shoulder lengths.

In the first position the 1 11/16-inch liameter is turned, using the roller back rest turner. In the second position face and neck preparatory to threading, us-ing the lever-operated cut-off slide; in the third position spot preparatory to drilling. Any straight shank drill may be used and is held in a little giant drill chuck.

In the fourth position the long hole is drilled, the drill being held in a sim-ilar chuck; in the fifth position the 1 11/16-inch diameter is threaded by a No. 6 Hartness automatic self-opening die. The production on this operation is 12 pieces per hour, and the time for one piece finished complete in two opera-tions is 11 minutes.

## CHISEL ARTICLE

Do you know how to make a chisel? If so, do you know how to make a good chisel? These important questions are asked in a recent leaflet issued by the Joseph T. Ryerson & Son, Chicago, and here is what they have to say on the subject:

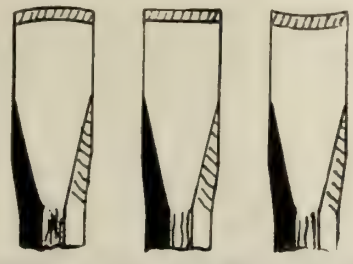
A very large percentage of the chisels now in use are not good chisels. They are not forged, shaped and hardened in the best way to give long life and ade-quate service. During the past few years we have secured valuable information from various chisel makers and users and pass it along believing that it will help you to turn out a tool far superior to those ordinarily furnished. Considering the making of a chisel from ¾-inch octa-gon tool steel, we suggest the following method:

### Forging

Cut off a length of steel, depending on the length of chisel desired, and heat up the end for 2 inches to a bright cherry red. Trim off two opposite sides so as to form a very blunt nosed tool. The object of this trimming is to do away with the danger of lapping when draw-ing out.

The horn of the anvil should be used in drawing out, inasmuch as this will have the least possible tendency to widen the piece, and therefore the minimum amount of "edging in" or hammering on the edge will be necessary. The reason a chisel should not be hammered on the edge is that the grain of the steel will thereby be distorted or, as you might say, "crumpled up," and this always has a tendency to weaken any metal. If in the final forging operation the chisel gets a little too wide, it can be very easily trimmed off on the emery wheel during the grinding operation. Draw the chisel out so that it will be about ⅛ inch thick at the end and about ⅜ inch thick about 1¼ inches back from the end.

The forging should be finished with light blows until the steel has almost lost color, but it absolutely must not be struck after the color has disappeared.



SKETCH 1, 2 AND 3, SHOWING THE DIFFER-ENT METHODS OF GRINDING CHISELS. NO. 3 IS BY FAR THE BEST FOR ORDINARY WORK.

It is a good thing to reheat the steel to a dull red without using any blast, and give it a second hammering with light blows until the color has again almost disappeared. The four important things to remember in forging a chisel are, therefore: Draw out at a good cherry red heat, finish with light blows at a dull red heat, do not hammer after the color has disappeared, hammer as little as possible on the edge and then only when the steel is fairly hot.

### Grinding

Grind the chisel before you harden it, as you can grind faster in this way with-out the danger of drawing the temper. The shape of the edge of the chisel is very important, although it is a thing which is often overlooked. Sketch No. 1 shows a chisel ground with a concave edge. If this chisel is driven on to a flat surface, it is obvious that a great strain will be put on the corners, and they are sure to break off. Sketch No. 2 shows a chisel ground with a perfectly flat edge. If this chisel is driven down onto a flat surface and held perfectly straight, the cutting strain will be distributed evenly over the entire edge, and the chisel should be satisfactory. It must be re-membered, however, that it is almost impossible to hold a chisel absolutely straight and, therefore, either one cor-ner or the other will be severely stressed by the chisel being tilted over. Sketch No. 3 shows a chisel ground with a slightly convex edge, which is by far the best for ordinary work. The corners of a chisel are always the danger point, and with the convex edge these corners are protected even when the chisel is tilted over considerably to one side or the other.

### Hardening and Tempering

After the chisel has been ground to the desired shape, heat it to a dull cherry red color for about 2½ inches from the end and quench it vertically in cold water to a depth of 1¼ inches, moving it up and down until no red color is left in any part of the steel. The part which has been drawn out should now be polished with emery cloth and the temper drawn to a dark purple or a blue by holding the chisel over the fire or in a furnace. Al-ways draw a chisel a little more in winter than in summer. We have suggested hardening the chisel back very much fur-ther than is usual. The reason is that a chisel so made can be ground a great many times without redressing. Inas-much as grinding is cheap and redress-ing is expensive, considerable loss can thereby be avoided.

## SOLDERING SHEET ZINC

Soldering sheet zinc is an easy task, if you are familiar with the work. How-ever, if you have never handled such material, read these few hints.

Most failures in the attempt to secure joints of the desired strength and qual-ity, where sheet zinc is concerned, are due to overheating the metal. Too long an application of the soldering iron is often responsible for unsatisfactory re-sults. Only a quick pass of the solder-ing iron over the metal is needed to pro-duce a sound joint. If the contact is prolonged the zinc may melt or its in-ternal structure become so changed by over-heating as to produce a weakening of the metal. Sheet zinc melts at a tem-perature of 786 degrees F. It is usual to heat the soldering iron until it be-comes a dull red, and that is sufficient to perform the soldering of joints of sheet zinc. Solder of half-and-half grade is suitable; but preceding the actual operation, a "cut acid" fluxing solution, or a solution of zinc chloride acidulated with muriatic acid, should be applied to the metal being prepared for the work. Care must be exercised to ensure the sheet zinc being first free from dirt or grease, particularly along the line to be soldered, and the seam sur-faces must be in perfect contact.



# WHAT OUR READERS THINK AND DO



## SCREW CUTTING QUERY

By JOHN S. WATTS.

REFERRING to the article under the above title, on page 74 of Canadian Machinery May 5th issue, I would solve the problem of finding the change gears to cut this thread as follows: The lead screw having four threads per inch, would have to travel $4 \times 9\frac{7}{8} = 39.5$ revolutions to travel the carriage $9\frac{7}{8}$ in., and the change gears must cause the lead screw to turn 39.5 revolutions while the spindle revolves six times. The ratio of speeds is therefore 39.5/6, and converting into whole numbers by multiplying by two, we get 79/12, that if a 79 tooth gear on the spindle, and a 12 tooth pinion on the lead screw, would give the exact ratio desired.

As we have neither of these gears available, we will try a double reduction, and splitting the ratio 39.5/6 into factors, we get

$$\frac{39.5}{6} = \frac{5 \times 7.9}{2 \times 3} = \frac{(5 \times 10) \times (7.9 \times 10)}{(2 \times 10) \times (3 \times 10)} = \frac{50 \times 79}{20 \times 30}$$

that is, the two driving gears will have 50 and 79 teeth, and the driven gears 20 and 30 teeth respectively. All of these are available except the 79 tooth gear which will have to be made if absolute accuracy is required.

To determine whether the gears available would give a ratio near enough for the purpose, is not so simple. By the regular process of factoring, as given above, the nearest we can come would be to use a gear having 80 teeth, in the place of the 79 tooth gear, which would give us six threads in ten inches, or an error of one-eighth of an inch in the six threads. As the thread projection is little more than one-eighth thick, this error would be too great.

Although we cannot find a nearer ratio by factoring, we cannot prove that the gears given will not combine to give us a ratio near enough for our purpose. On the other hand, to determine the nearest approximation that we can get by working out all the possible combinations is a formidable piece of work, as fourteen gears used to give two reductions will make precisely 1001 combinations.

Fortunately this is one of the many problems, that can be solved by graphic arithmetic in a much shorter time than by any other method, and is another proof of what I am often contending, that graphic arithmetic is a science that will well repay its study and practice. However, to return to our problem. I find by adopting the method which I will outline later; by using driving gears having 60 and 55 teeth, and driven gears having 20 teeth, we get a ratio of 6.6, and that this combination gives the closest approximation possible with the change gears available. These gears will cut 6 threads in a length of

$$\frac{6.6 \times 6}{4} = \frac{39.6}{4} = 9.9 \text{ inches.}$$

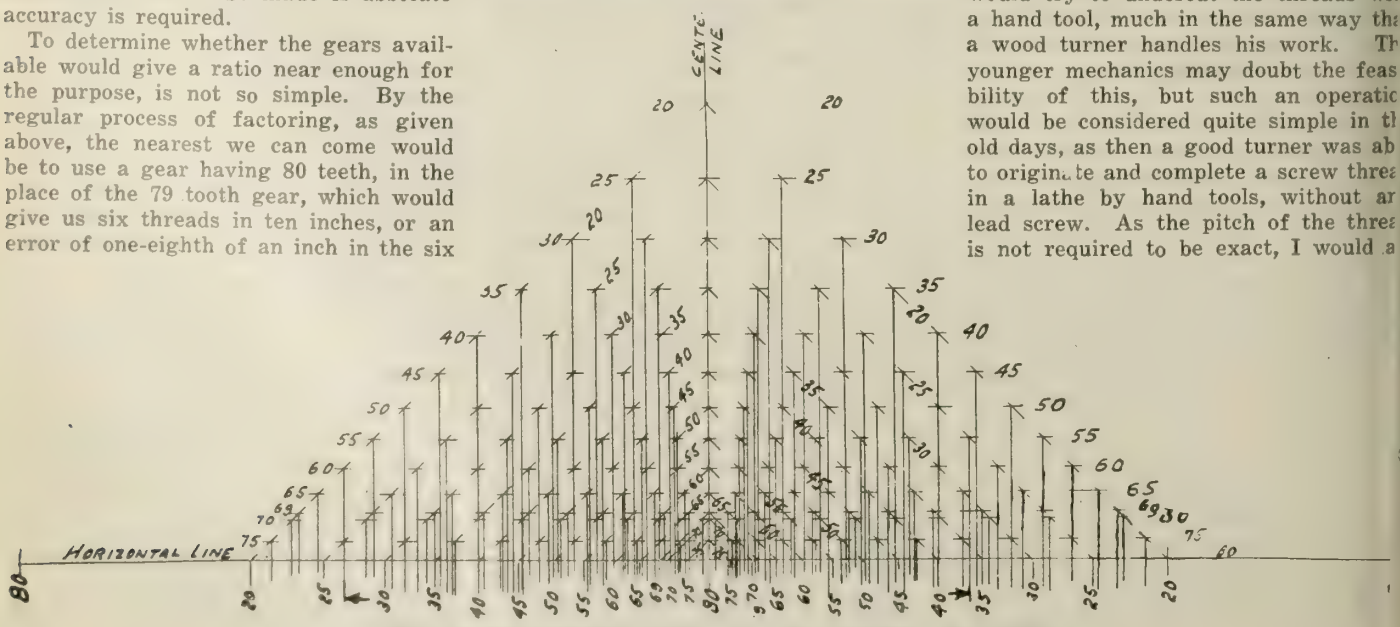
or an error of only .015 inch, which is amply near enough for the purpose.

While it will be possible to machine these rolls by this gearing, the work is difficult to perform, and will take a good mechanic a considerable time to finish one, because of the difficulty of withdrawing the tool at the end of the cut quickly enough, reversing the lathe, and bringing the tool back again to its cutting position. There are only seven threads in the length of the roll, and most of the time will be spent in manipulating the carriage, and reversing the lathe. If there could be a portion of the collars on the ends of the roll cut away to permit the tool to pass through them the work would be much facilitated, but even then the lathe has to be reversed after only seven revolutions, and it will keep the operator jumping to make an kind of an output.

If there are any quantity of these to make, it would be much more economical to make a metal pattern, and have the thread loose on the pattern, which would of course be split. The molder would then withdraw the body of the pattern from the mold first, leaving the loose threads in the sand, and withdrawing these threads later by revolving them in the sand one half turn. This would permit making the casting with the thread undercut, and eliminate the necessity for awkward machine work.

### Use the Hand Tool

If the castings are already made, would try to undercut the threads with a hand tool, much in the same way that a wood turner handles his work. The younger mechanics may doubt the feasibility of this, but such an operation would be considered quite simple in the old days, as then a good turner was able to originate and complete a screw thread in a lathe by hand tools, without any lead screw. As the pitch of the thread is not required to be exact, I would a




THE AUTHOR SUGGESTS THAT YOU USE A CHART AS SHOWN.

ıost be prepared to guarantee that I now men who could chip the undercut ut, and make a good job of it, in less ime than by any machining process posible, but, alas, these men are getting ery scarce now, and the most simple perations have to be executed by mahine, no matter how long it may take.

Returning to the working out of the ears. The set giving the closest aproximation was worked out by the use f the figure accompanying this article, nd as the construction is simple, and has wide range of applicability in gear rive problems, it is worth while studyıg its principle.

The problem to be solved is this. Givn a set of gears, having from twenty to ighty teeth, advancing by five, and one f sixty-nine teeth, which combination ill give the nearest ratio to 6.583. To olve this it is necessary to know all the ossible ratios.

The figure is based on the following roposition:

Let a and b = the number of teeth in he driving gears.

Let x and y = the number of teeth ı the driven gears.

Then $\frac{a}{x} \times \frac{b}{y}$ = the ratio of the gears.

Therefore (log a — log x)+(log b- g y) = logarithm of the ratio.

Starting from the center line lay off n both sides, on the horizontal line, he logarithm of eighty to scale. From he outer ends of this line, mark off oints at lengths equal to the logarhms of 25, 30, 35, etc., up to 75, doing is on both sides of the center line.

This is equivalent to taking the logarhm of 80, and graphically subtracting om it the logarithms of the various mbers, 20, 25, etc. It naturally folws that the point 40 for example, on left hand side, is distant from the nter line a distance equal to log 80 — g 40, which in turn will be equal to the g 80/40 = the log of the ratio of that air of gears.

Similarly, on the right hand side of e center line, it is obvious that the disce from the center line to, say, point is equal to log 80/30, or the logarm of the ratio of a pair of gears hav- 80 and 30 teeth. It follows then at the total distance, between these o points, measured horizontally, is al to the sum of the logarithms of the o ratios, and is therefore the logarm of the product of these two ratios, e the logarithm of the ratio of the pairs of gears combined in a double rtion.

From each of the points so found on horizontal line, we draw parallel gonal lines, meeting at the center line, through their intersections with the nter line horizontal lines which are mbered to correspond with their reective diagonal lines, as shown. A gonal line from point 80, is not shown, it is not necessary, but it will be apıarent that the lengths of all the horizontal lines, if produced out to this diagonal, would be equal to the logarithms of their respective numbers.

Just as the points on the lowest line represent the ratios (by their logarithms) of each pinion to an 80 tooth gear, so will the corresponding points, on the other lines, represent the ratios of the same pinions, to the other gears, having 75, 70, 65, etc., number of teeth.

The intersection of any diagonal line, and any horizontal line, must be distant from the center line a space measured horizontally equal to the logarithm of the ratio of two gears having a number of teeth, corresponding to the numbers on these lines. If we now drop vertical lines from each such intersection, we have graphically the logarithms of all the possible ratios, given by the distances from each vertical line on one side of the center line to each vertical line on the other side.

Taking a pair of dividers, set to the length corresponding to the logarithm of the desired ratio, namely, the logarithm of 6.583, we pick out the pair of lines whose distance apart comes nearest to being that distance, which are the pair marked by arrow heads in the figure.

Following these vertical lines up to their intersections, we find on the left that we have the choice of either 75 and 25 teeth, or 60 and 20 teeth, and on the right, we get 55 and 25 teeth. As we have only one gear of each size, we take the 60 and 20 for one pair, and the 55 and 25 for the other pair.

## SPRING COLLAR HOLDS GEAR IN PLACE

By F. H. M.

For holding a gear in place on a long shaft where it was necessary to remove the gear quite often a spring collar such as is shown by the accompanying illustration was used to good advantage.

This gear is a slip fit on the shaft and a square key drives the same. The shaft has a groove cut around or in it and the collar shown is slipped into this groove, the collar bears against the gear hub, thus retaining the gear in position on the shaft.

In making this collar it is bent slightly in the manner indicated and hardened and tempered in that position, thus it has a little spring to it which causes a slight tension on the gear and prevents rattle.

## SCREW CUTTING QUERY

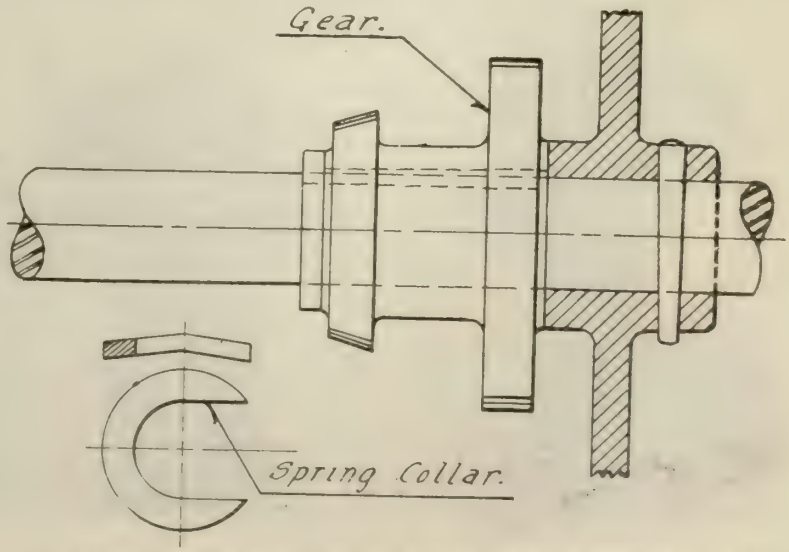
By H. R. J.

The question on screw cutting, which appeared on page 74 of the May 5 issue, is somewhat out of the ordinary but may be solved by the same method used for common threads—to a close degree of accuracy. It was shown that the pitch was 1.6458 inches, so that with a four-thread lead screw the ratio would be as .25 to 1.6458. It will readily be seen that the lead screw must revolve much faster than the work, so that the driving gears will require to have the greater number of teeth. It is also obvious that a tooth more or less in a large gear will make less difference in pitch cut than a tooth more or less in a small gear. For the problem in question (a four-thread lead screw and gears as stated) a suitable compound train would be 75 into 30 and 92 into 35 —the 92 being the new gear required, the two large gears being the drivers.

To prove the accuracy of the train, divide the product of the driving gears and the lead screw by the product of the driven wheels. Thus:

$$\frac{75 \times 92 \times .25}{30 \times 35} = 1.6428 \text{ inches.}$$

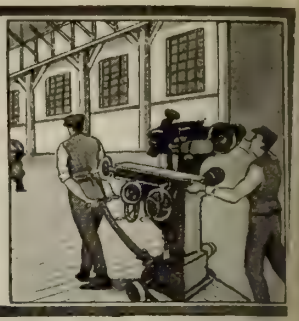
This is an error of 1.6458 minus 1.6428 equals 0.003 inch per pitch of screw, but only 0.018 in six complete revolutions. As absolute accuracy does not seem to be required, this discrepancy could be taken up by manipulating the compound rest.




METHOD OF HOLDING GEAR ON SHAFT WITH SPRING COLLAR.



# DEVELOPMENTS IN SHOP EQUIPMENT



## QUICK CHANGE LATHE

The Rockford Lathe & Drill Co., Rockford, Ill., have placed on the market a 14-inch swing, motor driven, geared head, quick change lathe as shown in the accompanying illustrations. This machine is intended to meet the demand for a small heavy duty lathe of sufficient weight and power to handle rapid production.

The bed is of deep cross section and is well braced. The headstock is driven by a single pulley running at 400 r.p.m. Twelve spindle speeds are provided in geometrical progression with the use of only 13 gears. These are of large diameter, wide face and coarse pitch, are cut from solid steel and run in continuous oil bath. Spindle and all shafts are of high carbon steel, accurately ground to size. Spindle has 1 5/16-inch hole through its entire length and is provided with special thrust bearings of alternate collars of hardened steel and bronze. All bearings are of high grade bronze and are equipped with large, sight feed oilers.

The tailstock is of the off set type, allowing compound to set parallel to bed and is provided with set-over for turning tapers. Tail spindle is locked by a new and improved clamp which does not require the barrel to be split.

The carriage is especially heavy, with extra wide bridge, and has a bearing on the ways of 20¼ inches, being provided with self oiling felt wipers. A thread cutting indicator enables operator to catch any pitch of thread without reversing lathe.

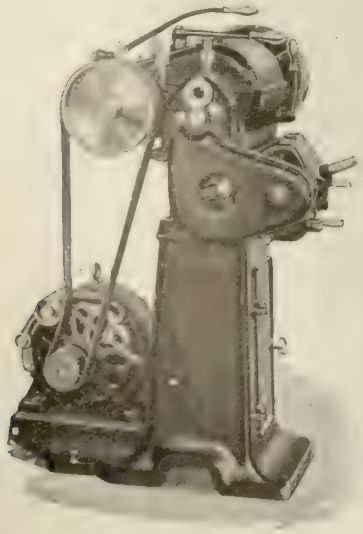
The quick change gear box is of new design, a simple and powerful unit having 32 changes of threads and feeds obtained through sliding steel gears and hardened steel clutches, controlled by two large convenient handles in connection with tumbler. Direct reading index plate mounted on front of box gives standard threads from 4 to 56 and feeds 18 to 252 per inch without the removal of any gears, but special pitches may be cut by substituting extra gears on the quadrant, giving an almost unlimited range. All gears are of wide face and coarse pitch and are cut from solid steel. Lead screw and feed shaft operate independently, either being engaged by knob in front of box.

The motor may be of any standard make, using either direct or alternating current, preferably of 1½ or 2 h.p., with constant speed having a maximum of 1,200 r.p.m. Motor is mounted on detachable plate securely fastened to base cast integral with cabinet leg, driving through a long belt 3 inches wide, kept at the proper tension by means of an adjustable idler pulley. This construction eliminates the task of removing motor should occasion arise to lift cover of headstock for inspection or adjustment. Lathe may be furnished with or without motor and is regularly supplied with cabinet leg as shown on cut. In some instances, motor may be placed on the floor, wall or ceiling and belted direct to headstock pulley, in which case idl pulley may be omitted as the belt te sion may then be taken care of by t usual motor base and adjustable rai When this arrangement is desired t ordinary leg is substituted for cabir leg.

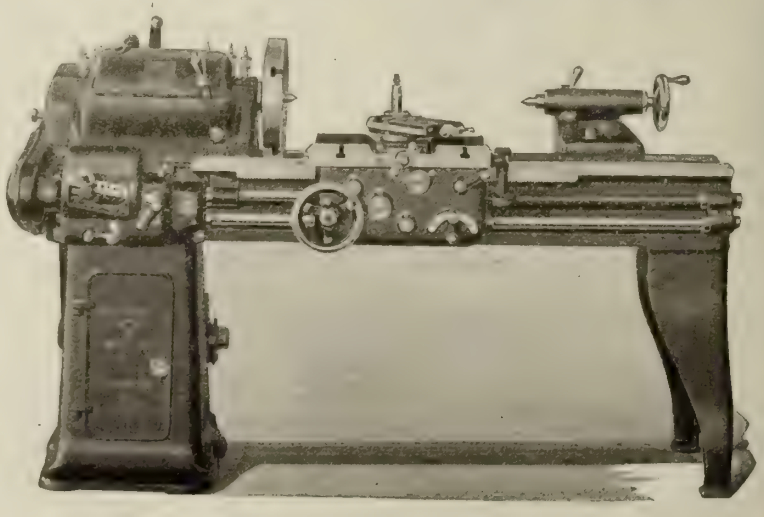
The regular equipment includes stea and follow rests, large and small fa plates and wrenches.

## LATHE TOOLS

Several new designs of lathe to s have been placed on the market by M. . Hill, 10 Eden Street, Worcester, Ma . These include a boring tool, a thread g tool, and a lathe test indicator. In e boring tool the bar is held by means f a swinging link that permits of vert l adjustment of the tool bit without al - ing the alignment. One single sc w provides facilities for tightening the .r and the holding link. The design of .e threading tool provides for its use eit r as a spring or a rigid tool. The cu r blades are interchangeable and are ad justed by means of a vertical screw s back of the cutter. The conversion o the tool from a rigid to a spring too is by means of a tapered bolt passing tr s versely through the shank. The l test indicator is fastened to the shan a universal joint, thus permitting e ready setting to any angle. The to provided with two sensitive points m either of these may be removed wit disturbing the other. Facilities are provided for easy access to the int for repairs or adjustment.



END VIEW OF MACHINE.



GENERAL APPEARANCE OF THE LATHE.

# NEW THINGS IN MACHINE TOOLS

### PUNCH AND RIVETER

The Band Pneumatic Tool Co., Kansas City, Missouri, have designed and developed a new punch and riveter.

Among the advantages claimed for this machine is the fact that although it is a standard unit it weighs but 750 pounds and can be readily moved from place to place in the plant where the work to be done is located. The air cylinder is of the single type and connected to the plunger by means of a heavy lever, the fulcrum point being so located as to give the maximum tonnage on the rivet dies. The frame is of single section, split head type, one piece, of high quality cast steel. The air cylinder piston head and cylinder head is of gray iron. Piston head provided with lever cups held in place by follower rings. The air cylinder head is provided with a stuffing box and nut, properly backed to prevent leakage around piston rod. Bosses are cast integral with outside base surface of air cylinder, providing proper connection through bolt with rear end of yoke, giving the air cylinder a knuckle joint motion. The fulcrum lever is strongly constructed of cast steel. The valve is equipped with foot pedal control, leaving both hands of the operator free to handle the production as it passes through the machine.

The machine has a capacity for punching 13/16-inch hole in a 9/16-inch plate and a riveting capacity of ⅜-inch cold rivets. It is operated on a standard air pressure of 100 pounds and exerts a pressure of 70,000 pounds on the rivet and punch dies. In a recent test this machine with two operators did the work heretofore accomplished by eight men using pneumatic hammers. It is said to be especially adapted for light structural steel work where mass production is desired and rigid fabrication essential.

### SELF-CENTERING CHUCK

A chuck operated by worm gearing in connection with a scroll plate has been developed and placed on the market by H. Spillman, of Zurich, Switzerland. The scroll proper is not an integral part of the plate, as is usual in chucks of this nature. The scroll is so designed that but one tooth of the jaw is engaged at the one time, with the exception of the small overlap given to the scroll. This construction makes it possible to give a shape of the jaw teeth that will add greatly to the bearing surface in contact and also to the efficiency of the chuck. The scroll is very heavy, is let into a groove in the plate and is hardened and ground. The jaws are of steel, hardened and ground.

### ECONOMIC TOOL HOLDERS

That "good tool holders are not an expense, but an investment" is the point emphasized by the Canadian Production Tool Co., Walkerville, in describing the merits of their new line of tool holders. These are made of tool steel, and slotted in such a way that turning bits of any length may be easily adapted to the job. An economic feature of this idea consists in the fact that broken or worn drills or pieces of high speed steel that can in any way be used as a tool may be converted into a valuable bit. A variety of designs have been followed in the holders, rendering them adaptable to any requirement. The straight shank holders are the best for heavy duty work and will stand up under exacting service. This tool has a round socket to permit of bits of any length being used. A right or left hand square turning tool holder is designed to utilize scrap high speed steel of any length. A right and left hand square turning tool holder without cap screw is adapted to work when it is necessary to have the holder and tool close up to the work, permitting heavy cuts at high speed without chatter. An economical holder is the right and left hand round turning, without cap screw. Time can be saved in not having to tighten and loosen the cap screw as the tool post screw will efficiently serve the purpose. A broken or worn drill is just as useful in this holder as a standard bit. The line includes right and left hand cutting off holders with or without cap screw, double and single blade parting tools, straight round turning tool holders, drop head wheel lathe tool holders and straight cutting-off tool holders. It is difficult to imagine a purpose in tooling to which these holders are not adaptable and the outstanding claim for them is that they pay for themselves by converting into actual value material that is very often regarded as waste.

### TWO-SPINDLE THREADING MACHINE

Some interesting features are incorporated in the new two-spindle threading machine recently brought out by the Geometric Tool Co., of New Haven, Conn. External or internal threads may be cut by using taps or dies in the heads, and several combinations of threading are possible by the use of the two heads. The drive for the two spindles is obtained through the one single pulley at the rear of the machine but each spindle may be controlled independently by means of the change gear levers located at either side of the machine. The opening or closing of the dies or taps is controlled by adjustable stops. Accurate setting of the work for length of thread is secured by means of suitable gauges. The machine, if desired, may be fitted with ball-drive reversing tap holders. The machine has a tapping range from ⅛ inch to 3 inches.

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## Ideas for Stimulating Interest

IT is a well-recognized fact that employees could, if they so desired, save many a dollar for their employers, but how to get them to make their suggestions is another question. In speaking on this subject, "Factory" tells the following story:

"An Eastern manufacturing company failed to get good results from their men through the suggestion boxes. Although they reorganized the committee handling the suggestions, and in every other possible way endeavored to get the men to make suggestions, still they were not successful.

"The prizes offered were cash payments and the company did not hesitate to pay well for good ideas. Yet all was to no avail. Finally the matter becmae such a drag that it was brought to the attention of the factory manager.

"He started out to make a detailed analysis of the problem and before he had gone very far he learned that the main trouble was due to the fact that the foremen were doing everything possible to get new ideas from skilled men, such as machinists, but were paying no attention to the semi-skilled and unskilled men. The situation had become so acute that the factory manager found most payments had been made to a few men who had been christened, by the balance of the employees, 'Suggestion Hoppers.'

"This opened his eyes and thereafter in each man's pay envelope there was a little slip telling a man how much more he would have had in his envelope if he had made a suggestion.

"For instance, one slip read: 'You lost the price of a new pair of overalls this week. Why? Because you did not turn in a suggestion.'

"After a four weeks' campaign of this nature there was literally a deluge of good suggestions. All this due to the fact that every man in the ranks was thinking, instead of just a few."

* * *

## Industrial Fatigue

THE subject of Industrial Fatigue was the title of a paper delivered recently before the Royal Society of Arts in London, England. It was pointed out by Dr. Myers, the author of the paper, that five different factors are involved in the problem of quantity production; namely, fatigue, practice, incitement, settlement and spurt. In commenting on the paper, "London Engineering" says:

"Dr. Myers showed some curves illustrating the effect of hours on workers, comparing the eight and ten-hour days and stated in his paper that the reduction in hours increases almost invariably the hourly output. Although there are, and have been, undoubted instances where this has occurred, there is, in our opinion, need of much further data before this rule can be laid down. The lessons of the past two years certainly in many directions are in conflict with the contention. Hours have been reduced 20 per cent., but output has fallen by a good deal more, in spite of many efforts to make the conditions of the employee more pleasant while at his work, and to assist him in enjoying his leisure in a healthy way. There must obviously be a limit, and who shall say definitely when we have overstepped it? After a few years of eight hours we will be told probably that output will increase if we reduce the hours to six; a spell of that and then the demand will be for four, which some labor idealists are dreaming of now. From present indications it would appear that the maximum output is to be obtained with something over eight. Even Dr. Myers' curves were by no means convincing on this point. In fact, when the classes of work were differentiated, it seemed to us in the short time the curves were to be examined on the screen that in some processes the ten-hour day seemed the more productive."

* * *

## Developing Export Business

TO develop a successful export business it is essential that the manufacturer provide adequate facilities in the new field for supplying the immediate needs of the prospective customer. The possibility of several weeks' delay in delivery of goods has frequently resulted in loss of business. The display of merchandise that can be disposed of on the spot is a necessary factor in creating and holding new markets. In a recent issue of "Machinery" appeared a brief statement—in the form of a suggestion—from Col. W. N. Taylor, European sales manager of the E. I. DuPont de Nemours Export Company, of Paris. He says:

"To solve this problem the only method at present is for each individual manufacturer to undertake the maintenance of a storehouse, but in many cases the overhead involved is prohibitive. It would be of interest to members of the American Chamber in France to consider the possibility of a number of houses forming a small company to maintain a warehouse, with a truck or trucks, for deliveries and for handling the stocks of the member companies. This would permit companies carrying a moderate-sized stock, or who are uncertain as to their proper stock volume, to enjoy the facilities of a stockroom, with access to and control of their merchandise in a manner more satisfactory than as at present in public warehouses."

* * *

## Trans-Atlantic Wireless 'Phones

IN a recent issue of the "London Times" appears a statement by Marconi, relative to the demonstration of long distance telephony carried out by Col. Varty in the United States. Mr. Marconi's ideas on this subject were, in part, as follows:

"It is a great achievement as far as ordinary telephony goes; the wireless part is only twenty-nine miles. That is nothing. If it had been 2,900 miles it would interest me. The demonstration is said to prove it is possible to telephone—by wire, of course—from London to India, and perhaps to the Cape. I say that it is quite true, but you would have to overcome the difficulties of maintaining a telephone wire of that length. If the wire were to South Africa it would have to go through France and Spain, across the Straits of Gibraltar and along the whole of Africa to the Cape. I do not think that is practicable in the present state of the world.

"The alternative is the wireless telephony that has been developed, but I do not think it is at present capable of doing these very long distances, although a few words have been gotten through from England to America and from America to France. Since ordinary telephony will not work through long cables, this achievement in America doesn't bring a solution of the problem any nearer, so far as telephony across the ocean is concerned. I expect to bridge the Atlantic with wireless telephony and I think—though one cannot always be certain—that the ocean will be bridged first in a practical manner by wireless telephony, and not by telephony through a cable. The cost of laying a practical telephone cable between Europe and America would be prohibitive."

## Development of Copper Steel

"IT is estimated that the annual wastage due to corrosion of iron and steel products is between 60 and 90 million dollars, this being the bare cost of the materials lost without taking into account other closely allied losses. During recent years the problem has been attacked from many different angles, but in the light of present knowledge, considering the average materials of construction, it is considered that the best results are obtained by alloying from 0.15 to 0.30 per cent. of pure copper with normal Siemens or Bessemer steel. Material of this nature has been on the market since 1911."

So states D. M. Buck in "Blast Furnace and Steel Plant," and the following information on the subject is quoted from various papers published over a number of years. Copper in soft Bessemer steel lessens corrosion. Copper steel resists the action of sulphuric acid. Bessemer and open-hearth steels containing 0.15 to 0.30 per cent. of copper show decided superiority against corrosion under actual service conditions. The corrosion of electrolytic iron is reduced if it is alloyed with various amounts of copper, nickel and manganese. The durability of old steel fencing wire is due to the fact that it contains copper. Steel with as little as 0.03 per cent. of copper corrodes only 60 to 70 per cent. as fast as steel containing 0.01 per cent. The minimum copper content from the point of view of resistance to corrosion is 0.15 per cent., and it is not necessary greatly to exceed this figure. The life of unprotected steel sheets having a copper content of 0.15 to 0.25 per cent. is increased from 300 to 500 per cent., while the increase in cost over plain steel is not more than $2 to $3 per ton.

While most iron and steel fittings used in exposed positions are, in most instance, provided with some sort of protective coating, this is generally only of a transitory nature, and as soon as it wears off the bare metal is subject to corrosion. If the metal were copper steel, the extra life would be an asset of incalculable value. It is also claimed that when copper steel is painted the adherence of the paint is much better than on ordinary material, so that this protective coating remains longer in position, and so adds further to the durability of the material as compared with ordinary steelwork. The claims of copper steel are fully substantiated, while the low melting point of copper ensures its rapid diffusion when added to molten steel, and it does not segregate.

* * *

## Keeping the Plant Running

WE hear a lot about hard times, poor business, and hard luck, in the United States, but in a recent article in American Machinist, an eastern manufacturer unloads himself of some splendid optimistic remarks. He states as follows:—

"These are ideal times to push new developments whether in machinery, tool design, method of work, or improvement of shop processes. Such work is of a nature to be day-work rather than piece-work, and to require almost the entire payment in the form of wages rather than material as compared with regular production work. The available resources can be used to carry the organization a longer time, at the same time producing results which will give a big boost to the production business when the demands for that again return.

"Our principal task is to maintain our organization. We plan, instead of laying off a certain percentage of men, to run the whole shop a certain percentage of the time, so that the entire organization may be carried along. Reduction of overhead expense is taken for granted, but this entails close supervision.

"While we are building some complete machines for storage, there are objections in connection with the income and excess profit taxes to this that set a limit to the practice. A given amount of labor and material will show a higher inventory value in finished machines than in any other form. This means a higher book profit at the end of the year, and a higher tax, even though not a machine is sold.

"We have no immediate expectation and do not think it will be necessary to reduce wages. The machinist has been poorly paid as compared with some of the organized industries and we believe that he should not suffer because he is unorganized."

## Two Methods of Saving Nails

NAILS, like matches, are very seldom considered an expensive item. At least, from the amount of nails and matches wasted, one could quite readily come to such a conclusion. A writer in Factory, speaking on the subject of nails, comments as follows:—

"After the steel strike the price of nails went sky high. The superintendent of a Connecticut factory found it difficult to get a supply sufficient for the every-day needs in the factory.

"By a little careful planning he was able to effect quite a saving of nails in the box and case department. All of the wooden boxes and cases are used for shipping purposes. So the number of nails to be used in the different widths of boards was standardized. Heretofore five or six nails were used in a board where four would have been plenty; or four nails when two would have been sufficient.

"The same method of procedure was carried out in the shipping room. They now use only enough nails to nail up the shipping cases properly. The superintendent prevailed upon the shipping clerks to keep within the standards set, and the results are gratifying.

"In the carpenter shop they are also conserving their nail supply by applying common sense to the use of nails. When the carpenters get through with a job anywhere around the factory there are always a lot of nails left scattered about the vicinity of the work.

"Some are perfectly good, others bent or blunt. By using a large magnet they can easily and quickly gather up the loose nails. These are sent to the gate house, where the gate man in his spare time sorts and straightens out the bent ones.

"All in all, they are saving a lot of nails in the factory every day; and, what is equally important they are effecting this saving almost without cost."

* * *

## Directing Power Into Useful Work

IN considering the question of power and its application to the machinery which it is to drive, we are confronted with a rather complex subject. So states H. Campbell in the "Michigan Manufacturers' and Financial Record."

"The last few decades," he continues, "have seen the development of the belt drive, and by far the greater amount of machinery, especially that used in production of small metal parts, is belt-driven. The use of the chain is coming more into favor, also, as a result of recent developments in chain-belt engineering. It is often exceedingly useful for transmission of power within the limits of a single machine, and beyond a doubt will be applied to many new uses in the future.

"The respective advantages and disadvantages of these methods depend upon the conditions, size of the machines to be operated, and the duty that is to be performed. Where the amount of equipment to be driven is not too great, the economy of driving direct from the lineshaft is apparent. But where the volume of equipment is so great as to necessitate the division of the plant into several departments, the problem is solved by the use of electricity. In this case, all the machines which would be most likely to be in operation at one time are grouped together and a motor supplied for the group. And very recently a number of plants have been built in which the individual motor-driven system was adopted, thus eliminating the problem of belts, shafts and countershafts, with all the attendant accessories.

"A recent survey of the methods of power transmission employed by American manufacturers has disclosed the fact that 78 per cent. use belting (or rope) in their plants. Of this number 48 per cent. use leather belting and 24 per cent. use rubber belting. The silent chain has gained favor rapidly in the last few years as a medium for power transmission.

"The pulleys in general use are the wood, iron, paper, and leather, and an iron pulley surface with hard maple wood.

"Bearings are now either the roller or the ball-bearing type, although a few bronze and babbitt bearings are still in use."

# What Business Paper Editors Say of the Outlook

## A Decided Undertone for Improvement

By J. L. WYCKOFF,
Editor "Canadian Grocer."

WHILE sales are still from ten to fifteen per cent. less than normal, viewing the business situation from the wholesale grocer's angle, there is a decided undertone for improvement. Last year wholesale merchants failed to see the hand writing on the wall and the mad scrambling to stock up that was manifest since 1914 continued until well into the fall of the year. Buying for future was the order of the day, undoubtedly more from force of habit than from lack of judgment and foresight.

When the markets commenced to sag some wholesalers still continued to buy futures. Take the case of prunes, for instance. The opening price on prunes was several cents per pound higher than in 1919, but in spite of this and the fact that other commodities were due for a landslide, heavy purchases were made. Some houses found themselves with as much as two cars of prunes on hand when the market broke. The downward movement on prunes continued until as much as seven cents per pound decline was registered on some sizes and around four cents on others. A car of prunes will average 30,000 pounds, so it is an easy matter to estimate the loss on this one article. But prunes was only one item; rice, canned good and dozens of other lines were equally hard hit.

One wholesale merchant recently told the writer that during the past year they wrote off $33,000.00 on their inventory. This firm takes stock twice a year. On the first of November lst $20,000 was deducted from the inventory and on the inventory just completed May first, the slate was further wiped to the extent of another $13,000. This was not done with the expectation of lower levels, but in order to bring their stock in line with present values.

Other wholesale houses have been doing the same and it is safe to say that the loss will average four per cent. and the loss in Toronto alone will run into half a million dollars. Keen competition, and in many instances selling goods at a less price than replacement costs, has resulted in fairly well cleaning up stocks, and no doubt will be the means of bringing about a more rapidly stabilized basis.

The fact of the matter is that the buying last year was unduly heavy and prices unquestionably too high. Something had to happen, and it did with heavy losses. This year wholesalers are not buying futures and intend to carry out this policy for the balance of the year at least. This will probably result in short packs, but perhaps, commendable, as it will tend to create a more active, sane movement.

* * *

## Farm Business Conditions

By F. M. CHAPMAN,
Editor "Farmers Magazine."

THE farmer's period of deflation has arrived. Tumbling prices for all his products have left him almost dazed with the giddy decline. All livestock have followed, although not so disastrously, the lead given by sheep and wool. Many feeders this past season have lost heavily in their sales of beef cattle. Some even were unable to repay the bank loans from the sales. Pork is down to a point where profits seem questionable. Following this, comes the fall in the prices of all coarse grains. Wheat has dropped to near the dollar mark. Oats and barley are below pre-war prices.

Poultry and dairy products have also declined to an extent which seemed impossible two months ago. Butter, despite the smaller cold storage returns, of over 500,000 pounds in the U.S. over last year, has been selling for 22 cents at country points, while one cheese board last week reported no sales with a quotation of 14 3-4 cents.

Nevertheless, farm operating expenses have declined nothing like these figures. Wages made at the beginning of the year are still high. Farm machinery has even advanced so that there is the unmistakable evidence throughout the country for farmers to stop buying beyond immediate necessities. It is noticeable though, where commodities are cut in prices with an evident desire to meet the drop in farm products, that there is a tendency to carry on in their purchases. An instance of this is seen in the paint business. Early price cutting by manufacturers induced many people to go ahead and apply the paint that was long overdue although this was hampered somewhat by the high retail prices on old stock.

Seeding has been done in Canada under fairly favorable conditions and the outlook for crops is so far a good average one. The usual enterprise in feeding cattle is not in evidence as livestock are a debatable question at present. The American tariff and the likelihood of the British embargo remaining on, are not encouraging agriculture for her future markets. High freight and express rates are having a most depressing effect on agriculture generally, for the returns to the farmer for his produce, after deducting freight and commission charges are so much lower that profits are entirely forgotten in farm business. Naturally then the farmer's buying power must be seriously interfered with.

The farmer is saying very little about it. He has not complained about the drop in prices. He is sitting tight waiting for others to do likewise and if he does not buy, business in Canada will certainly feel the jar. It is felt that a return to normal prices in labor as well as in commodities would encourage greatly the production of wealth, and a greater circulation of money during the coming fall and winter.

* * *

## Stocks Are Getting Much Depleted

By H. L. SOUTHALL,
Editor "Hardware and Metal."

WHILE wholesale hardware trade has been maintained in good volume during the first months of this year, little booking is being done for future delivery by the retail trade and some wholesalers fear a continuation of quiet trading during the summer months. On the other hand the retail trade has been ordering goods only as required, and generally frequent orders for small quantities, and if this policy continues the volume of summer trade may show up a good deal better than expected. Wholesalers are liquidating stocks in most seasonable lines in the expectation of lower prices before these will again be required, but on lines which are in demand all year round a normal stock is being maintained.

With retail hardware merchants reporting active business especially from the farming communities in Eastern Canada one prominent wholesale merchant is of the opinion that underlying conditions in the retail trade must be better than at this time a year ago, even if there is little evidence of improvement. He is of the opinion that retail stocks must be getting pretty well down to the shelves, and that the law of demand must soon make itself felt. Some wholesalers and manufacturers are of the opinion that a stimulation of export trade would materially help present conditions.

It is significant that hardware trade in manufacturing centres is feeling the pinch more than in the rural districts. Recent legislation affecting firearms and ammunition has curtailed trade in these lines, and some changes in prices of binder twine, etc., may be necessary, due to the increased taxation provided under the new budget.

Generally speaking, manufacturers and importers of hardware expect little change in prices due to the revised tax and tariff regulations, which add approximately 5 per cent. on U. S. goods imported into this country. The effect of the changed basis of value for duty may affect Belgian windo

Continued on next page

# CANADIAN MACHINERY
## AND MANUFACTURING NEWS

Published in the Interests of the Machinery, Manufacturing, Iron, Steel, and Metal Working Industries.

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## Must Act Quickly Now

THE charge has been made several times that Canadian firms are not very keen on following up chances to open accounts. Those who have had experience with Canadian business methods abroad find fault with them in many cases, and charge that strict attention to mail and requests for information would be the means of helping to secure quite a lot of business that is going elsewhere.

The purchasing agent of a manufacturing concern in Canada told a representative of Canadian Machinery of an experience his firm had in the last few weeks. They were in the market for a large quantity of work, as their business in this country is largely an assembling proposition, although the parts, in the great majority of cases, are made in shops in this country.

Recently a request was sent out asking for firms that were interested in doing certain parts of their work to make the fact known. It was not a small piece of business, either, but one that would keep a good many shops running comfortably for a spell.

The letter was sent to six firms. On the day following a wire was received from one firm saying that their salesman would arrive on the first train. The purchaser at once thought he was going to have a procession of salesmen at the plant, and get their wants attended to at once.

Four of the firms replied on the fifth or sixth day, and they each stated that they could handle the work if the firm in question sent on the blue prints and allowed them to figure on them.

The sixth firm has not been heard from yet, according to information received a few days ago.

The firm that sent up a salesman the day following the receipt of the letter received a sample order and is having it done in his plant, and the chances are that he will land a good deal more of the work, provided he can do the work to the satisfaction of the customer.

Business is for the man who is after it hard at present. There are very few orders being placed on platters and carried in just now.

## A Possible Solution

THE composite ton of steel was worth, at last reports, $43.05. By this is meant the average price of a ton of pig iron, billets, slabs, sheet bars, wire rods, steel bars, plates, structural shapes, black, galvanized and blue annealed sheets, tin plate, wire nails and black pipe. In February it was $48.81, and in March of 1920, $68.66. In May of 1914 the figure stood at $22.99.

Judge Gary, of the United States Steel Corporation, in annual report to stockholders, recommends as a possible solution of or antidote to labor union problems, publicity, regulation and reasonable control through Government agencies. Both organized capital and organized labor should be placed under these regulatory laws. Each should be entitled to the same protection, and be subject to the same restrictions and provisions.

It is significant, says Iron Trade Review, that although hundreds of attempts have been made to place the direct reduction of ore to finished steel on a commercial basis and more than 70 "direct" processes are known, none of these methods, in recent years at least, have been formidable competitors of the conventional process involving the blast furnace and steel melting furnace.

Produce cheaper and produce better than you have ever done before is the solution of the present situation. No easy matter, we know, but there is no other way out. To a very large extent this is a price market at present.

## Important Iron Discovery

SHOULD first reports be true of the recent discovery in the Cobalt district, Canada has added another important link in its industrial chain. It is claimed that the iron content is approximately 70 per cent., but it is more than likely that this figure will be found too high on more careful examination, as 70 per cent. iron is something not met with every day. In any case the presence of iron in mining quantities is very welcome, and the development of this new discovery will be watched with interest.

### WHAT BUSINESS PAPER EDITORS SAY

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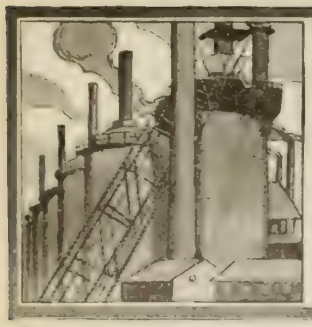
glass slightly, but this will not be a serious factor. German hardware will be affected to the greatest extent by this ruling.

The primary markets have been prominent when related to the production costs of the manufacturer, and declines in these have been felt in many hardware lines. Some marked changes to lower basis have been noted recently, among which are ingot metals; cordage and cotton goods; fuel and lubricating oils; solders, lead products, pipe fittings, corrugated sheets, Canada plate, waste materials, leather and harness parts, some lines of woodenware, tools, standard compression work, galvanized ware, ammunition, rule and level goods, range boilers and valves; boilers and radiators, pumps, etc.

Speaking of the popular sentiment that prices will soon return to pre-war levels, one manufacturer has the following to say:

"When we consider how anxiously everyone is now stewing around to try to determine whether the selling prices will go lower than in pre-war times, it causes one to smile when he thinks of the unanimous decision of all the wise ones that prices would never revert to old figures, because standards of living had raised to such an extent that people would never be satisfied to go back to pre-war prices.

"It is wonderful what a balloon will do in the way of collapsing if it is properly perforated."



# MARKET DEVELOPMENTS



## Buyers Purchasing Immediate Requirements Only

### Production of Steel in United States is About One-Third Normal —Demand Approximately at the Same Level—Wage Adjusting Continues—Pig Iron Dull, But Old Material Shows Strength

REPORTS from the steel markets confirm the idea that the present situation is one in which the buyers are pursuing a policy of "laissez faire." The general condition in industry is not what would tend to give much confidence, and what will satisfy the immediate requirements is about all that any consumer wishes to be burdened with. The usual period of dullness which comes in the summer months shows no signs of being lightened this year, but will more likely be accentuated. The production of steel in the U. S. is only about one-third of normal, and demand is at about the same level. There has been some export business booked by the Steel Corporation, about 11,000 tons of rails having been ordered for Japanese railways. There is also enquiry for rails for China, and Argentina is in the market for the same goods.

There is a good deal of wage adjusting going on in the Pittsburgh district, and this adjustment is all downwards, as would be expected. There are also signs that the automobile trade is about to enter on another quiet period, although the reductions in price which are promised for the end of June will perhaps have a stimulative effect on this trade.

The pig iron market remains dull for the most part, although there are some slight spots where a better business has been done. This has been in the line of supplying iron for special contracts, the prices remaining about the same as last week.

The old material market is stronger in U. S. centres, the steel grades showing better than the others. Dealers are stocking up their yards in the hope of realizing on a rising market, and this tends to keep prices firm.

Locally the demand for small tools and supplies continues to improve, and the market for structural shapes shows an upward tendency. Machine tools still stay in a comatose condition, but dealers generally are rather optimistic as to this market's immediate future.

## CONSUMERS CONFINE BUYING TO SUPPLIES FOR IMMEDIATE NEED

MONTREAL, Que., May 23.—Apart from the announcement here and there of slight betterment in business, the general tone is not one of promise for the near future. Dealers here now think that the coming weeks will be exceptionally quiet with very light inquiry. The warm weather and the holiday season will add to the dullness in industry, and prediction seems to favor a summer of quiet activity. Railroad shops here are again closing for a period of ten days, owing to business depression.

#### Dullness in Steel

"One feature of present inactivity," said a steel dealer here, "is the spasmodic buying that develops from time to time, and from many varying quarters. Just last week we had a fairly large order from a concern that has not bought for months. Everywhere we find that consumers are refraining from taking on any stocks and confine their buying to such supplies as will carry them over for the immediate present. In the light of clearing the decks of industrial plants this process is a good thing and should eventually prove beneficial and provide a good foundation for future construction, but it does not add to present activity." One dealer here reports some nice orders for wire rope. The plate demand in the district is almost nil, the railroads being quiet and shipyards doing only repair work. Steel production is said to be falling off and with foreign interests coming into the market it is not unlikely that the trade may see price declines in a short time.

#### Quiet Week in Machine Tools

District machine tool activity might be summed up in the three words, "very little improvement." There continues to be little inquiry for general supplies and for some lines of wood-working machinery, but the movement of metal working tools has shown no improvement. "We are entering a period which, in normal times, is credited with decreasing industrial activity, and it would not be surprising to see the next month or so featured by pronounced dullness in the movement of tools and supplies. The business now carried on is hardly sufficient to meet overhead charges, and very frequently the week will show a balance on the wrong side of the books. However, we still have hopes of a late summer revival."

#### Scrap Very Quiet

Complete absence of interest is shown by old material merchants, as there is little inducement to carry on business just now owing to the stagnant condition of the market. Little movement is reported and dealers with stocks on hand are reluctant to release material at prevailing figures, realizing that to do so would mean financial loss in many instances. "Quoting prices has no effect on the situation," said a dealer, "consumers are not buying on a basis of price, but only when they need scrap, and then the price is decided on according to the nature of the sale and the conditions involved. Almost any price might be quoted without awakening the

interest of buyers." What little movement is reported seems to favor the non-ferrous lines. Quotations on these are quite firm while steels are nominal.

## CONFIDENCE EXPRESSED FOR THE FUTURE

TORONTO, May 26th.—The spurt in business experienced by a few Toronto dealers and recorded in Canadian Machinery continued last week and is still being felt to some extent. Machine tools are quiet, also woodworking machinery. What activity there is is pretty well confined to small tools and supplies. This would indicate, as we have said before, a policy of hand-to-mouth buying. According to reports received in connection with a questionnaire sent out by Canadian Machinery to a number of metal-working concerns, business to date as compared with the same period last year trade is (on the average) about fifty per cent. below 1920. Considering that 1920 was an exceptionally good year this is encouraging. It explains the demand for necessities. The difficulty in making collections and the unsettled condition of things in general accounts for lack of buying on a larger scale. Dealers are sitting pat, picking up what business they can, optimistically awaiting the return of the buyer who even now is figuring on his requirements. One leading dealer expressed his confidence in the future and as evidence of his optimism outlined an aggressive sales and publicity campaign. Another dealer was of the opinion that a good deal of business could be done on long term financing, indicating that there is business in the background, but little cash to finance it.

**Steel Business Shows Improvement**

A report received by a Toronto house indicated a marked improvement in the market for certain lines of steel, largely accounted for by renewed demand by automobile manufacturers, and for structural steel plates. This condition has been reflected in the Canadian business of this concern especially in Ontario where considerable improvement was noted. Another jobber reported business in the mining district as fairly good, trade with other industries being very quiet.

Little change is noted or expected in the scrap metal market. Little business is being done.

## U.S. TOOL MARKET IS VERY DULL NOW

**Small Orders Only — Cranes Move In Small Lots — Cleveland Also Reports a Dull Season**

New York, May 26.—A dearth of demand prevails in the local machine tool market. Sellers assert there is no noticeable improvement in buying. The larger inquiries which have been reported, virtually all of which are from abroad, still are pending. Some buying by Cuban sugar interests of pipe fitting machinery and other equipment is noted, but this has been in evidence for several weeks and has not developed into business of special importance. However, in one or two instances some sizable buying is expected in the relatively near future. One is a list of approximately $100,000 of miscellaneous machine tools for a leading railroad in China, issued through the Wah Chang Trading Corp., 233 Broadway. Another is a list of equipment issued several weeks ago by the Japanese government for equipment for installation in its arsenals. Proposals some time ago were forwarded to Japan, and bidders are expecting a definite decision soon. A recent inquiry calls for a number of power presses for a Chinese mint. Domestic demand is comprised principally of inquiries for single machines.

Demand for cranes is listless. New inquiries are coming out slowly and orders are few. Sellers report several projects in prospect, but are not confident of business resulting soon. Recent inquiries include a 10-ton electric crane, with 47-foot span for the Foundation Co., 120 Liberty Street. A handpower crane of similar dimensions is specified as an alternate. A 15-ton electric crane, with 50-foot span, is to be bought by the Equipment Corp. of America. A 15-ton locomotive crane with 40-foot boom is being inquired for by L. B. Foster, 154 Nassau Street.

Cleveland, May 26.—Users of machine tools and equipment continue to confine their purchases to single units and repair parts. In the week just past demand even in this line was slack and dealers report there is little general activity other than that coming from the automotive trade. As yet orders and inquiries from the automobile industry are confined to single machines.

Prices continue weak although no new reductions have been noted. On the other hand dealers are known to be shading whenever necessary. A note of cheerfulness is reflected in the market, due to the better credit conditions. Dealers report bills are now being paid more promptly.

## POINTS IN WEEK'S MARKETING NOTES

**Inquiries are being made in the Buffalo market, asking for prices on quantities of iron for last half of the year delivery. This marks a departure from the policy which has prevailed for many months.**

**Scrap metal market at Pittsburgh shows a stronger tendency in the steel works grades. Some dealers continue to stock their yards in anticipation of a higher market. Trading is practically at a standstill at San Francisco.**

**Consumers are refraining from taking on stocks, confining their buying to immediate requirements. Some nice orders have been received for wire rope, and various enquiries have been made for general supplies, also certain lines of woodworking machinery. Metal working tools show no improvement, however.**

**One concern has announced the elimination of the eight-hour day and the substitution of straight time. This means roughly a reduction in wages of about 9 per cent.**

**The market for structural shops shows an improvement locally.**

**Small tools and supplies still continue favorable, but machine tools are rather inactive. Dealers in this latter line are, however, optimistic as to its future.**

**Consumers of scrap are not buying on a basis of price, but only when they need scrap. What little movement is reported seems to favor the non-ferrous lines.**

### RUSTLESS STEEL

According to the Vossische Zeitung, the Krupp works are paying special attention to the production of rustless steel, for which during the war there was an urgent demand as a substitute for platinum. The Krupp rustless steel contains a large amount of chrome, and is said to be remarkable for its hardness and strength. Its resistance to chemical influence is such that it is not affected by boiling nitric acid. One of the uses for which it is particularly proposed to apply it is as a substitute for nickel-plated metal in the manufacture of instruments. The firm is also studying the question of using rustless steel in the manufacture of plates for artificial teeth in place of the gold or vulcanite now generally employed.

### TWENTY-EIGHT YEARS' SERVICE

According to a statement made at the convention of the American Wood Preservers' Association, creosoted wood-stave pipes put in place twenty-eight years ago are still in perfect condition. The best method of treatment for the staves was described as being the empty-cell process with 50 pounds initial air pressure, following the creosote pressure period with several minutes' re-heating at about 25 degrees Fah. in excess of any previous temperature, then a vacuum of not less than 20 inches maintained for from 30 minutes to one hour. By this process a satisfactory creosote penetration is obtained, and the staves come out thoroughly clean, and so dry as scarcely to soil the hand.

# PRACTICALLY NO PRICE-CUTTING; STEEL PRODUCERS ARE NOT ALARMED

Pittsburgh, May 26.—Production of steel is declining at a slow rate. Measured by ingot output it was about 31 per cent. of capacity in April and is now a share below 30 per cent., while the indications are that a rate of 25 per cent, or less will be reached by July. That prediction is based on the fact that specifications and orders are coming in at a slightly lower rate now than a few weeks ago.

July is invariably a dull month in the steel market. Even in 1916, an extremely active year, the market was dull in both June and July, and this led to expectations in some quarters that the market would go off permanently, but it took a fresh start in August. Inasmuch as nothing good can be expected in July and we are only a few weeks from July now, it is regarded as certain that no definite improvement can occur in the near future. Predictions of improvement are now centering more definitely around the month of August, when a few weeks ago some predicted August, some September and some October. What is being predicted for later in the year is not a complete revival, but an improvement. Full operation of the steel industry is not expected before next spring at the earliest. It will be seen that if mill operations are 25 per cent. in July and become 50 per cent. in September, the 50 per cent. rate would be a very low one, but on the other hand it would represent a doubling in output, which would look very good. Before the war the steel industry had an idea that no combination of circumstances could put a demand to a point below 50 per cent. of capacity, and as a matter of fact there was never, before the war, an operation under 50 per cent. at any time. The capacity now, of course, is much larger.

### Attitude of Steel Mills

A notable fact in the situation, one that does not attract the attention it deserves, is the complaisance with which steel producers view the situation. They are not alarmed or perturbed or even particularly impatient. What is their philosophy? It is one that is common to the majority of business men today, that there must be a general and complete readjustment and that no one can expect real business activity until the adjustment is finished. Indeed, the philosophy goes farther than that, that no one should want a revival in business until the adjustment is completed, because such a revival would represent a false start, on an unsound economic basis, and there would be fresh trouble later.

Of course everyone would be much better satisfied if the readjustment should be completed suddenly, but it is recognized that it cannot be and men therefore are patient. An important point is that business men know, or at least are convinced that they know, just what they are waiting on, and they can read signs from day to day of how the readjustment is proceeding so that they can judge of the progress being made. There are various things needed for completion of the readjustment, but two things are picked out as the hardest and slowest and it is assumed that all the others will come around in ample time for these two, so that they are the ones to be watched.

These two are declines in retail prices commensurate with the declines in wholesale prices, so that the cost of living will be lowered by reasonable amount, and declines in those wage rates that are too high. When the readjustment started no one knew how far prices would decline or how far they ought to decline to produce a safe basis. Now, however, there have been such declines in some commodities and some wage rates that they can be used as a measuring stick for the others. Perhaps some of the prices and wage rates are a little too low now and will advance, but the advance would not be large and the decreases awaited are large. Thus tin, copper, zinc, lead and antimony have lately been below their pre-war averages and possibly that is a little too low, but building materials according to the latest report of the Bureau of Labor at Washington are 103 per cent. above their 1913 average and housefurnishing goods are 174 per cent. above. Everybody except those who are trying to sell these is agreed that they are altogether too high. The farmer in particular realizes that, when according to this same report farm products are only 15 per cent. (all figures refer to wholesale prices) above their 1913 average.

As to wages, the building trades are still holding out for an average of more than a dollar an hour, whereas common labor is available in many regions at 30 cents or less.

It is on account of this philosophy that the steel trade holds that the most favorable piece of news as to the prospects of the steel industry for the future that has come out for many weeks past was the announcement made last week by the Railroad Labor Board that a reduction in railroad wages is justified by present conditions. The steel trade would expect to profit by the railroads getting into better financial position, by saving money on payrolls and by having their borrowing power increased at the same time, but the more important influence of the railroad wage announcement, in the minds of steel makers, is the bearing it has upon wage rates generally, for it is expected to encourage wage declines in other directions, particularly in the building trades. In other words, the steel industry feels that the cost of consuming steel is too high and must come down before steel can be bought in large quantities. As to the prices of steel products, the steel mills will make the proper prices when buyers get in position to take hold.

### Prices Steady

The new prices developed for steel products in the fore part of April are being very well maintained. Occasionally there may be a concession on an order much larger than the usual run, but on ordinary busines prices are strictly by the card. There is practically no incentive to cut prices. Costs are high, with a mill running right along at 25 to 35 per cent. of capacity, or operating 50 per cent. in alternate weeks, or with a manufacturer who closes one plant and keeps a second plant operating at 50 or 60 per cent. The only way to decrease cost just now would be by a larger operation, and price cutting would not do that. Costs will come down some when freight rates are reduced, but it will be two or three months before that subject is even taken up. Here and there a slight further reduction in wages is being made by steel mills, but in general the recent reductions are likely to stand for some time, common labor being 33 to 37 cents an hour, with time and a half for hours over eight in a day. The Cambria Steel Company is reported to have reduced to 30 cents lately, without overtime, while the Republic Iron & Steel Company, paying 37 cents, is reported to have cut out the extra payment for overtime.

## Pig Iron Market

THE pig iron market continues dull with a tendency toward further concessios. Reports iindicate that in some sales made at distant points, at least one producer on the lakes has shaded the market freely. A New Jersey cast iron shop purchased about 6,000 tons, this being the only transaction of fair size on the market.

Pittsburgh reports that the past week has been one of the dullest the trade has ever experienced since the recession in buying developed last fall. A sale was made of 2,000 tons of basic iron to a Valley steel maker at $22 Valley furnace, and this business was taken by a merchant producer. Standard Bessemer still is quoted at $24, Valley furnace, but there are only a few carload sales to support this quotation. It is believed that a firm offer of less than $22 for basic iron would get consideration from some merchant producers to-day.

The Chicago market is quiet with only small sales to break the monotony; 200 tons of No. 1 foundry was bought by a Michigan melter at $23.50 Chicago furnace or $23 base for No. 2 material. Most sales from furnace continue to be made on a $23 base, but a few transactions have been closed at $22.50.

A cast iron pipe shop, which recently

took a contract for 6,000 tons of pipe, has purchased pig iron and scrap with which to make the pipe. One company is reported to have taken 2,500 tons of the pig iron at $23.50 furnace base, and another about the same tonnage at about $24 furnace. Definite anouncement as to price has not been made public. Sales for the past week in New York aggregated about 10,000 tons.

The largest sale reported on the Cincinnati market during the week was a sale of 250 tons of malleable iron. Several 100-ton lots were sold, but the majority of the transactions were for carload lots and even these were few. Chicago iron is being quoted in this district and some sales are said to have been made on a $22 furnace basis. There is no activity in basic and the quotation of $24 is only nominal.

Inquiries have been made on the Buffalo market by several buyers, asking prices on quantities of iron for last half of the year delivery. The total inquiry of this kind is slightly less than 3,000 tons, but it marks a departure from the policy which has prevailed amony buyers for many months. Foundries have not been interested in any future deliveries. Shipping on old contracts has not improved. An unusual development has been reported, namely the sale of 250 tons at $30 base by a furnace which has been out of the market by reason of determination to hold to a $30 price.

The local market at Philadelphia continues dull, aside from several fairly large sales of foundry iron to cast pipe manufacturers. Most foundries are calling only for carload lots for prompt shipment. A new Jersey pipe manuacturer about 6,500 tons of No. 2 plain iron, some or all of which was sold at $23.50 f.o.b. furnace. A small tonnage of gray forage was sold last week at $24.50 furnace. One company in this district which has all of its furnaces idle expects to put one in blast soon, probably on malleable iron.

On the Cleveland market there is a slight improvement in the demand for foundry iron in small lots for prompt shipment. Prices are about 50 cents a ton lower with quotations ranging from $23.50 to $24, but some furnaces are making sales at $23 and possibly lower to consumers with whom they have high-priced contracts and who are averaging down their costs by taking part high-priced iron and part present-priced iron. Generally, consumers are buying only for immediate requirements and that policy is bringing about many orders for car lots.

## Scrap Metal

THE scrap metal market at Pittsburgh has shown a stronger tendency in the steel works grades, largely as a result of some fairly sizable purchases by a large independent steel company during the last ten days. This interest recently paid $13.50 for a fair sized lot of heavy melting steel. One dealer now is offering $14 delivered this district, for heavy melting grade, and this is probably as low as any now can be bought.

On the Chicago market the dealers continue to buy material to stock in their yards, in anticipation of a higher market, and in many cases are paying more for this scrap than consumers are now willing to pay. This speculative activity is reflected in a number of advanced quotations.

New York reports a better feeling in the trade which has been reflected in slight price raises in a few items, notably heavy melting steel. Some of the mills from which nothing has been heard for weeks are sending out inquiries and buying small quantities.

Greater inquiry on the Buffalo market indicates to dealers improved furnace operation, and an advance in the price of heavy melting steel may come. A few dealers report a better week than any in recent months. Several sales of No. 1 machinery cast at $18 have been reported,

The tone of the Philadelphia scrap market is stronger, and dealers are not anxious to sell at present quoted prices because of the difficulty in covering on their orders at a profit. An eastern steel plant made purchase of about 1,000 tons last week at $12 to $12.50 delivered, but is now offering $12.

On the whole the scrap market at Cleveland is very dull. Purchases of heavy melting steel by local consumers are reported at $11.50 to $12.50, the higher price being paid for the best quality of scrap. The low prices that are being quoted on machine shop turnings are bringing out very little material. Dealers are offering $8.25 for mixed borings and short turnings, which are slightly lower.

Trading is practicallly at a standstill at San Francisco, in the scrap market. No sales of consequence have been reported recently. Prices are nominal at $12 gross ton delivered at the mill for heavy melting steel, and $30 for cast iron scrap.

### WATCH THE SCRAP HEAP

SAVING $50,000 a year sounds like a large-sized proposition, but, according to a story going the rounds about the superintendent of a large chemical and fertilizer plant in New Jersey, it is very easily accomplished. He claims he has saved his company $150,000 in the past three years, largely because of his ingenuity in applying the oxy-acetylene welding and cutting process. Much of this saving resulted from utilizing materials salvaged out of the scrap pile for the fabrication of equipment that would otherwise have been purchased new.

From the foregoing it would appear that the oxy-acetylene process as commonly practised in production and repair may be profitably extended to embrace a variety of economic operations that in many plants are entirely overlooked.

As in a general way the same class of opportunities may apply to manufacturing plants of other kinds, references to the typical fabrications at the plant noted ought to be of suggestive value. The principal ones are briefly outlined as follows:

In one instance a 4-inch steam pipeline, 300 feet long and carrying 150 pounds pressure, was constructed of second-hand pipe sections joined by butt-welding. This line was put in service three years ago, and has not shown the slightest trace of a leak at any point.

Another instance of the use of scrap material was the fabrication of two oil and water separators from old pipe. These separators were more compact and workmanlike than the manufactured article.

Another example of the use of scrap pipe was the building of a degreasing condenser from this material. The original condenser was built of screwed pipe and fittings and the loss through leakage of gasoline amounted to 18 gallons for every ton of fertilizer degreased. In the improvised welded condenser the loss was reduced to 3½ gallons per ton.

In the conversion of a coal burning power plant to burn oil, $2,160 worth of assorted pipe fittings were saved by welding in small nipples instead of cutting the main line and inserting "tees."

On another job thousands of pipe clamps and bolts were eliminated by welding electric conduit tubing to the web of "I"-beams.

In another case 5 feet "U" bends were made from scrap pipe. These bends, in which the oxy-acetylene flame was used, were not so symmetrical and uniform as the manufactured article, but were much cheaper and proved highly efficient in service.

The oxy-acetylene blowpipe was used also in making stairways and handrails. For treads 6-inch by ⅛-inch steel channels were welded, hollow side up, to steel channel stringers. The treads were filled in with steel borings and cement to make a non-skid surface. The verticals were welded to the sides of the stringer channels, the handrail being laid in a round groove at the top of the verticals, thus completing, after being welded, a staircase that was rigid and permanent. This application eliminated numerous railing fittings and adjustments at various angles of the stairways.

C. Verne Somerville, Superintendent of the Canadian Electrical Steel Company's plant at Montreal, and formerly well known in the electrical industry in Toronto, was accidentally killed while at work on May 21. While in Toronto, Mr Somerville was employed with the Canadian General Electric Company, and British Forgings, Ltd.

# SELECTED MARKET QUOTATIONS

**Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.**

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $25 00 |
| Lake Superior, charcoal, Chicago. | 40 50 |
| Standard low phos., Philadelphia. | 41 50 |
| Bessemer, Pittsburgh | 28 96 |
| Basic, Valley furnace | 26 00 |
| Toronto price:— | |
| Silicon, 2.25% to 2.75% | 34 10 |

## IRON AND STEEL

| Per 100 lbs. to Large Buyers | Cents |
|---|---|
| Iron bars, base, Toronto | $3 75 |
| Steel bars, base, Toronto | 3 75 |
| Iron bars, base, Montreal | 3 75 |
| Steel bars, base, Montreal | 3 75 |
| Reinforcing bars, base | 3 75 |
| Steel hoops | 4 50 |
| Tire steel | 4 00 |
| Spring steel | 6 00 |
| Band steel, No. 10 gauge and 3-16 in. base | 4 00 |
| Chequered floor plate 3-16 and heavier | 6 00 |
| Bessemer rails, heavy, at mill | 2 35 |
| Steel bars, Pittsburgh | 2 10 |
| Tank plates, Pittsburgh | 2 20 |
| Structural shapes, Pittsburgh | 2 20 |
| Steel hoops, Pittsburgh | 3 05 |
| F.O.B., Toronto Warehouse | |
| Small shapes | 4 50 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 3 48 |
| Structural shapes | 3 58 |
| Plates | 3 78 |
| Small shapes under 3-in. | 3 48 |

## FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

| | C.L. | L.C.L. |
|---|---|---|
| Montreal | 58½ | 73 |
| St. John, N.B. | 84½ | 106½ |
| Halifax | 86 | 108 |
| Toronto | 38 | 54 |
| Guelph | 38 | 54 |
| London | 38 | 54 |
| Windsor | 35 | 50½ |

Current surcharge, 7 per cent.

## METALS

| | Gross. Montreal | Toronto |
|---|---|---|
| Lake copper | $18 00 | $17 50 |
| Electric copper | 17 50 | 17 50 |
| Castings, copper | 17 25 | 18 00 |
| Tin | 38 00 | 39 00 |
| Spelter | 7 75 | 7 50 |
| Lead | 7 25 | 7 50 |
| Antimony | 8 00 | 8 25 |
| Aluminum | 34 50 | 30 00 |

Prices per 100 lbs.

## PLATES

| | | |
|---|---|---|
| Plates, 3-16 in. | $5 00 | $4 75 |
| Plates, ¼ up | 4 50 | 4 25 |

## PIPE—WROUGHT

**Standard Buttweld Pipe S/C**

Per 100 feet.

| Size | Steel Blk. | Steel Galv. | Gen. Wrot Iron Blk. | Gen. Wrot Iron Galv. |
|---|---|---|---|---|
| ⅛ in. | $ 6 50 | $ 8 50 | $ .... | $ .... |
| ¼ in. | 4 89 | 6 99 | 5 91 | 8 01 |
| ⅜ in. | 4 89 | 6 99 | 5 91 | 8 01 |
| ½ in. | 6 50 | 8 03 | 7 95 | 9 48 |
| ¾ in. | 7 99 | 10 06 | 9 95 | 12 02 |
| 1 in. | 11 82 | 14 38 | 14 71 | 17 77 |
| 1¼ in. | 15 99 | 20 13 | 19 90 | 24 04 |
| 1½ in. | 19 11 | 24 06 | 23 79 | 28 74 |
| 2 in. | 25 72 | 32 38 | 32 01 | 38 67 |
| 2½ in. | 40 66 | 51 19 | ..... | ..... |
| 3 in. | 53 17 | 66 94 | ..... | ..... |
| 3½ in. | 67 62 | 84 18 | ..... | ..... |
| 4 in. | 80 12 | 99 74 | ..... | ..... |

**Standard Lapweld Pipe S/C**

Per 100 feet.

| Size | Steel Blk. | Steel Galv. | Gen. Wrot Iron Blk. | Gen. Wrot Iron Galv. |
|---|---|---|---|---|
| 2 in. | $29 42 | $36 08 | $35 71 | $42 37 |
| 2½ in. | 44 17 | 54 70 | 54 11 | 64 64 |
| 3 in. | 57 76 | 71 53 | 70 76 | 84 53 |
| 3½ in. | 69 46 | 86 02 | 85 10 | 101 66 |
| 4 in. | 82 30 | 101 92 | 100 83 | 120 45 |
| 4½ in. | 95 89 | 1 20 | 1 30 | 1 54 |
| 5 in. | 1 12 | 1 40 | 1 52 | 1 80 |
| 6 in. | 1 45 | 1 81 | 1 97 | 2 33 |
| 7 in. | 1 89 | 2 37 | 2 53 | 3 01 |
| 8L in. | 1 99 | 2 49 | 2 66 | 3 16 |
| 8 in. | 2 29 | 2 87 | 3 07 | 3 64 |
| 9 in. | 2 74 | 3 43 | 3 67 | 4 36 |
| 10L in. | 2 54 | 3 18 | 3 41 | 4 05 |
| 10 in. | 3 28 | 4 10 | 4 39 | 5 21 |

**Prices—Ontario, Quebec and Maritime Provinces**

## WROUGHT NIPPLES

4-in. and under, 50 per cent.

4½-in. and larger, 40 per cent.

4-in. and under, running thread, 20%.

Standard couplings, 4-in. and under, 20%

Dd., 4½-in. and larger, net.

## OLD MATERIAL

Dealers' Average Buying Prices

Per 100 Pounds.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $ 8 50 | $ 9 00 |
| Copper, crucible | 11 00 | 11 00 |
| Copper, heavy | 10 50 | 11 00 |
| Copper wire | 11 00 | 11 00 |
| No. 1 machine composition | 9 50 | 9 75 |
| New brass cuttings | 6 00 | 8 00 |
| Red brass turnings | 8 00 | 8 00 |
| Yellow brass turnings | 5 00 | 6 00 |
| Light brass | 4 25 | 5 00 |
| Medium brass | 4 50 | 6 00 |
| Scrap zinc | 4 00 | 4 00 |
| Heavy lead | 4 25 | 4 00 |
| Tea lead | 2 25 | 2 00 |
| Aluminum | 12 00 | 10 00 |

| | Per Ton | Gross |
|---|---|---|
| Boiler plate | $10 00 | $12 00 |
| Heavy melting steel | 9 00 | 14 00 |
| Axles (wrought iron) | 20 00 | 20 00 |
| Rails (scrap) | 12 00 | 14 00 |
| Malleable scrap | 12 00 | 20 00 |
| No. 1 machine cast iron | 22 50 | 25 00 |
| Pipe, wrought | 8 50 | 8 00 |
| Car wheel | 22 00 | 25 00 |
| Steel axles | 18 00 | 18 00 |
| Mach. shop turnings | 5 00 | 6 00 |
| Stove plate | 17 00 | 20 00 |
| Cast boring | 3 00 | 7 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, 7-16 and up | Net list |
| Carriage bolts, ⅜" and less | 15 |
| Coach and lag screws | —20 |
| Stove bolts | 55 |
| Wrought washers | —25 |
| Elevator bolts | Net |
| Machine bolts, 7-16 and over | —5 |
| Machine bolts, ⅜-in. and less | —30 |
| Blank bolts | Net |
| Bolt ends | —5 |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | +25 |
| Machine screws, fl. and rd. hd., brass | Net |
| Machine screws, o. and fil. hd., brass | Net |
| Nuts, square, blank | +25 add $2 00 |
| Nuts, square, tapped | add 2 25 |
| Nuts, hex., blank | add 2 25 |
| Nuts, hex., tapped | add 2 75 |
| Copper rivets and burrs, list less. | 27½ |
| Burrs only, list plus | 10 |
| Iron rivets and burrs | 37½ and 5 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, bright | 67½ |
| Wood screws, flat, brass | 55 |
| Wood screws, O. & R., brass | 55½ |
| Wood screws, flat, bronze | 50 |
| Wood screws, O. & R., bronze | 47½ |

## MILLED PRODUCTS

(Prices on unbroken packages)

| | Per Cent. |
|---|---|
| Set screws | Less 40% |
| Square and hexagon head cap screws | Less 30% |
| Round head cap screws | Plus 10% |
| Fillister head cap screws | Less 10% |
| Flat head cap screws | Net list |
| Button head cap screws | Plus 10% |
| Studs | Less 20% |
| Semi-finished nuts up to and including 1-in. | Less 35% |
| Semi-finished nuts 1⅛ to 1½" | Less 30% |
| Semi-finished nuts 1⅝ to 2 in. | Net list |
| Coupling bolts | Plus 10% |
| Taper pins | Less 40% |
| Planer bolts without fillet | Plus 40% |
| Planer bolts with fillet | Pus 50% |
| Patch bolts | Plus 80% |
| Hollow set screws | Plus 20% |
| Thumb screws | Less 35% |
| Thumb nuts | Less 65% |

## BILLETS

F.O.B. Pittsburgh.

| | Per gross ton |
|---|---|
| Bessemer billets | $43 50 |
| Open-hearth billets | 43 50 |
| O.H. sheet bars | 39 00 |
| Forging billets | 48 50 |
| Wire rods | 48 00 |

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails, base | $4 55 |
| Cut nails, base | 5 10 |
| Miscellaneous wire nails | 50% |

## ROPE AND PACKING

| | |
|---|---|
| Plumbers' oakum, per lb. | 0 10¼ |
| Packing, square braided | 0 38 |
| Packing, No. 1 Italian | 0 44 |
| Packing, No. 2 Italian | 0 36 |
| Pure Manila rope | 0 26 |
| British Manila rope | 0 20 |
| New Zealand hemp | 0 20 |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | Net |



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DISC GRINDERS

Good grinding in fast time has made the Diamond popular in a host of shops. The right design and build eliminate vibration and give the operator a perfect surface every time. There is a suitable size and equipment for every surface grinding job you have. Workmanship and material of "Diamond" quality throughout.

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64 Front Street West
TORONTO

# The Week's Events in Montreal Industry

Charles P. Archibald, who for a number of years has served in the capacity of secretary for the Young Men's Canadian Club of Montreal, was elected to the office of president last week.

* * *

In connection with the construction of the new $6,000,000 Mount Royal Hotel that will shortly be commenced in Montreal, it has been announced that D. H. McDougall, assistant to the manager of the Toronto Power Company, has been appointed secretary-treasurer of the Mount Royal Hotel Company, and that he will have full charge of the construction arrangements.

* * *

The St. Lawrence Welding Works have changed their name to the St. Lawrence Welding and Engineering Works, Limited. This change was deemed necessary owing to the increased activities that the firm is now engaged in. In addition to welding of every description the firm carries on a general repair business, present marine contracts necessitating increased staff and operating hours.

* * *

Absence of freight in sufficient volume on the various railroads has again necessitated the closing down of the railroad repair shops in this district. Both the Point St. Charles shops of the Grand Trunk and the Angus shops of the C.P.R. will be closed from May 20 to June 1. It is expected that next month will see some adjustment in regard to the wages now paid to railroad operators.

* * *

The Dominion Steel Co. announce a change in the hours of work at the Sydney plant. For some time the works have been operating at irregular intervals, employing some 900 men, but this week it was found necessary to close down entirely. When operations are again started in the course of a week or so, it is the intention of the company to confine the working days to two a week.

* * *

W. J. Brown, manufacturers' agent, 117 Youville Square, Montreal, has secured the Eastern Canada agency for Byrne and Griffith, of Birmingham, Eng., manufacturers of steam and hydraulic fittings, and motor car gauges. It might be stated that Payne and Griffith has purchased the sole right to manufacture the Probert and Bridges line of high and low detectors for steam boilers.

* * *

For the first time in its history the U. S. Iron and Steel and Heavy Hardware Association will hold its convention this year in Canada, and the place selected is Montreal. This will be the twelfth annual meeting of the association and will take place on June 7, 8 and 9. The headquarters of the gathering will be at the Windsor Hotel. All of the large steel interests in the States and Canada will be represented. A meeting of the Montreal branch of the Metal and Hardware Association will be held this week to make arrangements for the visiting delegates.

* * *

A glance into future methods of conducting urgent business may be gathered from the fact that Thos. Hall, of the Hall Engineering Works, Montreal took advantage of the newly inaugurated Canadian Aerial Service, operating in conjunction with Bramson Limited, to pay a "flying" visit to Cornwall this week, in connection with some contracts of the firm. A trip that would otherwise consume several hours at the convenience of the railroad, was complete in about one hour.

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | $ 0 25 |
| Solder, guaranteed | 0 27 |
| Soldering coppers, lb. | 0 62½ |
| White lead, pure, cwt. | 17 00 |
| Red dry lead, 100-lb. kegs, per cwt. | 13 00 |
| Linseed oil, boiled, single bbls. | 1 03 |
| Wood alcohol, per gal. | 2 75 |
| Whiting, plain, per 100 lbs. | 3 00 |

### CARBON DRILLS AND REAMERS

| | |
|---|---|
| S.S. drills, wire size | 40 and 5 |
| Can. carbon cutters, plus | 10 |
| Standard drills, all sizes | 40 and 5 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 and 5 |
| Bit stock | 50 |
| Ratchet drills | 10 |
| Pure turp., single bbls., gal. | 1 20 |
| Linseed oil, raw, single bbls. | 1 00 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 50 |
| Sleeves | 50 |
| Taper pin reamers | 25 off |
| Drills and countersinks | Net |
| Bridge reamers, carbon | 50 |
| Centre reamers | 5 |
| Gasoline, per gal., bulk | 0 42 |
| Chucking reamers | Net |
| Hand reamers | 10 |
| High speed drills, list net to plus | 20 |
| Can. high speed cutters, net to plus | 10 |
| American | plus 40 |

### COLD ROLLED STEEL

[At Warehouse]

| | |
|---|---|
| Rounds and squares | $7.00 base |
| Hexagons and flats | 7.00 base |

### IRON PIPE FITTINGS

| | Black | Galv. |
|---|---|---|
| Class A | 60 | 75 |
| Class B | 26 | 36 |
| Class C | 17 | 26 |

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 6 00 | $ 6 50 |
| Sheets, blue ann., No. 10 | 5 25 | 5 50 |
| Canada plates, dull, 52 sheets | 7 50 | 13 00 |
| Can. plates, all bright | 14 00 | ..... |
| Apollo brand, 10¾ oz., galvanized | ..... | ..... |
| Queen's Head, 28 B.W.G. | 10 75 | ..... |
| Fleur-de-Lis, 28 B.W.G. | 10 00 | ..... |
| Gorbal's Best, No. 28 | ..... | ..... |
| Colborne Crown, No. 28. | ..... | ..... |
| Premier, No. 28, U.S. | 8 25 | 8 50 |
| Premier, 10¾-oz. | 8 25 | 8 90 |
| Zinc sheets | 13 00 | 15 00 |

### PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13; 5-16, $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

### ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13; 5-16 in., $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

**Prices per 100 lbs.**

### FILES AND RASPS

| | Per Cent. |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 32½ |
| Black Diamond | 27½ |
| J. Barton Smith, Eagle | 50 |
| McClennand, Globe | 50 |
| Delta Files | 20 |
| Disston | 40 |
| Whitman & Barnes | 50 |
| Great Western-American | 50 |
| Kearney & Foot, Arcade | 50 |

### BOILER TUBES

| Size | Seamless | Lapweld |
|---|---|---|
| 1 in. | $26 00 | $..... |
| 1¼ in. | 27 25 | ..... |
| 1½ in. | 26 25 | 29 50 |
| 1¾ in. | 29 75 | 27 00 |
| 2 in. | 29 25 | 24 50 |
| 2¼ in. | 33 00 | 28 50 |
| 2½ in. | 44 75 | 32 50 |
| 3 in. | 49 25 | 40 00 |
| 3¼ in. | ..... | 48 50 |
| 3½ in. | 63 50 | 43 50 |
| 4 in. | 85 00 | 55 50 |

Prices per 100 ft., Montreal and Toronto

### OILS AND COMPOUNDS

| | |
|---|---|
| Castor oil, per lb. | — |
| Royalite, per gal., bulk | 28 |
| Palacine | 31 |
| Machine oil, per gal. | 58 |
| Black oil, per gal. | 27 |
| Cylinder oil, Capital | 1.01 |
| Petroleum fuel oil, bbls., net | 11.2 |

### BELTING—No. 1 OAK TANNED

| | |
|---|---|
| Extra heavy, single and double | 15% |
| Standard | 15 and 10% |
| Cut leather lacing, No. 1 | 2 00 |
| Leather in side | 2 40 3 00 |

### TAPES

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES

| | |
|---|---|
| Polishing wheels, felt | $4 50 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, Turkish | 8¾ |
| Pumice, ground | 06 |
| Emery glue | 30 |
| Tripoli composition | 9½ |
| Crocus composition | 12 |
| Emery composition | 11 |
| Rouge, silver | 64 |
| Rouge, powder, nickel | 38 |

**Prices per lb.**

### ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | 8½ |
| Grits, 80 and finer | 6 |

### BRASS—Warehouse Price

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 30 |
| Brass sheets, 24 gauge and heavier, base | 38 |
| Brass tubing, seamless | 42 |
| Copper tubing, seamless | 44 |

### WASTE

| | |
|---|---|
| XXX Extra | 21 |
| Peerless | 22 |
| Grand | 21½ |
| Superior | 21½ |
| X L C R | 16½ |
| Atlas | 19 |
| X Empire | 15 |
| Ideal | 18 |
| X Press | 13½ |

### Colored

| | |
|---|---|
| Lion | 13½ |
| Standard | 12 |
| No. 1 | 14 |
| Popular | 10½ |
| Keen | 9 |

### Wool Packing

| | |
|---|---|
| Arrow | 35 |
| Axle | 28 |
| Anvil | 22 |
| Anchor | 17 |

### Washed Wipers

| | |
|---|---|
| Select White | 17 |
| Mixed colored | 14 |
| Dark colored | 13 |

**This list subject to trade discount for quantity.**

### RUBBER BELTING

| | |
|---|---|
| Standard | 10% |
| Best grades | 15% |

### ANODES

| | |
|---|---|
| Nickel | .55 to .60 |
| Copper | .38 to .40 |
| Tin | .70 to .70 |
| Zinc | .16 to .17 |

**Prices per lb.**

### COPPER PRODUCTS

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | $30 00 | $34 00 |
| Copper wire, list plus 10. | | |
| Plain sheets, 14 oz., 14x60 in. | 32 00 | 38 00 |
| Copper sheet, tinned, 14 x 60, 14 oz. | 38 00 | 42 00 |
| Copper sheet, planished, 16 oz. base | 44 00 | 48 00 |
| Braziers', in sheets, 6 x 4 base | 36 00 | 41 00 |

### LEAD SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $ 9 50 | $14 50 |
| Sheets, 3½ lbs. sq. ft. | 9 25 | 14 00 |
| Sheets, 4 to 6 lbs. sq. ft. | 9 00 | 13 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

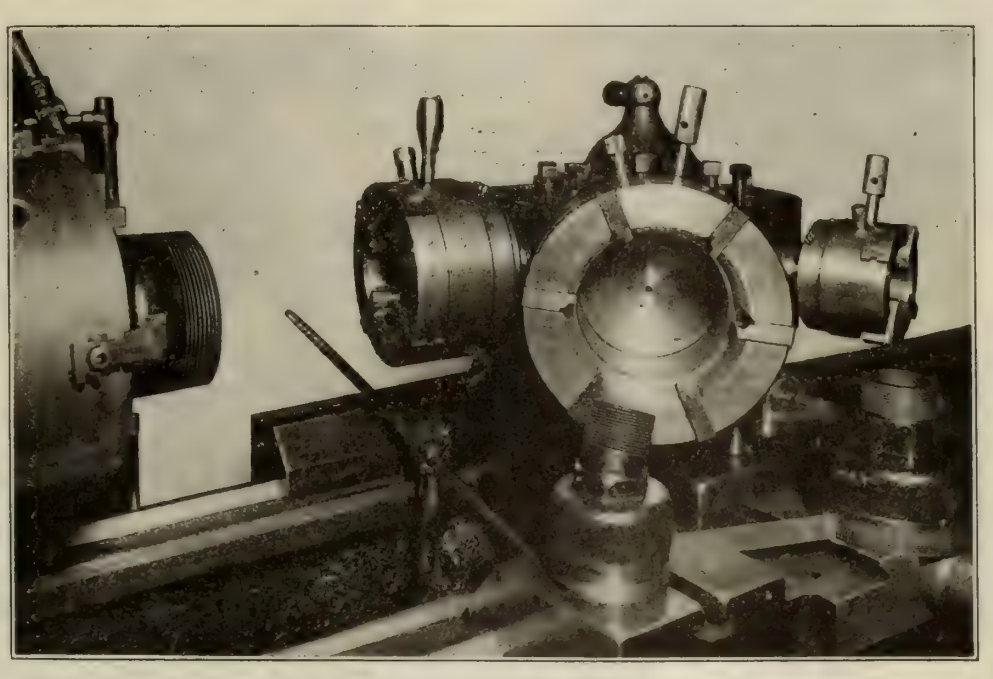
### PLATING CHEMICALS

| | |
|---|---|
| Acid, boracic | $ .25 |
| Acid, hydrochloric | .03¾ |
| Acid, nitric | .10¼ |
| Acid, sulphuric | .03¾ |
| Ammonia, aqua | .20 |
| Ammonium, carbonate | .23 |
| Ammonium, chloride | .22 |
| Ammonium, hydrosulphuret | .75 |
| Ammonium sulphate | .30 |
| Arsenic, white | .18 |
| Copper, carbonate, annhy. | .35 |
| Copper, sulphate | .10 |
| Cobalt, sulphate | .20 |
| Iron perchloride | .62 |
| Lead acetate | .30 |
| Nickel ammonium sulphate | 16½ |
| Nickel carbonate | .30 |
| Nickel sulphate | .17½ |
| Potassium sulphide (substitute) | .40 |
| Silver Chloride (per oz.) | 1.15 |
| Silver nitrate (per oz.) | 1.10 |
| Sodium bisulphate | .13 |
| Sodium carbonate crystals | .04 |
| Sodium cyanide, 127-130% | .39 |
| Sodium hyposulphite per 100 lb. | 6.50 |
| Sodium phosphate | .15 |
| Tin chloride | .80 |
| Zinc chloride, C.P. | .30 |
| Zinc sulphate | .08 |

**Prices per lb. unless otherwise stated**

Right on the Lead

# A Well Dressed Screw Machine Carries a Geometric in Its Turret



A group of Geometric Die Heads at work for The Greenlaw Manufacturing Co.

For close on to fifteen years The Greenlaw Manufacturing Company have used Geometrics, and their General Foreman says they are the kind of Tools that earn, rather than spend the firm's money. In their shop five Geometric Die Heads and six Geometric Collapsing Taps are at work every day. All their screw thread cutting is done with Geometrics.

*A Mechanical Engineer's comment is:*
*Wherever I go I find Geometric Tools accepted as standard.*

**--- A Geometric Will Solve Your Screw Thread Problem ---**

## THE GEOMETRIC TOOL COMPANY
## NEW HAVEN CONNECTICUT

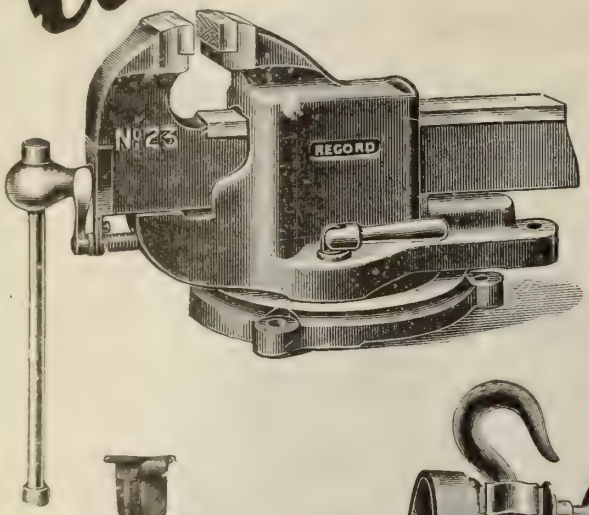
*Canadian Agents:*

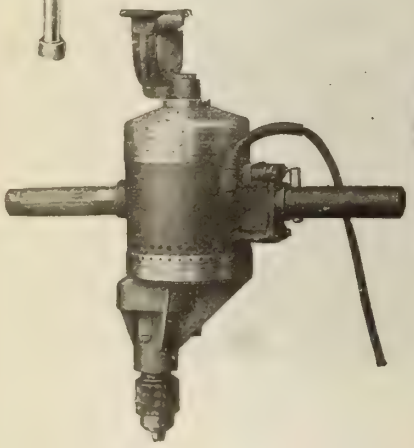
Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Toronto, St. John, N.B., Halifax, N.S.

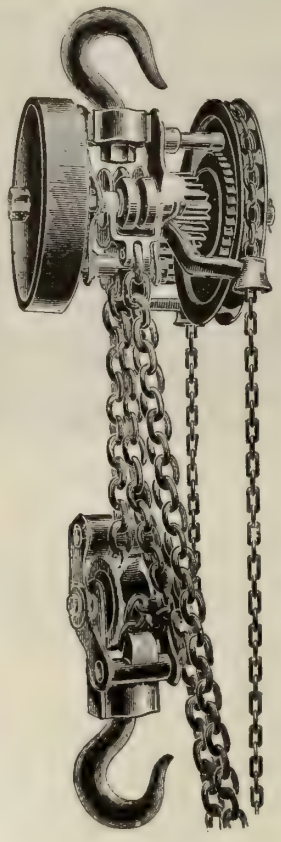
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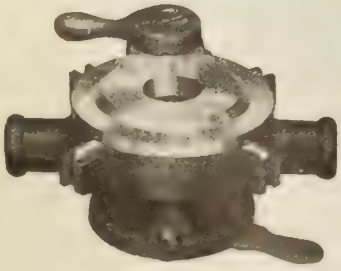
Aikenhead's

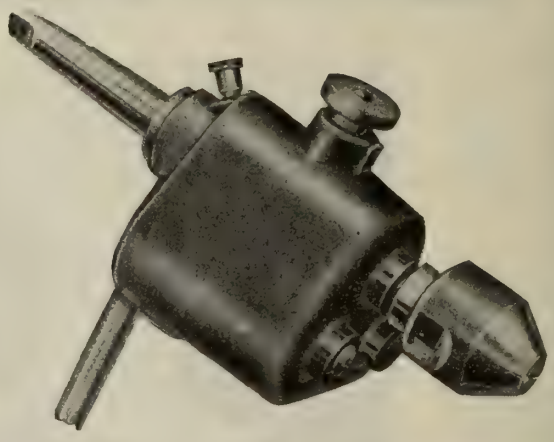
# Canada's Leading Tool Supply House









## Wahlstrom's Tapping Attachment

THE Wahlstrom prevents tap breakage by keeping the lands free from chips by means of an oscillating motion which duplicates the simple to-and-fro motion of hand tapping. For tapping in soft materials the oscillating motion can be changed to a continuous revolution.

The Wahlstrom fits any drill press. It is made in two sizes. No. 1 takes taps of all sizes from 5-40 to ½ inch; No. 2 takes taps from ¼ inch to ¾ inch.

# AIKENHEAD

## 17 Temperance Street

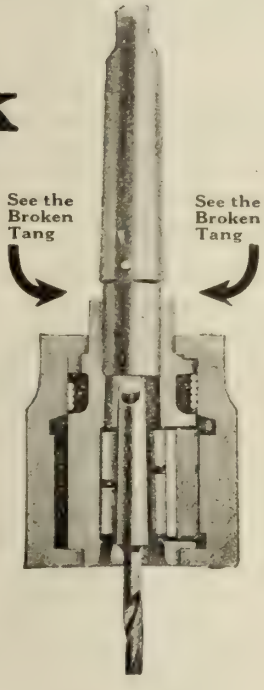
*If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.*

# Everything in Tools

Aikenhead's

## Wahlstrom's Automatic Drill Chuck

WITH a Wahlstrom your operator can drill any number of holes of different diameter, one after the other, simply by grasping the chuck with one hand and replacing the loosened drill with another—and two seconds does it! It is not even necessary to stop the spindle.

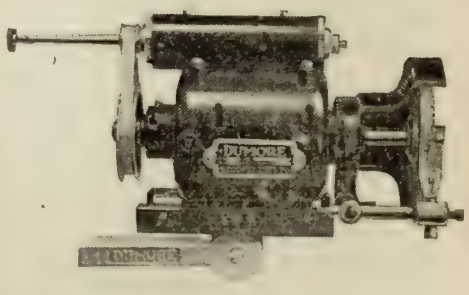



This Wahlstrom Automatic self-centres the tool perfectly and its instant-acting jaws close on the entire shank in a grip that becomes firmer as the resistance to the tool increases. The clutch can't slip and the jaws never mark a tool.

Made in two styles. One holds Nos. 1, 2 or 3 Morse Taper Shank Tools—with or without tang. The other is made in three sizes: 15/64 to ½ in.; ⅜ to ¾ in. and 17/32 to 1 in., thus holding all sizes of straight shank tools from 15/64 to 1 in. Booklet upon request.





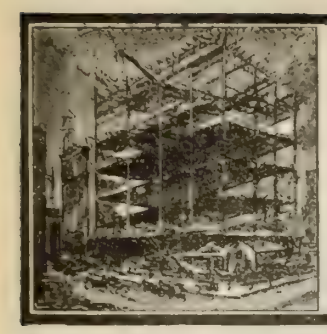


# HARDWARE

LIMITED

Toronto, Ontario

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# INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES



## LARGE IRON FIND IN NEW ONTARIO ANALYSIS GIVES OVER 55 PER CENT. IRON

ACCORDING to recent report, an important discovery of hematite iron has been made in the Cobalt district. The territory lies within the triangle on the points of which are Cobalt, Porcupine, and Sudbury, and the new deposit lies in the townships of Yarrow and Morel, within 14 miles of the railway at Elk Lake.

### High Grade Ore

The ore is said to be exceedingly high grade, massive hematite, showing in one place over a width of four to five feet, and the owners declare they walked along it for about 150 feet, in which the iron content is approximately 70 per cent. In addition to this massive ore there is a series of four dikes or lenses of quartz and jasper in which the iron content is 55.98 per cent. An analysis from the Morel deposit gave the following results: Iron, 55.98 per cent.; silica, 19.60 per cent.; phosphorus, 0.07 per cent.

Geologists had previously expressed the opinion that nothing more than low-grade iron ore would be found in Northern Ontario, but the ore in sight may be measured in thousands of tons. This information is said to be based on the strength of the opinion of leading mining men and on an analysis made in the Ontario Government ore-testing plant at Cobalt, where some of the ore has been found to contain more than 70 per cent. iron, and with the general analysis showing more than 55 per cent. iron.

The ore occurs in sedimentary rocks, being conglomerate and slate, and its general characteristics are almost identical with the Gogebic iron range, which has made the states of Michigan and Wisconsin world-famous as producers of iron ore. The ore in this new range in Northern Ontario occurs in large lenses, and is traced for close to a mile on the surface.

The discovery was made by Frank Wescott, of Elk Lake, Ontario, and he claims that he knew about the presence of the iron for some years, and has repeatedly shown samples to geologists and told them the district in which he found it. These geologists appear to have disbelieved the story, and refused to accompany the discoverer to his supposed find. It was not until Wescott told his story to B. W. Hartley, a prospector in Cobalt, that he succeeded in receiving attention. Mr. Hartley accompanied Wescott to the scene of the find, and in his own words states that what he saw was "almost unbelievable." He packed out 140 pounds of the ore for testing purposes, and after securing a large acreage of the territory gave out the details.

Hartley and Wescott intend to interest Eastern Canada operators in the development of the deposit, and the general impression is that the discovery may be measured in importance with those of Cobalt and Porcupine.

### Same as Lake Superior

Mining men who are familiar with the Lake Superior regions and the deposits there when shown the ore from the new discovery were heard to remark that it was "Gogebic iron," meaning that it came from the mines on the Gogebic iron range in the Lake Superior region. The new discovery lies in sedimentary formation, conglomerate and slate formation being in evidence, with well-rounded pebbles occurring in the conglomerate. Wescott claims to be familiar with the mining area in Michigan and Wisconsin and declares that the geological structure of the new discovery has many characteristics in common with that big iron field.

Wescott declares that he believes the new deposit in Yarrow and Morel townships may actually be related to the northeasterly continuation of the deposits of the Lake Superior region, which have enabled the United States to lead the world in iron ore production, that country having produced upward of 70,000,000 tons in a single year, the 1919 output amounting to 60,000,000 tons, of which 85 per cent. was taken from the Gogebic, Marquette and Menominee ranges of the Lake Superior region. By way of comparison it may be noted that the iron ore deposits which have been mined to depths of as much as 1,500 to 2,200 feet in the Lake Superior region are of the following composition: Iron, 54.01 per cent.; silica, 6 per cent.; phosphorus, 0.03 per cent.

## Trade Gossip

**Reduction Made.**—A reduction of 15 cents an hour will be effected in the wages of Winnipeg bridge and structural iron workers as a result of the decision of the Joint Council of Industry, presented to officials of the union. The previous wage agreement called for $1.25 an hour. The men have agreed to abide by the ruling.

**Warns Them Away.**—Deploring the influx of men from other cities seeking work, Mayor Wilson, of Windsor, requested newspapers to assist in giving publicity to the scarcity of employment along the border. Scores of men from eastern Canadian cities, the Mayor said, are arriving there looking for work that does not exist.

**New Brokerage Firm.**—A new brokerage firm has been formed in Montreal by Graham Drinkwater under the name of Drinkwater & Co., and the seat of Oswald Bros. has been transferred to Mr. Drinkwater. The new broker is at present connected with Aldred & Co., and previous to that was vice-president of Canadian Fairbanks-Morse Co., Limited.

**Meet In Montreal.**—Probably the vastest aggregation of capital ever represented in Montreal will be gathered there June 7-9 next, when the American Iron and Steel Heavy Hardware Association will hold their twelfth annual convention there at the Windsor Hotel. It is expected that about 250 representatives of the leading iron and steel and hardware corporations of the United States will be present.

**Have Contracts.**—Messrs. Sir W. G. Armstrong, Whitworth & Co., Ltd., of London, England, have recently booked a contract for the construction of docks and the installation of the necessary machinery and plant in Nigeria. We understand the total amount of the contract is £3,500,000 sterling. They have also booked a contract for similar civil engineering work in Portuguese East Africa. The contract sum is approximately £1,500,000 sterling. These contracts will be carried out in their entirety by this English firm, who will manufacture and supply from their own works all requisite machine tools, dock gates, handling machinery, etc.

# ATKINS

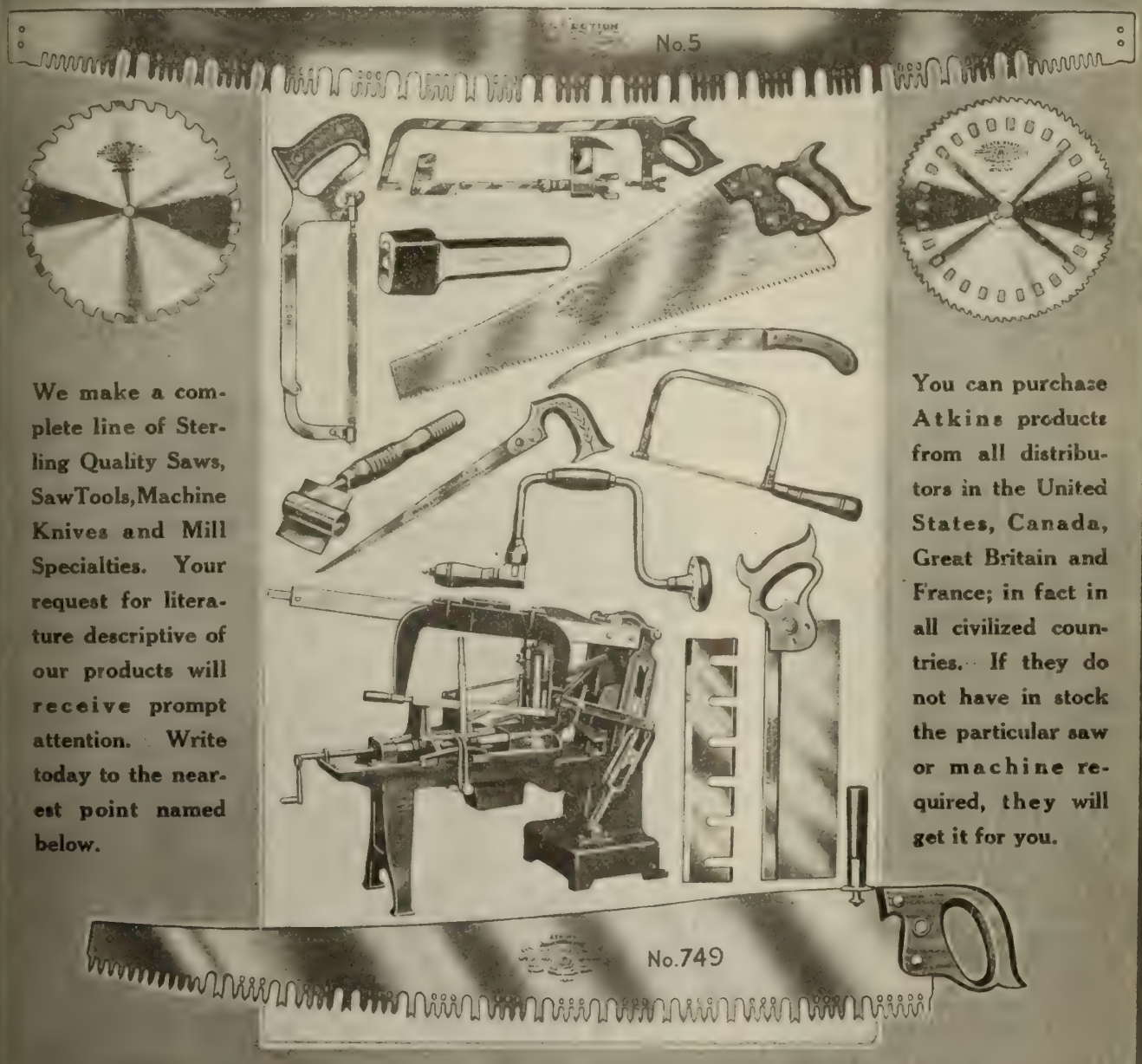
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You can purchase Atkins products from all distributors in the United States, Canada, Great Britain and France; in fact in all civilized countries. If they do not have in stock the particular saw or machine required, they will get it for you.

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## E. C. Atkins & Company

Established 1857

*Canadian Factory:* HAMILTON, ONTARIO

*Branch:* VANCOUVER, B. C.

# GOOD PACKING DOES MUCH TO CUT DOWN LOSS FROM STEALING

THE current journal of the Huddersfield (England) Chamber of Commerce contains an article on pilferage and packing, in which attention is drawn to the systematic thieving in connection with goods in transit, and the question is raised as to what extent packers are responsible. "It is safe to say that if all goods, at all times, were as much at the mercy of thieves as are 'goods in transit' the business world would have to put up its shutters because it could not carry on." While losses are directly due to thieves, it is suggested that it is nevertheless a fact that very often "the sight of means to do ill deeds makes ill deeds done," and one fault of present-day shipping practice is that it affords many opportunities to "make a thief." The object of packing is not merely for protection against damage, but for security against theft, and the important bearing of bad packing not only upon the loss of goods by theft but also upon the settlement of claims for such losses is largely overlooked.

**Some Examples of Faulty Packing**

While there are many examples of faulty packing that help the thief and free the various authorities from responsibility, they are roughly divided, the Journal states, into a few leading types:

One of the most common faults in packing is the use of second-hand cases, which are, of course, comparatively easy to open without detection. The result is that, as officers cannot judge by appearance as to whether goods have been taken out before the cases reached the ship, they are obliged to give a "repacked" receipt, which means that no claim will be paid by the ship for loss or damage by thieves.

Another common fault is the use of new cases with weak lids, protected, it may be, by extra battens around the edge, but the nails of which are driven straight down without clinching, with the result that the top boards drop and the nails "draw."

Cases otherwise satisfactory but not bound with hoop-iron are also frequently used, and are often quite unable to meet the ordinary inside and outside strains. The nails become sprung with a few handlings on train and wharf, and the goods are exposed by their own weight. For these cases, which offer a distinct temptation to the pilferer, the ship will only sign an "insufficiently packed" receipt, which prevents any claim for theft.

Other cases are bound with soft hoop-iron, which actually breaks in handling on and off the freight cars and before the ship is reached. Cases with openings similar to crates in which hooks can easily be inserted, and cases so frail as to be unfit for ordinary handling are other familiar examples of packing which not only throws the loss but most of the blame for pilferage upon the shippers themselves.

The Journal offers several practical suggestions for remedying the evil:

1. Don't use second-hand cases unless they are strong and good and unless they contain articles not likely to attract thieves.

2. See that all cases have good ends and that all nails are properly clinched.

3. Bind all cases with strong hoop-iron at ends and also around middle.

4. Don't use frail cases.

5. Use only hoop-iron that will stand the strain of ordinary rough handling. "Scrap" all old soft hoop-iron.

---

Mr. McFadden, of the Diamond State Fibre Company, of Toronto, who has been confined to the hospital at Port Hope several weeks with pleurisy, has fully recovered and is taking up his duties again.

# RAILROAD WAGES CUT ABOUT JULY 1

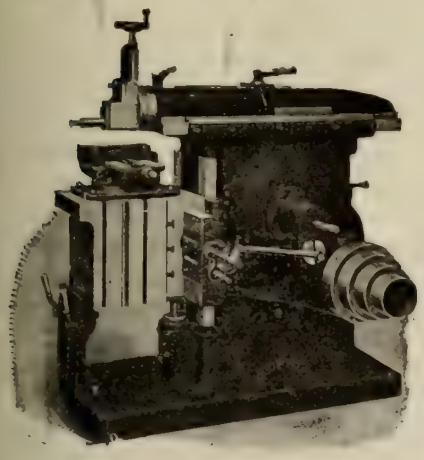
Work of unskilled railroad workers will be cut July 1, according to a decision made by the United States railroad labor board, which has been conducting hearings in Chicago since the early part of April. The amount of the reduction was not stated in the decision, but will be announced on June 1. Practically every railroad in the country will be affected by the ruling, the total number of unskilled employees approximating 1,000,000 men. The decision came somewhat earlier than was expected, no ruling having been expected for several weeks. At the same time the board announced that on June 6 it would open hearings to receive proposals from the railroads relative to wage decreases for the skilled class of workers, and that the decision reached also would be made effective on July 1. With skilled labor receiving a cut, practically every class of railway workers would be affected, the total number of men employed by the roads being about 2,000,000. The last wage decision of the board was made on July 20, 1920, and increased the pay of all classes of workers about 21 per cent. or $600,000,000 a year.



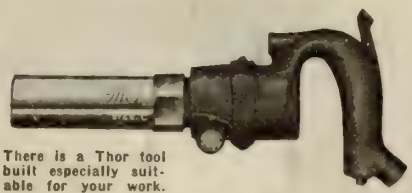

**Don't stop, you're almost out of the woods.**
—Chapin in St. Louis "Star."

# GARLOCK WALKER

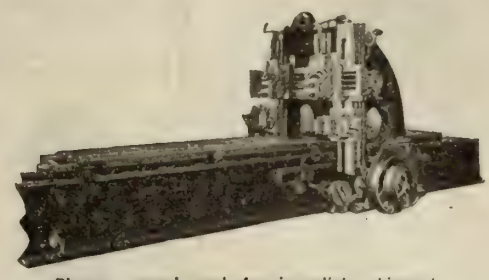
## HIGH GRADE MACHINE TOOLS



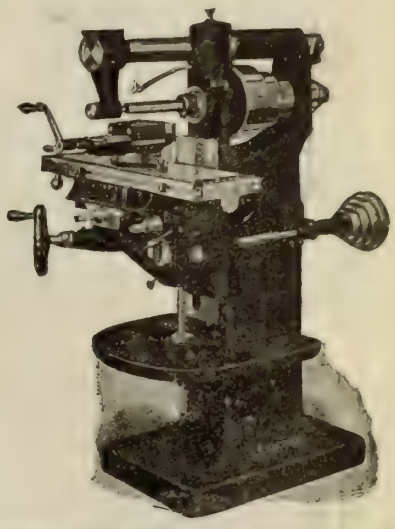
Shapers of various sizes, with single pulley or cone drive, both new and used, in stock for immediate shipment.



There is a Thor tool built especially suitable for your work.



Planers, several used for immediate shipment. Standard and openside machines for good delivery.



Small Milling Machines for your light work will save you money. Get our quotations.

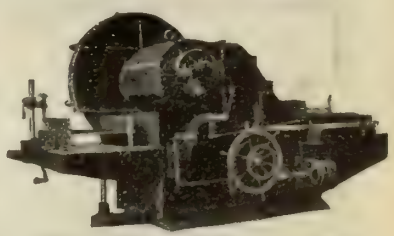


Hand Feed Jointer for your pattern shop. Sizes in stock 12" to 24".

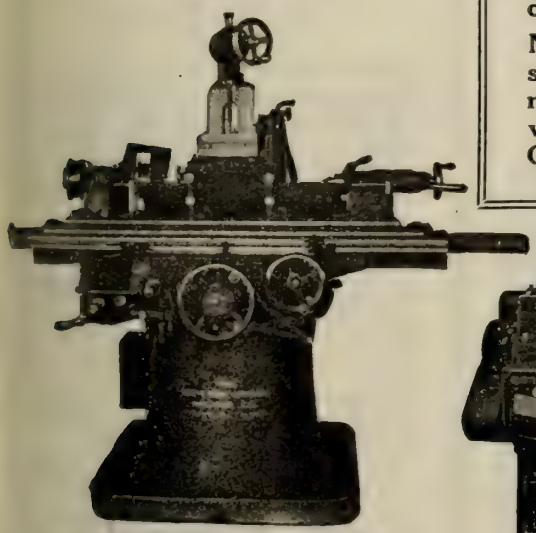
### New or Used
## Tools for Every Shop

THE Garlock-Walker line of machine tools is inclusive. It embraces machinery for every metal and woodworking operation.

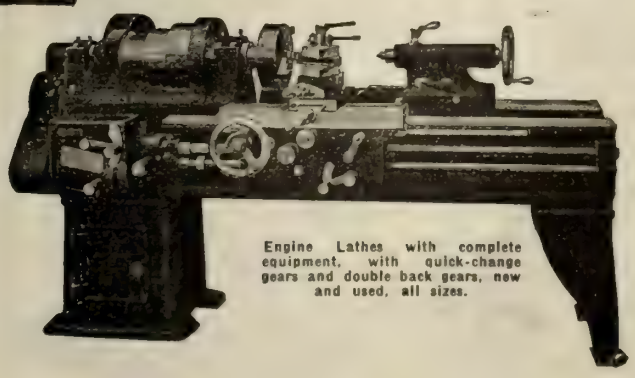
No matter what the size of your shop or what the equipment you need, your every requirement will be satisfactorily filled by Garlock-Walker.



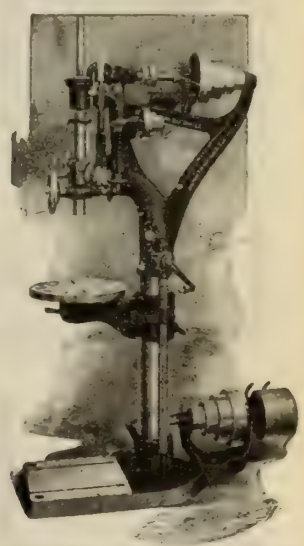
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Engine Lathes with complete equipment, with quick-change gears and double back gears, new and used, all sizes.



Many Silver, Champion, Rockwell and other back geared drills for your selection.

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of your employees
depend your profit
and production



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Throw out the germ-laden Drinking Cup!

Give your men a clean drink

PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)



Allows just the proper amount of cool, clean fresh water to come through the bubbler. No spurting, overflowing, no loss. "Puro" regulates itself. "Puro" saves 35% on water bills, too. You can attach it in a few minutes. Tell us how many men, how many departments and we'll tell you how much the cost will be.

Puro Sanitary Drinking Fountain Co.

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Holds over 850 lbs. 22 inches from center of swivel block. This means heavier cuts and more production. Over 2000 satisfied users all over the world.

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Also Manufacturers of "DICKOW SUPERIOR EIGHT" Precision Lathes

Dependable and Accurate.

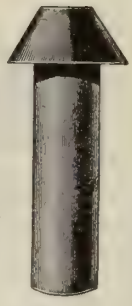
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No. 4 Press
10 to 12
tons

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# MASSEY-HARRIS CO. STUDIES NEW MARKET

**Shows Example of Good Export Trade Policy By Studying Conditions**

An example of how Canadian firms should enter the export market is provided in the policy of the Massey-Harris Company in extending their field of operations. For a number of years the company has been successfully marketing a combination reaper-binder in Australia and South America. When, however, Spain, Algeria and South Africa were considered, certain changes and improvements on the machine were effected in order to make it more thoroughly suitable to the type of farming and class of people found in these new markets. A number of machines were next shipped over and complete tests and study of the situation instituted. It may safely be said that if mechanical harvesting equipment is saleable at all in these countries, the Massey-Harris Company will secure its fair share of business by these methods.

The case is but a repetition of the advice which men experienced in export problems have always given. The market is available for those firms who will by first-hand investigation find out the local conditions of trade and the particular fancies or needs of the people.

## Trade Gossip

**Want Machines Made.**—An American firm, making a well-known line of vibrators, state they would be pleased to get in touch with any firm in Canada that has the facilities for making their vibrators. The address of this firm can be secured from Canadian Machinery.

**Want Equipment.**—The McIlroy Belting Works, of Kingsville, Ont., want to buy second-hand calendar rolls, 8 by 1[illegible] inches in diameter and 36 by 40 inches long, slow geared. These gears are used for squeezing surplus compound back into the tank after belts are passed through.

**Want Dies Made.**—The Canadian Edison Appliance Co., Ltd., of Stratford, Ont., will have in the vicinity of $30,0[illegible] worth of die work to give out during the year and are anxious to get in touch with outside firms who could handle this sort of work to advantage. They are manufacturers of the Edison, Hotpoint and Hughes lines of electrical goods. D. Fuller, of the above firm, reports that the Hotpoint Iron Week has been a big success. Their plant has been running 24 hours a day for the past month and the chief trouble has been in the securing of raw materials.

## AUTOMOBILE MARKET

### Studebaker Sales Show 157 Per Cent. Increase For First Four Months

That the buying of motor cars in Canada is on the upward trend is evidenced by the statement of the Studebaker Corporation of Canada, Ltd., who report that their sales for the first four months of this year show an increase of 157 per cent. over the corresponding period last year. They further report that their factories at Walkerville, Ont., have been into full production since the first of April.

## Personals

J. E. Davies, president of the Alberta Foundry and Machine Company, Ltd., Medicine Hat, has been appointed president of the Lethbridge Iron Works Co., Ltd., succeeding C. A. Magrath. Mr. Magrath will continue with the firm as vice-president. V. W. Parrish, who is secretary of the Alberta Foundry and Machine Company, is the new secretary-treasurer of the Lethbridge Iron Works Company.

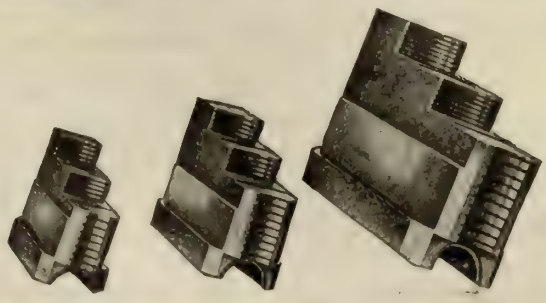
At the recent meeting of the Electric Club of Toronto, Mr. Frank Kennedy was elected president, succeeding Mr. Geo. D. Perry.





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STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY



The Jaws Are Extra Strong

THEY are drop forgings, made of best quality steel, heat-treated and hardened. The threaded portion of jaws form a half nut for the setting-up screws. Have stood the test of heavy duty work in our own shops where accuracy was the only accepted standard.

DOMINION STEEL PRODUCTS CO.
LIMITED
*Engineers • Manufacturers*
BRANTFORD, CANADA

3

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ATTORNEYS

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The old established firm. Patents everywhere. Head office, Royal Bank Bldg., Toronto. Ottawa office, 5 Elgin St. Offices throughout Canada. Booklet Free.

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OVENS
Japanning and Varnishing Ovens heated by Gas, Electricity, Steam or Coal. Kernchen Siphonage Ventilators, Bakers' Ovens, trucks, casters, etc. Write for Booklet.
Brantford Oven & Rack Co. Ltd
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HAMILTON ENGINEERING SERVICE
LIMITED
*Consulting and Designing*
Tools, Jigs, Fixtures and Special Machinery. Let us shoulder your problems.
17 MAIN ST. EAST, HAMILTON

DROP FORGE DIES
Send us your blueprints and specifications. Entrust your requirements to experienced workmen and up-to-date equipment. Have your dies made in Canada. First-class workmanship guaranteed.
THE KIMBER & HILLIER MFG. CO.,
Thorold Road, - St. Catharines, Ont.

Oil Tempered Steel Springs
—for every purpose and the best for each use.
Special styles of all kinds to Order.
THE CLEVELAND WIRE SPRING COMPANY
Cleveland, Ohio
U.S.A.

"Maple Leaf"
BRAND
Stitched Cotton Duck Belting
"Maple Leaf" brand costs less than leather, rubber and balata; has a positive grip on the pulley and is true running.




Have us send you samples and see just why "Maple Leaf" sets the standard in economy, strength and durability.
Dominion Belting Co. Ltd.
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Quebec Branch: 51 Duluth Bldg., Montreal

Your Wants are many here below. Use the Want Ad. page and get rid of a few of them.

# Classified Opportunities

## BUSINESS CHANCES

WANTED—BY AN ESTABLISHED CONCERN. Twelve to fifteen thousand dollars for a period of from one to three years, to take care of business expansion. This concern will stand the fullest investigation. 8% is offered with ample security to principals only, with an opportunity of becoming permanent associates with the partners, if mutually satisfied. Box 767, Canadian Machinery. (ctfm)

## MOTORS WANTED

WANTED—ONE 10 H.P., 3-PHASE, 25-CYCLE, 220 volts; one 25 h.p., 3-phase, 25-cycle, 220 volts. Complete with low voltage release starter, base and pulley. Box 781J, Canadian Machinery.

## MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

### MACHINE WORK WANTED

We are equipped to handle all kinds of general or special machine work. All operations in our plant are done under the most careful supervision and we can satisfy you as to price. Always available for consultation.

**PERFECT MACHINE COMPANY, GALT**

Builders of Reliable Machinery.

Phone Park. 3550

### A. AUSTIN

**GENERAL MACHINE WORK**

Turret Lathe and Automatic Screw Machine a Specialty. Let us quote on your work.

*With:* Garlock, Walker Machinery Co. 163 Dufferin Street.

PARTIAL LIST

### Machine Shop Equipment

***At Extremely Low Prices***

LATHES—All sizes and lengths of bed. Special price quoted on rebuilt 20 in. x 8 ft. C.M.C.

AIR COMPRESSOR—8 in. x 8 in. Chicago Pneumatic.

TANKS—10 Tanks 10 ft. 6 in. diam. x 29 ft. 6 in. long. 19,000 gals.
3 Tanks, 10 ft. 0 in. diam. x 39 ft. 0 in. long, 5/8 in. Heads. 22,893 gals.
Full line of other Steel Storage Tanks, open and closed, all sizes.

PUMPS—1 Triplex Power Pump, 1½ in. x 6 in. Hydraulic Machy. Co. Also 1 in. x 5 in. West Tire Setter.
1—Centrifugal Pump, 2½ in. x 1½ in. Gould.
1—Gould Triplex Power Pump, 2 in. x 3 in.

Milling Cutters and Reamers, full assortment, all sizes and shapes, at less than half price. Send us your enquiries.

**Standard Equipment & Tool Works**

Dept. K. 307 St. James St.
Main 2286 MONTREAL
(20)

## MECHANICS WANTED

WANTED — DRAUGHTSMEN HAVING EXperience on transformers and motors. Apply, stating qualifications and salary expected, to Canadian Crocker-Wheeler Co., Ltd., St. Catharines, Ont. (cfm)

### Used Belting, Pulleys, Etc.

We carry right in stock a large quantity of used Belting, Pulleys, Hangers, Shafting, etc., in good condition, which we sell at half the price of new. Inquiries solicited. In writing mention sizes wanted. L. S. Tarshis & Sons, 92 Wellington St., Montreal.

### Modern Marine Machinery

Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

### Grey Iron Castings

Light and Medium-Bench and Floor Repetition Castings; Capacity 15 tons per day.
Expert Metal and Wood Pattern Work. Our advice and estimates will save you money.
Semi-finishing operations on Lathe or Grill on Castings supplied if required.

ASK US.

**THE KATIE FOUNDRY, GALT, ONT.**

### WANTED

Second-hand calender rolls 8" to 12" in diameter, 36" or 40" long, slow geared. These gears are used for squeezing surplus compound back into the tank after belts are passed through. Address, The McIlroy Belting Works of Canada, Limited, Kingsville, Ont.

### REGO WELDING *and* CUTTING APPARATUS

Oxygen, Acetylene, and a complete line of Welding and Cutting Supplies.

**Carter Welding Co.**
**of Toronto, Limited**
**7-11 Sheppard St., Toronto, Ont.**
Phones: Adelaide 2841 and 1524
(TF)

## PATTERNS

TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (ctfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

## FOR SALE

ELECTRIC STORAGE BATTERY LOCOMOtives for sale. Two. 36-inch gauge. Complete and in good condition. R. T. Gilman & Company, Dept. "E," 211 McGill Street, Montreal (ctfm)

MOTORS FOR SALE — 5 H.P. CAN.-GEN Electric, 2-phase, 60-cycle, 1800 r.p.m., switc starter; 20 h.p., Fairbanks-Morse, 2-phase, 60 cycle, 1200 r.p.m., Auto starter (without lo voltage release); 25 h.p., Can. Gen. Electric, 2 phase, 60-cycle, 1000 r.p.m., no starter; 30 h.p Westinghouse, 2-phase, 60-cycle, 945 r.p.m., Aut starter (without low voltage release); 3 h.p Westinghouse, 2-phase, 60 cycle, 1700 r.p.m switch starter; 1 Smart-Turner Triplex Bel driven Pump, 2 x 3. Box 780J, Canadian Machinery.

### Used Machinery For Sale

1—No. 3 Greenard Arbor Press and Stand
1—Small Drill Grinder
1—No. 150 Wells Tool and Cutter Grinder
1—8" Heald Rotary Surface Grinder
1—No. 70 Heald Internal Grinder
1—18" x 8' Mueller Lathe
1—Belt Driven Oil Separator

**CHARLES P. ARCHIBALD & CO.,**
285 Beaver Hall Hill - - MONTREAL

Machine Shop and Foundry for sale, St. Catharines, Ont. In the centre of the Welland Ship Canal and Hydro activities. Going concern capable of handling all classes of work. Turnover $60,000 a year. Good reasons for selling. Box 777, Canadian Machinery. (c5m)

### SUNCLO BRAND

**WIPING CLOTHS**
**COTTON WASTE**
**WOOL WASTE**

*Prepared By*

**THE LEVI'S**
**98 John Street**
**TORONTO, ONT.**

*Prices on application*

# Classified Opportunities


MACGOVERN & COMPANY POWER MACHINERY

We have for sale the following

## Small Sized A.C. Generators

3 Phase, 60 Cycle

| K.W. | Volt. | Make | R.P.M |
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| 15 | 2300 | Ft. Wayne | .... |
| KVA 20 | 2300 | Fairbanks-Morse | 1800 |
| 25 | 2300 | Ft. Wayne | 1800 |
| 30 | 2400 | Westinghouse | 1200 |
| KVA 30 | 2300 | Fairbanks-Morse | 1200 |
| KVA 35 | 2300 | Allis-Chalmers | 1200 |
| 37½ | 2300 | Westinghouse | 1200 |
| 42 | 2300 | Electrical Machinery | 1200 |
| 45 | 1150 | General Electric | 1200 |
| 50 | 550 | Crocker-Wheeler | 1200 |
| 50 | 2300 | Fairbanks-Morse | 300 |
| 50 | 2300 | General Electric | 900 |
| 60 | 2200 | Warren | 600 |
| KVA 60 | 2300 | Electrical Machinery | 900 |

**MacGOVERN & COMPANY, INC.**

285 BEAVER HALL HILL, MONTREAL

Offices: New York, Pittsburgh, Seattle. Plant: Linden, N.J.

Buyers and Sellers of New and Used Machinery



## WAITING

*For What?*

## LOWER PRICES

If you are just stop and figure out what it is costing you in efficiency and overhead.

**THEN**

join the wise ones and take advantage of this

**EXCEPTIONAL OFFER**

2—26″ x 12′ C.M.C.'s, 3-step cone, D.B.G., Q.C.G., complete with all equipment and in first-class operating condition.

1—No. 4 Greenard Arbor Press, practically new.

1—No 9 Badger State Hendey Whitmore Double End Punch and Shear, ½″ in ½″, first-class condition.

1—Smart & Turner 2-ton Hand Travelling Crane, 24′ span, a bargain for quick disposal.

1—24″ Bertram Shaper, rebuilt and equal to new.

1—No. 2 Garvin Universal Manufacturing Miller, complete with dividing head and equal to new.

A complete line of metal and woodworking machinery for immediate delivery. We are open to either buy, sell or exchange all kinds of spare equipment.

We are satisfying others, PERHAPS we can satisfy you.

Send lists of your requirements, together with list of spare equipment which you have for disposal. We can quote either new or used machines to meet all requirements at to-day's value.

**R. S. HOLLY**

Suite 502 Kent Building

TORONTO, ONTARIO

Phone Adel. 3147



## A Sacrifice

6 ft. used Bertram Plain Radial Drill with Speed Box.

42 x 36 x 44 ft. used Bertram Planer arranged for Motor Drive.

24 x 14 x 20 ft. C.M.C. used Gap Lathe.

**Machines in first-class condition, at greatly reduced prices, subject to prior sale.**

**Williams & Wilson Ltd.**

84 Inspector Street

MONTREAL



## STOCK SHIPMENTS

## Auto Body Steel

Deep Drawing Crown Fender Stock—Deoxidized—Oiled.

10,200 lbs., 23 Ga., 30″ x 96″ Primes
5,785 lbs., 23 Ga., 30″ x 96″ Seconds

Deep Drawing Hood and Fender Stock—Oiled.

8,265 lbs., 22 Ga., 30″ x 96″ Primes
1,435 lbs., 22 Ga., 30″ x 96″ Seconds

Regular Auto Body Stock—Oiled.

20,765 lbs., 20 Ga., 30″ x 96″ Primes
6,935 lbs., 20 Ga., 30″ x 96″ Seconds
3,220 lbs., 18 Ga., 39″ x 96″ Primes

Cold-Rolled Strip Steel and Bars.

Sheets—Black, Galvanized, Brass, Copper Aluminum.

Tubing—Welded and Seamless Steel, Brass, Copper, Flexible Steel Steam Hose.

**Your enquiries are solicited.**

**Ontario Metal Products Co.**

Limited

237 Dufferin St. - Toronto, Canada

# THE MACHINE YOU WANT AT A LOW PRICE

**VERTICAL BORING MILLS**
2—30″ London Machine Tool.
1—42″ Bullard.

**HORIZONTAL BORING MILLS**
1—4″ Bar Beaman & Smith Floor Type.
2—4″ Bar Bertram Elevating Table.
1—8″ Bar Barrett Cylinder Boring.
1—8″ x 7′ Canada Fdy. Co. Boring Bar.

**BOLT AND NUT MACHINERY**
1—2 Spindle Nut Tapper, ½″.
1—½ to 2″ Bolt Cutter.
1—¾″ National Nut Forging Machine.
1—1½″ Acme Bolt Header and Forging Machine.
1—4 Spindle Bertram Nut Tapper.
1—Blake & Johnson Thread Rolling Machine.
1—¼ x ½″ Pawtucket Cold Nut Press.

**BLOWERS**
1—No. 4 Roots Pressure Blower.
2—57 Cubic Ft. Connersville Blowers.
1—No. 10 Canada Blower & Forge Co. Blower.
1—No. 6 Sturtevant Blower.

**DRILLING MACHINES**
1—12″ Perfect Sensitive.
1—14″ Excelsior Sensitive.
1—0 to ½″ Capacity, National Sensitive.
1—20″ Prentice, Geared Drill, Plain Lever Feed.
1—20″ Bertram, Sliding Head, B.G., P.F.
1—25″ Barnes, Stationary Head, B.G., P.F.
2—20″ Style F Baker.
1—3′ Gang Radial.
1—5′ Western Radial.
1—6′ Western Radial.
1—5′ Bickford Full Universal Radial.
1—4′ London Semi-Universal Radial.
1—12′ MacGregor-Gourlay Plate Radial.
1—3′ MacGregor-Gourlay Wall Radial.
1—6-Spindle Crosby Mud Ring Drill.
1—13′ MacGregor-Gourlay Radial and Countersinking.

**GRINDERS**
18—Miscellaneous Pedestal Emery Grinders. Bench, floor and wet, 8 to 20″ wheel capacity.
1—8″ Goddard Piston Ring Grinder Magnetic Table.
1—40″ Can. Fdy. Co. Piston Ring Grinder.
1—12″ Pendrith Swing Arm.
1—Gisholt Tool Grinder.
1—Walker Universal Tool & Cutter Grinder.

**LATHE**
1—Brown & Sharpe Bench Lathe.
1—12″ x 5′ W. P. Davis.
2—14″ x 5′ Bertram.
1—14″ x 6′ Monarch.
2—14″ x 6′ Porter.
1—15″ x 8′ Le Blond.
2—16″ x 6′ Canedy-Otto.
1—16″ x 6′ MacGregor-Gourlay.
1—16″ x 6′ F. E. Reed.
1—16″ x 6′ Le Blond.
1—16″ x 8′ Cleveland.
1—16″ x 8′ Lodge & Shipley.
1—18″ x 6′ Cincinnati.
1—18″ x 12′ Porter.
1—18″ x 12′ Bertram.
1—18″ x 8′ Bertram.
1—18″ x 10′ Stevens Hamilton.
1—20″ x 8′ MacGregor-Gourlay.
1—20″ x 10′ Bertram.
1—20″ x 10′ Canada Machy. Corporation.
1—20″ x 10′ MacGregor-Gourlay.
1—20″ x 10′ Boye & Emmes.
1—20″ x 10′ London.
1—20″ x 10′ Whitcomb Blaisdell.
1—22″ x 8′ Bertram.
1—24″ x 10′ Bertram.
1—24″ x 12′ London.
1—24″ x 12′ Schumacher & Boye.
1—24″ x 20′ Stevens-Hamilton.
1—26″ x 12′ Fitchburg.
1—26″ x 16′ Bertram.
1—26″ x 18′ Bullard.
1—28″ x 10′ Pond.
1—40″ x 18′ London.
1—20″ x 34″ x 10′ London Gap.
1—18″ London Fox Turret.
1—14″ Bertram Fox Turret.
6—1½″ Wood Tilted Turret.
3—No. 4 Bardons & Oliver Turrets.
3—1¾″ National Acme Turrets.
1—Pratt & Whitney Turret.
8—6A Potter & Johnson.
5—16″ Bawden Single Purpose.
1—100″ Bertram Locomotive Wheel.
1—Bertram Axle Turning.

**MILLING MACHINES**
1—No. 00 Brown & Sharpe Bench.
1—No. 3 Hendey Universal.
1—No. 2 London Plain.
1—No. 13 Brainard Universal.
1—No. 3 Bertram Plain.
1—Brown & Sharpe Plain.
1—24″ Bertram Slab Miller Planer Type.
1—40″ Bertram Slab.
1—42″ Newton Vertical.
1—54″ Newton Slab.

**METAL PLANERS**
1—24″ x 24″ x 6′ London.
1—30″ x 30″ x 10′ London.
1—30″ x 30″ x 8′ Bertram.
1—36″ x 36″ x 10′ Bertram.
1—48″ x 48″ x 14′ Stirk.
1—87″ x 60″ x 16′ London.
1—106″ x 84″ x 28′ Bertram.
1—40″ x 40″ x 10′ Bertram.

**SHAPERS**
1—14″ Bertram Traverse, Double Table.
1—16″ T. W. Hand Traverse.
1—16″ Broadbent Traverse.
1—15″ Smith & Mills Plain.
1—20″ Hendey.
1—20″ Bertram.
1—24″ Morton Draw Cut.
1—30″ Morton Draw Cut.

**STEEL PLATE MACHINERY**
1—18′ Niles Plate Planer.
1—40″ Bertram Rotary Planer on Turntable.
1—27′ Allis-Chalmers Bending Rolls, capacity 1¼″ Plate.
1—9′ 6″ Bertram Straightening Rolls, capacity 1″ Plate.
1—8′ Smith Bros. Straightening Rolls, capacity 1″ plate.
1—7′ Rushworth Straightening Rolls, capacity ½″ Plate.

**PUNCHES AND SHEARS AND BENDERS**
1—Cleveland Beam Punch and Coping Machine, 24″ Beams.
1—Bertram double end, 32″ throat, capacity 1″ x 1″.
1—Long & Alstatter Bending Machine, capacity 15″ Beams and Channels.
1—Bertram Beam Coping Punch, capacity 24″ Beams.
1—No. 2 Bertram, double end, 30″ throat, capacity 1″ x ¾″.
1—Corbett, double end, 24″ throat, capacity ½″ x ½″.
1—Long Alstatter, double end, 18″ throat, capacity ¾″ x 1″.
1—Smith Bros., double end, 30″ throat, capacity 1″ x 1″.
1—Canada Machy. Corp., single end, 30″ throat, capacity 1″ x 1″.
1—Bertram Angle Shear, capacity 8″ x 8″.
1—Hilles & Jones Splitting Shears, capacity 1″.
1—Pells T-40 Beam Shear, capacity 15″ Beams and Channels.
1—Canada Machy. Corp., 60″ Gate Shear, capacity 1″.
1—Wangler Rotary Shear, capacity ¾″.
1—No. 2 Cleveland Bending Machine, capacity 24″ Beams.
1—Cleveland Horizontal Punch, capacity 1¼″ x 1″.

**PRESSES**
4—No. 666 Toledo Knuckle Joint.
5—No. 856 Toledo Rack and Pinion.
8—No. 857 Toledo Rack and Pinion.
2—No. 114 Toledo Semi-auto Reducing.
1—No. 45 Bliss, Straight Side, Geared.
1—No. 68N Bliss.
1—No. 57½ Toledo.
1—No. 166 Pawtucket.
1—No. 172 Pawtucket.
1—200-ton Pneumatic Forcing Press, 36 x 36 Platen.
1—Pneumatic Forging Press, 24 x 24″ Platens.
2—Hand Screw Presses.
1—MacGregor-Gourlay Notching Press.
1—No. 4 Zeh & Hahnemann Notching Press.
1—Champion Scrap Busheling Press.

**WOODWORKING MACHINERY**
1—12″ J. A. Fay Jointer.
1—16″ MacGregor-Gourlay Jointer.
1—32″ Crescent Band Saw.
1—MacGregor-Gourlay Rip and Cross-Cut Saw Table.
1—24″ McG.-G. Planer and Matcher.
1—McG.-G. "Daniels" Timber Planer.
1—54″ McG.-G. Band Resaw.
1—McG.-G. Railway Cut-off Saw.
1—McG.-G. 12″ 4-side Moulder.
1—McG.-G. 6″ 3-side Moulder.
1—McG.-G. 2-spindle Shaper.
1—McG.-G. 5″ Tenoner with Copes.
1—McG.-G. 20″ x 14′ Wood Lathe.
1—McG.-G. 48″ 3-drum Sander.
1—McG.-G. 4′ x 8′ Door Clamps.
1—McG.-G. 42″ x 6′ Sash Clamp.
1—McG.-G. Solid Spindle Mortiser.
1—McG.-G. Horizontal Boring Machine.
1—Jackson & Cochrane Horizontal Boring Machine.
1—No. 1 Beach Scroll Saw.
1—Covel Band Saw Stretcher.
1—No. 2 Oliver Wood Trimmer.

**MISCELLANEOUS**
1—10″ Crosby Slotting Machine.
1—24″ Bertram Triple Head Locomotiv Frame Slotter.
2—4″ Pipe Machines.
1—2″ Pipe Machine.
2—Coil Winding Lathes.
1—Coil Winding and Measuring Machine.
6—Bull Riveters, 9″ to 42″, Allan & Hanni
8—6″ Racine H.S. Hack Saws.
2—6″ Marvel H.S. Hack Saws.
1—10″ Racine H.S. Hack Saw.
1—Hand Bending Machine.
1—12″ x 72″ Grindstone with bearings.
2—3-ton Harrington Hoists.
1—2-ton Harrington Hoists.
1—2-ton Sprague Electric Hoist.
1—Single Friction Drum Cable Hoist.
1—Sand Mill.
1—No. 2 Garvin Tapping Machine.

***We Solicit your enquiries.***

## CANADIAN ALLIS-CHALMERS, LIMITED

**King and Simcoe Sts., TORONTO, ONT.**

# We Are Selling Out Our Entire Plant

***Prospective Buyers of Various Equipment will find in our List some very attractive offers***

**LATHES**
2—16″ L. & S. Selective Head.
2—16″ Reed-Prentice.
1—20″ Reed-Prentice.
3—14″ C.M.C. Lathes.
1—Bench Lathe.
1—24″ L. & S. Lathe.
1—16″ C.M.C. Lathe.
1—14″ Amer. Tool Lathe.
1—24″ Bridgeford.
1—Brightside Roll Turning Lathe.

**TURRET LATHE**
1—3¼″ No. 2A Warner & Swasey.

**HACK SAWS**
8—Racine Hack Saws.
4—Ed. Herbert Hack Saws.

**GRINDERS**
1—Landis Universal.
1—Walker Double Stroke Surface.
1—Walker 10″ Single Stroke.
1—Norton 10″ x 50″ Plain, No. 2178.
2—B. & S. No. 3 Cutter Grinders
3—B. & S. No. 2 Cutter Grinders.
1—Wells No. 190.
1—Walker 8″ Surface.
2—B. & S. No. 11 Plain.
2—B. & S. No. 10 Plain
1—B. & S. No. 13 Surface.
2—Heald No. 70 Boring.
1—Rivet No. 3 Boring.
1—Landis 10″ x 20″.
1—Landis 12″ x 42″ Plain.
1—Valley City Duplex Tool.
1—Ford-Smith.
2—Holroyd Grind Relieving Machines.
2—Wilmarth & Mormen Drill Grinders.
1—Washburn Drill Grinder.

**MILLING MACHINES**
1—No. 0 Reinecker Miller.
1—P. & W. Duplex Spindle Profiler.

**CENTERING MACHINES**
1—Hendey.
2—Wells. No. 132.

**WOODWORKING MACHINERY**
1—Circular Saw.
1—Band Saw.
1—Stamping Machine.

**AUTO SCREW MACHINES**
1—¾″ Cleveland Automatic.
1—1¼″ Cleveland Automatic.
1—2″ 6-spindle Cleveland Automatic.
1—1¼″ 4-spindle Cleveland Automatic
1—2¼″ Gridley Automatic.
1—4¼″ Gridley Automatic.
1—2″ Cleveland Automatic.

**RELIEVING LATHES**
1—Holroyd Universal.
1—2A Reinecker Universal.
1—Flather Plain.
4—A. W. Plain.

**DRILLS**
1—J. Bertram Drill Press.
1—Avery Drill Press.
1—A. Herbert Single Spindle.

**FLUTING MACHINES**
1—Holroyd ¼″ to ½″.
1—Holroyd ½″ to 1″.
1—A. W. 1½″ to 2″.
1—Holroyd 1″ to 2″.

**BOILERS**
2—500 H.P. B. & W. Boilers.
2—500 H.P. G. & McC. Boilers.
2—250 H.P. G. & McC. Boilers.
1—100 H.P. G. & McC. Boilers.

**BORING MILLS**
2—100″ C.M.C. Boring Mills.
1—72″ Stirk Boring Mill.
1—42″ Bullard Boring Mill.

**PRESSES**
1—Morgan Hydraulic Stamping Press.
1—Morgan 1,000-Ton Steam Hydraulic Press.
1—Morgan 2,000-Ton Steam Hydraulic Press.
1—Morgan 600-Ton Steam Hydraulic Press.
1—United Eng. 500-Ton Steam Press.
1—Morgan Centering Press.

**PUMPS**
2—Smart - Turner Double Acting Boiler Feed Pumps.
1—Deane Hydraulic Pump.
1—Darling Bros. Vacuum Pump.
2—Can. Allis-Chalmers No. 3 Single Stage Turbine Pumps.

**ELECTRIC FURNACES**
1—3-Ton Heroult Tilting Furnace.
2—6-Ton Heroult Tilting Furnaces.
1—6-Ton Heroult Rocking Furnace.

**ROLLING MILLS**
1—9″ Boonton Rolling Mill.
1—12″ Lamberton Rolling Mill.

**JIB CRANES**
6—2-Ton Jibs, complete with Air Hoists.

**STEAM ENGINES**
1—1,000 H.P. C.C. Steam Engine.
1—350 H.P. Porter Allen Simple Steam Engine.
1—1000 H.P. Tod Simple Steam Engine.
1—600 H.P. Goldie & McCulloch C.C. Steam Engine.

**CRANES**
2—Lowground Charging Machines.
4—5-Ton Whiting Cranes, 48 ft. span.
1—15-Ton Whiting Crane, 72 ft. span.
1—15 Wellman, Seaver & Head, 72 ft. span.
1—5-Ton Whiting Crane, Hand Operated.
1—10-Ton Whiting Crane, Hand Operated.

**STEAM HAMMERS**
1—Bertram, 3-ton.
1—Massey, 1-ton.
1—Massey, 12 cwt.
1—Massey, 8 cwt.
1—Massey, 4 cwt.

**SHEARS**
1—Craig & Donald Shear.
1—Long & Alstatter Shear.
1—Hydraulic Shear.
1—Cleveland Shear.

**MISCELLANEOUS**
1—Amer. Tool No. 2 Oil Separator.
2—Auto. Machine Co. Threading Lathes.
1—Hoefer Tap Threading Machine.
1—A. S. Thread Grinder.
1—Taylor & Hobson Etching Machine.
1—No. 4 Tilghman & Brockman Sandblast.
2—Ed. Herbert Hack Saws.
1—Bar Reeling Machine, 1¼″ Rd. to 2¼″ Rd.
1—Tyre Rolling Mill.
1—Wheel Rolling Mill.
1—600 H.P. Cochrane Leed Water Heater.
1—Hydraulic Accumulator, 1,500 lbs. pressure.
1—Bar Straightening Machine, ¼″ to 1¼″.
9—Swing Grinders.
1—Crosseley Coke Grinder.
1—Betts Horizontal Boring Mill.
1—Crosseley 20″ Pug Mill.
1—Crosseley Crucible Pot Moulding Machine.
2—Champion Blacksmith Forges.
1—American Clay Co. Hot Top Machine.
1—American Clay Co., 7 ft. Wet Pan.
1—Newton Cold Saw.
6—10-Ton Ladles.
1—Tensile and Bending Testing Machine.
1—Brinell Testing Machine for Hardness.
1—Microscopic Photographic Bench.
1—Canadian Ingersoll Air Compressor, 732 cu. ft. per min.
1—Powdered Coal Plant, complete.
2—Bruce Peebles Motor Generator Sets, 350 K.W. each.
1—Swedish General Electric Steam Driven Generator, 375 K.W.

***Complete line of motors in various H. P. and Speeds.***

***Permission to view plant can be obtained at***

## Armstrong Whitworth of Canada, Limited

**298 St. James Street, Montreal**

# Let Us be Your Toolroom

We have one of the finest equipped shops for producing

**Tools, Dies, Fixtures, Gages and Special Machines**

## CONTRACT WORK

Our organization and equipment is at your service for the economical manufacturing of your product

*We solicit your enquiries*

**British Canadian Machine & Tool Co., Ltd.**

111 Adelaide St. West, TORONTO, CANADA



# MACHINERY FOR SALE

### Lathes

1—26″ x 12′ Pond Lathe, S.B.G., C.R., P.C.F.
1—24″ x 12′ New Haven Lathe, D.B.G., S-Q.C.G., C.R.
1—24″ x 12′ Can. Mach. Lathe, S.B.G., C.R., P.C.F.
2—22″ x 10′ Davis Lathes, D.B.G., Q.C.G., C.R.
1—22″ x 10′ Rahn-Larmon Lathe, S.B.G., S-Q.C.R., C.R.
1—21″ x 10′ London Lathe, S.B.G., C.R., P.C.F.
4—20″ x 8′ C.M.C. Lathes, D.B.G., S-Q.C.G., C.R.
3—18″ x 8′ C.M.C. Lathes, D.B.G., Q.C.G., C.R.
1—18″ x 10′ Butler Lathe, D.B.G., Q.C.G., C.R.
1—18″ x 8′ London Lathe, S-Q.C.G., D.B.G., C.R.
1—16″ x 6′ McDougall Lathe, S.B.G., S-Q.C.G., C.R.
1—18″ x 8′ Mueller Lathe, D.B.G., Q.C.G. Turret on cross slide.
1—14″ x 6′ Flather Lathe, S.B.G., Q.C.G., C.R.

### Shapers

1—16″ Butler Shaper.
1—12″ Port Hope Shaper.

### Drills

1—No. D-1 H.D. Colburn Drill.
2—No 24 H.D. Foote Burt Drills.
1—28″ Barnes Drill, B.G., P.F.
1—22″ Barnes Drill, B.G., P.F.
3—20″ McDougall Drills, W. & L.F.

### Miscellaneous

2—2″ x 26″ Pratt & Whitney Turrets.
1—No. 2 Gardner Disc Grinder.
1—3″ Acme Bolt Cutter.

## YEATES MACHINERY

HALE STREET
LONDON, ONT.



# FORD-SMITH

**Secure our Estimates on Your Requirements in the Shape of**

# SPECIAL MACHINERY

## DIES, JOBBING WORK, ETC.

Expert machinists of long experience only are employed in the construction of our special machines in addition to those employed on—

**OUR REGULAR LINES OF**

**Milling Machines, Motor Driven and Belt Driven Grinders, Polishers, Disc Grinders, Swing Grinders.**

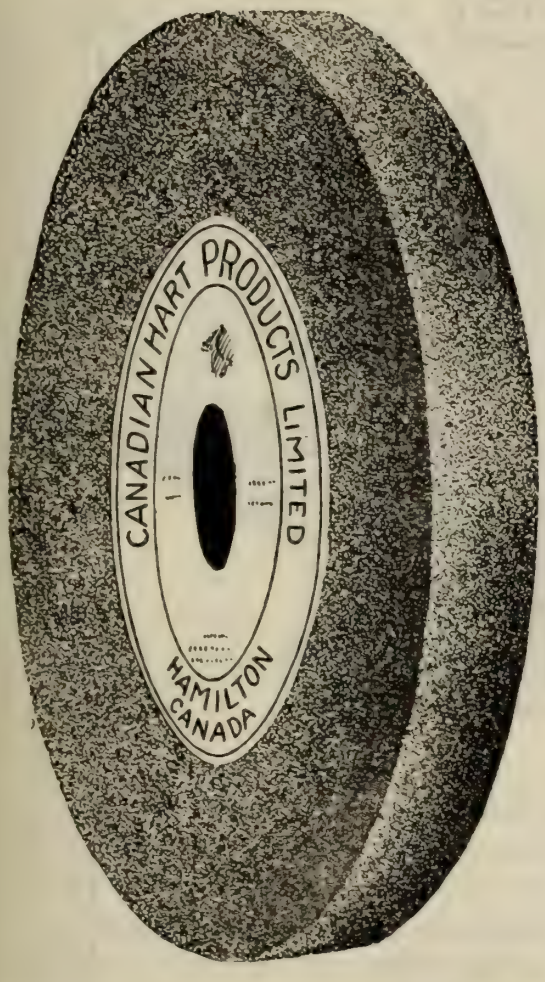
***Our Engineering Staff is Ready to Advise You!***

## THE FORD-SMITH MACHINE CO., Limited

**Hamilton, Ontario, Canada**

# CANADIAN HART WHEELS

## *Vitrified — Silicate — Shellac*




**Canadian Hart Vitrified Wheels**—recommended for the majority of grinding jobs. May be used wet or dry; give better all-around satisfaction and have a longer life.

**Canadian Hart Silicate Wheels**—can be made in twenty-four hours and are often substituted when it is inconvenient to wait the required length of time for Vitrified Wheels.

**Canadian Hart Shellac or Elastic Wheels**—indispensable for slotting work where a thin wheel is required, or for work requiring a special finish. Can be operated wet or dry.

**Tell us what you want to grind and we will tell you the wheel to use for the best results.**




## Canadian Hart Products
LIMITED

**Hamilton - Ontario**

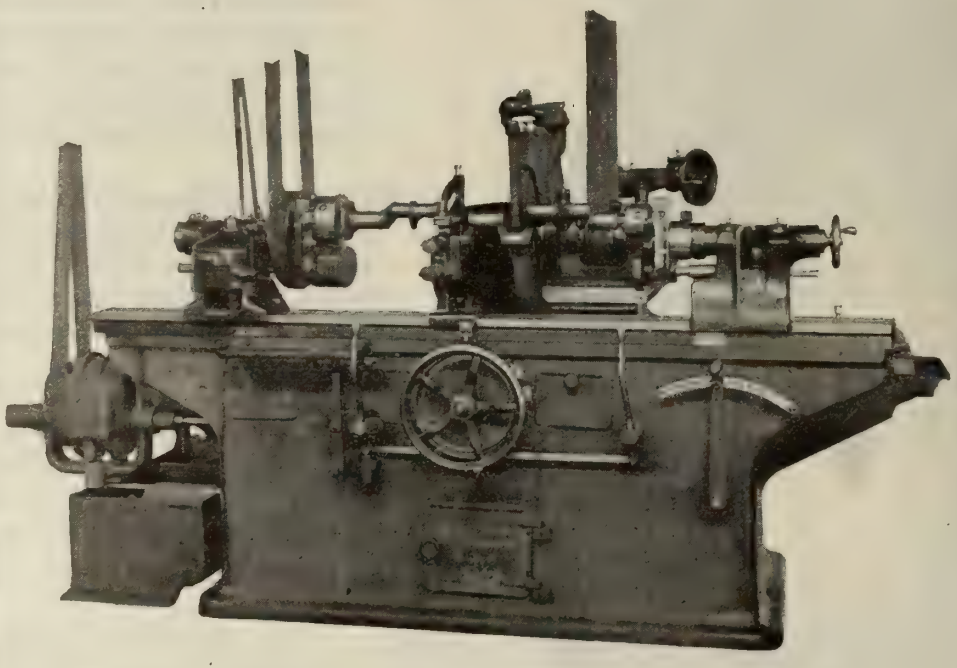
**Made in Canada**

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# For Regrinding ALL Types of Crankshafts

## No. 4-A Special Grinding Machine

LANDIS



Why turn away the best jobs when you can handle them on a Landis 4A Special? This machine was designed especially for performing every operation necessary to put the gasoline motor in first-class condition.

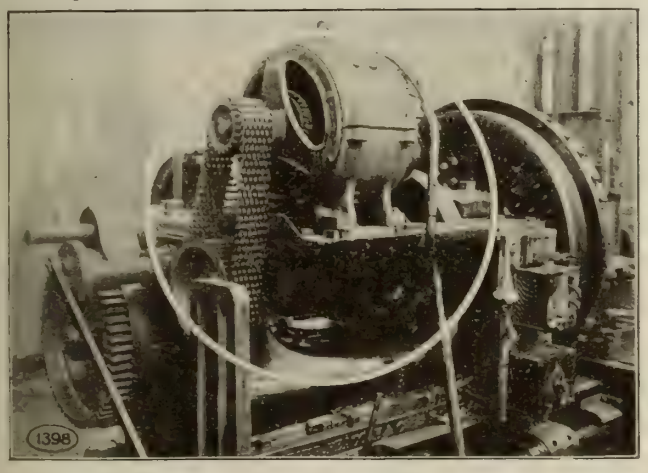
Let us show you what this machine has done for others—it will do the same for you. Send for literature.

## Landis Tool Company, Waynesboro, Pa.

Canadian Agents: A. R. Williams Machinery Co., Toronto, Winnipeg, Vancouver.
Williams & Wilson, Montreal.

# RENOLD
## DRIVING CHAINS

**Reliable — Efficient — Durable — Compact**

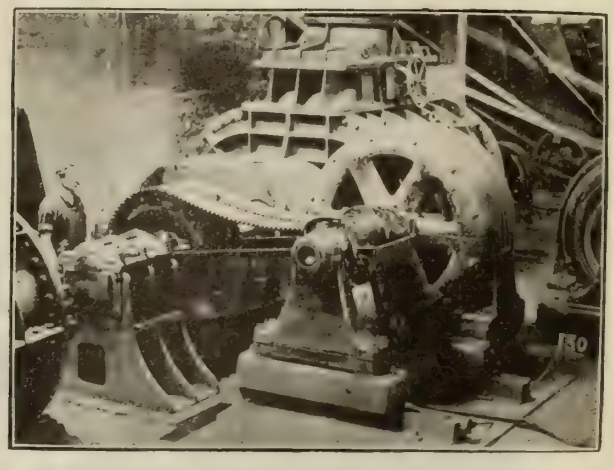



20 H.P. "RENOLD" SILENT CHAIN OPERATING 36-IN. LATHE

No Power too Small.
No Power too Large.
No Drive Impossible.
Noiseless in Operation.
Unaffected by Heat, Cold or Dampness.
Short Centres—Positive Speed Ratios.
Maximum Life and Durability.
Efficiency 98.2%.

Have YOU any Power Transmission Problems, Noisy Gears, or Slipping Belts? If so, *write us.* Our Engineering Service is at your disposal.

*We carry large stocks of Silent and Roller Chains at Montreal. Quickest possible deliveries of complete Drives ensured.*



350 H.P. DOUBLE-STRAND RENOLD SILENT CHAIN DRIVE OPERATING ROOTS BLOWER.
(Note: Top half of Oil-Bath Chain Case removed)

**THERE IS ONLY ONE "RENOLD" CHAIN**

Sole Canadian Representatives:

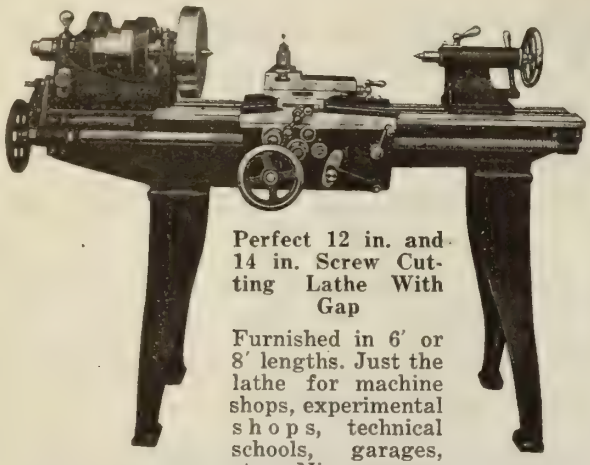
## HANS RENOLD OF CANADA LIMITED

HEAD OFFICE
11 St. Sacrement Street
MONTREAL

BRANCH OFFICE
32 Front Street West
TORONTO

*If interested tear out this page and place with letters to be answered.*

# PERFECT MACHINES



**Perfect 12 in. and 14 in. Screw Cutting Lathe With Gap**

Furnished in 6′ or 8′ lengths. Just the lathe for machine shops, experimental shops, technical schools, garages, etc. Nice convenient design, small consumption of power, and low price.

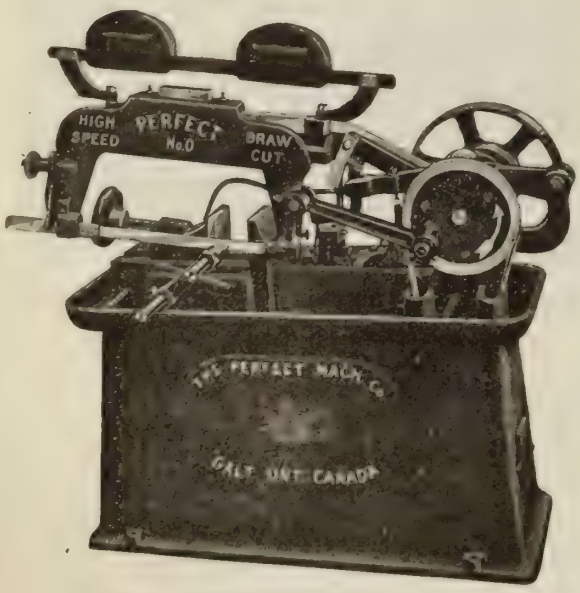
**Satisfy Your Requirements from this array of Tested Machines**

Every machine we feature here is thoroughly reliable and guaranteed to give satisfaction. We are proud of their "performance" records. Every tool subjected to the most rigid tests before leaving our plant.



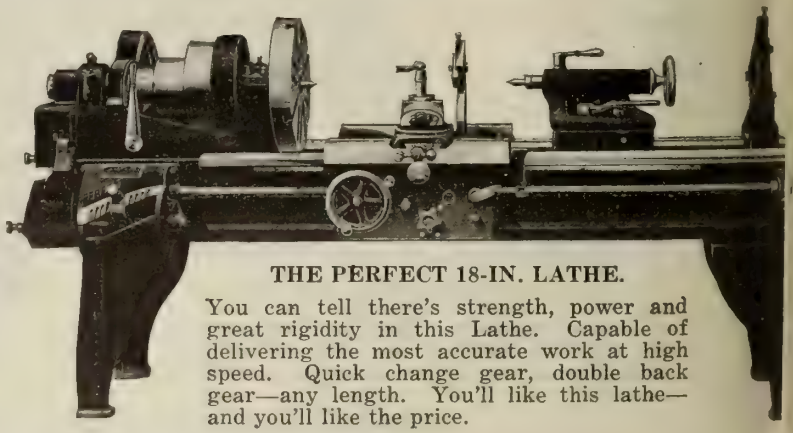
**NO. 19 DRILL**

Lots of power here. Handles a drill from 0 to 29/32. Geared 2 to 1, and driven by a 2-in. belt.




**NO. 0 PERFECT HACK SAW**

Look at this sturdy little worker. It's a High Speed tool and **perfectly** built. Capacity 0″ to 6″ or more on request. Speed 120 R.P.M. Weight, 600 lbs.



**THE PERFECT 18-IN. LATHE.**

You can tell there's strength, power and great rigidity in this Lathe. Capable of delivering the most accurate work at high speed. Quick change gear, double back gear—any length. You'll like this lathe—and you'll like the price.

# PERFECT

## GALT,

**For Sale in Canada by All**




## Perfect Machine Company, Limited, Galt, Ont., Canada

THE Perfect Machine Co., Limited, manufacture a very high grade line of Iron Working Tools, consisting of Lathes for Tool Room, Machine Shop, or Garage; Drill Presses, Hack Saw Machines, Buffing Lathes, Grinding Machines, Drill, Shaper and Bench Vises, and special Machines of any kind.

We solicit Pattern and Model Making, and also make Grey Iron and Semi Steel Castings.

**S. L. CLARK, President and Managing Director.**
**WESLEY CLARK, Vice-President.**
**R. M. RENWICK, Secretary-Treasurer.**

**Directors: JOHN S. RUMBLE.**
**WM. B. CALL.**
**Superintendent, GEO. J. CLARK.**

---

# *Mr. Manufacturer:-*

### If you're not already located here, why not do *your* manufacturing in Canada?

Arrangements could be made with us with this end in view that would be mutually advantageous.

We have an up-to-date Foundry, Pattern Shop, Machine Shop, and Mechanics second to none.

Can we not co-operate and manufacture your goods as well as our own?

***If You're Interested, Write***

# MACHINE CO., Limited

## ONTARIO

**Leading Machinery Houses**

*Represented in Great Britain by*

***FRY'S (London) Limited***

*If interested tear out this page and place with letters to be answered.*

# HACK "STERLING" SAWS




*MANUFACTURED BY*
DIAMOND SAW & STAMPING WORKS -:- BUFFALO, N.Y., U.S.A.

# EMPIRE

TOOLS, DIES, JIGS AND FIXTURES

are made with the idea of increasing the *quality* and *quantity* of your product. Our production department can do your manufacturing in a manner pleasing and *profitable to you.*

Send us your Enquiries and Blue Prints.

## EMPIRE TOOL WORKS

100 King St. W.
Adelaide 5274 TORONTO, ONT.

## Don't Keep It--Sell It!

If you have a lathe
a drill
a milling machine
a planer
a chain block
a chuck
a motor
a crane
a stock of belting
an engine
a compressor
or any other machine shop equipment for which you really have no further use, why not turn it into *cash?*

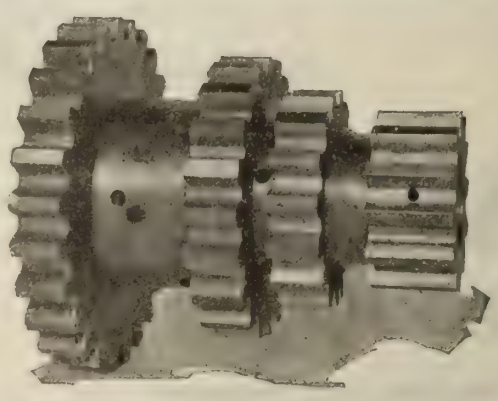
Someone may be looking for just the machine you may want to sell. Let us bring you together.

A "classified" ad. in CANADIAN MACHINERY, costing a few cents per issue, has done wonders for others. Why not try it?

Turn to the "Classified" section in this issue and see what is being offered and what is wanted at present.

**CANADIAN MACHINERY**
*Classified Advertising Section*
143-153 University Avenue TORONTO, ONT.

THIS IS TO CERTIFY THAT
Canadian Machinery and Manufacturing News
HAS SUBSCRIBED TO THE STANDARDS OF PRACTICE AND IS ENTITLED TO THE PRIVILEGES AND BENEFITS OF MEMBERSHIP IN
THE ASSOCIATED BUSINESS PAPERS, INC.

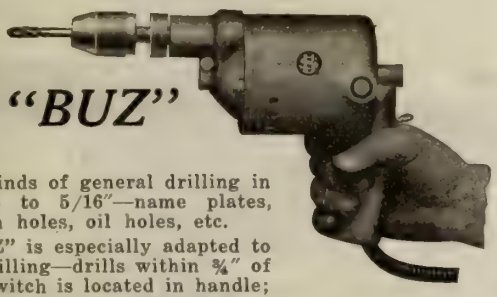


CUT GEARS

*Good Gears*

**Hamilton Gear & Machine Company**
Van Horne Street, TORONTO

# United States Electric Drills and Grinders



## The "BUZ"

For all kinds of general drilling in metal up to 5/16"—name plates, cotter pin holes, oil holes, etc.

The "BUZ" is especially adapted to corner drilling—drills within ¾" of corner. Switch is located in handle; under absolute control at all times. Attaches to any lamp socket, alternating or direct current, 110 or 220 volts. Guaranteed the most powerful electric drill of its weight on the market.

Order a few to-day for trial. Their time and labor saving ability will convince you you need more!

For Sale By

**The Canadian Fairbanks-Morse Co., Limited**

Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver

**THE UNITED STATES ELECTRICAL TOOL CO.**

CINCINNATI, OHIO



This is a Canadian - Made Planer. Standard size 42" x 42" x 10' 0". For general dependability use a Hepburn. It pays.

# HEPBURN

## HIGH-SPEED PLANER

The material in this Hepburn Planer is of the best, and the workmanship equal to any other. Thus long service is assured.

Two or four heads supplied as required. The rack is of cast steel and the pinions are made solid with the shafts. Write for specifications.

We also manufacture Power Presses, Cranes, Pumps, Engines, Cut Gears and Grey Iron Castings.



**JOHN T. HEPBURN**

LIMITED

*Engineers and Iron Founders*

18-60 VAN HORNE ST.

TORONTO, ONT.


# Do You Read These Advertisements?

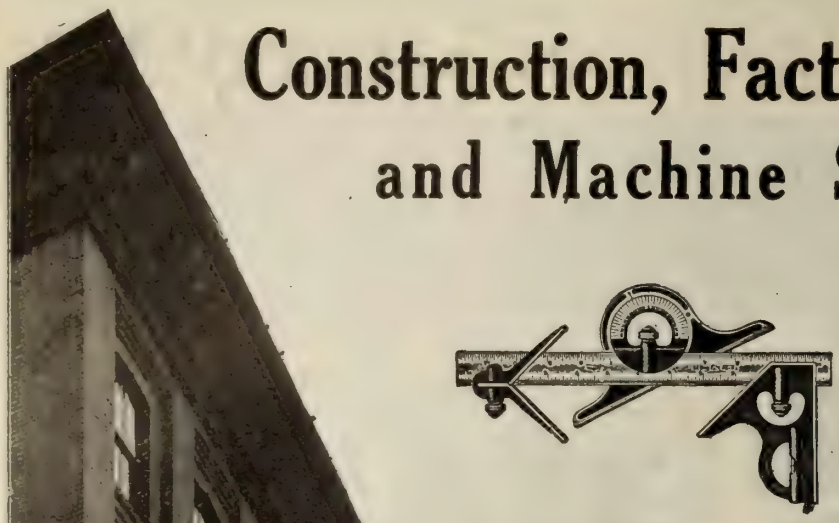
Every advertisement in this magazine is worth reading. It is the product of some concern that is using a modern method of making sales, viz., technical paper advertising, in order to present most effectively to you the leading features of its line.

These advertisers are making it easier for you to buy intelligently with the least waste of your time and theirs. They realize that a sales force cannot replace this service at equal cost. They know that advertising is good business, for the manufacturer who does not advertise cannot save the cost of advertising. Consistent advertisers are progressive merchandisers. They are saving your money and their own; and it pays to do business with them.

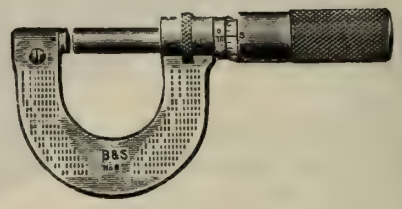
Don't miss your opportunities. These advertisements are interesting. Many are distinctly instructive, and a glance through them every month will keep you posted on the latest developments for machinery equipment.

*If interested tear out this page and place with letters to be answered.*

# Construction, Factory, Foundry and Machine Shop Supplies






Bar Iron; Sheet Iron (black and galvanized); Mild Steel; Machine Steel; Cast Steel; High-speed Steel; Carbon Steel; Cold-rolled Steel.

Hack Saw Blades, Machine Screws, Set Screws, Cap Screws, Drills (Carbon and High-speed), Files, Starrett, Brown & Sharpe, and other Machinists' Tools, etc.

For seventy-three years our products have been well and favorably known to users of hardware and metal supplies throughout Canada. We handle only reliable lines and endeavor to render satisfactory service to all our customers.

We shall be glad to quote prices and dates of delivery on such of our lines as interest you.

## RICE LEWIS & SON, Ltd.

*Established 1847*

19 VICTORIA STREET
TORONTO






# A Big Thing in Ball Bearings

EVEN if ball bearing manufacturers considered case-hardening economy more important than the quality and uniformity and dependability of the case, Cast Nichrome Retorts and other styles of Nichrome Containers would still serve them to best advantage.

The economy that comes from less spoilage of expensive materials, of the shorter heats and less fuel consumption, is in addition to the economy that comes from the longer life of Cast Nichrome Containers. Thousands of furnace hours at 1800°F. are *guaranteed*.

*Manufactured under HENDERSON PATENTS*

CANADIAN DRIVER-HARRIS CO.
WALKERVILLE, ONT.
American Office and Works
Chicago-Detroit Harrison, N. J. England-France

Retorts of

# Cast Nichrome

ENDURE IN HIGH TEMPERATURE

*If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.*

# *Let's Be Reasonable*

Does any reader of this page believe that **at this time** a re-adjustment of wages and hours in the printing industry involving an increase in labor costs of 36 per cent. is justified?

"Well," the reader asks, "What **are** present wages and hours?"

Toronto printers now have a minimum wage scale of $35.20 per week for 48 hours. This is an increase of 10 per cent. over the scale called for in the agreement now expiring and was granted voluntarily by employers a year ago.

Their demands now are for a wage of $44 per week for 44 hours.

This is an increase of $8.80 per week for four hours less work.

It means an increase in labor costs of 36 per cent.

Toronto employing printers feel that they cannot grant these demands, and they believe that the general public will support them in their opposition to an increase of from 73c per hour to $1.00 per hour to printers, pressmen, bookbinders, and mailers, **at the present time** and in view of business conditions **as they now exist.**

It is understood that International Union officials at Indianapolis have issued orders to local unions that the 44-hour week must be the basis of all new agreements.

In this order, employing printers believe that these Indianapolis officials are out of line with the need which is apparent in every industry for lower cost of production.

This is not a time for saddling any industry with an additional 36 per cent. labor cost, and publishers and job printers feel that they are justified—in the interest of the public—in resisting this unreasonable demand from Indianapolis.

The issue will be decided between now and June 1st. If the union demands of an increased wage of $8.80 per week for 4 hours' less service are not withdrawn, a strike seems inevitable.

Pressure, therefore, must be brought to bear upon the officials at Indianapolis. They must be shown by members of the local union (many of whom feel that they are being forced to make unreasonable demands) that the Canadian public which buys the product of the printing craft, either in the form of advertising or subscription, does not look with favor upon any ruling which would add so heavily to the cost of that product.

Publishers and job printers in Toronto want to be fair. This is indicated by their action in voluntarily raising wages a year ago.

They must, however, in justice to themselves and the public they serve, resist these impossible demands.

## Let's Be Reasonable

**An expression of opinion of readers of this paper on the Union's proposals, involving an increase of 36% in the labor cost of printed matter, is asked. Will you not write a letter (no for publication) telling him your view of the situation?**

***This statement is published by and has received the endorsation of Toronto publishers who are members of the***

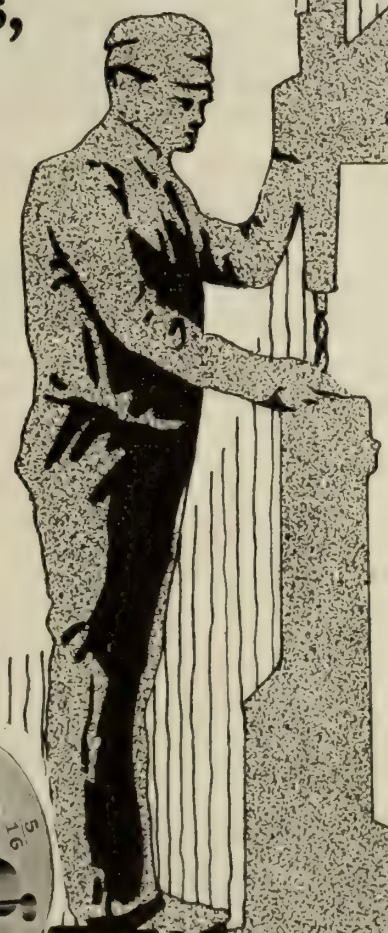
## Canadian National Newspapers and Periodicals Association

**including Cdnadian Machinery**

# BUTTERFIELD

## Drills, Reamers, Milling Cutters, Taps and Dies

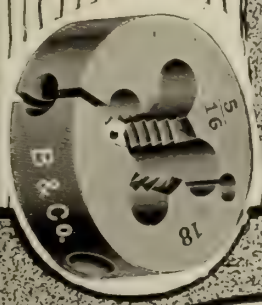
*THE TOOLS YOU BUY AGAIN*

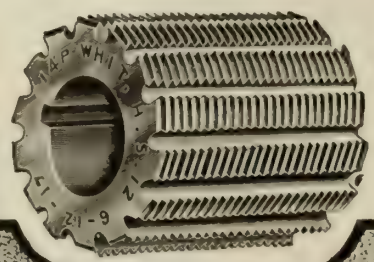


MERIT in tools to-day is judged by their ability to do efficient work, save labor and expense. These are the factors the Butterfield engineers have aimed to impart to all Butterfield products. That Butterfield *engineers* have succeeded in their aim is proven by the ever increasing demand for Butterfield TWIST DRILLS, REAMERS, MILLING CUTTERS, TAPS AND DIES.

If you have not used Butterfield tools you must admit they are worth giving a trial.







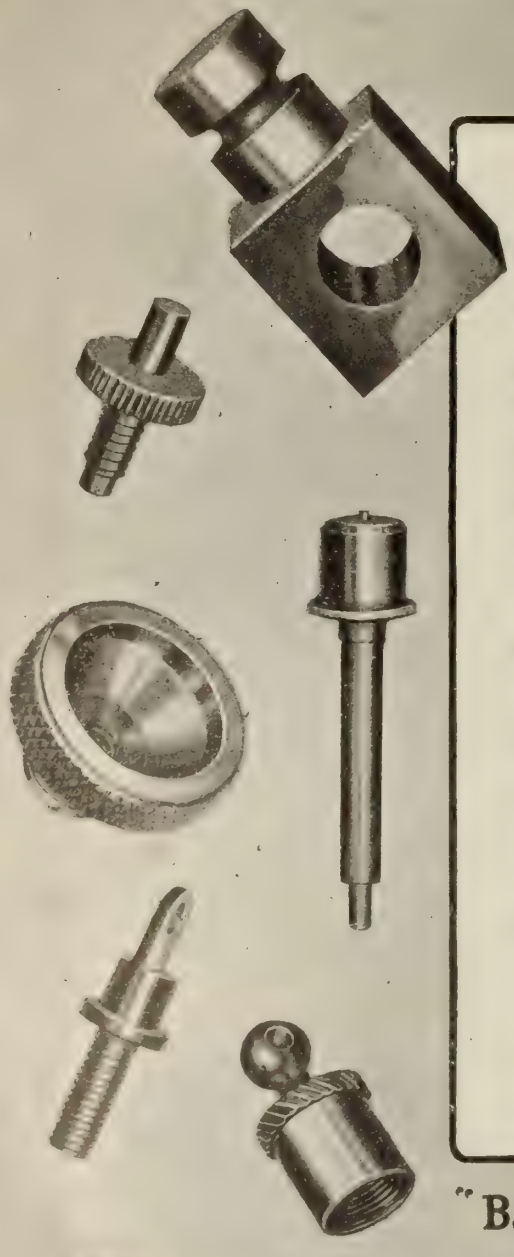


**Butterfield & Company,** Division
UNION TWIST DRILL CO.
Rock Island, Que. - - Canada

Stores:—220 King Street West, Toronto. 131 St. Paul Street West, Montreal.
Agents:—D. Philip, 138 Portage Ave., Winnipeg, Man. The Triangle Co., Standard Bank Bldgs., Vancouver, B.C.

Foreign Representatives: Great Britain, Geo. H. Alexander, 82-84 Coleshill St., Birmingham, England. France, Italy, Belgium and Switzerland, Fenwick Freres, 8 Rue de Rocroy, Paris; Sweden, Norway and Denmark, Ab Sigfr. Anderson & Co., Malmo; Spain, Casamajana Hermanos, Barcelona; Japan, Abe-Kobet & Co., Yokohama; Greece, Stephen C. Stephanson, 11 Lycourgan St., Athens; Netherlands, Wynmalen & Hausman, Rotterdam; Australia, H. R. Richardson, 82 Pitt St., Vickery's Chambers, Sydney; South America, Charles Dreyfus, B. Mitre 735, Buenos Aires, R.A.; South Africa, H. Parker Wood, Cape Town, Durban and Johannesburg.

# The Wallace Barnes Company



SPRINGS, WIRE & STEEL — EST. — "BARNES-MADE" PRODUCTS — 1857 — SCREW MACHINE PRODUCTS

**This Company is equipped to make a thousand-and-one Small Parts, threaded or unthreaded, and of "Barnes-Made"—meaning of *guaranteed*—accuracy.**

**In any metal, according to specifications or requirements—plain, case-hardened or any other finish.**

**Limits: 1¼ inches in diameter.**

***Let us quote on your requirements.***

THE WALLACE BARNES CO.

*"Spring Makers for Three Generations"*

Main Office and Works: Bristol, Conn.

Western Office: Book Bldg., Detroit

**"Barnes-made for every trade"**





# *Oakite Saves Over $4,000 a Year On One Cleaning Operation*

This Advertisement is one of a series based on actual occurrences.

In a certain plant, small brass parts were washed with soda ash to remove rubber compound. Soda ash left a sediment, so 5 girls had to be employed to scrub the parts with soap to remove the sediment.

This operation was slow, tedious and costly.

An Oakite representative was given an opportunity to investigate cleaning conditions in this plant. The use of 30 lbs. of Oakite every week to replace 444 lbs. of soda ash was recommended and Oakite was adopted.

The parts now come from the tank absolutely clean. No sediment. No scrubbing.

Oakite has saved this plant $83.52 weekly on one cleaning operation—or more than $4,000 a year.

We have a representative in your territory. May we ask him to call at your plant and have him go over your cleaning requirements with you? This will take but a few minutes of your time, and you can find out just what it would involve to run a competitive test on your work. He can perhaps indicate just what results you can expect and offer suggestions as to methods and materials best suited to your work.

Now is the time to cut expenses. A request from you for an Oakite service man to call to look over your cleaning problem places you under no expense or obligation whatever. Write to-day.

**Resident Canadian Representatives: Mr. C. P. Murphy, Toronto, and Mr. C. Burgin, Montreal**

**OAKITE** MANUFACTURED BY OAKLEY CHEMICAL CO. 44 THAMES STREET · NEW YORK

*If interested tear out this page and place with letters to be answered.*




# BRADLEY HAMMERS

*Upright Helve Hammer*

## When the Work is Severe and Continuous

The Bradley Upright Helve Hammer is of that type in which the head or ram is operated vertically in guides or ways.

As the dies in this style of hammer are always parallel regardless of the opening between them, it is most desirable for general jobbing of a severe nature, where frequent variation in the size of stock occurs, and where forgings are made from flat stock that must be edged up.

*"Forge Ahead with a Bradley Hammer"*

The Bradley Upright Helve Hammer we recommend where the work is exceptionally severe and continuous. For work of a lighter nature of the same style the Bradley Upright Strap Hammer is our choice.

Bradley Hammers contain more material than others. The Anvil Blocks are much heavier in proportion to weight of head. Their design and the workmanship put upon them are of the highest order. They are Cushioned Hammers in the very best sense of the word. These are some of the features that justify us in guaranteeing them to do a quarter more work with less power and fewer repairs than any other belt Hammer in the world.

## C. C. BRADLEY & SON, Inc.

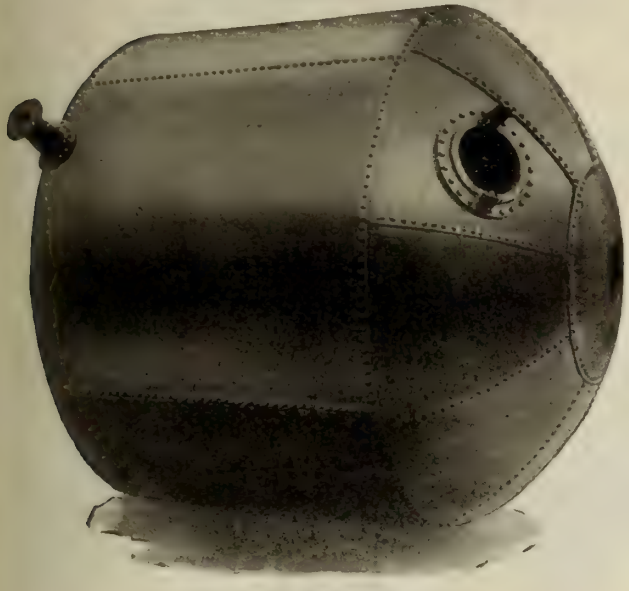
**SYRACUSE, N.Y.**

*Bradley Hammer Builders for 49 Years*

**FOREIGN AGENTS:** England, Buck & Hickman, Ltd., London; France, Fenwick Freres & Co., Lyons, Rhone; Italy, Fenwick Freres & Co., Turin; Belgium, Fenwick Freres & Co., Liege; Brazil, Fenwick Freres & Co., Rio de Janeiro; Switzerland, Fenwick Freres & Co., Zurich; Portugal, Fenwick & Co., Lisbon; Spain, Fenwick Freres & Co., Barcelona; Alsace-Lorraine, Fenwick Freres & Co., Luxembourg; China, Anderson Meyer & Co., Ltd., Shanghai.

# STEEL TANKS

## LIGHT and HEAVY



T.I.W. STEEL PLATE CONSTRUCTION

IF it's a tank or any piece of steel plate construction we can make it.

*Here are a few of our lines:—*

**STORAGE TANKS**
*for—*
Oil Refineries
Oil Distributing Stations
Sugar Refineries
Distilleries
Packing Houses
Soap Works
Chemical Works
Asphalt Plants
Cyanide Installations
Varnish Works

**PRESSURE TANKS**
Filter Tanks
Air Receivers
Hydro-Pneumatic Tanks
Hot Water Tanks

Blow-off Tanks
Steam Jacketed Tanks

**BINS and HOPPERS**
*for—*
Coal and Ash Handling Systems
Grain Elevators
Mines and Quarries

**SMOKE STACKS**
**BOILER BREECHINGS**
**RIVETED STEEL PIPE**
**PENSTOCKS**
**CAISSONS**
**TANK WAGONS**

**Consult us about your requirements or for Acetylene or Electric Welding.**

THE
**TORONTO IRON WORKS**
LIMITED

HEAD OFFICE: ROYAL BANK BLDG. TORONTO WORKS: CHERRY STREET





Franklin Die-Castings Used in Vending Machines

# *Speeding Up Distribution*

The strenuous life of to-day has practically crowded out leisure even at meals. "Automats," which now supplant old time taverns, save the business man valuable time, while smaller vending machines for distributing confections and matches add to his comforts.

This need for speedy distribution has been aided by the application of Die-Castings to vending machines.

In 1892 we originated the Die-Casting Process, and for nearly thirty years we have been reducing the cost and simplifying the output in many fields of industry. The addition of the standard No. 12 Aluminum to the Tin, Lead and Zinc base alloys already in use has enabled us to meet a still wider range of individual needs.

***We quote from samples or blueprints***

***Write for booklet:***
***"Franklin Die-Castings in Many Fields."***

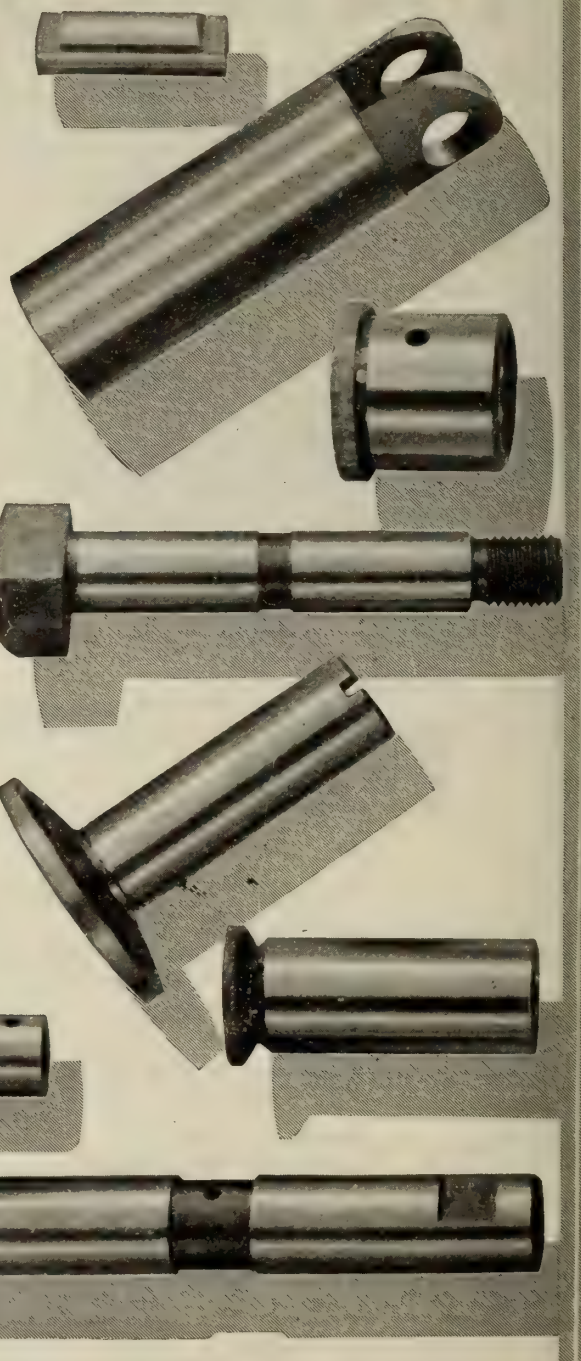
**FRANKLIN**
**DIE-CASTING CORPORATION**
**Gifford and Magnolia Streets**
**Syracuse, N.Y.**

**FRANKLIN DIE-CASTINGS**


*If interested tear out this page and place with letters to be answered*

# NAMCO

## HARDENED AND GROUND SCREW MACHINE PARTS



### *Special*

Screw machine product up to 2¼ in. diam.—to specifications. Hardened and ground screw product—to specifications.

### *Standard*

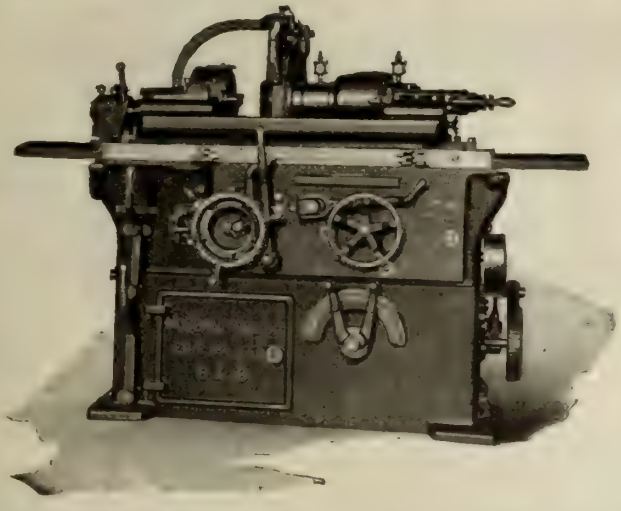
V. & U. S. S. Semi-finished Nuts
V., U. S. S. & S. A. E. Cap Screws
V. & U. S. S. Set Screws
S. A. E. Plain and Castellated Nuts.

THE NATIONAL ACME COMPANY
MONTREAL, P.Q.

De Courcelles G.T.R.R.

# MODERN

**Self-Contained** **Plain Grinding Machines** **Fully Guarded**



## ASK US

*--- what the outstanding quality of a "Modern" is and we'll answer instantly ---*

## DEPENDABILITY

BY THAT we mean the ability to stick to the job of producing. "Moderns" are strong and rugged. They are not easily put out of order. They are painstakingly made, and may be relied upon for accurate work in profitable volume. The extra strength of a Modern admits of a much wider scope of work without loss of efficiency. Modern are noted for both volume and accuracy of work.

Among the special features are:

*—Full self-contained—Fully Guarded*
*—All controls centered on front.*
*—Silent chain work drive*

Made in 8 sizes—8″ x 18″ to 16″ x 60″

***Send for technical bulletin***

## MODERN TOOL CO., ERIE, PA.

**Main Office and Works: STATE and PEACH STREETS**

**BRANCH OFFICES:**

Detroit, Mich., Kerr Bldg., 642 Beaubien St.
Cleveland, Ohio, 408 Frankfort Ave.
Philadelphia, Pa., The Bourse
Buffalo, N.Y., Associated Service Bldg.
Export Dept., Bishop Bldg., New York, N.Y.

**GRINDING MACHINE SALES AGENTS:** Walter H. Foster Co., 50 Church Street, New York City, N.Y.; Sherritt & Stoer Co., 2006-2008 Market St., Philadelphia, Pa.; E. L. Essley Machine Co., 551-557 Washington Blvd., Chicago, Ill. Branches: Milwaukee, Wis.; Moline, Ill.; Manning, Maxwell & Moore, Inc., Railway Exchange Bldg., St. Louis, Mo.; English Tool & Supply Co., 930 Grand Avenue, Kansas City, Mo.; F. E. Satterlee Co., 120 Washington, N., Minneapolis, Minn.; Herberts Machinery & Supply Co., Los Angeles and San Francisco.

**FOREIGN REPRESENTATIVES:** Yamatake Company, Tokyo, Japan; Leo C. Steinle, 53 Victoria St., London, S.W., England; Glaenzer & Perreaud, 18 and 20 Faubourg du Temple, Paris, France; Rylander & Asplund, Stockholm, Sweden; C. Civita & Company, Milan, Italy; J. Lambercier & Co., Geneva and Zurich, Switzerland; Rudel-Belnap Machinery Co., Ltd., Toronto and Montreal.

*If interested tear out this page and place with letters to be answered.*

# MADE IN CANADA



# DOMINION

## Grinding Wheels Shipped Abroad

Dominion Grinding Wheels appeal to overseas buyers for the following reasons:

1—No delay in filling orders.
2—Highest quality products.
3—Made true to grain and grade.
4—Unfailing in service.
5—Sold at reasonable prices.

**Dominion Abrasive Wheel Co., Limited**

MIMICO, ONTARIO, CANADA

# Grinding Wheels

FOREIGN REPRESENTATIVES—Hugh Scott Young, Melbourne, Australia; E. & J. Denis & Co., Brussels, Belgium; Riolet Dufom, Paris, France; La Maquinaria, Anglo-Americana, Barcelona, Spain; Dominion Abrasive Wheel & Supply Company, Birmingham, England.



# Special Machinery

## *GREY IRON CASTINGS*

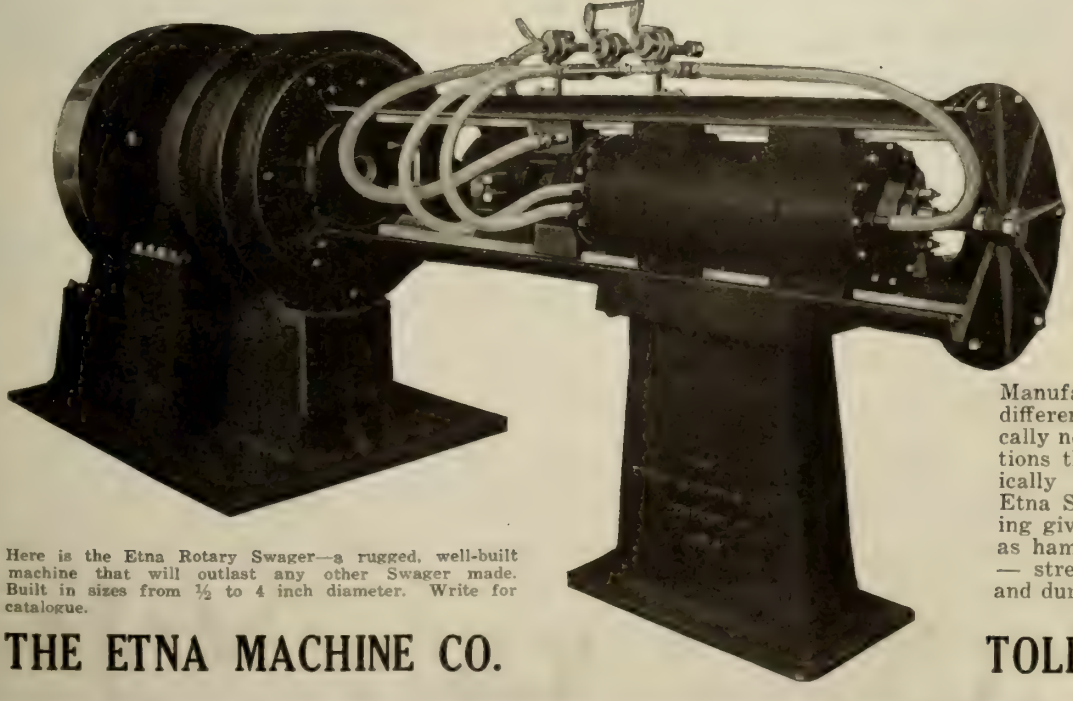
Our plant is equipped to handle special machinery of any kind to blue print. Engineering department always available for consultation.

**Large machine shop with extraordinary facilities. We are in best possible position to cooperate on manufacturing or production problems for home or export trade.**

**Grey Iron foundry has capacity of 15 tons. Mixture by chemical analysis and all castings sandblasted.**

**MacFarlane Engineering Limited, Paris, Ont.**

# ETNA SWAGING



**Swaging the "Etna" Way Reduces Costs on Many Classes of Work**

Manufacturers of widely different lines find practically no limit to the operations that can be economically performed on an Etna Swager. Etna Swaging gives the same results as hammer blows, namely — strength, smoothness and durability.

Here is the Etna Rotary Swager—a rugged, well-built machine that will outlast any other Swager made. Built in sizes from ½ to 4 inch diameter. Write for catalogue.

**THE ETNA MACHINE CO.** **TOLEDO, OHIO**

*If interested tear out this page and place with letters to be answered.*

# Overhaul Your Furnaces Now

IT WAS neither feasible nor politic to shut down your furnaces when prices were at the top and demand was greater than supply. Everything had to be sacrificed to production! Cost was a secondary consideration.

But those days have gone and now we are faced with the necessity of getting down to bed-rock in the matter of production costs, or going to the wall.

Lloyd George says Germany must pay her debts to the Allies in goods—that means low-priced imports, and if the home market is to be kept for Canadian manufacturers, they must set their house in order and look carefully after their manufacturing costs.

"Oilgas" furnaces have proved to be a most important factor in helping many Canadian manufacturers to cut their heat treatment costs in two. What they have done for others they can and will do for you.

Our Engineers are available for conference at your plant any time at your convenience, without any obligation on your part.

Oilgas furnaces are different. They are made in Canada with Canadian capital.

Every furnace bought abroad adds to the discount at which Canadian funds are held. Patronize home industries.

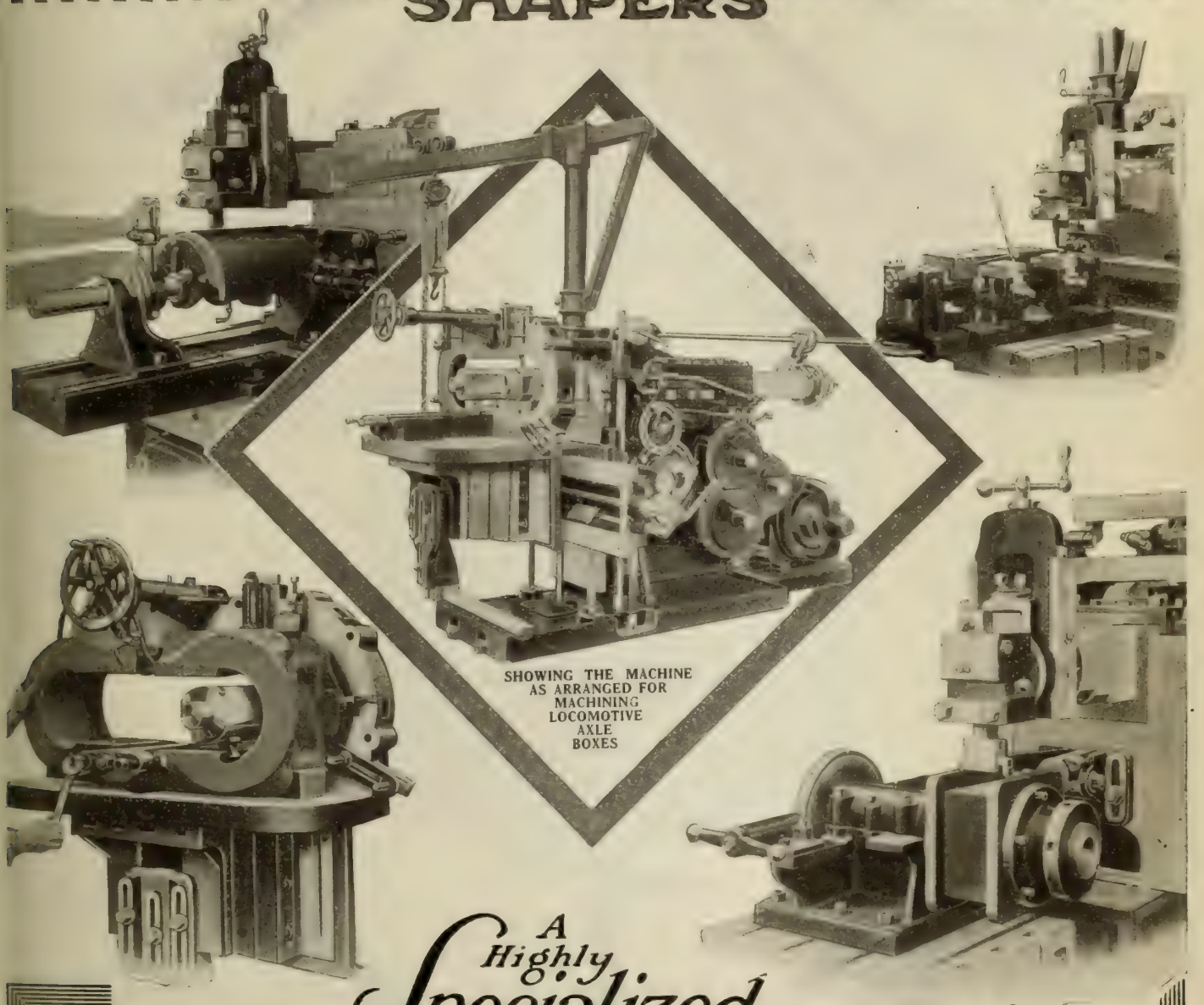
**GENERAL COMBUSTION COMPANY OF CANADA, LIMITED**

**NEW BIRKS BUILDING, MONTREAL**

***"Industrial Furnaces for Every Duty"***

# MORTON

## HEAVY DUTY RAILROAD SHAPERS



SHOWING THE MACHINE AS ARRANGED FOR MACHINING LOCOMOTIVE AXLE BOXES

## A Highly Specialized MULTI-DUTY MACHINE

THIS Morton Heavy-Duty Draw-Cut Railroad Shaper is a specialized tool of exceptional design.

It is a multi-duty machine and the ease and rapidity with which changes are made from one class of work to another are features which make it a highly profitable producer. Fully equipped with the latest time-saving devices! A machine of maximum rigidity! Deep cuts, coarse feeds, and smooth and accurate work make it a tool of outstanding ability.

Send for bulletin 6A—it contains a complete and interesting story of this finely built tool.

## MORTON MANUFACTURING CO.

MUSKEGON HEIGHTS, MICHIGAN, U.S.A.

*If interested tear out this page and place with letters to be answered.*




*MADE IN CANADA*

# WILLIAMS' SUPERIOR WRENCHES

In addition to our Standard Superior Drop-Forged Wrenches and Machinists' Tools, we manufacture the most comprehensive line of adjustable wrenches on the market. All have our reputation behind them.

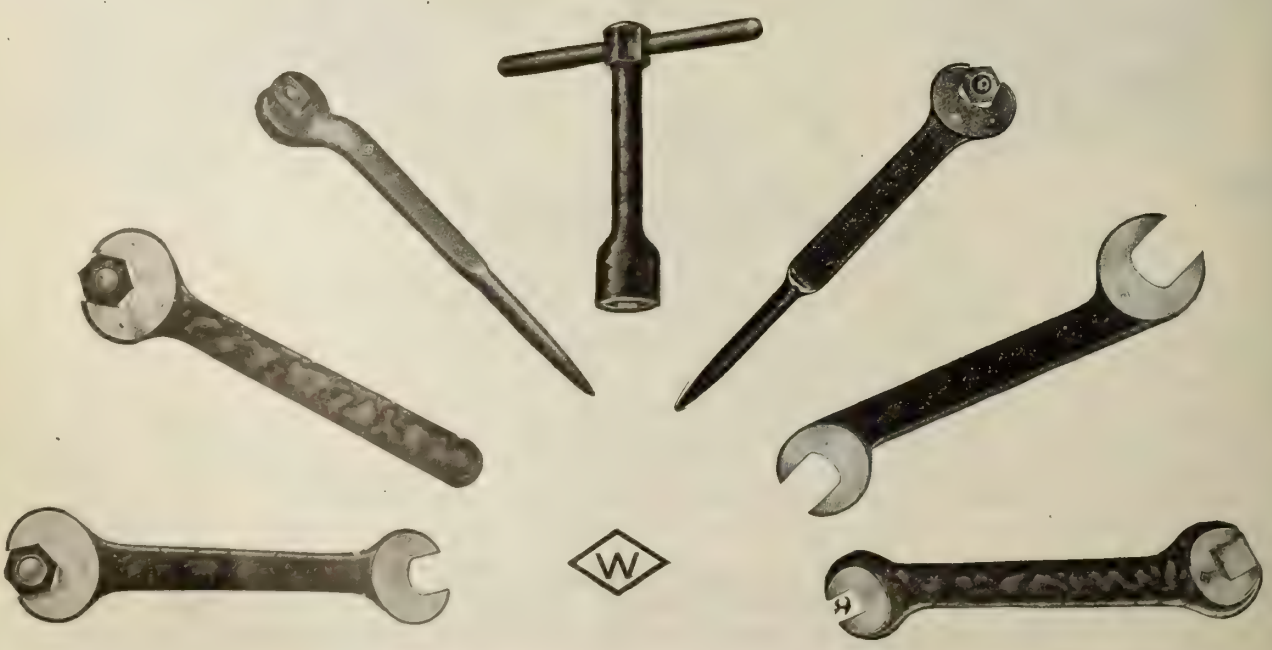
***Catalog on Request.***

## J. H. WILLIAMS & Co., Limited

*"The Wrench People"*

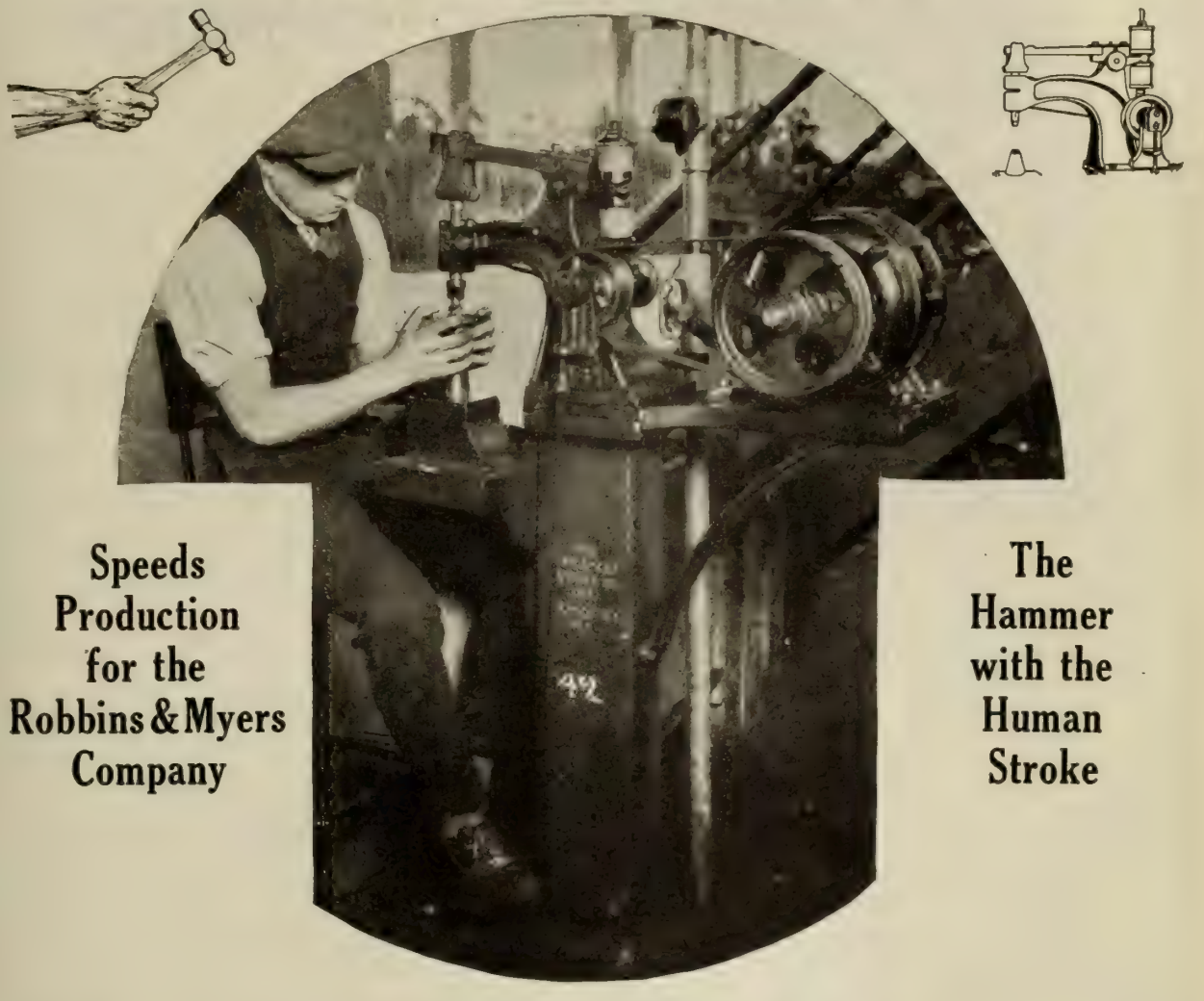
Formerly Canadian Division of
The Whitman & Barnes Mfg. Co.

**45 Thorold Road** **St. Catharines, Ont.**




*If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.*

# HIGH SPEED
## RIVETING HAMMERS



**Speeds Production for the Robbins & Myers Company**

**The Hammer with the Human Stroke**

AN immediate production increase was the result of installing a High Speed Riveting Hammer in the plant of the Robbins & Myers Co., Brantford, Ont.

The work caught by our camera man is Riveting Formed Fan Punching to hub. It demands neatness and speed—to conform to the high standards of this plant.

It takes just half a minute for this work — no comparison with the laborious method of hand sledging. Send us samples or blue-prints and we will quote production figures.

Besides often as much as quadrupling production, High Speed Hammers also better the quality. Hand work cannot approach them for uniformity and fine finish.

## THE HIGH SPEED HAMMER COMPANY, Inc.
ROCHESTER, N.Y., U.S.A.

FOREIGN AGENTS:—For British Isles: Burton Griffiths & Co., Ltd., London, E.C.
For Sweden and Finland: Aktiebolaget Rylander & Asplund, Stockholm, C.
For Japan and Dependencies: China, Japan and South America Trading Company, Ltd., Kobe.

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# These Workers Need

## STOCO SAFETY GOGGLES

(Pat Dec. 12, 1916)

Air drill operator.
Air hammer operator.
Asphalt cutter.
Bessemer—Manganese man.
Boiler cleaner.
Boiler maker.
Boiler repairman.
Buffer.
Car repairman, metal.
Casting house worker.
Caulker.
Cement gun operator.
Chipper, welding shop, foundry, machine shop, etc.
Cinder man.
Concrete chipper or cutter.
Core remover—large castings.
Cupola tender, charger or tapper.
Cutter—with chisel, hammer or sledge.
Dresser of tools.
Drill press operator, high speed.
Driller and countersinker or drill press hand in ship shed or boiler shop.
Driller of concrete, stone, brick, coal, cast iron, etc.
Emery wheel grinder.
Engineer, electric and steam locomotive.
Ferromanganese breaker.
Firemen's helper.
Fireman, locomotives.
Flue setter, locomotive.
Furnace reliner.
Gage glass replacer.
Grinder, rough emery, welding shop, foundry or machine shop, etc.
Holder on and bucker up.
Machine tool dresser.
Machine tool operator—on tool steel, cast iron, brass, etc.
Mailing machine adjuster.
Open hearth stoker.
Planer operator.
Pneumatic tool worker and those working in close proximity.
Reamer.
Rivet cutter.
Riveter.
Roll grinder.
Rolling mill—worker on rolls and ragger.
Scaler—steel bars or plate.
Shaper operator.
Sledger of rock or other hard substances.
Staple machine adjuster.
Stone cutter.
Stone breaker.
Tank cleaner.
Tool dresser.
Tool grinder (street railway).
Turret-lathe operator.

This is the List or occupations for which type No. 2 Goggles are specified in the Pennsylvania State Industrial Board's "Safety Standards" for Head and Eye Protection.

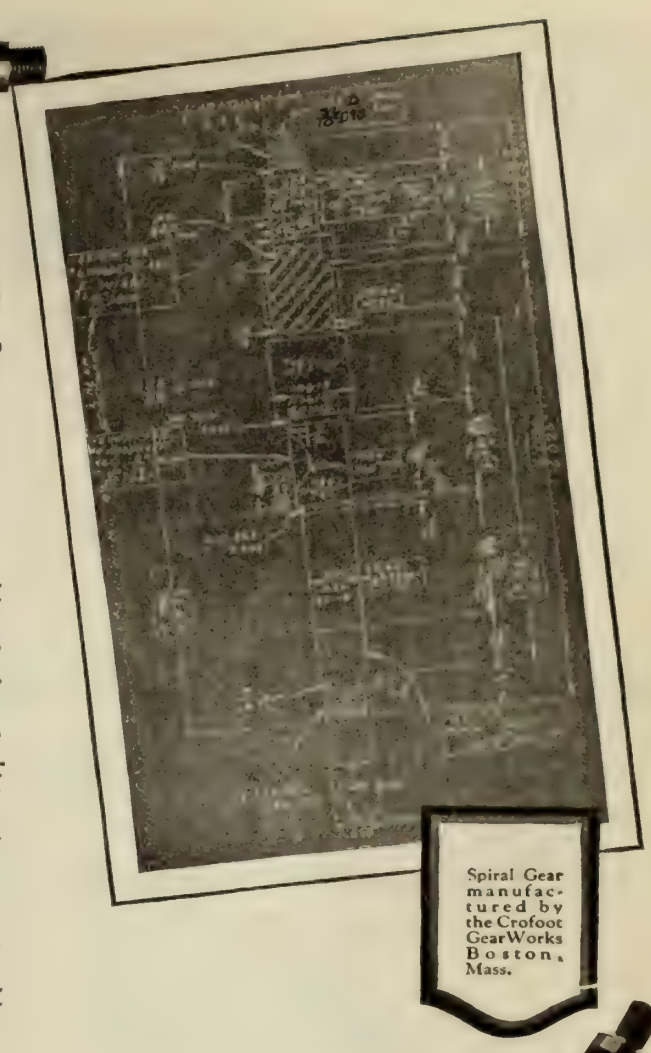
A sample of the Stoco Safety Goggle will be sent interested responsible people—without charge—on receipt of request on letter-head. The price of the Stoco Safety Goggle is 90 cents each—$1.15 each with "Celoglas" Shatter-Proof Lenses—f.o.b. Geneva, N. Y. Interesting discounts from those prices are allowed for quantity orders.

## THE STANDARD OPTICAL CO. GENEVA N.Y.



# Have you the tools that this job calls for?

*A Starrett Thread Gage, Micrometer, Bench Micrometer, Micrometer Caliper Stand, and Taper Gage.*



Spiral Gear manufactured by the Crofoot GearWorks Boston, Mass.

Spiral gear cutting calls for the best there is in workmanship and tools, and because of their reputation for accuracy, two generations of machinists, to whom accuracy is a matter of pride as well as livelihood, have shown a decided preference for Starrett Tools.

Check up your personal kit with the new Starrett Catalog No. 22 "3" Sent free upon request.

**THE L. S. STARRETT CO.**

*The World's Greatest Toolmakers*
*Manufacturers of Hack Saws Unexcelled*

**ATHOL, MASS.**



# Use Starrett Tools

*If interested tear out this page and place with letters to be answered.*

# HINTS TO BUYERS


## STEEL CASTINGS

ELECTRIC Steel Castings of all kinds from 5 pounds to 5,000 pounds.

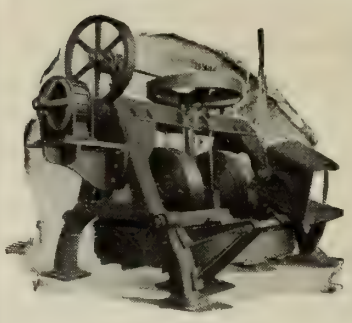
PROMPT DELIVERY

**Manitoba Steel Foundries, Ltd.**

1204 McArthur Building

Winnipeg - - - Manitoba

## Canadian Steel Foundries Need Frost Improved Sand Mills



WINNING FEATURES

Heavy Mullers
Unloading Device
Motor or Belt Drive

**The Frost Mfg. Co.**
112 W. Adams St., Chicago

## The Hughes Owens Co. Ltd.

MONTREAL TORONTO OTTAWA WINNIPEG

*Manufacturers*

Blue and Black Print Papers
Drawing Office Supplies for Students, Architects and Engineers.

## Mechanical Engineering Company

Limited

PRACTICAL AND CONSULTING ENGINEERS

*Builders of "MECOL" Industrial Furnaces for use with oil, gas or coal fuel*

Executive Offices
Room 408, 3 St. Nicholas St.
Montreal

General Offices and Works
Three Rivers, Que.

## FOR SERVICE ON

## Jigs, Fixtures, Gauges

SPECIAL MACHINE TOOLS
SPECIAL MACHINERY

General Machine Work and Repairs

*Write*

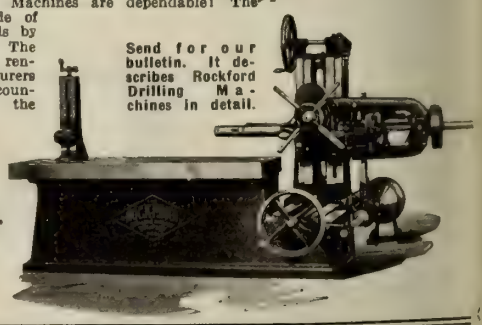
**The Crescent Machine Co.**
LIMITED
20 Longueuil Lane Montreal, Que.

## ROCKFORD DRILLING MACHINES

Note the lateral and vertical adjustment of this Rockford Drilling Machine. It operates anywhere on a surface 18" high by 36" wide!

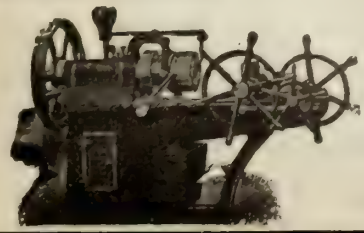
Rockford Drilling Machines are dependable! They are carefully made of the finest materials by skilled workmen. The service they are rendering manufacturers throughout the country proves that the design is right.

Send for our bulletin. It describes Rockford Drilling Machines in detail.



**The Rockford Drilling Machine Company**
Rockford, Ill., U.S.A.

Canadian Agents:
Rudel-Belnap Machinery Co., Toronto and Montreal.



## BOLT, NUT, FORGING AND WIRE NAIL MACHINERY

"National" Bolt Cutters, "Wedge Grip" Bolt and Rivet Headers, Forging Machines, Nut Machines, Roll Threaders and Wire Nail Machines are used by leading Railroads and Industrials.

THE NATIONAL MACHINERY CO TIFFIN, OHIO, U.S.A.

CANADIAN AGENT
**H. W. PETRIE, Ltd.**
TORONTO, ONT.
MONTREAL, QUE.
VANCOUVER, B.C.

# WHEEL TRUEING TOOL CO.

DETROIT

IMPORTERS OF
**INDUSTRIAL DIAMONDS**
Goods Submitted on Memorandum if Desired
JOHN W. GORDON, Manager
5 James Street, ST. CATHARINES, ONTARIO



MANUFACTURERS OF
**DIAMOND POINTED TOOLS**
All Mountings Fully Guaranteed
Office and Factory:
88 West Pitt Street, WINDSOR, ONTARIO



## Gear Cutting Machines
Hand Feed
Semi-Automatic, Fully Automatic
*Also Lathe Chucks and Centering Machines*
THE D. E. WHITON MACHINE CO.
NEW LONDON, CONN., U. S. A.

## PRESSES and SHEARS
Sheet Metal Working Machinery
**THE D. H. STOLL CO., INC.**
26 Lansing St., BUFFALO, N.Y.

## DIE-CASTINGS
*ACCURACY—SERVICE*
Fisher Motor Co., Ltd.
ORILLIA - ONTARIO

## DARLING BROTHERS, LIMITED
*Engineers, Manufacturers and Founders*
120 Prince Street, MONTREAL, P.Q.
*Pumps for any Service—Steam Appliances—Freight Elevators—Webster Vacuum Heating System.*



SPRING SHACKLE BOLTS
Complete Line of Oilers, Oil Cups, Brass Dowel Pins and Pressed Steel and Brass Grease Cups All Types
*Write for catalogues and prices*
THE CANADIAN WINKLEY CO.
Limited
WINDSOR - ONTARIO

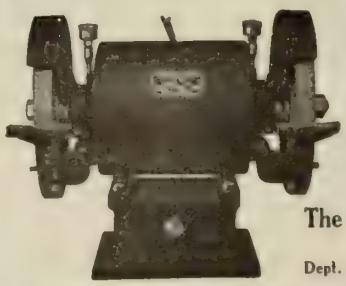


"D"



PLAIN

## CINCINNATI
Portable Electric Bench Grinder



A practical time-saver for machine shops, mills and garages. Adapted for grinding, buffing and polishing of all kinds.

The Cincinnati Electrical Tool Company
Dept. G-4 Cincinnati, O.
*Makers of complete line of Portable Electric Drills and Grinders*

## CASTINGS
MALLEABLE AND GREY IRON
**FITTINGS** Limited, OSHAWA

## Miller Bros. & Sons, Limited
Founders, Machinists, Millwrights and Engineers
120 Dalhousie St., Montreal

**VICTORIA** Special Machinery
DESIGNS PATTERNS
CASTINGS FORGINGS
*Send for Catalogue*
Victoria Foundry Co., Limited, Ottawa, Canada

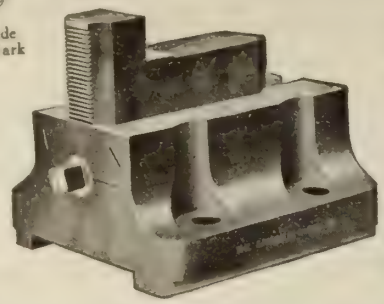


## NORTON JACKS
FOR ALL KINDS OF HEAVY LIFTING
Send for complete catalogue showing 50 styles 10 to 100 tons capacity.
*Made only by* A. O. NORTON, Limited
Coaticook, Prov. Quebec, Canada




WE MANUFACTURE RIVETS of every description, 5/8 inch dia. and smaller

PARMENTER & BULLOCH CO., LTD.
GANANOQUE, ONT.



# SKINNER BORING MILL JAWS

Note the powerful compact construction of these sturdy jaws. For heavy duty work on boring mills and large lathes these jaws, fitted to the parallel slots in the face plate or table by means of the double rib, insure a most positive grip.

*Furnished in iron or steel body—single or double rib as desired*

THE SKINNER CHUCK COMPANY

NEW BRITAIN, CONN. U.S.A.

Established 1887

New York Office: 94 Reade Street. San Francisco Office: Rialto Building. Chicago Office: 552 West Washington Blvd.

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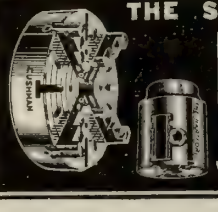
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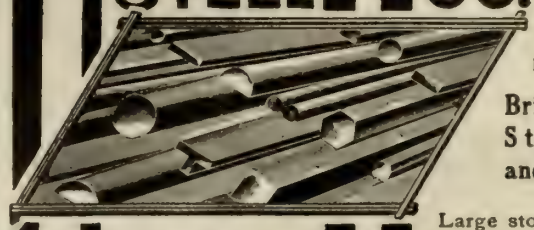
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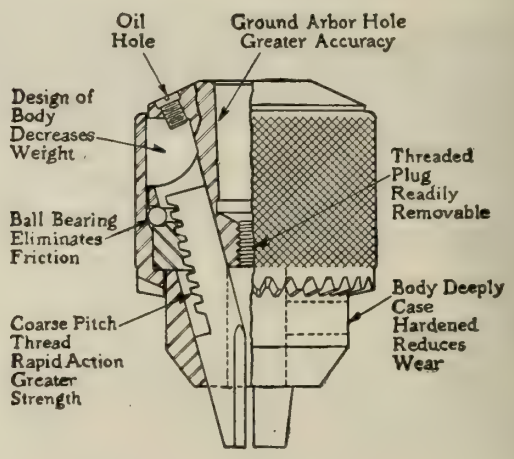
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Oakey & Sons, Ltd., John London S E., Eng.

**Abrasive Materials**
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Dom. Abrasive Wheel Co., Ltd , Mimico, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Acetylene, Dissolved**
L'Air Liquide Society, Toronto, Ont.

**Accumulators, Hydraulic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Air Cocks**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Air Lifts**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Analyses, Chemical**
Toronto Testing Laboratory, Toronto, Ont.

**Angle Bars**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Anvils**
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Columbia Hdwe. Division, Cleveland, O.
Petrie, Ltd., H. W., Toronto, Ont.

**Arbors**
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Brown & Sharpe Mfg. Co., Providence, R.I.
Cleveland Twist Drill Co., Cleveland, O.
Ford-Smith Machine Co., Hamilton, Ont
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Jacobs Mfg. Co., Hartford, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.

**Axles, Car**
Dom. Foundries & Steel, Hamilton, Ont.

**Babbitt Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.

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Canada Foundries & Forgings Co., Welland, Ont.
Canadian SKF Co., Toronto, Ont.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

**Barrels, Tumbling**
McDougall Co., Ltd., R., Galt, Ont.

**Bars, Boring**
Armstrong Bros. Tool Co., Chicago, Ill.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Madison Mfg. Co., Muskegon, Mich.

**Bars, Boring, Portable**
Underwood Corp., H. B., Philadelphia, Pa.

**Bars, Bronze Cored**
Moore & Son, Thos., Montreal, Que.

**Bars, Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Bars, Steel**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.

**Bearings, Ball**
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Railway Roller Bearing Co., Syracuse, N.Y.

**Bearings, Bronze**
Railway Roller Bearing Co., Syracuse, N.Y.

**Bearings, Die-Cast**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Tallman Brass & Metal Co., Hamilton, Ont.

**Bearings, Journal**
Fisher Motor Co., Ltd., Orillia, Ont.

**Bearings, Roller**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

**Belt Cement**
McLaren Belting Co., J. C., Montreal, Que.

**Belt Dressings and Fillers**
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Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.

**Belt Fasteners**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Belt Hooks**
Torrington Co., Ltd., Upper Bedford, Que.

**Belt Lacing**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

**Belt Lacing, Steel**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing, Hinged**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing, Flexible Steel**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing Machines**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
McLaren Belting Co., J. C., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Belt Joiners, Conveyor**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Tools**
Graton & Knight Mfg. Co., Worcester, Mass

**Belting, Chain**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Belting, Fabric**
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Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
McLaren Belting Co., J. C., Montreal, Que.
Sumner & Co., New York City.

**Belting, Leather**
Can. Fairbanks-Morse Ltd., Montreal. Q.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Smith Belting Co., Toronto, Ont.
Sumner & Co., New York City.
Tullis & Son, Ltd., John, Glasgow, Scot.

**Belting, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.
Quaker City Rubber Co., Philadelphia, Pa.

**Belts, Abrasive**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.

**Bench Countershaft Standards**
Ford-Smith Machine Co., Hamilton, Ont.

**Benches, Work**
Aikenhead Hardware Ltd., Toronto, Ont.

**Bending Machines, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bertrams Ltd., Edinburgh, Scotland.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Bins, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Blocks**
Ford Chain Block Co., Philadelphia, Pa.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Chain (See Hoists, Hand)**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**Blocks, Die**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Blocks, Pillow**
Can. Link-Belt Co., Toronto, Ont.

**Blowers**
Can. Blower & Forge Co., Ltd., Kitchener.
General Combustion Co. of Can., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Sturtevant Co., B. F., Boston, Mass.

**Bolt and Nut Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Bolt and Nut Machinery, Automatic**
National Acme Co., Cleveland, Ohio.

**Bolts and Nuts**
London Bolt & Hinge Works, London, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Petrie, Ltd., H. W., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Bolt Threading Die Heads**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa

**Boosters**
Sturtevant Co., B. F., Boston, Mass.

**Boring and Turning Mills, Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.

**Boring, Drilling and Milling Machines, Horizontal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa.

**Boring, Drilling and Milling Mach., Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Boring Heads**
Aikenhead Hardware Ltd., Toronto, Ont.

**Boring Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Gisholt Machine Co., Madison, Wis.

**Brakes, Magnetic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Brass**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Brass Valves**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Brass Pipe Fittings**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Bricks, Fire**
Elk Firebrick Co. of Can., Ltd., Hamilton, Ont.

**Bridges**
Hamilton Bridge Works Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

**Broaching Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Bronze**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bronze, Phosphor**
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bucket Carriers, Pivoted**
Can. Link-Belt Co., Toronto, Ont.

**Buffing or Polishing Machines (See Polishing and Buffing Machines)**
Blount Co., J. G., Everett, Mass.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
U S. Electrical Tool Co., Cincinnati, O.

**Bulldozers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Burners, Oil and Gas**
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co , W. S., New York City.

**Bushings**
Fisher Motor Co., Ltd., Orillia, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Cabinets, Oil**
S. F. Bowser & Co., Ltd., Toronto, Ont.

**Calipers**
Brown & Sharpe Mfg. Co., Providence, R.I.
Starrett Co., L. S., Athol, Mass.

**Cams**
Canada Foundries & Forgings Co., Welland, Ont.

**Can-Making Machinery (See Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.

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MacKinnon Steel Co., Sherbrooke, Que.

**Castings, Aluminum**
Canada Electric Castings Co., Ltd., Orillia
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Brass and Bronze**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Copper**
Can. Hanson & Van Winkle Co., Toronto, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Marine**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Castings, Die Molded**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Ferro-Alloy**
Can. Steel Foundries, Montreal, Que.

**Castings, Iron**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Hyd. Press**
Can. Steel Foundries, Montreal, Que.

**Castings, Monel Metal**
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

**Castings, Naval Bronze**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Nichrome**
Can. Driver-Harris Co., Walkerville, Ont.

**Castings, Nickel**
Can. Hanson & Van Winkle Co., Toronto, Ont.

**Castings, Semi-Steel**
Davidson Mfg. Co., Thos., Montreal, Que.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

**Castings, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

**Cements, Iron**
Smooth Mfg. Co., Jersey City, N.J.

**Centering Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Chains (See Sprockets and Chains)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chains, Driving**
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chasers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chemists**
Toronto Testing Laboratory, Toronto, Ont.

**Chucking Machines**
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Chucks, Drill**
Jacobs Mfg. Co., Hartford, Conn.

**Chucks, Drill and Tap**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Lathe**
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Magnetic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**
Columbia Hdwe. Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

**Cleaners, Metal, Waste, General**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Clocks, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Clutches, Friction**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**
Can. Link-Belt Co., Toronto, Ont.

**Cocks and Faucets**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Collars, Shaft or Set**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

**Collets**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compressors, Air**
Curtis Pneumatic Machinery Co., St. Louis, Mo.

**Compressors, Air and Gas**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**
Ford-Smith Machine Co., Hamilton, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Conveyor Belt Joiners**
Flexible Steel Lacing Co., Chicago, Ill.

**Copper**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Cored Bronze Bars**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Cotter Pins**
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Counterbores**
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Countershafts**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Couplers, Car and Locomotive**
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Couplings, Flexible**
Holden Co., Ltd., Montreal, Que.

**Couplings, Rigid**
Bernard Industrial Co., A., Fortierville, Que.

**Couplings, Shaft**
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

**Cranes, Electric**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.

**Cranes, Hand (See Hoists, Hand)**
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

**Cranes, Locomotive**
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Cranes, Traveling**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Crank Pin Turning Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia, Pa.

**Cutters, Flue**
Holden Co., Ltd., Montreal, Que.

**Cutters, Gear**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wi.
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Milling**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Milling Machine Co., Cleveland
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wi.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.

**Cutters, Stay Bolt**
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, P.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Thread**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, P.

**Cutting-Off Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.
Etna Machine Co., Toledo, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Cutting-Off Machines, Pipe (See Pipe Cutting and Threading Machines)**
Landis Machine Co., Inc., Waynesboro, P.
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Cutting-Off Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago.
Pilot Steel & Tool Co., Montreal, Que.

**Cutting Oil Filters (See Oil Filtering Systems)**
Bowser, S. F., & Co., Ltd., Toronto, Ont.
Cataract Refining Co., Toronto, Ont.

**Cutting, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

**Cutting, Oxy-Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Dealers, Machinery (See Searchlight Section)**
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Deckle Straps**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Diamonds, Black and Rough**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond, Carbon and Bortz**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Desmond-Stephan Co., Hamilton, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Wheel Trueing Tool Co., Detroit, Mich.

**Diamond Crossings**
Can. Steel Foundries, Montreal, Que.

**Die-Castings**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Dies, Pipe-Threading**
Jones & Lamson Machine Co., Springfield, Vt.

**Die Sinking Machines, Automatic**
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

**Die Sinkers**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Screw and Thread Cutting**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo, Ohio

# BUYERS' DIRECTORY

**es, Forging**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

**es, Hammer**
Kimber & Hillier, St. Catharines, Ont.

**es, Self-Opening, Adjustable**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**es, Threading-Opening**
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**ae Cement**
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**viding Heads**
Ackworthie, Ltd., John, Birmingham, Eng.
Dickow, Fred. C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**ge, Lathe and Milling Machine**
Armstrong Bros. Tool Co., Chicago, Ill.

**rafting Boards and Tables**
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**rafting Materials**
American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**rasers, Grinding Wheel**
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**rill Holders**
Armstrong Bros. Tool Co., Chicago, Ill.

**rill Rods**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**rill Speeders**
Canada Machinery Corp., Galt, Ont.

**rilling Machine Heads**
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

**rilling Machines, Automatic**
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

**rilling Machines, Bench**
Beacon Engineering Co., Tipton, England.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U. S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**rilling Machines, Electric and Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**rilling Machines, Gang**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**rilling Machines, Heavy Duty**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Multiple Spindle**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

**Drilling Machines, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Drilling Machines, Portable**
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Radial**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Drilling Machines, Sensitive**
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Turret**
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

**Drilling Machines, Vertical**
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng.
Streiinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Drills, Center**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drills, High Speed Twist**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Drills, Twist and Flat**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.

**Dust Handling Equipment**
Can. Blower & Forge Co., Ltd., Kitchener.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Electrical Instruments**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Electrical Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O.

**Elevating Trucks (See Trucks)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Elevators and Conveyors**
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Emery Wheels (See Grinding Wheels)**
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Hart Products, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Engines, Capstan**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Engineers, Mechanical**
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.

**Expanders, Tube**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Eyeglasses, Safety (See Goggles, Safety)**
Prest-O-Lite Co. of Can., Toronto, Ont.
Willson Goggles, Inc., Reading, Pa.

**Fans, Electric**
Can. Blower & Forge Co., Ltd., Kitchener
Can. Fairbanks-Morse Co., Ltd., Montreal
Northern Electric Co., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Exhaust**
Can. Blower & Forge Co., Ltd., Kitchener.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Ventilating**
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**File Handles**
Ingersoll File Co., Ltd., Ingersoll, Ont.

**Files and Rasps**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Filing Machines**
Garlock-Walker Mchy. Co., Toronto, Ont
Oliver Machinery Co., Grand Rapids, Mich
Williams Machinery & Supply Co., A. R., Montreal Que.

**Filler, Iron (See Cements, Iron)**
Smooth Mfg. Co., Jersey City, N.J.

**Fire Extinguishers**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Fittings, Pipe**
International Malleable Iron Co., Guelph, Ont.

**Flexible Shafts**
Aikenhead Hardware Ltd., Toronto, Ont.

**Flux, Galvanizing**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Fluxes, Welding**
L'Air Liquide Society, Toronto, Ont.

**Forging Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.

**Forgings, Drop**
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd., Toronto, Ont.

**Forgings, Hammer**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Foundry Equipment**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Foundry Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Frogs, Spring or Rigid**
Can. Steel Foundries, Montreal, Que.

**Fuel Oil Burning System**
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Coal**
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Oil and Gas**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bellevue Industrial Furnace Co., Detroit.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces and Ovens, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces, Tempering and Annealing**
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furniture, Machine Shop**
Garlock-Walker Mchy. Co., Toronto, Ont.

**Gages, Comparator**
Jones & Lamson Machine Co., Springfield, Vt.
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont.
Perdue, W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass.

**Gages, Measuring (See Tool Work)**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont
Starrett Co., L. S., Athol, Mass.

**Gages, Recording**
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont

# BUYERS' DIRECTORY

**Gages, Snap, Thread and Cylindrical**
Ackworthie, Ltd., John, Birmingham, Eng.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Standard**
Armstrong Whitworth Co. of Can., Lt. Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis,
Johansson Inc., C. E., Windsor, Ont.

**Gages, Thread**
Ackworthie, Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Garnet, Emery and Flint Paper and Cloth**
Ritchey Supply Co., Toronto, Ont.

**Gas, Coal Compressed**
L'Air Liquide Society, Toronto, Ont.

**Gas, Compressed**
Prest-O-Lite Co. of Can., Toronto Ont.

**Gaskets**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

**Gear Blanks**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear-Cutting Machines**
Bertram & Son Co., Ltd, The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

**Gear Testing Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.

**Gears, Cast**
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

**Gears, Cut**
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co. Ltd., Montreal, Q.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hamilton Gear & Machine Co., Toronto, Ontario
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Gears, Dressed**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Gears, Forged**
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Gears, Herringbone**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

**Gears, Machine Moulded**
Can. Steel Foundries, Montreal, Que.

**Gears, Rawhide (See Gears, Cut)**
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear, Silent Chain**
Gardner & Son, Robt., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Can Link-Belt Co., Ltd., Toronto, Can
Hans Renold of Canada, Ltd., Montreal, Quebec

**Gears, Worm**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.

**Generators, Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Generators, Electric**
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Goggles, Safety**
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

**Grab Buckets**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Grease Cups, Pressed Steel and Brass**
Can. Winkley Co., Ltd, Windsor, Ont.

**Greases, Lubricating**
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

**Grinding Discs**
Ritchey Supply Co., Toronto, Ont.

**Grinding Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**Grinding Machines, Abrasive Belt**
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Automatic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Bench**
Aikenhead Hardware Ltd., Toronto, Ont.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Grinding Machines, Center**
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines Chaser**
Jones & Lamson Machine Co., Springfield, Vt.

**Grinding Machines, Cutter and Reamer**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Cylindrical**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Die**
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

**Grinding Machines, Disc**
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Drill**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Face**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Floor and Tool**
Beacon Engineering Co., Tipton, England.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Grinding Machines, Internal**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Portable**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Power Oscillating Tool**
Herbert Ltd., Alfred, Toronto, Ont.

**Grinding Machines, Ring Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Snagging**
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Surface**
Garlock-Walker Mchy. Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machinery, Tool Post**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Universal**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.

**Grinding Wheels**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Guards, Emery Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Guards, Machinery and Window**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Guards, Electric Lamp**
Flexible Steel Lacing Co., Chicago, Ill.

**Gun-Barrel Machinery**
Steinle Turret Machine Co., Madison, Wis.

**Hack Saws, Power**
Ackworthie, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Hamilton, Canada.
Garlock-Walker Mchy. Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hammers, Chipping**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hammers, Drop**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

**Hammers, Electric**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Hammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Hammers, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hammers, Riveting**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hangers, Shafting**
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Terry & Co., John C., Birmingham, Eng.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hardening, Case-Hardening and Tempering**
Hamilton Gear & Machine Co., Toronto, Ont.

**Hardness Testing Apparatus**
Shore Instrument Co., Jamaica, N.Y.

**Heating**
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.

**Hobbing Machines**
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hobs**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Hoists, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

**Hoists, Hand**
Lyman Tube & Supply Co., Montreal, Que
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Hoists, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Holders-On, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill

**Hose, Flexible Steel**
Can. Fairbanks-Morse Co., Ltd., Montreal
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Hose, Industrial**
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Hose, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Foamite Firefoam Co., Hamilton, Ont.

**Hydraulic Leather**
Graton & Knight Mfg. Co., Worcester, Mass.

**Hydraulic Machinery**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Stewart & Co., Duncan, Glasgow, Scot

**Hydrogen**
National Electro Products, Ltd., Toronto Ont.

**Index Centers**
Dickow, Fred C., Machinery Co., Chicago, Ill.

**Igniters, Gas Engine**
Canada Foundries & Forgings Co., Welland, Ont.

**Indicators, Speed and Test**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis,
Brown & Sharpe Mfg. Co., Providence, R.

**Insulation**
Diamond State Fibre Co. of Can., Ltd Toronto, Ont.

**Iron Valves**
Puro Sanitary Drinking Fountain Co Haydenville, Mass.

**Jacks, Hydraulic**
Norton, A. O., Boston, Mass.

**Jacks, Planer**
Armstrong Bros. Tool Co., Chicago, I
Starrett Co., L. S., Athol, Mass.
Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que.
Crescent Machine Co., Ltd., Montreal,

# BUYERS' DIRECTORY

**gs and Fixtures (See Tool Work)**
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**ryseating Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**ys, Machine**
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

**ives, Machine**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Simonds Canada Saw Co., Montreal, Que.

**url Holders**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**ing Leather**
Upper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

**mps, Electric**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**the Attachments**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ort.

**the Pans, Portable**
Canada Machinery Corp., Galt, Ont.

**the Tools**
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

**thes, Automatic and Semi-Automatic**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**thes, Bench**
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**thes, Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

**thes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont
McDougall Co., Ltd., R., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**thes, Engine**
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Sidney Machine Tool Co., Sidney, Ohio.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R. Montreal, Que.

**thes, Extension and Gap**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**thes, Heavy Duty Projectile Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blaskill Wire Machy. Co., Ltd., Montreal.
Sidney Machine Tool Co., Sidney, Ohio.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio.
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Polishing (See Polishing and Buffing Machines)**
Ford-Smith Machine Co., Hamilton, Ont.

**Lathes, Relieving**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Lathe, Universal Hand**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Lathes, Screw-Cutting**
Jones & Lamson Machine Co., Springfield, Vt.

**Lathe, Speed and Hand**
Blount Co., J. G., Everett, Mass.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Lathes, Spinning**
Terry & Co., John C., Birmingham, Eng.

**Lathes, Threading**
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

**Lathes, Vertical Turret**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

**Lathes, Wood Turning**
Blount Co., J. G., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Lead Pipe**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Lighting Fixtures**
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont

**Linoleum Mill Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Liquid Air Plants**
L'Air Liquide Society, Toronto, Ont.

**Lockers, Clothes**
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

**Lubricants**
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Lubricating Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Machinists' Small Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Mandrels, Expanding**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Mandrels, Solid**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co. Cleveland, O.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Measuring Machines**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Metals, Alloy**
British Smelting & Refining Co., Ltd. Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Tallman Brass & Metal, Ltd., Hamilton, Ontario.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Metalite Cloth**
Ritchey Supply Co., Toronto, Ont.

**Micrometer Calipers**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Milling Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Milling Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**Milling Machines, Automatic**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Bench**
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Hand**
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

**Milling Machines, Horizontal and Planer Type**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Milling Machines, Plain**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Milling Machines, Universal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Milling Machines, Vertical**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

**Monel Metal**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Motors, Electric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Moulded Rubber Goods**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Nail Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Nails and Staples**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Nickel, Bars, Sheets, Wire, Etc.**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Nickel Plating Outfits**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Nickel Silver**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Nitrogen**
L'Air Liquide Society, Toronto, Ont.

**Nut Tappers (See Bolt and Nut Machinery)**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

**Nuts, Finished and Semi-finished**
Galt Machine Screw Co., Galt, Ont.

**Nuts, Machine Screw**
Torrington Company, Ltd., Upper Bedford, Que.

**Nuts, S.A.E., Plain and Castellated**
Galt Machine Screw Co., Galt, Ont.

**Oil Cocks and Burners**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Oil Filtering and Storage Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oil Storage Engineers**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oils**
Canadian Oil Companies, Ltd., Toronto, Ont
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Hole Covers**
Can. Winkley Co., Ltd., Windsor, Ont.

**Oils, Soluble**
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oxygen**
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

**Oxy-Acetylene Apparatus**
L'Air Liquide Society, Toronto, Ont.

**Packing, Hydraulic**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

**Packing, Steam**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

**Paper Mill Conveyors**
Bertrams Ltd., Edinburgh, Scotland.

**Patents**
Fetherstonhaugh & Co., Ottawa, Ont.
Marion & Marion, Montreal, Que.

**Pans, Wet and Dry**
Frost Mfg. Co., Chicago, Ill.

**Pattern-Shop Machinery (See Woodworking Machinery)**
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co , Grand Rapids, Mich.

**Patterns, Wood and Metal**
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Wraggis Pattern Works, Galt, Ont.

**Penstocks, Steel**
MacKinnon Steel Co., Sherbrooke, Que

# BUYERS' DIRECTORY

**Phosphor Tin**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Photographic Duplicating Machines**
Commercial Camera Co., Providence, R.I.

**Pig Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Bending Machines**
American Pipe Bending Machine Co., Boston, Mass
Can. Fairbanks-Morse Co., Ltd., Montreal.
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

**Pipe Couplings**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Cutting and Threading Machines**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**
Landis Machine Co., Inc., Waynesboro, Pa.

**Pipe Fitters' Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa.

**Piston-Ring Machines**
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Planers, Parallels**
L. & P. Mfg. Co., Niagara Falls, Ont.

**Planing Machines**
Bertram & Son Co., Ltd., The John Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Planing Machines, Rotary**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Plumbers' Brass Goods**
Pure Sanitary Drinking Fountain Co., Haydenville Mass

**Pneumatic Tools**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**
Ackworthle, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Blount Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Pots, Steel**
Swedish Crucible Steel Co of Canada, Ltd., Windsor, Ont.

**Pressed Steel Parts**
Ackworthle, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich.
Can. Fairbanks-Morse Co., Ltd., Montreal.
L. & P. Manufacturing Company, Ltd., Niagara Falls, Ont.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Presses, Drop and Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Toledo Machine & Tool Co., Toledo, Ohio

**Presses, Foot and Hand**
Brown, Boggs & Co., Ltd., Hamilton Ont.
Terry & Co., John C., Birmingham, Eng.

**Presses, Forcing**
Atlas Press Co., Kalamazoo, Mich.
Stewart & Co., Duncan, Glasgow, Scot.

**Presses, Hydraulic**
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

**Presses, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Protractors**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Propellers**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Pulleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal and Fibre**
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Pulp and Paper Mill Equipment**
MacKinnon Steel Co., Sherbrooke, Que.

**Pumps, Automobile Tire**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Pumps, Barrel and Boiler-feed**
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coalant**
Trahern Pump Co., Rockford, Ill.

**Pumps, Geared and Hand**
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**
Can. Fairbanks-Morse Co., Ltd., Montreal
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

**Pumps, Lubricant and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Jardine & Co., A. B., Hespeler, Ont.

**Punches, Power**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

**Punching Machines, Horizontal**
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Racks, Cut**
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**
Holden Co., Ltd., Montreal, Que

**Reamer Holders**
Cleveland Twist Drill Co., Cleveland, O
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

**Reamers, Expanding**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Reamers, Solid**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Reamers, Taper**
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Recorders, Temperature**
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Recorders, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Rheostats**
Northern Electric Co., Montreal, Que

**Resistance Materials**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Respirators**
Willson Goggles, Inc., Reading, Pa.

**Rivets**
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

**Rivet Heaters**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.

**Riveting Machines**
Bilton Machine Co., Bridgeport, Conn.
Can. Fairbanks-Morse Co., Ltd., Montreal
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**
Stewart & Co., Duncan, Glasgow, Scot.

**Rolls (Rubber Covered)**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rudder Frames, Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Rubber Goods, Mechanical**
Quaker City Rubber Co., Philadelphia, Pa.

**Rules, Steel**
Chesterman & Co., Ltd., J., Sheffield, Eng.

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Rust Preventatives**
Oakley Chemical Co., New York, N.Y.

**Sand Equipment**
Can. Link-Belt Co., Toronto, Ont.

**Sand Mills**
Frost Mfg. Co. Chicago, Ill.

**Sanding Machinery**
Oliver Machy. Co., Grand Rapids, Mich.

**Sand Rammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Cleveland Pneumatic Tool Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill
Keller Pneumatic Tool Co., Grand Haven Mich.

**Saw Frames and Blades, Hack**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F. Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que

**Sawing Machines, Metal**
Atkins & Co., Inc., E. C., Indianapolis, I
Foss Machinery & Supply Co., Geo. F Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que

**Sawing Machines, Power Hack**
Ackworthie, Ltd., John, Birmingham, Eng
Atkins & Co., Inc., E. C., Indianapolis, I
Can. Fairbanks-Morse Co., Ltd., Montrea
Williams Machinery & Supply Co., A. R. Montreal, Que.

**Saw Sharpening Machines**
Atkins & Co., Inc., E. C., Indianapolis, I
Oliver Machinery Co., Grand Rapids, Mich

**Saw Tables, Universal**
Atkins & Co., Inc., E. C., Indianapolis,
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, On
Oliver Machinery Co., Grand Rapids, Mich
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**
Atkins & Co., Inc., E. C., Indianapolis,
Simonds Canada Saw Co., Montreal, Que
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis,
Simonds Canada Saw Co., Montreal, Que

**Saws, Hot and Cold**
Atkins & Co., Inc., E. C., Indianapolis, I
Simonds Canada Saw Co., Montreal, Que
Stewart & Co., Duncan, Glasgow, Sco

**Saws, High Speed Steel**
Armstrong-Whitworth of Canada, Ltd Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis,
Butterfield & Co., Inc., Rock Island, Que
Clemson Bros., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que

**Saws, Metal Band**
Atkins & Co., Inc., E. C., Indianapolis.
Oliver Machinery Co., Grand Rapids, Mic

**Saws, Metal, Power**
Clemson Bros., Inc., Hamilton, Ont.

**Saws, Metal Cutting**
Atkins & Co., Inc., E. C., Indianapolis.
Brown & Sharpe Mfg. Co., Providence, R
Butterfield & Co., Inc., Rock Island, Que
Clemson Bros., Inc., Hamilton, Ont
Lyman Tube & Supply Co., Montreal, Que
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que
Starrett Co., L. S., Athol, Mass.

**Saws, Milling**
Atkins & Co., Inc., E. C., Indianapolis.
Butterfield & Co., Inc., Rock Island, Que
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.

**Saws, Screw Slotting**
Atkins & Co., Inc., E. C., Indianapolis.
Butterfield & Co., Inc., Rock Island, Que
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que

**Saws, Swing Cut-off**
Oliver Machinery Co., Grand Rapids, Mich

**Scales**
Brown & Sharpe Mfg. Co., Providence, R
Can. Fairbanks-Morse Ltd., Montreal.

**Screens**
Can. Wire & Iron Goods Co., Hamilton Ont.

**Screw Drivers, Optical, Jewelry a Novelty**
Torrington Co., Ltd., Upper Bedford, Q

**Screw Driving Machine**
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbroo Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago,

**Screw Extractors**
Cleveland Twist Drill Co., Cleveland.

**Screw Machine Work**
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
Tallman Brass & Metal Co., Hamilton Ont.

# BUYERS' DIRECTORY

**rew Machinery, Wood and Leg**
ook Co., Asa S., Hartford, Conn.

**rew Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**rew Machines, Automatic**
arlock-Walker Mchy. Co., Toronto, Ont.
lerbert Ltd., Alfred, Toronto, Ont.
ational Acme Co., Cleveland, Ohio.

**rew Machines, Plain or Hand**
cme Machine Tool Co., Cincinnati, Ohio.
reenfield Tap & Die Corp., Galt, Ont.
lerbert Ltd., Alfred, Toronto, Ont.
ones & Lamson Machine Co., Springfield, Vermont.
ratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
arner & Swasey Co., Cleveland, Ohio.

**rew Machine Products**
orrington Company, Ltd., Upper Bedford, Que.

**rew Plates**
lkenhead Hardware Ltd., Toronto, Ont.
utterfield & Co., Inc., Rock Island, Que.
reenfield Tap & Die Corp., Galt, Ont.
ardine & Co., A. B., Hespeler, Ont.

**rews, Cap and Set**
alt Machine Screw Co., Galt, Ont.
lorrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
ational Acme Co., Cleveland, Ohio.
orrington Company, Ltd., Upper Bedford, Que.

**rews, Lock Cap**
orrington Company, Ltd., Upper Bedford, Que.

**rews, Machine**
arnes Co., Wallace, Bristol, Conn.
teel Co of Canada, Ltd., Hamilton, Ont.
orrington Company, Ltd., Upper Bedford, Que.

**rews, Safety Set**
arnes Co., Wallace, Bristol, Conn.
alt Machine Screw Co., Galt, Ont.
lorrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**rews, Side Knob**
orrington Company, Ltd., Upper Bedford, Que.

**rews, Thumb**
orrington Company, Ltd., Upper Bedford, Que

**cond-Hand Machinery**
**( See Searchlight Section)**
etrie, Ltd., H. W., Toronto, Ont.

**parators, Moisture and Oil**
owser, S. F., & Co., Ltd., Toronto, Can.
an Ingersoll-Rand Co., Ltd., Sherbrooke, Que

**parators, Oil and Waste**
owser, S. F., & Co., Ltd., Toronto, Can.

**afting**
anada Foundries & Forgings Co., Welland, Ont
an Drawn Steel Co., Hamilton, Ont.
S Steel Co., Ltd., New Glasgow, N.S.
illiams Machinery Co., A. R., Toronto, Ont
illiams Machinery & Supply Co., A. R., Montreal, Que.

**apes, Cold-Drawn Special Steel**
nion Drawn Steel Co., Hamilton, Ont.

**aping Machines**
anada Machinery Corp., Galt, Ont.
oss Machinery & Supply Co., Geo. F., Montreal, Que.
ender Machine Co., Torrington, Conn.
erbert Ltd., Alfred, Toronto, Ont.
olly, R. S., Toronto, Ont.
arion Mfg. Co., Muskegon, Mich.
cDougall Co., Ltd., R., Galt, Ont.
oelefson Machine & Tool Co., Toronto, Ont
mith & Mills Co., Cincinnati, Ohio
alcott Lathe Co., Jackson, Mich.
illiams Machinery Co., A. R., Toronto, Ont

**apers, Wood**
liver Machinery Co., Grand Rapids, Mich.

**ears, Hand**
an Blower & Forge Co., Ltd., Kitchener.

**ears, Power**
liss Co., E. W., Brooklyn, N.Y.
rown, Boggs & Co., Ltd., Hamilton, Ont.
anada Machinery Corp., Galt, Ont.
an. Blower & Forge Co., Ltd., Kitchener.
tall Co., Inc., D. H., Buffalo, N.Y.
& Co., Duncan, Glasgow, Scot.
oledo Machine & Tool Co., Toledo, Ohio.
illiams Machinery Co., A. R., Toronto, Ont.

**hearing Machines, Angle, Iron Bar ad Gate**
ertrams Ltd., Edinburgh, Scotland.

**heet Metal Working Machinery**
liss Co., E. W., Brooklyn, N.Y.
rown, Boggs & Co., Ltd., Hamilton, Ont.
arlock-Walker Mchy. Co., Toronto, Ont.
erbert Ltd., Alfred, Toronto, Ont.
tall Co., Inc., D. H., Buffalo, N.Y.
erry & Co., John C., Birmingham, Eng.
oledo Machine & Tool Co., Toledo, Ohio.

**heets, Nickel, Resist, Alloy**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**heets, Nickel, Monel and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Side Frames, Locomotive**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Slotting Attachments**
Ford-Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

**Slotting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

**Solders**
British Smelting & Refining Co., Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Canada.

**Snap Flasks**
Oliver Machy. Co., Grand Rapids, Mich.

**Special Machinery and Tools**
Brown Engineering Corp., Ltd., Toronto.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Specialties, Swaged and Headed Work**
Torrington Company, Ltd., Upper Bedford, Que.

**Spectacles, Industrial**
Willson Goggles, Inc., Reading, Pa.

**Springs**
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

**Spring-making Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Sprockets and Chains**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Squares**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Stamping, Metal**
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Stamps, Steel**
Diamond Saw & Stamping Works, Buffalo, N.Y.

**Stairways, Wrought Iron**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Steam Specialties**
Crane Ltd., Montreal, Que.

**Steel Plate**
Dom. Foundries & Steel, Hamilton, Ont.

**Steels, Tool**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel Blooms and Billets**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steel, Cold-Rolled Strip**
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Steel Castings**
Dom. Foundries & Steel, Hamilton, Ont.

**Steel Forgings**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Steel, Shafting and Free Cutting Screw**
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

**Steel, Sheet**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

**Steel, Tanks**
Can. John Wood Mfg. Co., Toronto, Ont.

**Steel, Stainless**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co of Can., Ltd., Hamilton, Ont
Vanadium Alloys Steel, Latrobe, Pa

**Steel Wire Rods**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steels, Alloy, Open Hearth and Electric**
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
United Alloy Steel Corp., Canton, Ohio.

**Steels, Alloy and Carbon**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steels, High-Speed**
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel, Magnet**
Can. Atlas Crucible Steel Co., Toronto, Ont
Vanadium Alloys Steel, Latrobe, Pa.

**Steel, Structural**
MacKinnon Steel Co., Sherbrooke, Que.

**Steel Tubing, Close Joint and Welded**
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

**Stern Frames, Cast Steel**
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Straightening Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Studs**
Galt Machine Screw Co., Galt, Ont.

**Surface Plates**
Bilton Machine Co., Bridgeport, Conn.

**Swaging Machines**
Atkins & Co., Inc., E. C., Indianapolis, I
Etna Machine Co., Toledo, Ohio

**Swaging Machine Parts**
Etna Machine Co., Toledo, Ohio

**Switches, Railway**
Can. Steel Foundries, Montreal, Que.

**Switches and Switchboards**
Northern Electric Co., Montreal, Que.

**Tablets, Bronze, Memorial**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Tachometers**
Alkenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

**Tanks, Steel**
MacKinnon Steel Co., Sherbrooke, Que.

**Tanks and Pumps, Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

**Taper Cutting Dies**
Jones & Lamson Machine Co., Springfield, Vt.

**Tap Holders**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taper Pins**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Tapes, Measuring**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass.

**Tapping Machines and Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Taps and Dies**
Ackworthie, Ltd., John, Birmingham, Eng
Butterfield & Co., Inc., Rock Island, Q
Can. Fairbanks-Morse Co., Ltd., Montreal
Geometric Tool Co., New Haven, Conn
Greenfield Tap & Die Corp., Galt, Ont
International Machinery & Supply Co Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taps, Collapsing**
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Teeth, Dredge Bucket**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Testing Metals and Materials**
Toronto Testing Laboratory, Toronto, Ont.

**Thermometers**
Bristol Co., Waterbury, Conn.

**Thread-Cutting Tools**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Thread Cutting Machines**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa.

**Threaded Wires**
Torrington Company, Ltd., Upper Bedford, Que.

**Threading Machines**
Acme Machinery Co., Cleveland, Ohio.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Thread Lead Testing Machines**
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Thread-Rolling Machines**
Bliss Co., E. W., Brooklyn, N.Y.

**Tongs**
Hepburn Ltd., John T., Toronto, Ont.

**Tool Cases**
Rice Lewis & Son, Ltd., Toronto, Ont.

**Tool Holders**
Armstrong Bros. Tool Co., Chicago, Ill.
Bilton Machine Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Markers, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Tool Posts, Lathe**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Steels for all Purposes**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Tools, Small (See Machinists' Small Tools)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Bertrams Ltd., Edinburgh, Scotland.
Burgess & Marchand, Montreal, Que
Can. Fairbanks-Morse Co., Ltd., Montreal.
Chesterman & Co., Ltd., J., Sheffield, Eng.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.
National Machine Tool Co., Racine, Wis
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strellinger Co. of Can., Ltd., Chas. A. Windsor, Ont.
Wheel Truing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Tool Work**
Brown Engineering Corp., Ltd., Toronto
Crescent Machine Co., Ltd., Montreal, Q
Ford-Smith Machine Co., Hamilton, Ont

# BUYERS' DIRECTORY

**Torches, Blow**
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Trackwork, Railway**
Can. Steel Foundries, Montreal, Que.

**Trackwork, Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Transformers**
Northern Electric Co., Montreal, Que.

**Transmission Machinery**
Bernard Industrial Co., A., Fortierville Que.
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Jones & Glassco, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Toronto, Ont.
Renold (Hans) of Canada, Ltd., Montreal Que.

**Transportation Systems (See Trucks)**
Mathews Gravity Carrier Co., Port Hope, Ont.

**Treated Bits**
Can. Atlas Crucible Steel Co., Toronto Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Trolleys and Tramways**
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Wright Mfg. Co., Lisbon, Ohio.

**Trucks**
Can. Fairbanks-Morse Ltd., Montreal Q
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Maple Leaf Mfg. Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Trucks, Industrial Motor**
Maple Leaf Mfg. Co., Montreal, Que.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Tube, Products**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Electric Welded or Oxy-Acetylene Welded**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Flexible**
Dunlop Tire & Rubber Goods Co., Ltd Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Tubing, Seamless Steel**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Seamless Steel, Brass and Copper and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Steel Products Co., Brantford, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Tubing, Welded**
International Nickel Co. of Can., Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Tubing, Welded Steel**
Tube Co. of Canada, Toronto, Ont.

**Turbines, Water**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Turret Heads**
Ackworthle, Ltd., John, Birmingham, Eng.
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Turret Machines (See Lathes, Horizontal Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Cook Co., Asa S., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Turrets, Tool Post**
Gisholt Machine Co., Madison, Wis.

**Unions, Pipe**
Crane Ltd., Montreal, Que.

**Universal Joints**
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Valves**
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Crane Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Vises, Drilling Machine**
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.

**Vises, Metal Workers'**
Aikenhead Hardware, Ltd., Toronto, Ont.
Columbia Hdwe. Division, Cleveland, O.

**Vises, Milling Machine**
Brown & Sharpe Mfg. Co., Providence, R.I.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Victor Tool Co., Waynesboro, Pa.
Parmenter & Bulloch Co., Gananoque, Ont.

**Voltmeters**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Wagon Loaders**
Can. Link-Belt Co., Toronto, Ont.

**Washers**
Barnes Co., Wallace, Bristol, Conn.
Diamond State Fibre Co., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

## DIRECTORY OF DEALERS

THE Buyers' Directory of CANADIAN MACHINERY was originally intended to contain information regarding lines actually manufactured by our advertisers. We now carry the advertising of leading machinery dealers, some of whom represent scores of manufacturers in addition to being manufacturers themselves in some cases. This necessarily widened the scope of our Directory, but it would be impracticable to list all the lines handled by all the dealers. We recommend, therefore, if our subscribers cannot find what they want in our Directory that they communicate with the dealers whose names appear herewith.

### MACHINE TOOLS AND METAL WORKING EQUIPMENT

Chas. P. Archibald & Co., Montreal, Que.
The Canadian Fairbanks-Morse Co., Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
H. W. Petrie Limited, Toronto, Ont.
The Standard Equipment & Tool Co., Montreal, Que.
Chas. A. Strelinger Co. of Canada Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Wilson-McGovern Limited, Toronto Ont.
Yeates Machinery Co., London, Ont.

### MACHINE SHOP AND FACTORY SUPPLIES

Chas. P. Archibald & Co., Montreal Que.
The Canadian Fairbanks-Morse Co., Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
H. W. Petrie Limited, Toronto, Ont.
The Standard Equipment & Tool Co., Montreal, Que.
Chas. A. Strelinger Co. of Canada Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Wilson-McGovern Limited, Toronto Ont.
Yeates Machinery Co., London, Ont.

### POWER EQUIPMENT AND SUPPLIES

The Canadian Fairbanks-Morse Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
H. W. Petrie Limited, Toronto, Ont.
The Standard Equipment & Tool Co. Montreal, Que.
Wilson-McGovern Limited, Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.

### WOODWORKING MACHINERY

Chas. P. Archibald & Co., Montreal, Que.
The Canadian Fairbanks-Morse Co., Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
H. W. Petrie Limited, Toronto, Ont.
Chas. A. Strelinger Co. of Canada Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Yeates Machinery Co., London, Ont.

**Vises, Pipe**
Columbia Hdwe. Division, Cleveland, O.
Greenfield Tap & Die Corp., Galt, Ont.

**Vises, Planer and Shaper**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Superior Machine Co., London, Ont.

**Vises, Wood Workers'**
Columbia Hdwe. Division, Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Oliver Machy. Co., Grand Rapids, Mich.

**Washers, Rubber**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Welding Apparatus, Oxy-Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Welding, Electric**
All-Weld Company, Toronto, Ont.
Carter Welding Co., Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.

**Welding Filler Rods**
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

**Welding Machines, Oxy-Acetylene**
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

**Welding, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Prest-O-Lite Co. of Can., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

**Welding Rod, Tobin, Manganese Bronze and Aluminum**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Welding Supplies**
British Smelting & Refining Co., Ltd., Montreal, Que.
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Canada, Ltd., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

**Wheels, Cast, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Wheels, Industrial**
American Pulley Co., Philadelphia, Pa.
Hull Iron & Steel Foundries, Hull, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.

**Winches, Electric**
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

**Winches, Headgate**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Winches, Stoplog**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Wire**
Barnes Co., Wallace, Bristol, Conn.
Canada Metal Co., Ltd., Toronto, Ont.
Dennis Wire & Iron Works, London, Ont
Greening Wire Co., B., Hamilton, Ont.
Northern Electric Co., Montreal, Que.

**Wire Cloth**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Wire Coiling Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Wire Rope**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Wire Straightening and Cutting Machinery**
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Schuster Co., F. B., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

**Wire, Welding**
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Wires, Special**
Dennis Wire & Iron Works, London, Ont.
Greening Wire Co., B., Hamilton, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Woodworking Machinery**
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Wrenches, Drop Forged**
Armstrong Bros. Tool Co., Chicago, Ill.
Canada Foundries & Forgings Co., Welland, Ont.

**Wrenches, Machinists'**
Armstrong Bros. Tool Co., Chicago, Ill.
Canada Foundries & Forgings Co., Welland, Ont.

**Wrenches, Pipe**
Canada Foundries & Forgings Co., Welland, Ont.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.

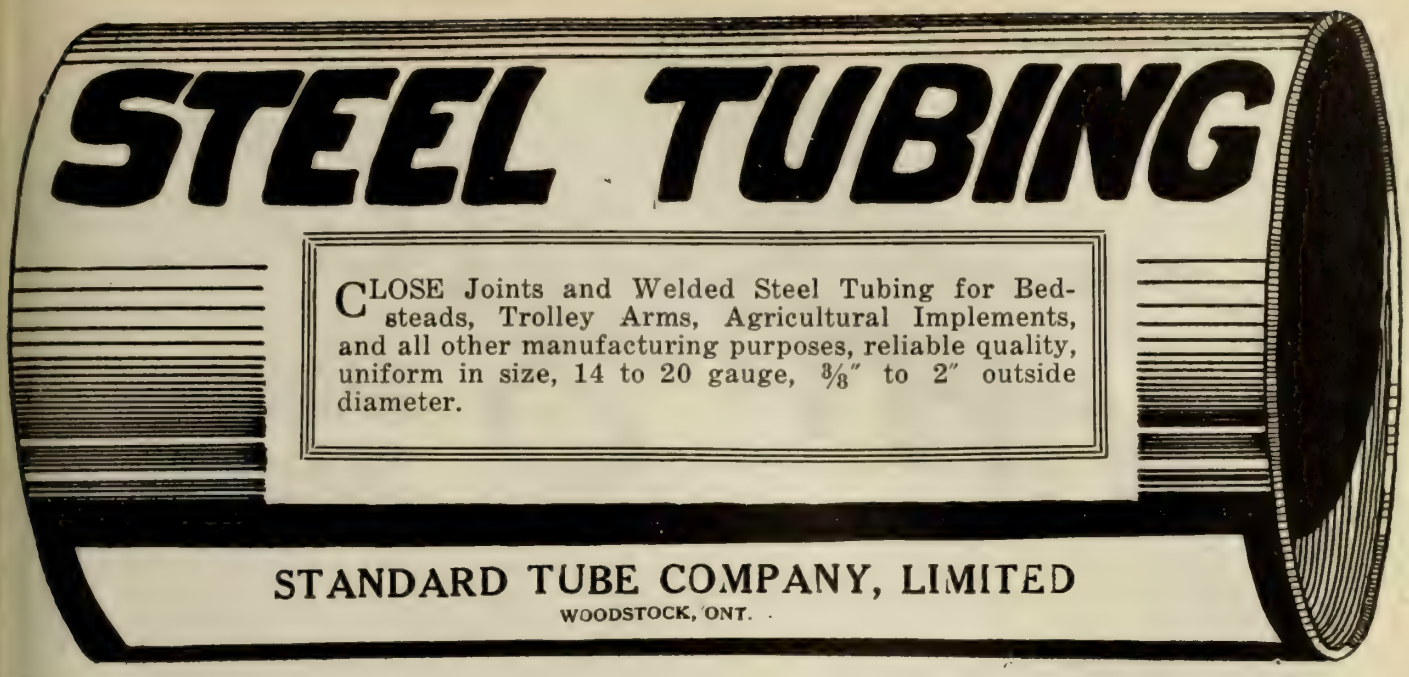
**Wrenches, Tap**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.

**Wrought Iron Pipe**
Steel Co. of Canada, Ltd., Hamilton, Ont.


## CANADIAN MACHINERY AND MANUFACTURING NEWS

143 UNIVERSITY AVE., TORONTO, CANADA

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MADE-IN-CANADA

# Torrington

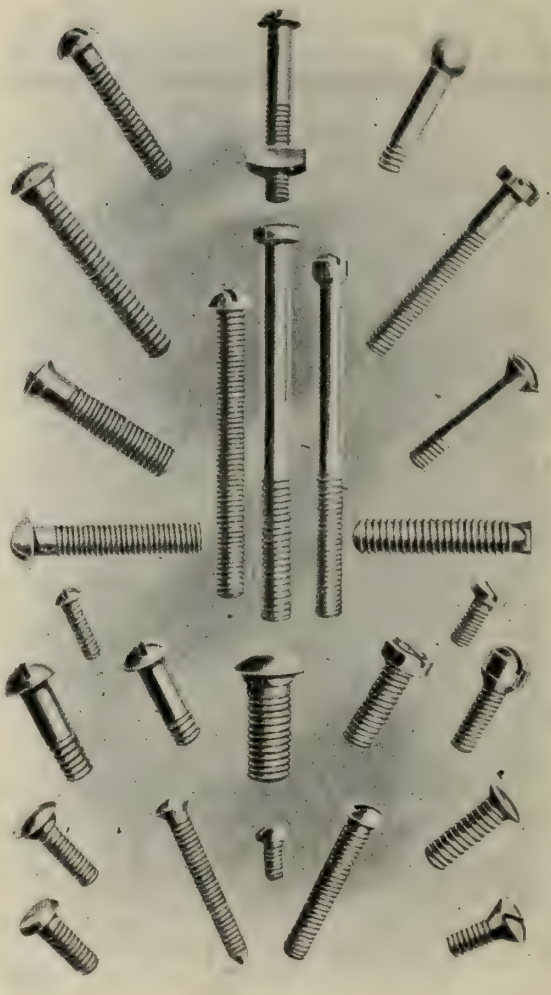
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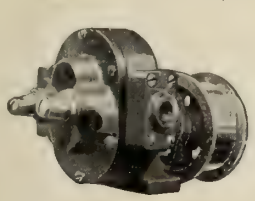
TORONTO

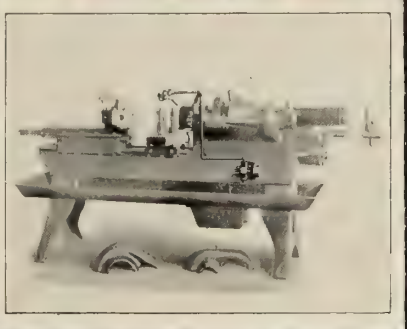
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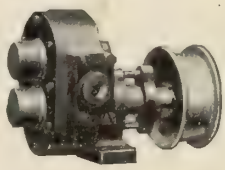
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**ROCKFORD, ILL., U.S.A.**

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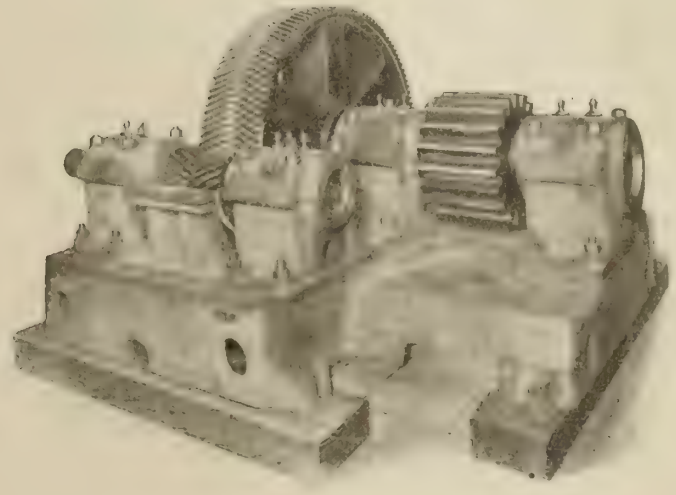
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Double Helical Reduction Set
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All kinds of Gears—Write us

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# The BERTRAM Page

## MACHINE TOOLS

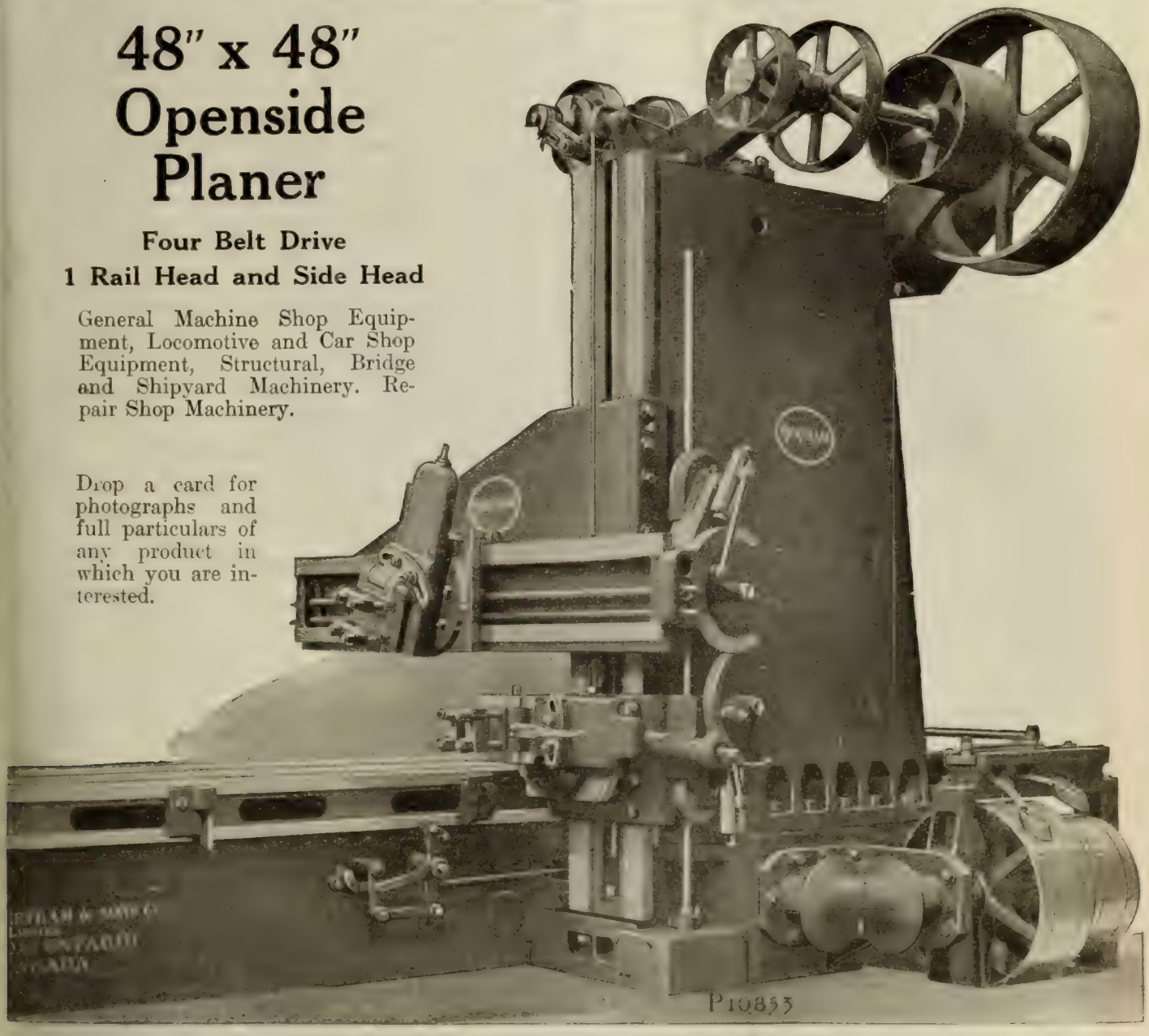
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General Machine Shop Equipment, Locomotive and Car Shop Equipment, Structural, Bridge and Shipyard Machinery. Repair Shop Machinery.

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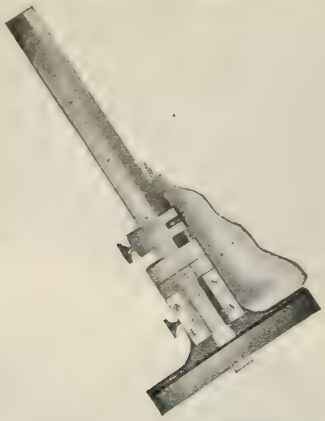

## The John Bertram & Sons Co., Limited

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"Remember that accuracy is the first requirement of a good machinist. Speed comes after.

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"In the long run, that means more than getting jobs done right—it means saved time and saved material. All of which helps save your job when the tool-borrowing, time-wasting, botch workers are being weeded out of the shop.

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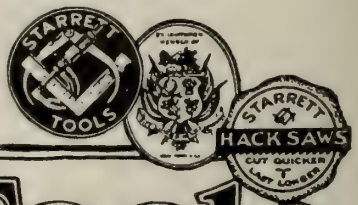
"When you go home tonight, it would be a good idea for you to drop into the hardware store and look over the Starrett line.

"Get posted on tools you need. Write for the Starrett Catalog No. 22 "3."

**THE L. S. STARRETT CO.**

*The World's Greatest Toolmakers*
*Manufacturers of Hack Saws Unexcelled*
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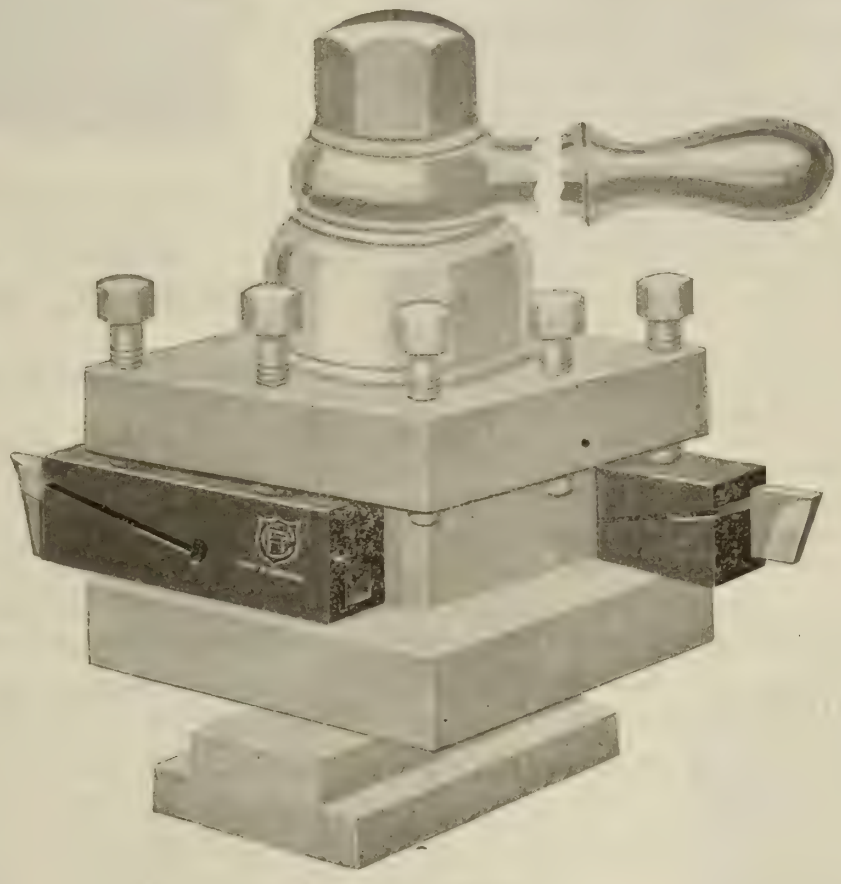

# Use Starrett Tools

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# Canadian Production Tool Company

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Manufacturers of High Grade

## Tool Holders

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# MACHINERY and SUPPLIES

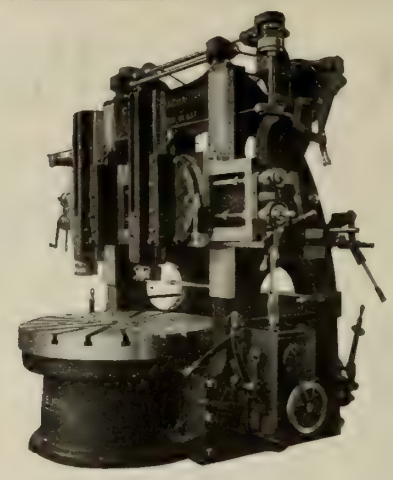
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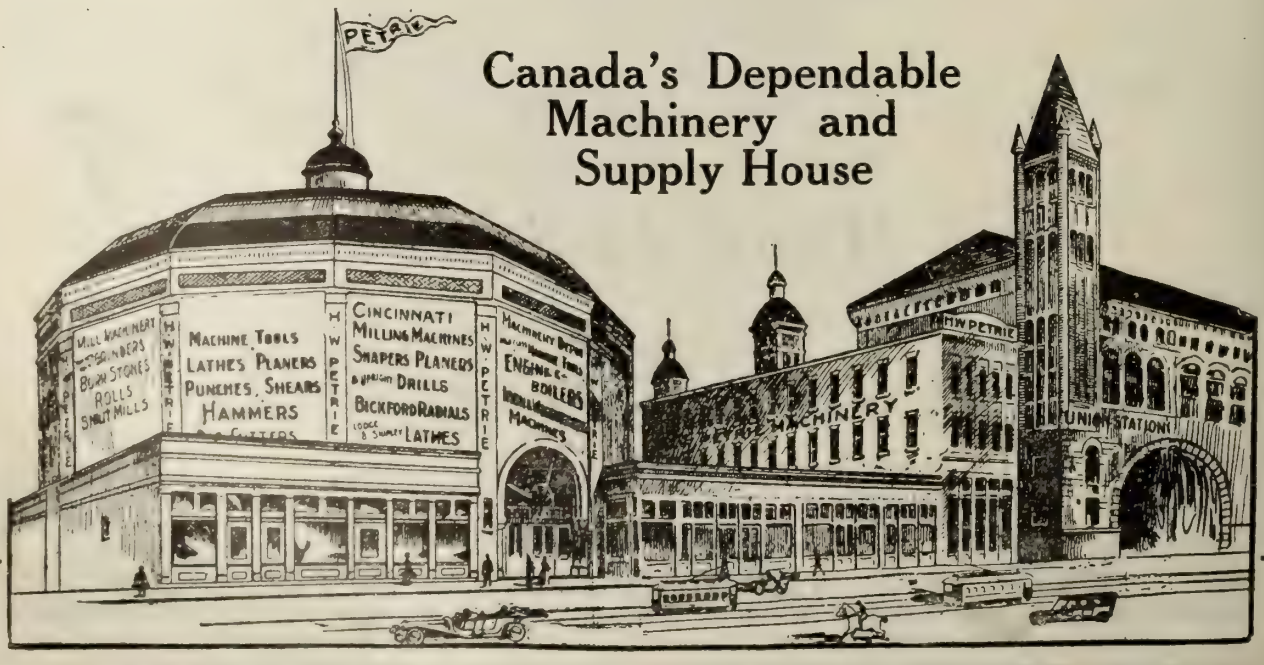
A "Colburn" means Power, Speed, Precision, Economy and Satisfaction.

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## Canada's Dependable Machinery and Supply House

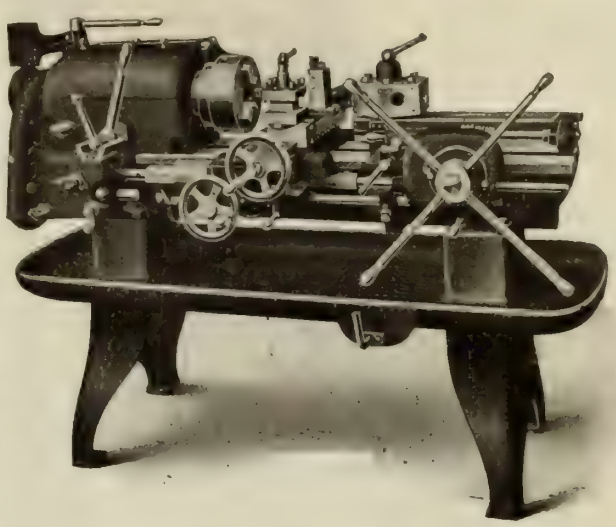



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# No. 4 Alfred Herbert Capstan Lathe

**Swing 13". Bar Capacity 1⅝" x 10"**

Our No. 4 Capstan LATHE, commonly called by machine tool users a universal turret lathe, on account of its wonderful versatility, presents a machine admirably adapted for small chuck or bar work within its capacity and is largely used on such work as wing pump bodies, carburetor parts, and general brass work, etc., etc.



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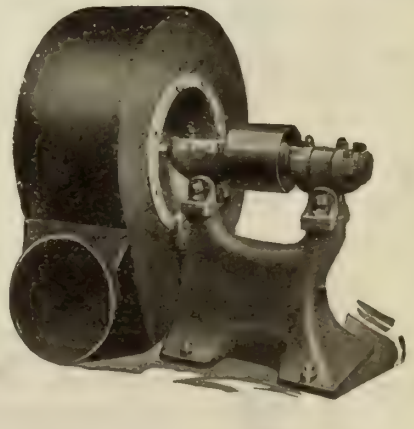
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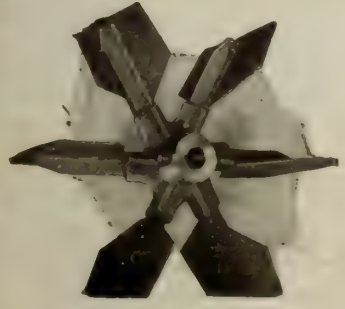
*We carry in TORONTO a very comprehensive stock selection of turret lathe tools, such as box tools, roller steady turning tools, etc., etc., and solicit the favor of your esteemed enquiries.*

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They are adjustable to any angle of discharge instantly —have universal type of wheel and carefully constructed, self-aligning oil-ring bearings.

Catalog 410-77—gives technical data and prices. Write for a copy.

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American Drill Grinder
For Wet or Dry Drill Grinding 1/8" to 2¼". Also 1/8" to 3½" dia.

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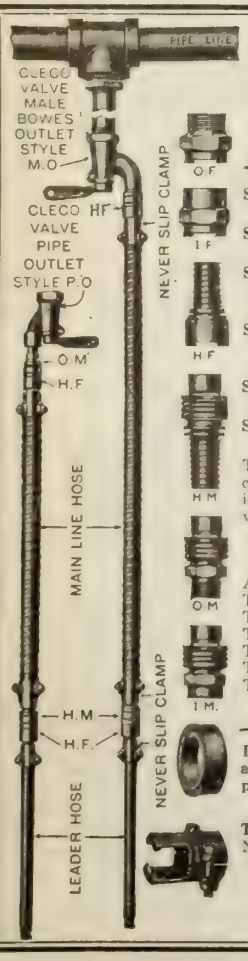
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**STYLE I.F.** is an Inside Thread Female Pipe End. Made in sizes ¼-inch to 1½-inch.

**STYLE H.F.** is a Female Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-inch to 1½-inch.

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**STYLE I.M.** is an Inside Thread Male Pipe End. Made in sizes ¾-inch to 1½-inch.

The Male and Female Ends of Bowes Couplings interchange in sizes ¼-inch to ¾-inch. Sizes 1-inch and 1¼-inch interchange. The 1½-inch ends interchange only with themselves.

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They interchange in sizes most commonly used.
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They are made of brass and will not rust.
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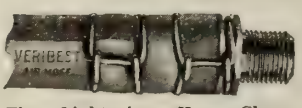
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**Style P.O.** **Style M.O.** **Style A.**

Style P.O.—Made in sizes ¼ in., ¾ in., ½ in., ¾ in., 1 in., 1¼ in., 1½ in., 1¾ in., and 2 in. Pipe Outlets. Inlets are one pipe size larger.
Style A—30° Angle Valves, are made in sizes ½ in., and ¾ in.
Style M.O. Valve—Has 1 in. Inlet and Bowes Coupling Outlet. Connects with Bowes sizes ¼ in. to ¾ in.

### CLECO GROOVED HOSE NIPPLES




Grooved Nipples when attached to the Hose with Wire Clamps as illustrated cannot "blow out." Wire clamp tool shown below applies the wires to hose.

**The Lightening Hose Clamp Tool** illustrated applies wire clamps at a cost of 1½ cents each.




**In stock:** Riveting and Chipping Hammers, Air Drills, Emery Grinders, Sand Rammers, etc.

Use Annealed Wire No. 14

**IMPORTANT:—The Small Leaks in your "AIR LINE" mean serious loss in DOLLARS. Have you any idea of the amount of "Air" wasted in small leaks at your connections? Air Leakage through 1-16 in. opening equals 5.32 cu. ft. per minute at 80 lbs. It will pay you to install Bowes Couplings and Cleco Valves, which will stop costly leaks.**

**Bulletins Nos. 43, 44, 46 and 47 mailed on request.**

**THE MODEL HOSE LINE** illustrated shows correct styles of couplings and valve to use and proper way to attach the Cleco Never Slip Hose Clamps to Bowes Couplings. No "blow-offs" can occur when "Cleco" Clamps are used.

## CLEVELAND PNEUMATIC TOOL CO. OF CANADA, LIMITED

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# NOVO-SUPERIOR

HIGH SPEED STEEL
INTRA STEEL GIBRALTAR STEEL
Tool Steel for Every Purpose
Swedish Lancashire Iron

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# WHY EXPERIMENT ?
## WE DID IT FOR YOU YEARS AGO



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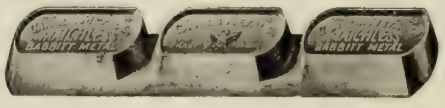



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**HARRIS HEAVY PRESSURE**

THE COPPER COATED CAKE

For Donkey Engines, Saw Carriages, Small Motors, Transmission Line Shafting and all steady heavy pressure duty.




**Matchless**

Suitable For Slow-Moving Bearings

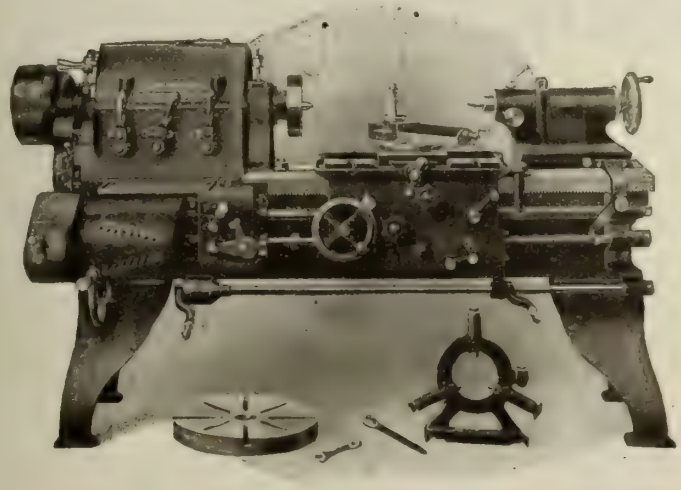
Write For Prices

**THE CANADA METAL CO., LIMITED**
TORONTO HAMILTON MONTREAL
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# The "Lehmann" Improved Selective Head Lathes
(Patents Pending)

SIZES—14" to 24" SWING

On account of its simplicity of construction, great driving power and rigidity, ample range of speeds, moderate tooth travel of its gears, compact and shapely appearance, the "LEHMANN" Selective Head Engine Lathe stands to-day in a class *ahead* and *alone*. Some of the features of construction are:



Sixteen Spindle Speeds in correct geometrical progression obtained with the use of only ten gears.

Improved Friction Clutches (Patents Pending) running in oil, requiring no adjustment and giving forward and reverse control to spindle.

Heat-treated or Hardened Steel gears.

All Shafts, except spindle, running on ball bearings.

Spindle of alloy steel, hardened and ground at the bearings and running in phosphor bronze boxes.

Head Casting forms oil-tight case enclosing all running parts.

In addition these lathes embody all features such as the patent quick change mechanism, the tailstock spindle locking device, the rod and screw shift, etc., forming part of the "LEHMANN" Cone Head Lathes which have acquired an enviable reputation for accuracy and production.

*Let us describe more fully this Exceptional Lathe and its Distinctive Advantages*

**Lehmann Machine Company - St. Louis, U.S.A.**
Chouteau Avenue at Grand


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# THE JOHNSON FRICTION CLUTCH

## The Case Against the Countershaft

The old familiar countershaft drive, through cross belts and tight and loose pulleys, stands accused of the following offences against efficiency:

1. Involves needless equipment.
2. Costs too much to set up.
3. Prevents economical and systematic use of space.
4. Operates sluggishly.
5. Multiplies belt troubles and the resultant cost of upkeep.

Modern practice has discarded the antiquated countershaft for the simplicity and efficiency of the clutch drive direct from lineshaft.

**Adopt the Johnson Lineshaft Drive**

The economical, efficient and durable method of power transmission through friction control.

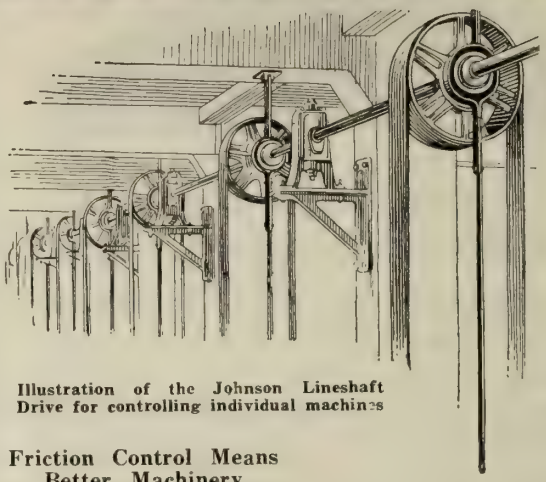
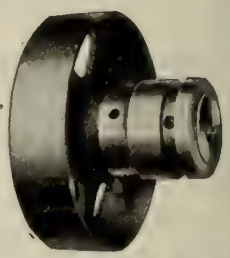


Illustration of the Johnson Lineshaft Drive for controlling individual machines

**Friction Control Means Better Machinery**

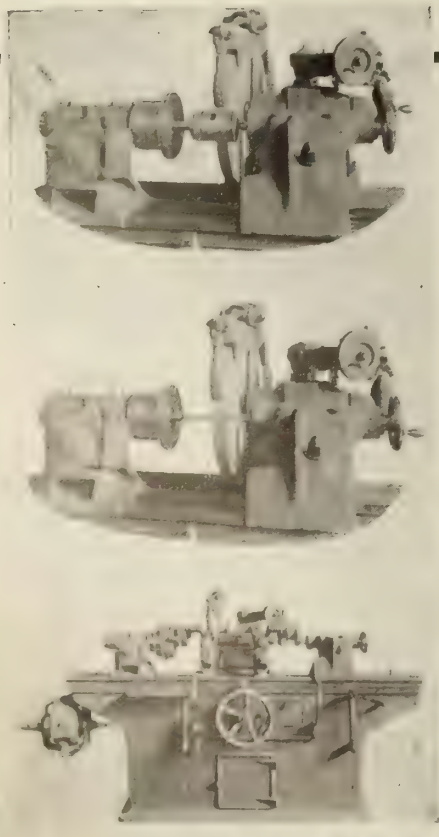
Whether it is applied overhead or in the machine itself.



Write for our Booklet "Clutches as Applied to Machine Building" and our Yellow Catalog.

CANADIAN AGENTS:
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CANADIAN FAIRBANKS-MORSE CO., LTD., Montreal, Toronto, Winnipeg

**THE CARLYLE JOHNSON MACHINE CO. MANCHESTER, CONN.**



**LANDIS**

# No. 4A SPECIAL GRINDING MACHINE

This Landis Grinding Machine can perform all the operations necessary to put the gasoline motor in first-class condition and repaired as good as new. The installation of one machine in your shop is not limited to work of any special nature, it is designed to handle any grinding operation connected with the repairing of automobile, truck, tractor and other gasoline engine parts.

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Waynesboro, Pa. New York Office: 51 Chambers Street


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## AMONG OUR PRODUCTS

**O. H. STEEL**
- Bolsters
- Couplers
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- Locomotive Side Frames
- Machinery Castings
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**FERRO-ALLOYS**

**MANGANESE-STEEL**
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- Special Trackwork

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**TRACKWORK**
- Diamond Crossings
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This list is merely an indication

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**Parts of every description in cast steel**

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**HAMILTON, CANADA**

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## Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

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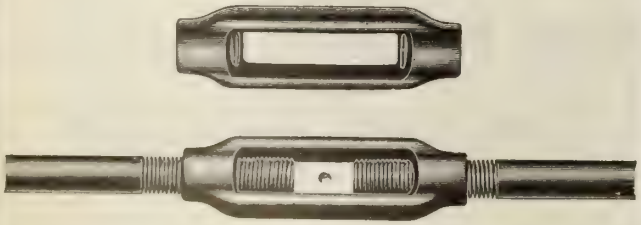
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16 Sizes with / without } Stubs

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Why not Save Time, Grinding Wheels and High Speed Steel by using Armstrong Tool Holders on Your Lathes and Planers?

Refuse Imitations and Substitutes.

**Catalogue free.**

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The fact that "Hisco" Machine Molded Gears require no pattern is a factor of considerable importance when the price of lumber and labor is so high. "Hisco" quality insures accurate, dependable gears. Remember — **the price of "Hisco" gears does not include the cost of patterns.**

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*Let us know your requirements—we do the rest.*

**Hull Iron & Steel Foundries, Limited**
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Made in Canada

**L-XX HIGH-SPEED**
**ATLAS TOOL STEELS**
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for Machine Tools, Automotive Parts, etc.
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*QUICK DELIVERIES*

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*QUALITY GUARANTEED*

Sizes—½ lb. to 5,000 lbs. each

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ESTABLISHED 1860



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A dull file is an inefficient one and wastes your workmen's time.

Discard the inefficient file; files cost less than labor.

To get efficient, keen cutting, money saving files, specify one of these standard brands:

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*Files and Rasps*

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**Increased Output**
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WHICH is the most suitable brush for any machine depends on correct analysis of all the relevant facts. That is why the Columbia Data Sheet Service improves motor and generator efficiencies. The essential facts are ascertained by Columbia Brush Specialists. These facts are carefully analyzed by the Columbia Board of Engineers. The Columbia Pyramid Brushes specified as correct for each unit are guaranteed to give satisfactory service.

Columbia Data Sheet Service is at your command. It does not matter whether you have one brush equipped unit or a thousand. Avail yourself of it.

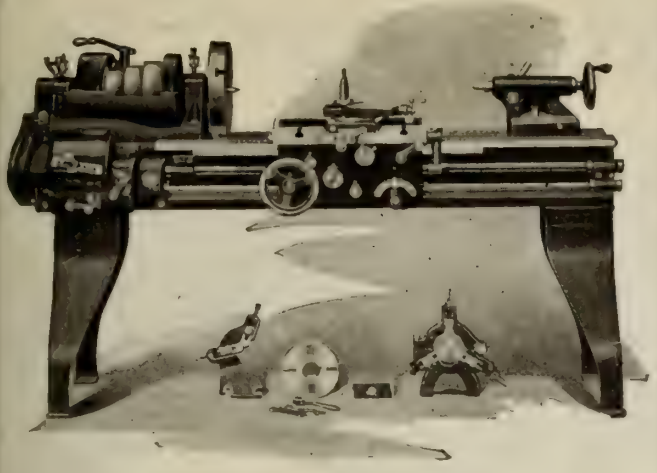
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COLUMBIA Data Sheet Service Solves Your Brush Problems.
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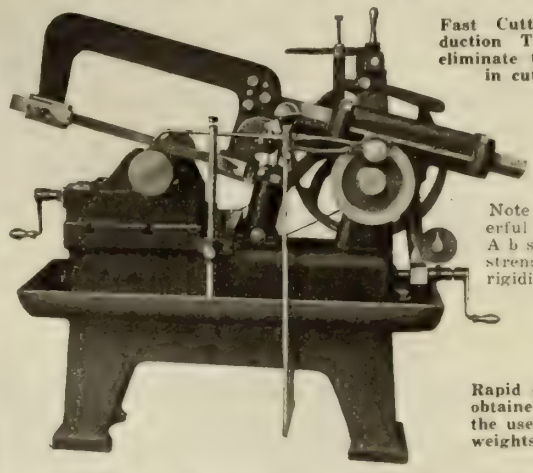
## Sufficient Weight and Power to Handle Modern Production

Though small in size, the "Economy" Double Back Geared, Quick Change Engine Lathe is strong and powerful. Its extreme accuracy makes it particularly adapted to the tool room of the modern manufacturing plant. Made in 14 in., 18 in. and 22 in. swing.

**Write for complete information of this small, heavy duty lathe, without delay.**

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## SAWING MACHINES



**Fast Cutting Production Tools that eliminate the waste in cutting.**

Note the powerful design. Absolute strength and rigidity.

**Rapid cutting is obtained without the use of heavy weights.**

FEW Sawing Machines can compare with this "Rapid" for fast cutting ability, length of life, low up-keep and cutting-economy. On most work it is a decided advantage over circular or hand saws.

The simple, rigid construction and minimum of working parts is an insurance of cheaper and better work. 3,000 of these machines giving satisfaction.

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Next time a tap breaks below the surface of a large casting, don't let some make-shift method of removing it injure the thread and waste half an hour of valuable production time. Instead—



## Walton it Out in a Jiffy

And save the casting.

Special analysis steel fingers of the Walton Extractor drop into the flutes of the broken tap—and grip. Then a few turns of a wrench applied to the squared end of the Extractor backs out the buried tap.

**Sixty-day trial offer** proves the Walton Extractor pays for itself.

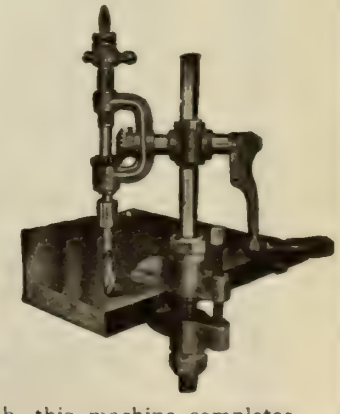
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**The Walton Co.**
**Hartford, Conn.**

## Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.





On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

**Weight, 40 lbs. Price, $26.50 net.**
**Sold by all Machinery and Supply Houses.**

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The Welded Tank answers ideally the demand of the industrial engineer for tanks which must be tight, strong and permanently leak-proof.

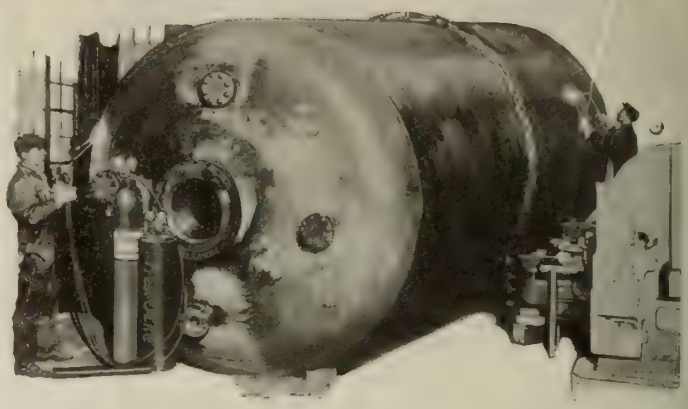
The oxy-acetylene process has made such tanks possible and

Prest-O-Lite

DISSOLVED ACETYLENE

because of its high quality and extreme portability has increased the usefulness of the welding and cutting torches a thousand fold.

Especially is this true wherever large, cumbersome sections are to be welded—Prest-O-Lite can readily be carried anywhere—it goes to the job.

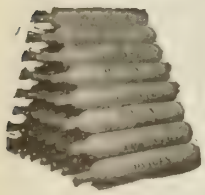


Tank makers are assured of the highest quality of gas and a constant and unlimited supply by using Prest-O-Lite.

A chain of plants and warehouses is kept busy meeting the demand for this most useful of gases.

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PWC-529





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## (ELECTROLYTIC)

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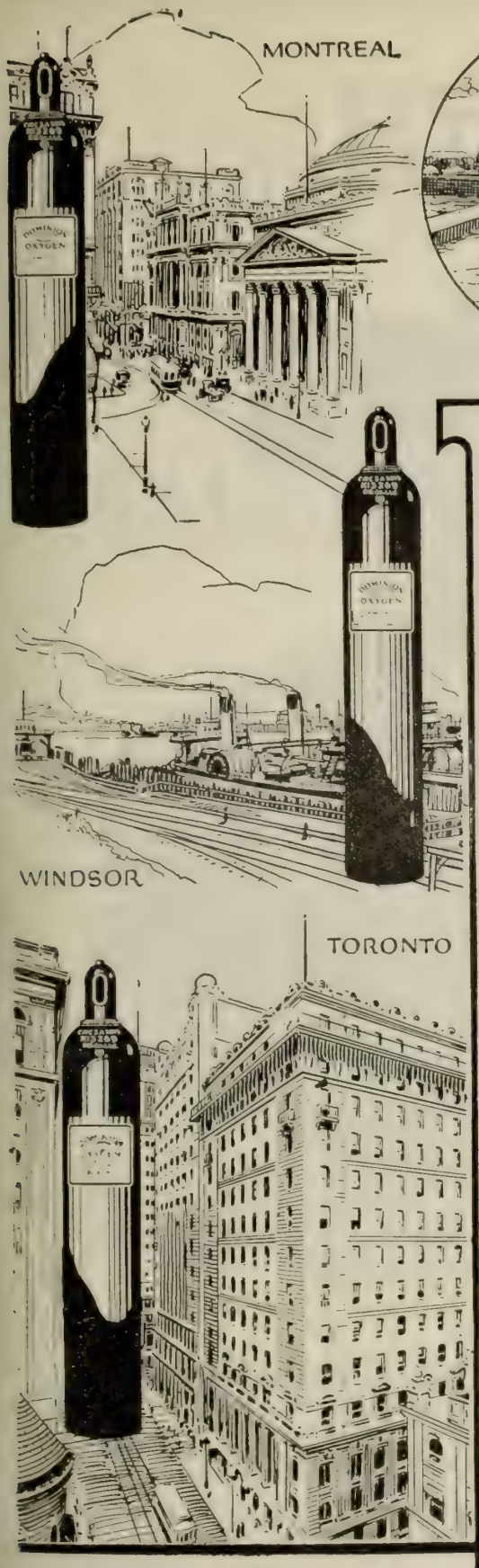
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We call your attention—pridefully—to such Service as part and parcel of our system, where all energies are bent to the end of a perfected product backed by a policy of deliveries that is equal to any emergency.

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**DOMINION OXYGEN COMPANY LIMITED**

***Hillcrest Park, Toronto***

**Hamilton, Montreal, Welland, Windsor, Merritton**

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## KEMPSMITH No. 33 Production Miller

**Paramount in Production**

A machine designed for the rapid production of duplicate parts.
Our literature will tell you all about it. Write for it.

## THE KEMPSMITH MANUFACTURING CO.

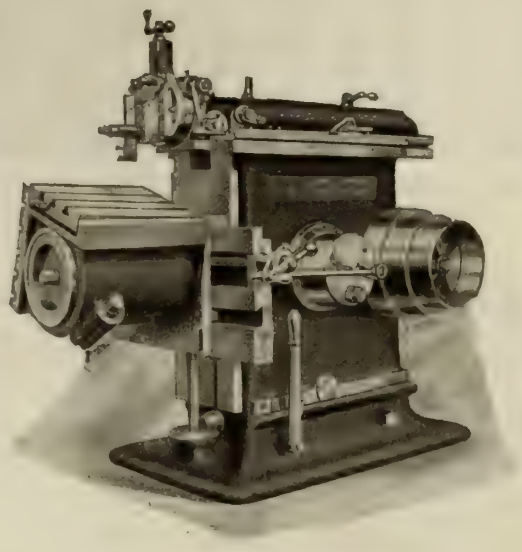
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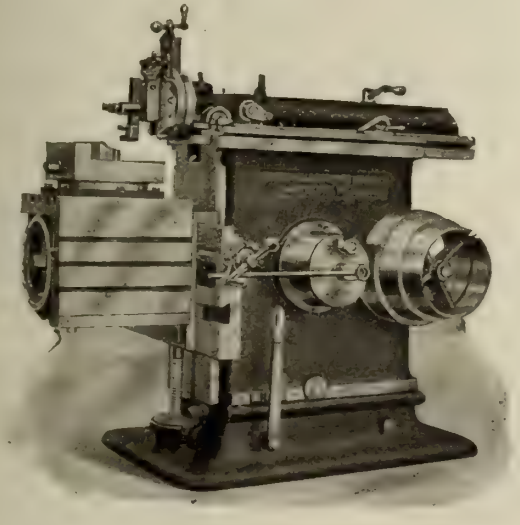

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No special vises or fixtures needed; the Universal features of these machines take care of everything, making them particularly adapted to—

Die Work, Tool Making and General Manufacturing.



Machines regularly furnished with—

- Swivelling Graduated Table,
- Auxiliary Tilting Side for Compound Angles,
- Power Down Feed on any angle, with any variation of feed,
- Automatic Feed Stop,
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- Table raised and lowered by power on 24-in. size.

**We carry large stocks of our 15-inch and 24-inch shapers in our Toronto show rooms—all ready for immediate shipment.**

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## ROELOFSON MACHINE & TOOL CO., Limited

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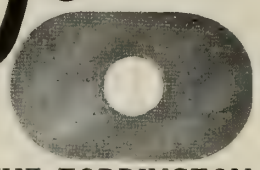
SPECIAL MACHINE TOOLS
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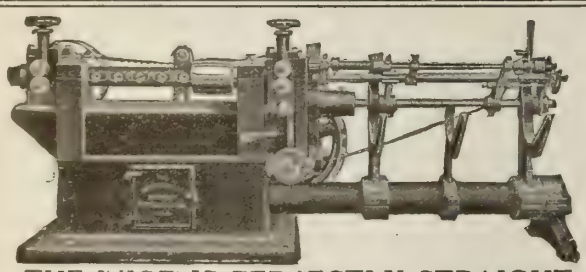
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MACHINE SCREWS



**Brass, Nickel and Plated Washers**

We also manufacture—in addition to our well-known line of Machine Screws—high-grade Rivets, from Brass, Copper, Steel, German Silver and Aluminum. Prices on request.

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THE WIRE IS PERFECTLY STRAIGHT
and cut to accurate lengths when it comes from our AUTOMATIC WIRE STRAIGHTENING AND CUTTING MACHINE, whether it's ¾" diameter or only .020" wire, hard or soft wire, highly polished or rough stock. May we send you catalogue C?

**The F. B. SHUSTER COMPANY, New Haven, Conn.**
Formerly John Adt & Son. Established 1866.
Also makers of Riveting Machines, Sprue Cutters, Cotter Pin Machines, etc.

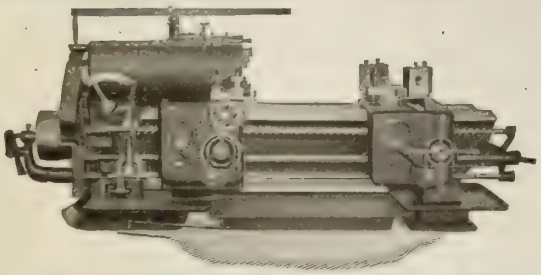
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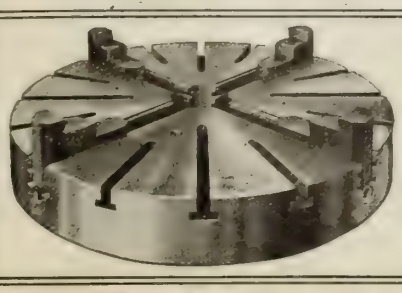
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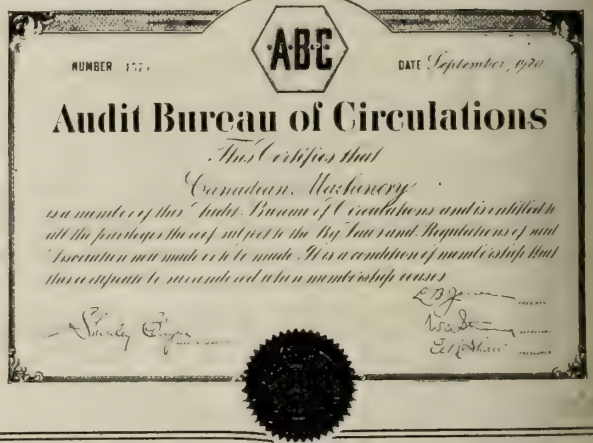
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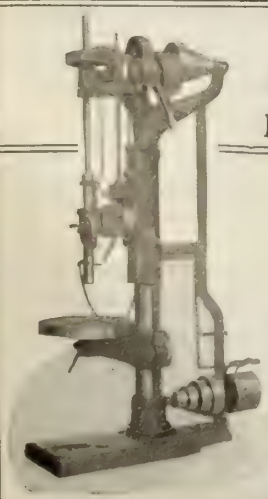
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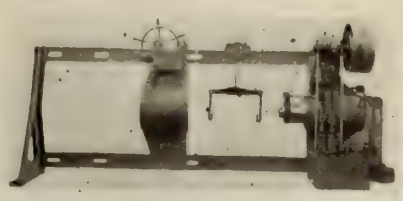
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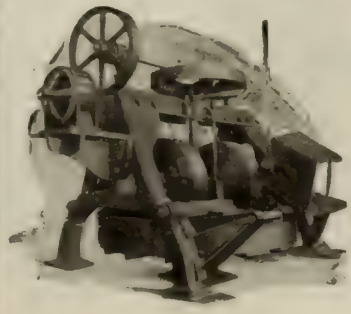
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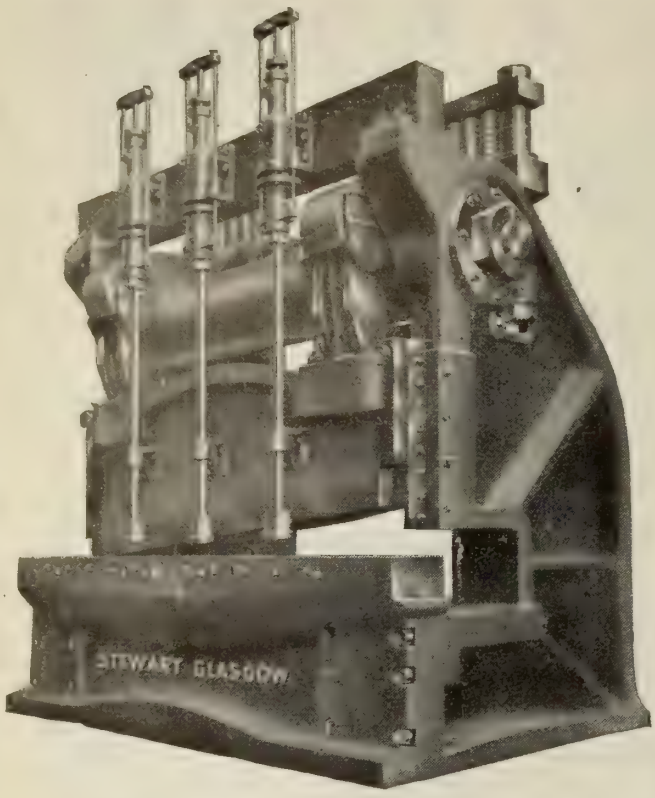
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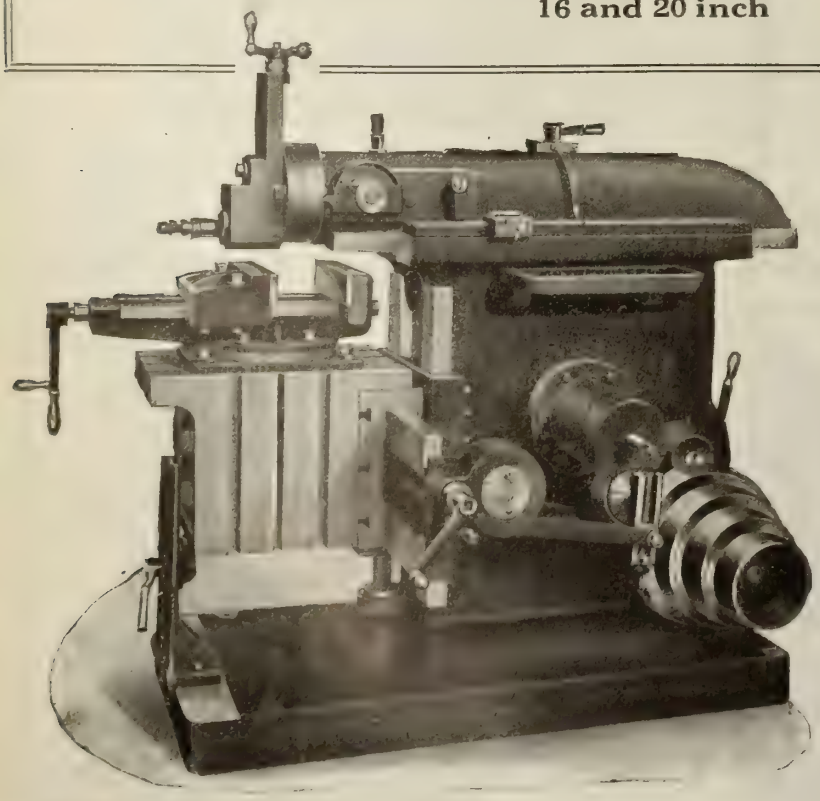
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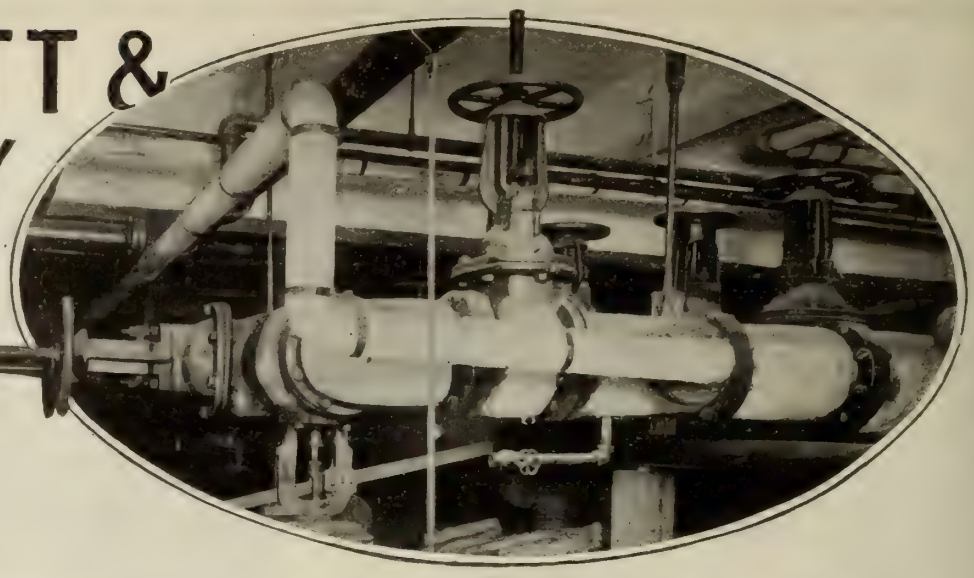
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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

)L. XXV. No. 22 June 2, 1921

# )isc Grinding Manifolds for Automobile Engines

## The Application of Disc Grinding—Miscellaneous Work Performed—Grinding Gear Covers—Manifolds—Cast Iron Pipe Flanges—Drop-Forged Parts—Cast Iron Tanks and Car Brasses

By J. H. MOORE

THE exact date of the origin of "Disc Grinding" is something over which considerable discussion ight be started. In fact it is frankly mitted by some that they do not know 10 originated the idea, although it is nown that abrasive papers have been anufactured since about 1840, and it quite certain that the process of disc inding has been used for more than lf a century.

When the disc grinder was first ought out, about twenty years ago, rcles were cut from commercial emery th, and at that time answered the rpose fairly well on light finish grind-, although they were not suitable for moving much stock. Since that time velopment, both in the machines, and the abrasive circles used, has been ry rapid, until at the present time disc inding has reached the stage where can be termed an essential manufac-ring operation, not merely a finishing ocess.

Various features have been added to e grinders generally, but perhaps the ief improvement of all is the design the modern work table. From a common flat resting slab, we now have tables that have all modern improvements, such as slots, lever feed, micrometer adjustment, etc. The work can now be held in any desired position and forced against the abrading disc at whatever pressure is desired. Of course there are numerous other improvements. For example, the spindles on disc grinders are now of the latest design and are able to withstand heavy duty. In other words the design of the machines has progressed at equal rate with its new uses. Even the disc wheels have received careful attention, such wheels being usually made of wrought steel, specially treated to eliminate strains in the metal. They are carefully machined, are practically flat and of uniform thickness to within .001 inch and can run at much higher speeds than they formerly could.

The types of machines have also branched out, until we now have the single spindle, the vertical spindle, the double spindle and the patternmaker's style of grinder. All have their own particular field of usefulness, and later on we shall show examples of work completed on the various types. To describe in detail the field for such machines would occupy considerable space, without accomplishing anything in particular, so sufficient to say that to our knowledge over 250 lines of manufacture are using the disc grinding process to speed up their production.

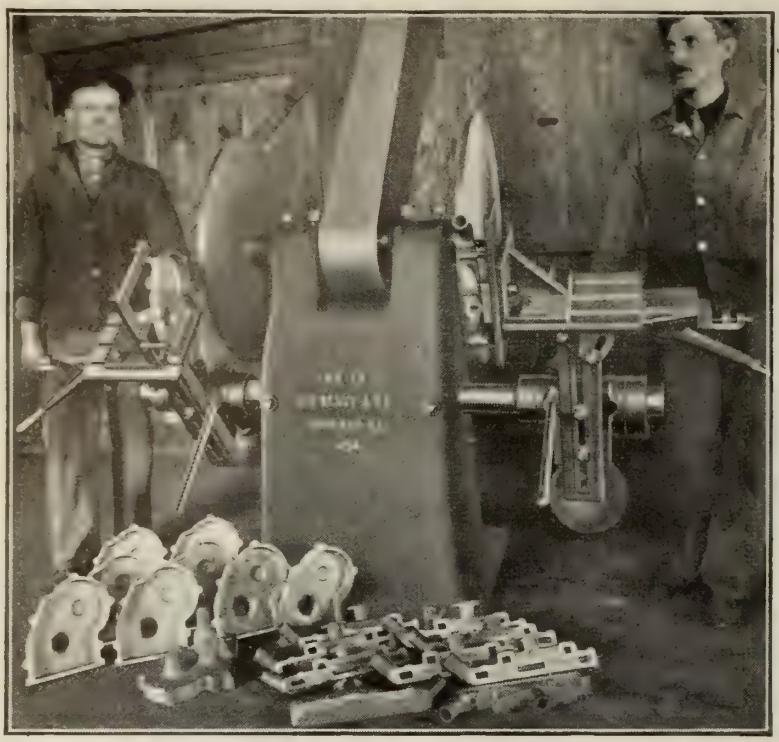
### The Application

The success of any grinder depends largely on its application. A manufacturer can easily be disappointed in such a machine, if he does not give it a proper chance to produce. Let him treat it as a machine tool, for such it is. One would not think of placing a first-class lathe in some dark, out of the way corner, yet quite often in passing through a plant you will see a disc grinder shoved away into some corner, where it will never get a chance to accomplish its best work. In spite of these conditions disc grinders work satisfactorily, so that given better treatment they can produce still further work.

Another point to watch is the use of jigs and fixtures. Wherever quantities of similar prices are being turned out it pays to design some simple holding fix-



A MISCELLANEOUS COLLECTION OF PARTS PRODUCED BY DISC GRINDING. NOTE THE RECESSING IN ALL OF THESE CASTINGS.



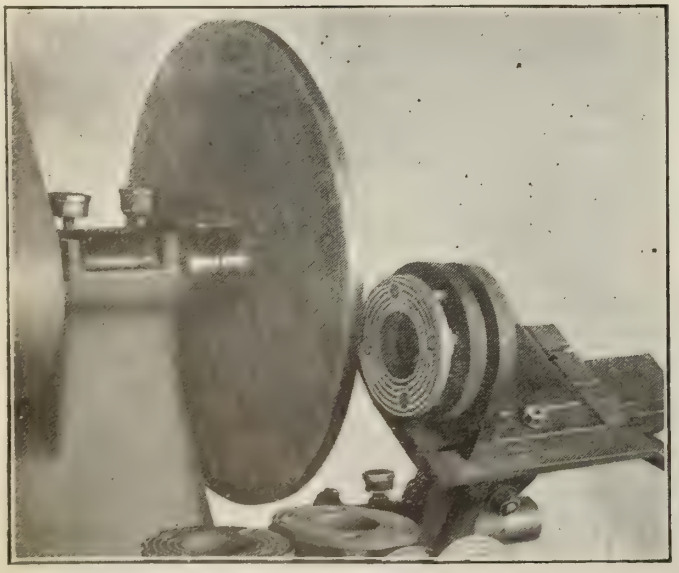
The photograph shows a 14-30"-L Besly grinder at work on gear covers and manifolds for automobile engines. This clearly illustrates the simplicity of work holders which can be used with such grinders. The work shown was ground from the rough casting at the rate of 60 surfaces per hour per operator. As the machine accommodates two operators, the above production may be doubled.

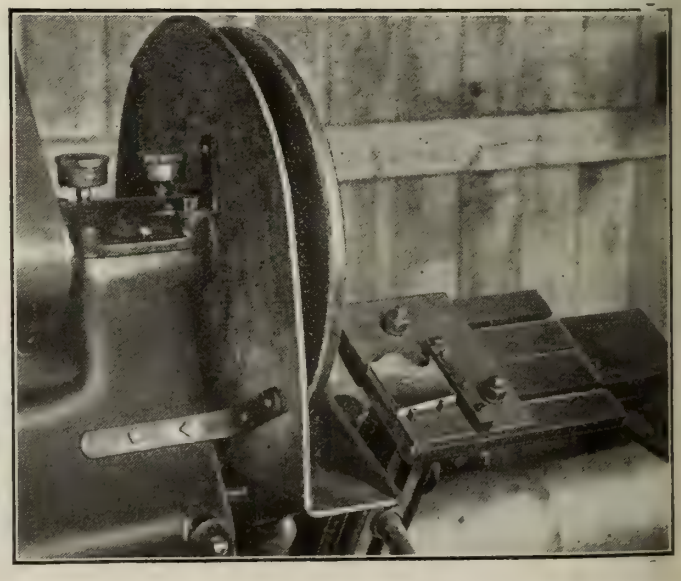
ture for the part, as in this way handling time can be reduced to a minimum. The time spent in the making of such fixtures will be soon wiped out by the large cost reductions that will ensue.

The design of the pieces to be ground is without doubt most important. It is often possible to redesign a part in such a manner that the operation time can be considerably reduced. The chief aim should be to present to the abrading disc as small an area to be ground as possible. Many parts formerly manufactured on other types of machine tools have been redesigned in such a way that by disc grinding 50 per cent. to 90 per cent .operation time has been saved. The selecting of proper abrasive circles is equally important, and when in doubt it is good policy to put your problem directly up to the maker of the machine or discs.

In selecting work for the disc grinder these points should be kept in mind: The amount of stock to be removed, the distribution of the ground surface, the total area of the ground surface and the thickness of adjacent stock for absorbing the heat from grinding, and for resisting distortion. By exercising care in the design of the piece, production will soar, and the operation cost drop accordingly.

The allowance for finish on parts to be disc ground is very much less than in such operations as planing, milling, shaping, etc., and designers who understand disc grinding practice generally call for disc grinder finish on their drawings. The patternmaker on seeing such a notation leaves very little finish on the pattern. In fact a molder will often "rap" a pattern enough to leave sufficient stock for grinding.





The photograph to the left shows a 14-30"-O Besly grinder surfacing from the rough cast iron pipe flanges, 10" outside diameter and smaller. Time, 100 to 300 surfaces per hour. Face of casting is corrugated to facilitate grinding. Corrugations also make a better holding face for gasket. The work holder is of the floating type with ball and socket joint and embodies other novel features which aid in the quick handling of the work. The use of this device allows the ground surface to clean up with the removal of the minimum amount of stock and practically doubles the production as compared with the use of an ordinary rigid angle plate.

The photograph to the right illustrates a Besly disc grinder facing the sides and edges of drop forged parts, used in the construction of metal shear. An inexpensive work holder is used, this being clearly seen in the photo. Note that locating pins are used and are so stationed that the edges of the parts are ground to the required angle.

### Amount of Stock Removed

The cost of grinding is usually direct- proportional to the amount of stock moved, so, as stated previously, it is esirable that the minimum finish be left the surfaces to be disc ground. Chas. . Besly & Co., Chicago, whose machines e show in operation throughout this rticle, find that in practice the removal f .005 inch to .050 inch of stock is sually enough to clean up a surface, lthough they have seen as much as ¼ ch ground off some brass and cast iron rfaces with profit. Generally speak- g, however, here is the amount they llow in actual practice on various work.

Drop forged wrenches: .008 inch to 015 inch.

Brass hexagon nuts up to 2-inch iameter: .015 inch. On larger sizes up .030 inch.

Steel punchings: .005 inch to .015 ch.

Cast iron machine parts: 1/32 inch 1-16 inch.

Cast brass machine parts: 1/64 inch 3-32 inch.

These amounts may vary one way or he other and much depends on the na- ure of the material, the speed of the brasive and the distribution of the round surface.

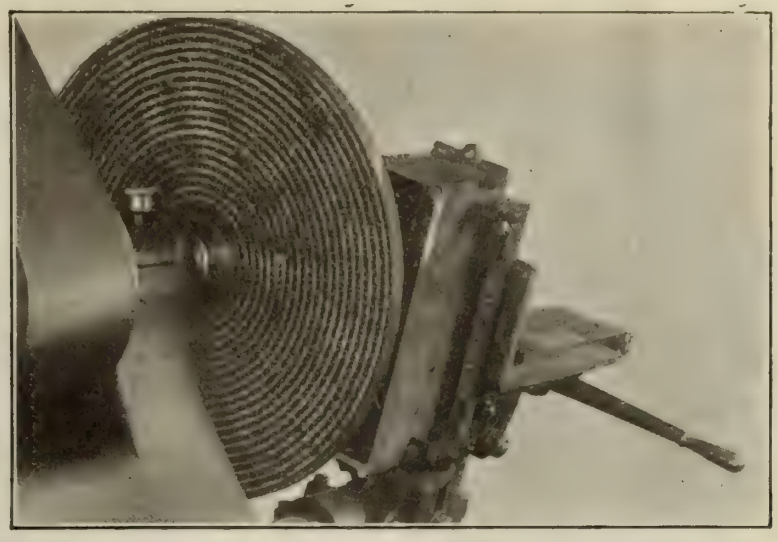
### Points to Remember

Cast metal is more easily ground than olled, or wrought metal, and soft metal easier ground than hard metal. Where on castings are small and thin, the on is often denser and harder to grind an in larger and thicker castings. cale on castings and forgings is harder n circles than clean metal, and where he scale is excessive, it is good policy remove it before disc grinding. The cale can be broken up by the use of itrified grinding wheels, either the ordi- ary type running on solid emery wheel tands, or ring wheels held in special ing wheel chucks running at one end f the disc grinder spindle. In other ases the scale is broken up by tumbling, and-blasting or pickling. Where a orging or hot rolled material is ex- essively scaled, the best method for emoving it is by pickling.

### Speed of Abrasive

The speed at which the abrasive ravels is important, and on the softer naterials a higher speed is required than n the harder metals. As the abrasive t different points from the center to eriphery of the disc wheel runs at dif- erent speeds, it would seem that the peed of the wheel was not of great mportance, but actual practice has hown that the average speed of the brasive is of the utmost importance.

Where you are in doubt it is good pol- y to consult the maker of the disc, tell im all details of the work you are pro- ucing, in this way getting the benefit f his experimental and practical experi- nce. For example, it is generally known that too high an abrasive speed on the hard metals tends to glaze and dull the circles; that too slow a speed on the softer metals tends to fill and clog the circles; while too high a speed on wood tends to burn the work. In spite of this knowledge being existent, many plants continue to waste abrasive discs through not watching these points.



Here we see the grinding off the tops and feet of rectangular cast iron tanks, 5 inches deep and varying in length from 9 in. to 20. in. On this work it is not necessary to grind to size or exactly parallel. The surfaces must be straight and flat and the manufacturing cost low.

An ordinary angle plate is bolted to the geared lever feed table. 30 in. grinding discs are used. The work is forced against the grinding disc by a single ball point, projecting from the face of the angle plate and bearing on the centre of the work, so that the work is free to "float" against the grinding disc and clean up with the removal of the minimum amount of stock.

The work is supported and approximately centred on the ball point by a simple frame bent up from 1 in. square rough bar steel mounted on the face of the angle plate. This frame is drilled to carry adjustable stops for approximately centring the work on the ball point. By raising or lowering the frame on angle plate and changing the position of the stops, the one frame is used for grinding many different sizes of tank castings, varying in width, depth and length. The position of the ball point on the face of the angle plate is not changed.

These long castings are ground in a vertical position. This is desirable on such long work, as it keeps the circle in better shape, the work is handled more quickly and it grinds nearer flat and straight than if supported in a horizontal position. The tops of castings 20 in. long by 5 in. wide are finished from the rough by unskilled labor at the rate of 50 per hour, or eight times faster than the previous milling time.

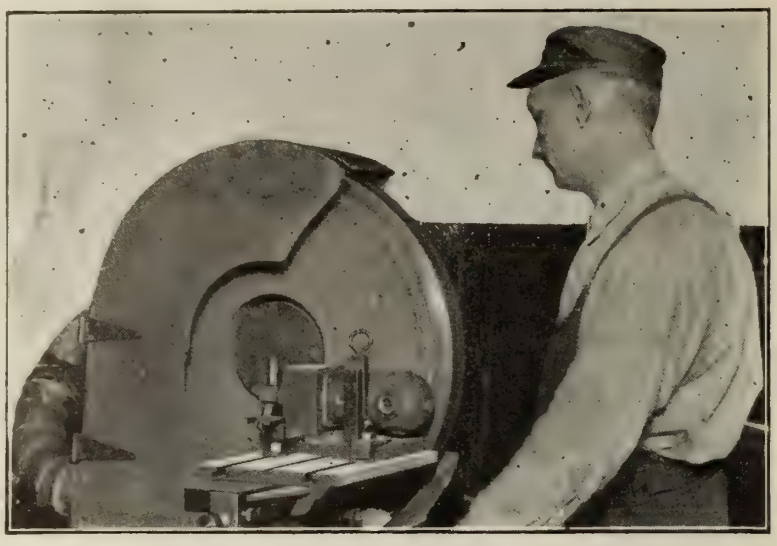
The same fixture is used in grinding off the feet on these castings; the ball point in that case being on the end of a stud projecting far enough from the face of the angle plate to reach the inside of the bottom of the tanks and allow the work to float against the grinding disc.

### Distribution of Surface

Disc grinding should be completed dry. In other words water should never be used for carrying away the heat generated in grinding, because water will destroy the circles. Heat is, of course, caused by friction in grinding, while friction is caused in turn by the abrasive grains rubbing on the work, and the ground particles rolling between the circle and the work.

In disc grinding, the entire face to be surfaced is usually in contact with the surface, so that hundreds or thousands of cutting points are at work simultaneously. These cutting points are working at a very high speed, and the more cutting points at work, the more friction and heat. Thus a sharp, free cutting circle creates less friction than a dull or glazed one. Where feeding pressure is insufficient, the cutting points rub and burnish the work, creating excessive friction and consequent heat.

Most of the heat generated in disc grinding is from friction caused by grindings (or ground particles) rolling between the circle and the work. The greater distance these grindings are carried between the circle and the work before being discharged, the greater the friction and heat generated. Excessive travel of grindings is the principal cause of heat, therefore the distance travelled by these grindings before being discharged from circle is one of the most important considerations. It is at this point that the benefit of properly designed work shows up, for where a surface is broken up by indentations, into which the grindings discharge, less heat is generated because the travel of grindings is reduced.



In the production department at the Evinrude Motor Company's shops in Milwaukee, they keep three disc grinders busy all the time, surfacing a variety of bronze, brass and cast iron parts, many of which were previously milled. The operation shown is surfacing carburetor flanges on cast iron cylinders for Evinrude motors—surfaces 2¼ in. long and 1½ in. wide. From 1-32 in. to 1-16 in. of stock is removed by a No. 17 grinder at the rate of 90 per hour—previous milling time being 60.

**Heat Should Be Avoided**

The work should not be allowed to get too hot, for cold metal always grinds easier than very hot metal. Hot metal in contact with the circle also tends to destroy the bond in the circle, and at this point we again emphasize the advantage of properly designed parts that will carry away the heat generated.

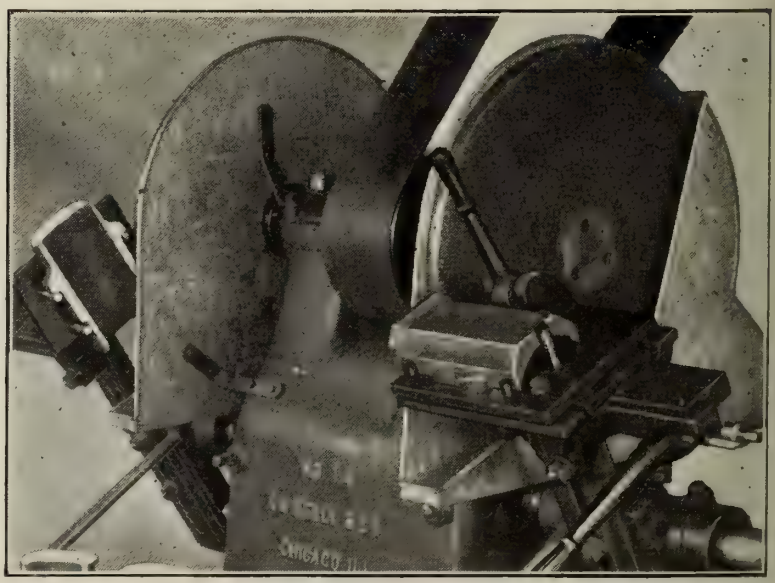
The expansion from frictional heat is seldom evenly distributed through the work and this unequal expansion often warps the part being ground. If grinding is continued while the work is distorted, it is only natural that the ground surface will not be flat when the work has cooled or contracted. In every case avoid hot work, for apart from the above stated disadvantages the parts are not so conveniently handled by the operator.

To minimize the generation of heat, there are certain things can be done. First of all select carefully a sharp, free cutting circle of the coarsest grains practicable, and use sufficient feeding pressure to make these coarse grains bite and cut so that the stock will be roughed off quickly.

If the circle becomes glazed, resharpen it by running a suitable dresser lightly over the surface. A stiff wire brush makes a good tool for such a purpose when grinding carbon, brass, cast iron, etc. The correct feeding pressure to use varies, but the work should never be forced against the circle for more than three to twenty seconds at a time, this of course depending upon the nature of the work. Should the work get too hot before sufficient stock has been remove it is better to handle it more than on allowing it to cool between operatio In the average case, however, especia when the part is properly designed, ov heating does not occur. The three pri cipal methods of reducing the travel grindings are: recessing of patterns, r tating the work and using groov circles.

The importance of breaking up t surface to be ground cannot be ov emphasized. Relieve the finished su face area wherever possible, as by doing you will not only increase prod tion, but will reduce the cost of grin ing, save money on the purchasing circles and make it easier for the op ator. Another point often forgotten that by recessing large castings you a ually save metal, and in some cases t saving in the price of the metal h been known to pay the grinding cos

In a later issue we shall discuss fu ther points to watch for in the art disc grinding, and in the meantime wo suggest you study carefully the exa ples shown throughout this portion the article.



Squaring car brasses on a 26 in. disc grinder. These surfaces are finished straight and true from the roughcasting, so when brasses are clamped in the babbitting fixture, the joints are tight and prevent the babbitt from leaking out. The work does not come in contact with work tables to mar and wear their surfaces. Renewable work holders take all this wear. Time, 20 seconds per surface, from the rough.

Left hand table. Non-rigid. Left hand table carries an ordinary angle plate. Work is located and supported, without clamping, by four studs projecting from face of angle plate; three of which appear in the cut. Feeding pressure keeps the work on a three point bearing formed by three studs projecting from face of angle plate. This is the first operation on the casting.

Right hand table. Rigid chucking. Right hand table carries a quick clamping fixture for grinding the end of the brass. This is the second operation. The end must be ground at right angles to the first finished surface and as nearly as possible at right angles to axis of the brass. Therefore, rigid chucking is desirable to secure accuracy in angularity. Work is located by three studs projecting from top of work holder and is clamped rigidly by means of quick-acting cam lever shown.

# Jigs and Fixtures Used in Making of Truck Parts

## Fixtures For Certain Parts of Truck, These Including Engine Front Support Arm—Tail Lamp Bracket—Water Pump Body—Radiator Front Support Bracket—Tow Hook and Shaft Sprocket

By ROBERT MAWSON

THE workmanship entering into the manufacture of a truck for commercial purposes has to be of the very best. Interchangeability is absolutely essential in order to reduce the assembling time to a minimum, intensive manufacture being, after all, a secondary consideration. The article to follow covers a description of various jigs and fixtures used in the manufacture of trucks manufactured by the Northway Motors Corporation.

The illustration, Fig. 1, shows the machining of the engine front support arm. The casting is placed on the two pads A and forced against the locating stop pin B with a screw at the opposite end. The pin headed screw C is next tightened to force the piece down on to the pads A. Three straps D being tightened as shown, hold the support arm securely in the jig. The tool is first placed on the machine table resting on the four pads E, when a 1-inch hole is drilled and reamed, afterwards being counterbored, for a part distance, to 1¼ inches.

The jig is then placed in the position shown, and two 21/32-inch holes drilled, the tool being guided through bushings F. It will be noted that the placing and removing of the part in this jig is very simple, the straps swinging clear from the element to be machined so that the operator can slide it in from the front, and yet see that it assumes the correct location before starting to drill, thus preventing errors which might be caused if a closed in fixture was used.

The illustration, Fig. 2, shows the jig used when drilling the tail lamp bracket. The forging is located between the two pins A, and a stop in the cover of the jig. The special nut B is then tightened, and the pressure exerted forces the strap shown on to the part and holds it securely. It will be noticed that the strap is provided with an adjustable screw C, which can be regulated so that the strap will rest parallel on the piece being machined. When the bracket is in the position shown, two 5/16-inch holes are drilled, the tools being guided through the bushings in the jig cover. To remove the part, the special nut is screwed off the stud and the strap swung back out of the way.

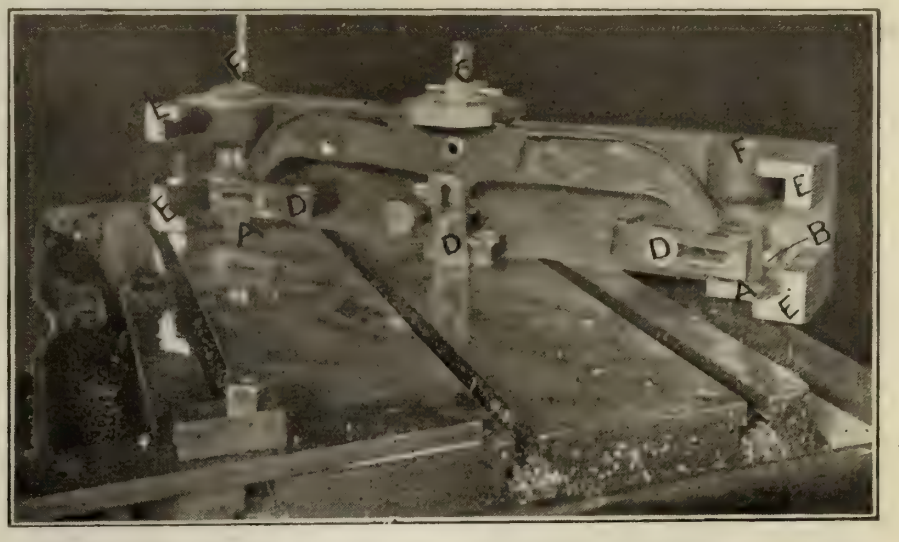



FIG. 1—MACHINING AN ENGINE FRONT SUPPORT ARM.

### Drilling the Water Pump Body

The jig used when drilling the water pump body is shown in Fig. 3. The casting is located by means of a raised projection on the jig which fits into a machined recess in the casting. The pin headed screw A is then tightened, and this forces the piece back against the stop B. The wing nut C being tightened on to the screw as shown holds the casting securely in the jig for the machining operation. The tool is then placed with the surface D resting on the machine table, and two 5/16-inch holes drilled. The jig is then turned over and six ¼ inch holes are drilled in the pump body, using suitable bushings.

A rather simple jig is used for drilling the tow hook, this being illustrated at Fig. 5. The interesting feature of this tool is the method of locating the piece. The hook end of the forging is placed in the hardened steel vee block A, and the other end is set into the steel vee block B, the knob C is then tightened, and as the screw motion forces along the block B the forging is not only centred between the two blocks, but also held in the proper location. Two 9/16-inch holes are then drilled.

The illustration, Fig. 6, depicts the jig used when drilling the radiator front




FIG. 2—DRILL JIG FOR TAIL LAMP BRACKET.

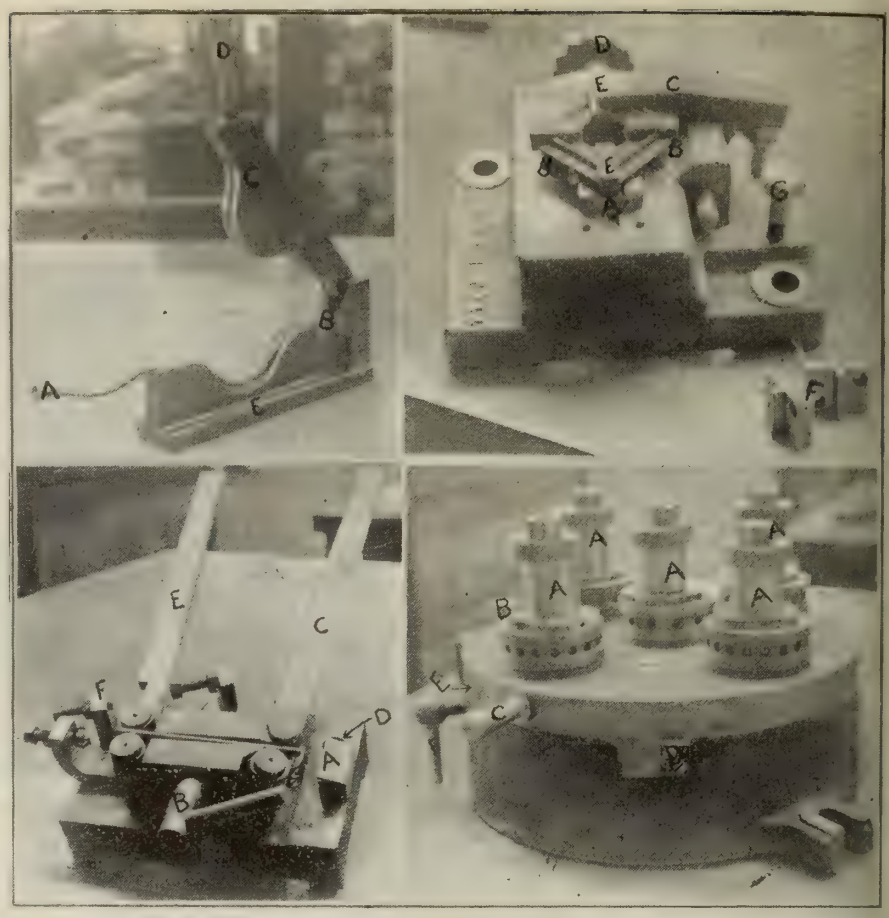
FIG. 3—DRILL JIG FOR WATER PUMP BODY.

support bracket. This casting has been milled on the joint surface in a previous operation, and is then located in the fixture shown by means of two lugs A, one on each side, and two pins placed to form a vee at the left hand end. The cover B is dropped down and held with the swinging bolt and knob nut C. The two knobs D are next tightened and these operate screws that come in contact with the casting and force it back into the proper location, holding it securely. Three 13/32-inch holes are then drilled, the drill being guided through the bushings E and F, and another placed opposite the latter.

### Two Bending Fixtures

A somewhat simple type of bending fixture is used when making the oil relief valve tube; this is shown in Fig. 7. The tube used to make the element is made of copper, and is purchased by the company to the correct size. It is then cut to length, the two ends threaded, and couplings attached as at A. The other coupling is placed in the locating block B, with the tube resting in the slot of the fixture. The cover C is dropped down, and the man pressing down on the handle D can exert sufficient pressure to bend the tube until it takes a similar contour to that of the fixture. The base of the tool E is held in the jaws of an ordinary vise. One of the finish formed parts is shown in the slot of the fixture.

The fixture employed when bending the spark control rod is illustrated in Fig. 8. The rod is first cut to the correct length and located in the fixture by means of a block placed between the inner end of the stop A, and the end of the rod. The holding vise is then tightened on to the part by means of the screw and handle B. The bending handle C is next pulled over, and the end of the rod formed, the handle being drawn down until it comes in contact with the stop D. The handle E is now pulled down until it touches the stop F, and the other end of the rod is bent. It will be observed that the bending levers are provided with hardened steel rollers on both sides of the rod being bent. With the use of these rollers the operation is much easier for the man, less pressure being required, and also the formed portion is much smoother, kinks on the surface of rod being prevented. This tool is also used for bending a longer rod and when adapted for this operation the screw G is used as the locating medium. It will be seen that this tool is very simple in its construction, yet accurate parts are produced, its manipulation is simple, and it leaves little or nothing to guess work or trial.




UPPER LEFT FIG. 7. LOWER LEFT FIG. 8. UPPER RIGHT FIG. 9. LOWER RIGHT FIG. 10.

### Interesting Milling Fixture

The illustration, Fig. 9, depicts a milling fixture used when machining the accelerator shaft floating member. This casting is located on two steel blocks A, the other being at the far side of the tool and resting on two height pins B The strap C rests on top of the piece a one end as shown. The knob D is then tightened and as the slot in which the blocks fit is machined on a taper, a the screw is tightened the blocks are forced upward against the casting, thu holding it firmly in the fixture. A key way is then machined in the arms E the cutter being located by means of th edge of the strap. The casting is the revolved around 180 degrees, and th operation repeated. The casting is nex reversed and located in the tool b means of the steel blocks F, which hav been substituted for the blocks A. I will be observed that these latter block are provided with a tongue, this fittin in the keyway of the casting machine in the previous operation. The piece i held in a manner similar to that alread described, and the four keyways ma chined on the other sides of the arm making in all eight slots. It might b added that another guide strap is some times used on the bolt G to insure ac curacy in the alignment of the keywa cutter.

The fixture shown in Fig. 10 is em ployed when machining the accessorie shaft sprocket, the fixture being de signed to mill five pieces at one setting

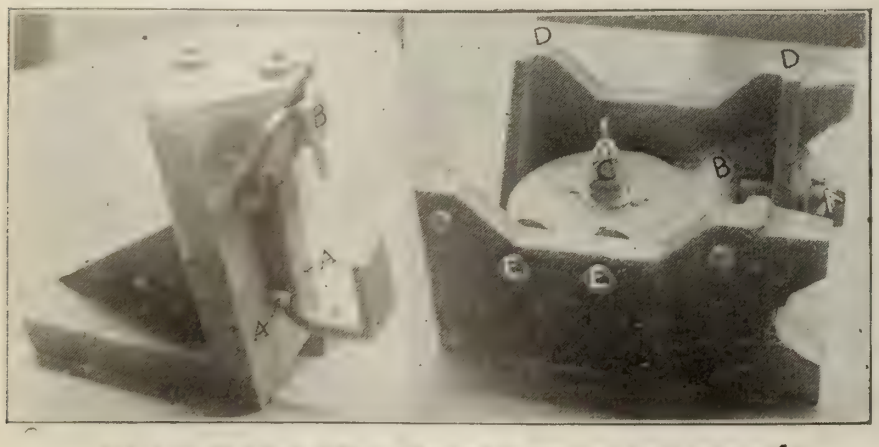



FIG. 5—LEFT HAND VIEW. SIMPLE JIG FOR DRILLING TOW HOOK.
FIG. 6—RIGHT HAND VIEW. DRILL JIG FOR RADIATOR FRONT SUPPORT BRACKET.

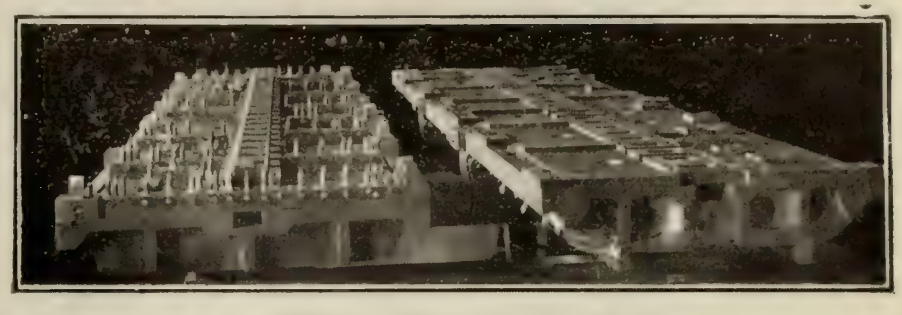
hese are located by being placed on the round pins A and held in place with ıe nuts shown at the upper end of the prockets. For the operation of machin-ıg, four cutters are used, being accu-ıtely spaced on the machine arbor. he fixture is then fed under the revolv-ıg cutters in the usual manner, being ıstened on the machine table and lo-ıted by means of keyways in relation ) the cutter arbor.

After two sides of each element have een machined, the fixture is indexed round by means of the pin B, which s withdrawn and placed into another ıcating bushing in the fixed member of he fixture, using the handle C to revolve ıe sliding part of the tool. Guide stops ), the other being at E, are attached to he fixture to assist the operator in de-ermining the positions of the locating ushings.

The crank handle F is then turned, nd this operates a screw coming gainst the sliding member, and assists ı holding the fixture rigid during ma-hining operation. The other surfaces re then milled on the sprockets, mak-ıg four machined faces on each element, s shown by the pieces in the fixture hich have been completed.

The illustrations, Figs. 11 and 12, how the jig used for machining the uffler front bracket. The casting is laced in the tool and slid over against he fixed stop A. The knurled head crew is tightened, and the pressure xerted holds the piece in contact with his locater. The screw C is adjusted y means of the knob, and this also orces the element against the stop pin. The special hook strap D is afterwards astened in contact with the bracket asting by screwing the knob at the rear n to the threaded stud which is made ntegral with the strap. These three lements therefore serve the dual pur-ose of forcing the casting in contact ith the locating stop pin and also olding it rigidly for the machining operation. Two 13/32-inch holes are drilled, the tool being guided through the bushings E. The jig is then turned over on the machine table until it assumes the position shown in Fig. 12, when two ⅜-inch holes are drilled.

It will be observed that this jig is of open construction, and the operator can see at once if the part is correctly located without any chance of error. Open jig construction is a good design to follow if at all possible.



GENERAL APPEARANCE OF THE DIE.

## SEED DRILL DIE

By TRACEY MANES

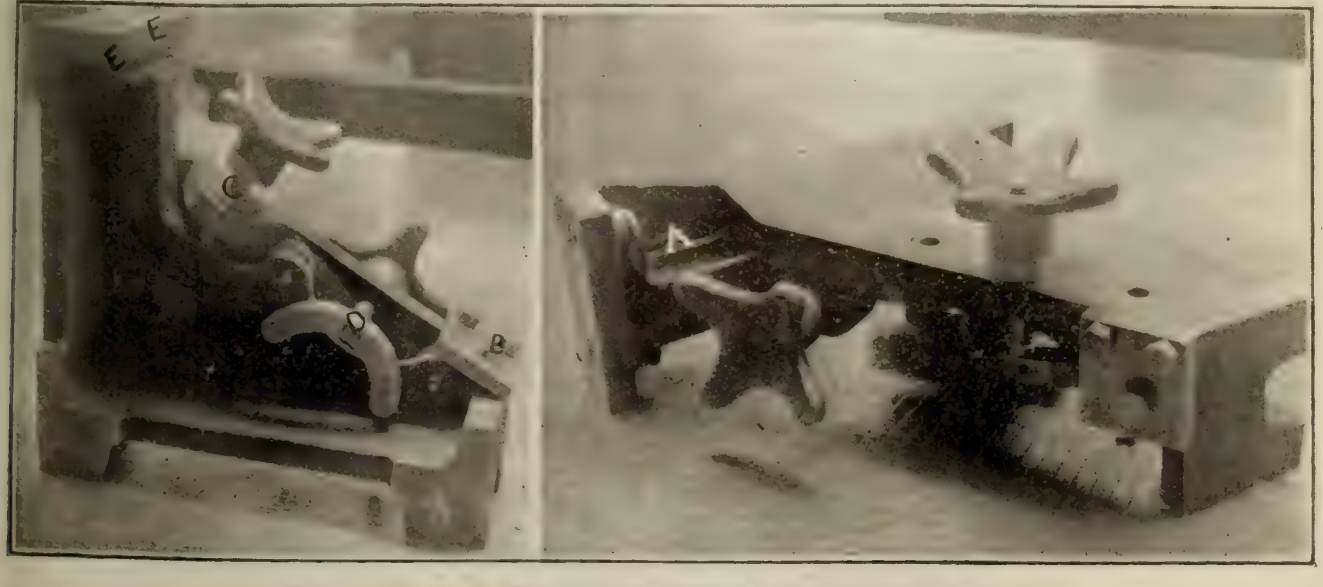
A very interesting die is shown in the accompanying illustration. This depicts a punch die, used in the Massey-Harris plant at Toronto, for producing the hopper for seed drills. The complete die is 34 inches wide, and 144 inches long; 380 punches of various sizes are used, these ranging from 7/32 inch diameter up to 4-inch by 2-inch section, with semi-circular ends. The punches are 2½ inches long, while the die insert blocks are 1¼ inches thick. The hoppers were produced on a W. & W. press, the stock being 1/16 inch thick.

A special feature on this die is the fact that it produces seven different combinations. By removing, or adding, punches as the case may be, seven different hoppers, known technically as the 8, 12, 14, 16, 20 and 22 respectively, can be punched out with the same die. Out of the 380 punches, 96 are 7/32-inch diameter; 7/1000 clearance per side was allowed in the making of the die.

## CLAY FOR LOADING PAPER

A highly colloidal clay which exists in large deposits in the intermountain regions of the United States has been found by the United States Forest Products Laboratory to be valuable as a loading material for giving finish and printing qualities to book paper. When this clay is used in conjunction with English china clay, the retention of the English clay is materially increased, and the paper produced has a superior finish and appearance, and a more velvety feel. The admixture of this clay similarly improves the retention of other fillers, and is especially desirable with some which have a low retention.

The ability of the new clay to remain in suspension may make feasible the installation in paper mills of a central mixing plant, from which the loading material can be piped a considerable distance to the beaters, without danger of setting or clogging of the pipe lines, and with the assurance that the concentration will remain uniform. The properties and use of the new loading material are more fully described in a report which may be obtained from the laboratory on request.—Scientific American.




FIGS. 11 AND 12—JIG USED FOR MACHINING MUFFLER FRONT BRACKET.

# The Determining Factors in Any Industry

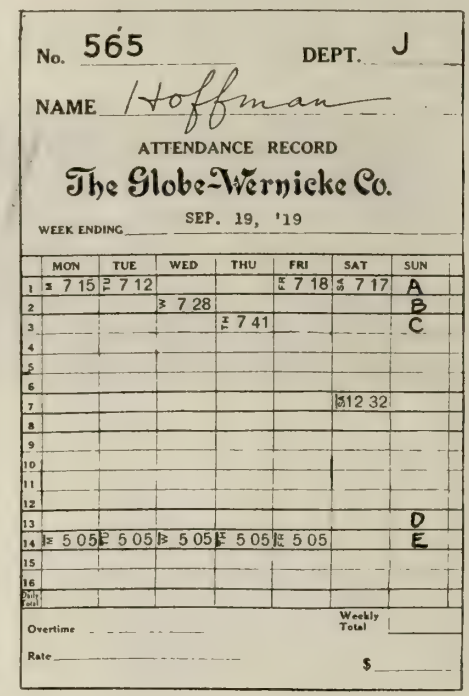
## Time the Factor to be Considered—Any Time-recording System If Used Effectively Benefits Employer and Employee—One Method Employed Includes Special Inducements to Workers

MOST concerns engaged in manufacturing have come to realize that time is the element upon which depend all costs and all production; time is always working. When used effectively throughout a manufacturing plant it is working for both the firm and the employee, but when wasted or misspent the result is an increase in labor cost and overhead expense; in other words, a loss of production and profit to both employer and employee. When profits consistent with the amount of capital invested are not forthcoming, a manufacturing enterprise loses its attraction and incentive and eventually operations must be discontinued. As a matter of fact, the use of time and how it is accounted for are the determining factors in the adjustment of any industrial plant to conditions which prevail to-day—namely, increased labor and material costs, shorter working hours and keen competition.

To account for every factory worker's time at the plant and to know just how much of it is spent productively on various jobs and operations is indeed a problem, especially to those engaged in operating woodworking establishments. A practical and effective solution which has been adopted by many large manufacturers consists of an installation of modern time-recording equipment.

If you wish to run a plant smoothly with every job or operation planned in advance and scheduled so that all departments will correlate perfectly; to keep a check on the factory to see that it does not lose time by waiting of one department for another for delivery of parts, raw material, etc., to know exactly how much time is being spent by each department productively and non-productively; to know exactly how each operator's time is divided between various jobs and whether or not his work is up to standard of production; to know just how much was day work and how much piece work or bonus time, etc.; to know just how much wages each employee is entitled to; to determine accurately the cost of every part or article manufactured; then to do all these things accurately, impartially and inexpensively, you must have some form of time-recording. The Globe-Wernicke Co. decided to install a time-recording system, and this story tells of the method employed.

They installed a complete Stromberg electric automatic time system, this consisting of sixteen "in-and-out" time recorders, forty job time recorders, sixty secondary or wall clocks and a system of factory signal horns and bells, all operated electrically from a central master clock.


No. 565 DEPT. J

NAME Hoffman

ATTENDANCE RECORD

The Globe-Wernicke Co.

WEEK ENDING SEP. 19, '19

| | MON | TUE | WED | THU | FRI | SAT | SUN |
|---|---|---|---|---|---|---|---|
| 1 | 7 15 | 7 12 | | | 7 18 | 7 17 | A |
| 2 | | | 7 28 | | | | B |
| 3 | | | | 7 41 | | | C |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | 12 32 | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | |
| 12 | | | | | | | |
| 13 | | | | | | | D |
| 14 | 5 05 | 5 05 | 5 05 | 5 05 | 5 05 | | E |
| 15 | | | | | | | |
| 16 | | | | | | | |
| Daily total | | | | | | | |

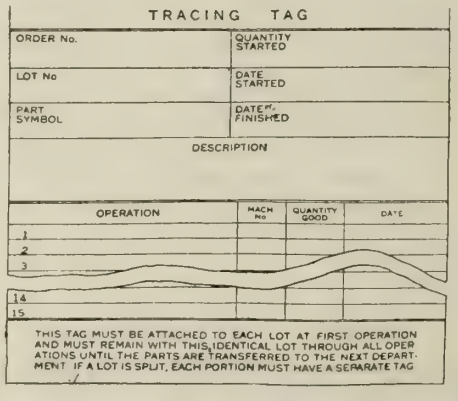
Overtime

Rate

Weekly Total

$

FIG. 1—UPPER VIEW. SHOWING ATTENDANCE CARD.


TRACING TAG

ORDER No. | QUANTITY STARTED

LOT No | DATE STARTED

PART SYMBOL | DATE FINISHED

DESCRIPTION

| | OPERATION | MACH No | QUANTITY GOOD | DATE |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 14 | | | | |
| 15 | | | | |

THIS TAG MUST BE ATTACHED TO EACH LOT AT FIRST OPERATION AND MUST REMAIN WITH THIS IDENTICAL LOT THROUGH ALL OPERATIONS UNTIL THE PARTS ARE TRANSFERRED TO THE NEXT DEPARTMENT. IF A LOT IS SPLIT, EACH PORTION MUST HAVE A SEPARATE TAG

FIG. 6—LOWER VIEW. TRACING TAG USED.

The master clock is automatically wound by the same electrical current that operates the recorders, clocks and signal horns. Since this is the only clock works in the entire system, and as the secondary units are automatically regulated by it, perfect synchronism of time is obtained throughout the plant. The recorders and other secondary apparatus, not having any delicate clock works, but being driven instead by powerful electro magnets, operate under any condition of dust, vibration, varying temperature or abuse, with practically no maintenance or repair expense. Electric current for operating the system is supplied by batteries which are automatically charged from the regular 220 volt electric light current.

### Attendance Records

A record of the exact time of arrival and departure of employees is made at the "in-and-out" recorders. Railings around these recorders, and aisles leading past each one, serve to prevent confusion and crowding at registering time. Each employee has a weekly attendance card like that appearing in Fig. 1. These cards are kept in the numbered pockets of convenint "out" racks near the 'in-and-out" recorder, while the employee is not on duty. When a workman comes in the morning he takes his card from the "out" rack, inserts it in the recorder and by pressing a lever, stamps the exact time on it. He then places it in a similar "in" rack near the foreman's desk, where it remains until he is ready to ring out at night. By having these cards so filed close to the foreman's desk, the foreman is able to determine at a glance how many employees have not reported for work, and thus he can rearrange their work and plan the day's operations accordingly. The cards can be used for ringing out and in at lunch also, but this practice is not followed at the Globe-Wernicke plant. The lunch period is only a half-hour and most of the employees eat lunch at or near the plant.

As an inducement for every employe to be in his respective department and on the job full time, the company adds an hour to the day's pay of every workman who registers "in" on or before 7:20 a.m. — ten minutes before actual starting time—and "out" on or after 5:05 p.m.—five minutes after actual quitting time. There are many advantages in this plan. While it does not exactly penalize the individual who prefers to register in and out "on the dot" or carries barely enough margin of time to avoid being docked for lateness, it rewards those who are willing to get in a few minutes early and remain a few minutes late in order to be in working togs and engaged in productive work the full nine hours. An hour's bonus pay for fifteen minutes' extra time is of course equivalent to quadruple pay for that period. This plan also has the effect of preventing over-congestion at registering time.

In order to make it easy for the pay roll clerk to readily distinguish between different registered time entries—those ten minutes or more early, those barely on time, and those late—the recorder is adjusted to print each class on a different line on the attendance card. At exact

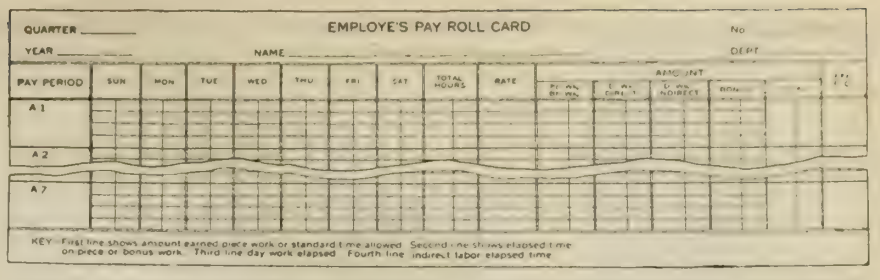
7:20 a.m. the mechanism automatically changes so that all registrations before that time appear in space No. 1 on the card, Fig. 1, and after that time they appear in space No. 2. At 7:30 there is another change so that late arrivals are registered on space No. 3. A similar automatic classification is made at ringing-out time. The recorders automatically set themselves to the proper "in" and "out" spaces for all classes, and also automatically distinguish tardiness and other irregularities of all employees. This plan greatly facilitates the work of the pay-roll clerk in taking off time from the attendance record cards and entering it on the employee's pay-roll card, Fig. 2, as he need only deal with the exceptions.

### Job Time Records

The starting and stopping time of each job is stamped on work-order and time card (see Fig. 3) with job time recorders. These recorders are distributed throughout the various departments of the plant. The work-order time cards are compiled from current cutting bills and operating records, by the departmental planning clerk, and filed in proper rotation in pockets (there being a pocket labeled for each machine in the machine department) on the dispatch board. When a workman presents his attendance card in the morning, he is given a work-order time card, which is then stamped with the starting time on the recorder. When the operation designated on the card is completed the workman returns his card to be stamped with stopping time and gets another job card. This routine continues just like clock-work throughout the day, and at quitting time the last card is turned in and stamped, regardless of whether or not the operation is finished. If unfinished, the space under "continued" in the lower left-hand corner is check-marked and a new card is issued next day for the completion of the operation.

Up-to-date unit standards of time for all operations are kept on file at the desk of the planning clerk. The unit standard for the kind of work designated is entered in the proper column of every work-order time card, and by multiplying this by the number of pieces or units in a run, the total standard time is found. Thus in Fig. 3 the unit standard is marked 1.5, meaning 1.5 hours per thousand. Multiplying the number of pieces on the ticket (800) by 1.5 gives 1.2 hours as the standard time allowed for the task. Referring to the registrations of the job time recorder, it is evident that the time elapsed (5.2 minus 4.0) is 1.2, which shows that on this operation the workman attained 200 per cent. efficiency, and, according to present rules, is entitled to a 20 per cent. bonus. Bonuses on production start at 67 per cent. and gradually increase with the percentage of efficiency.

A clerical labor saving feature of these


QUARTER _____ EMPLOYE'S PAY ROLL CARD No
YEAR _____ NAME _____ DEPT

| PAY PERIOD | SUN | MON | TUE | WED | THU | FRI | SAT | TOTAL HOURS | RATE | AMOUNT | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A 1 | | | | | | | | | | | | | | |
| A 2 | | | | | | | | | | | | | | |
| A 7 | | | | | | | | | | | | | | |

KEY—First line shows amount earned piece work or standard time allowed. Second line shows elapsed time on piece or bonus work. Third line day work elapsed. Fourth line indirect labor elapsed time

OPERATION Face — WORK ORDER AND TIME CARD — Dept. C-1

| Order No | DESCRIPTION | Mach. No. | Pieces On Order | Units To Do | Units Finished | Unit Std. | Standard Hours | Actual Hours | Earnings |
|---|---|---|---|---|---|---|---|---|---|
| 37115 | 242-316 | C3 | 800 | 800 | 800 | 1.5 | 1 20 | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| DEC 30 | 5 | 2 | STOPPED | Time On This Card / Daily Total | | 1 20 | 1 2 | $4 |
| DEC 30 | 4 | 0 | STARTED | OPERATOR Carter | | | Number 1302 | Hr Rate 45 |
| Finished / Continued | 1 | 2 | TIME ELAPSED | HELPER Lampert | | | Number 1307 | Hr Rate |

FIG. 2—UPPER VIEW. THE PAY ROLL CARD USED.
FIG. 3—LOWER VIEW. WORK ORDER AND TIME CARD.

job time recorders is that they automatically eliminate the lunch period from all jobs that start in the morning and finish after noon, so that clerk need not make any deductions from the time shown on the job ticket for the lunch period. As an example, the recorders print 0.0 at 7:30 a.m., which is starting time in the morning. At 12:00 the recorders print 4.5 and then are automatically suspended until 12:30, when they again automatically start up with 4.5. So, a man starting a job at 7:30 a.m. and finishing it at 3:00 p.m. will register as follows:

| | |
|---|---|
| Stop | 7.0 |
| Start | 0.0 |
| Elapsed time | 7.0 hours |

The clerk needs merely to make a simple subtraction, without the necessity of deducting the lunch period. The simplicity of calculating time in this decimal scheme is also valuable.

The information and records obtained from work-order and time card are summed up and entered on the employee's pay-roll card (Fig 2) and on the piece-part cost summary as well as on other cards, including piece-part-progress records, etc.

It will be noticed that on each work-order time card there are spaces for four order numbers on jobs. This is done to permit of bunching two or more jobs and running them all at one time when possible. Every lot of parts on a job going through is identified by a tracing tag like that shown in Fig. 6. These tags are placed with the various batches of material when it is cut by the stock-cutters, and they follow the material through all the machine operations, remaining with it until it is transferred to the assembly department. When any set of parts leaves the stock sawyers it is up to the planning clerk to route the work from then on, assigning it to various machines and machine operators by schedule.

### Secondary Clocks

The secondary or wall clocks indicate the same accurate time as the rest of the time system equipment and are so located as to be seen by practically every employee.

Careful observation has proved that employees will ascertain the time of day, if not by a mere glance at the wall clock, then by walking over to a neighboring employee who is known to have a watch. This usually leads to a more or less lengthy conversation with the result that both employer and employee are losers in production.

It is highly important that the secondary clocks be exact in time and agree with other time equipment. An entire department of fifty employees might lay down their tools and prepare for quitting a minute too early, if their department clock is one minute fast. Thus, a total loss of fifty minutes, at noon and again at night, would be occasioned.

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The Canadian Des Moines Steel Co., Chatham, Ont., has been awarded the contract for the construction of elevated steel tank for York Township Council.

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The Welland Machine and Foundries Ltd., Welland, Ont., as a result of the recent organization, will operate under the management of William Edestrand, who at one time was with the Dain Mfg. Company.



# WELDING AND CUTTING



# Selection of Gas Welding Apparatus for Economy

## Blowpipes Should Be Selected According to Requirements of Work, Consideration Being Given to Economy, Etc.—How to Overcome Backfiring—Job and Production Work Differ Widely

By F. W. SMITH*

OXY-ACETYLENE work in general is peculiar in that in all cutting and in all but the lightest welding, the cost of the fuel gases, oxygen and acetylene, is greater per hour than the cost of the labor of the operator even at the present high price of labor. This can readily be computed from the cost of oxygen, two cents per cubic foot, and acetylene, one and a quarter to three cents per cubic foot, and the fact that the lightest cutting ordinarily done consumes over 35 cubic feet of oxygen and 15 cubic feet of acetylene per hour, while welding of anything as heavy as 3/16-inch steel plate will consume at least 15 cubic feet of each gas per hour.

Too much weight, therefore, cannot be given to the economical operation of the blowpipe as regards gas consumption and it follows that it is also economical to hire a very high class of labor and to keep this labor well satisfied in order to secure co-operation in the economy of fuel gases.

Welding consists of two separate operations, one the raising of the temperature of the work to welding heat and the other the application of the filler rod, flux, mechanical pressure or such other means as may be necessary to supplement the heat from the blowpipe to secure a satisfactory weld. It should be recognized that the function of the blowpipe is that of heating alone. If the blowpipe does the heating economically as to gas consumption and conveniently from the point of view of the operator, its entire duty has been performed. The rest is up to the operator and his supplies and mechanical equipment.

### Must Align Seams

For instance, in steel tube welding, where no filler rod or flux is used, the success of the process depends on the blowpipe only in so far that the flame must be sufficiently hot to bring the edges of the seam to a welding heat as fast as it is desired to weld and that this must be done with an economical consumption of gas. Of equal importance and more difficult to attain is an exact alignment of the edges of the seam with each other under the blowpipe. For this alignment accurate forming of the tube, previous to its introduction into the welding machine, is essential. To secure a weld of the proper penetration and thickness, it is further necessary to adjust accurately the compression on the welding rolls which force the edges of the seam together after they have been heated.

In the case of hand welding, where filler rod and possibly flux are to be added, inexperience or carelessness on the part of the operator may cause cold shuts or blow holes in the weld quite independent of the efficiency of the blowpipe.

These examples are sufficient to establish the contention that the function of the blowpipe is merely to supply heat and that no blowpipe, however perfect, can guarantee a satisfactory weld without the necessary adjuncts of a good operator and accessory equipment.

The first consideration in regard to any blowpipe should be its heating efficiency. The transference of heat is dependent on two factors, the difference in temperature between the flame and the work, and the length during which the gases are in contact with the work. Since the temperature of the oxy-acetylene flame is the same in all blowpipes, the heating efficiency will depend entirely on the length of time the burned gases are in contact with the work. The time is determined by the speed of the gases issuing from the blowpipe tip. Therefore, the first necessity in a blowpipe is low velocity of the gases at the tip or, as the welder generally phrases it, "a soft flame." Velocities from 300 to 350 feet per second are found by experience to be the lowest practicable and the heating efficiency of the blowpipe depends upon how closely its gas velocities approach these values.

### Testing Method

To test the blowpipe for this quality the most reliable and scientific method is to run accurate gas consumption tests on the blowpipe and by dividing the sum of the volumes of the two gases by the area of the hole in the tip, to secure a figure which will represent very closely the gas velocity desired. The experienced welder can, however, tell almost immediately by looking at the flame what its character is, and a very reliable test is to attempt welding steel overhead or on a vertical seam where it will be found that the molten metal can be controlled satisfactorily only with a soft

#### REGARDING THE BLOWPIPE

It should be recognized that the function of the blowpipe is that of heating alone. If the blowpipe does the heating economically as to gas consumption, and conveniently from the point of view of the operator, its entire duty has been performed. The rest is up to the operator and his supplies and mechanical equipment.

In hand welding, where filler rod and possibly flux are to be added, inexperience or carelessness on the part of the operator may cause cold shuts or blow holes in the weld, quite independent of the efficiency of the blowpipes.

This proves that the function of the blowpipe is to supply heat only, and that no blowpipe, however perfect, can guarantee a satisfactory weld without the necessary adjuncts of a good operator, and accessory equipment.

*The author was formerly chief engineer at the Oxyweld Acetylene Co., Newark, N.J., and his article first appeared in the Iron Trade Review.

flame. This consideration is given first importance because it applies to every job regardless of size or character.

The subject of backfiring is of great importance. In the beginning of the industry, when the majority of welding work was done under accidental and generally adverse conditions, backfiring was one of the greatest difficulties encountered and consequently great value was attached to a blowpipe which would not backfire. Backfiring is the burning of the gases inside of the blowpipe. Such an occurrence stops the welding process immediately and, if allowed to persist, will damage the blowpipe irreparably. It is then necessary to close the oxygen valve and relight and readjust the flame.

Backfiring is caused either by overheating the blowpipe to such an extent that the mixed gases ignite from the heat of the passages in the interior of the tip or head, or by the obstruction of the tip by touching the molten metal or slag which so slows up the mixed gases that the flame will burn back against their current into the interior of the torch. It will readily be seen that in modern production welding the adverse conditions which cause backfiring are practically entirely eliminated by the convenient location of the work and the high skill developed by repetition. Even in the hottest emergency repair jobs backfiring can be minimized by water-cooling the blowpipe and is, in any case, comparatively infrequent with a properly trained operator.

While backfiring was an important consideration in the early stages of the art, present day developments have relegated it to a far less important position. The criticism aroused by backfiring has resulted in the appearance on the market of numerous blowpipes which do not backfire even under the most severe conditions. On the other hand, it is found that this non-backfiring feature frequently is attained by the sacrifice of the low velocity of the gases and in consequence such blowpipes should be tested very thoroughly for welding efficiency.

Welding logically divides itself into two branches, quantity production welding and job welding and for these branches different considerations govern.

For job welding, the principal considerations are reliable and satisfactory operation and flexibility so that jobs of widely various character can be handled with the minimum of investment in equipment.

The question of the reliability of various makers of apparatus is one not properly to be dealt with in this article but the purchaser should bear in mind that, in regard to durability, exactly the same considerations will govern oxy-acetylene apparatus as any other equipment. He should picture to himself not only what will happen to each part in the correct course of operation but also how easily they may be damaged by accidental happenings which are unavoidable in every sort of mechanical work and especially in the rough and ready repair jobs such as are encountered in job welding.

### Strength Is Necessary

All parts such as valve stems, hose connections and union nuts should carry sufficient weight to be structurally strong and complicated mechanisms should be avoided above all things.

Tips and other detachable parts are subject to more damage and loss when not in use and lying loose in the tool box than when actually attached to the blowpipe. Tips having joint surfaces exposed so that they will be marred by accidental dropping or rattling against each other are to be avoided unless the operator can be trained under all circumstances to carry these tips in racks or other cases which provide the necessary protection.

In this class of work it pays to anticipate the worst possible conditions as the operator must frequently travel some distance to get to the job and there is usually a premium on finishing as rapidly as possible. Nothing will give the shop a black eye as quickly as to have a delay because of some minor fault in the apparatus.

In regard to flexibility, it may be assumed that a welding blowpipe which will burn approximately 70 cubic feet of each gas per hour will do the heaviest welding which it has been found practicable to attempt. For this class of work a torch of considerable length is required because, owing to the intense heat of preheating fires usually used, the operator cannot stand very close to the work. If work of this character is to be undertaken, this special large sized torch is desirable. For all other lighter classes of work, where consumptions vary from 40 cubic feet downward, usually a single blowpipe 18 inches in length can be made to cover the entire range by the use of tips of assorted sizes. Unless the shop is of sufficient size and has sufficient steady trade to guarantee a steady flow of jobs, both large and small, blowpipes of this nature should be used. As the business broadens out and certain lines are definitely established, it will always be possible to purchase other equipment which will render the handling of such particular work economical.

Production welding is of only recent development and its possibilities are little realized. It is entirely different from job welding in that it assumes a year-in-and-year-out demand for an article which can be produced wholly or in part by the welding process. For such a demand, elaborate plans and arrangements can be made, such as convenient benches and seats for the operators, jigs and handling devices for the work, specially designed blowpipes and light hose.

The question of flexibility in the apparatus enters only to a very slight degree as the work will probably be confined to one weight or gauge of metal and the blowpipe should operate for long periods of time without changing the tip or making other adjustments. Most of the accidental damages are entirely eliminated and a much less rugged type of apparatus in general can be considered. In fact, the proposition often resolves itself into one of time study operations done by specially trained men or girls using equipment arranged with only this operation in view.

The purpose of a regulator for welding is to reduce the high pressures at which compressed gases are supplied to the trade to pressures suitable for use in blowpipes. Regulators are probably the most difficult of all oxy-acetylene apparatus to manufacture and it is believed there is no regulator on the market which can be guaranteed to work reliably for a considerable period of years. The very high pressures which they are required to handle render leaks and erosion very difficult to combat and the impossibility of preventing dust and small grit from being entrained in the gases and getting into the regulator seat, make it only a question of time when the regulator will begin to leak. The result of these leaks is the building up of pressure in the hose as soon as the blowpipe is shut off, resulting in the blowing off of the hose with attendant dangers.

### Pressure Decrease Important

In the case of acetylene regulators, this feature is particularly objectionable as the limit at which free acetylene can safely be worked is about 30 pounds. In acetylene regulators also the amount of drop or decrease in delivery pressure when the blowpipe is turned on is of

### BACKFIRING. HOW TO AVOID IT

Backfiring is the burning of the gases inside of the blowpipe. It is caused either by overheating the blowpipe to such an extent that the mixed gas ignite, or by the obstruction of the tip by touching the molten metal or slag, which so slows up the mixed gases that the flame will not burn back against their current into the interior of the torch.

This trouble however, is not very wide spread as modern torches are much better constructed than formerly. Even in the hottest repair jobs backfiring can be minimized by water cooling the blow pipe. With a properly trained operator, backfiring becomes an easy matter to overcome.

Preference should be given blowpipes which have full, long preheating flames, calculated to operate entirely across the face of the intended cut.

considerable importance since the working pressure of acetylene is limited by fire underwriters' regulations to 15 pounds. It will readily be seen that if the drop from 15 pounds is 7 pounds, there will be only 8 pounds pressure left on which to operate the blowpipe and this is prohibitive in case the blowpipe requires a higher pressure. The drop measures to a certain extent the freedom of the moving parts and the tightness of the regulating valve.

The prospective user of acetylene should make up his mind to purchase the best regulators and only the best and to establish a careful system of maintenance on them, to keep them in good order. Periodical monthly inspections followed up by thorough repairs of any faults detected are the best methods of accomplishing this and in the initial purchase the customer should be governed by observation of the performance of the regulator during tests, its freedom from leakage when the blowpipe is shut off and convenience for repair when leaks develop. He should also give consideration to the mechanical construction of the regulator, especially the method of suspension of the moving parts since the sensitiveness of the regulator should be governed largely by the freedom of these parts.

In most cutting, much the same considerations govern as in job welding. In other words, reliability and flexibility are at a premium. Even in steel foundries where the cutting of risers is a regular step in the production of steel castings, the work can hardly be arranged in any way which will not subject the apparatus to the roughest sort of usage. Durability is the first consideration in cutting apparatus.

In heavy cutting large quantities of gas, as high as 1,500 cubic feet of oxygen and 50 cubic feet of acetylene per hour are used. Economy of operation in the blowpipe is a feature of special importance. Before selecting apparatus for work of this kind, consumption tests of the most elaborate nature should be run, preferably on the actual work. It will be found from such tests that a blowpipe having very ample preheating flames will accomplish the start, the most difficult part of the operation, far more rapidly than if the preheating flames are limited in size, and that the whole process is speeded up by satisfactory preheating. Preference should be given blowpipes which have full, long preheating flames, calculated to operate entirely across the face of the intended cut.

The oxygen regulator for this class of work should be designed with especially large passages, as otherwise, due to the rapid expansion of the oxygen discharging from the cylinder, there is a tendency for the regulators to freeze and clog which, of course, puts an immediate stop to the work. In heavy cutting also it not infrequently occurs that the pressure in the cylinder runs from the original 2,000 pounds down to almost as low as the working pressure of the blowpipe. In this case many regulators show a marked drop in the operating pressure during this change in the cylinder pressure. Such regulators will be unsatisfactory for heavy cutting.

### Speed Is Required

Light cutting presents usually no features not found in heavier work except that it sometimes occurs as a production proposition and in this class of work the same conditions govern to a certain extent as in production welding. There is, however, one phase of light cutting very widely practised in shipyards, namely, the burning out of countersunk rivets and piercing of blind holes where special conditions occur which must be considered. As most countersunk rivets are burned out in repairs, speed is the first consideration. Furthermore, the conditions under which the blowpipe must operate are very adverse. Slag from the burned rivet frequently falls directly upon the blowpipe and the preheating flames beat back upon it from the blank surface with great intensity. Under these circumstances backfiring occurs with such frequency and is so inconvenient to the operator that it entirely outweighs the considerations of gas economy and here the non-backfiring blowpipe is a necessity.

Oxygen is supplied to the trade generally in cylinders of 200 cubic feet capacity at a pressure of about 2,000 pounds. Acetylene can also be had compressed into cylinders of 100 or 300 cubic feet capacity at pressures of 225 pounds. These cylinders are practically the only source of acetylene available for jobs outside of the shop. Where the work can be done in the shop, however, it takes only a comparatively small consumption of acetylene to justify the purchase of a generator. Acetylene can be generated from calcium carbide at about half the price at which it can be purchased in cylinders. There is also usually a considerable initial payment attached to the use of acetylene cylinders themselves.

# The Danger of Using Unknown Scrap

IN speaking of the scrap dealer who purchases old metal tanks, barrels or cylinders, Acetylene Journal emphasizes the necessity of ascertaining definitely the uses to which such containers have been put. They continue:

If they have held combustible gases or liquids or even certain dry chemicals they are a serious source of danger.

The following case, which is by no means an isolated instance of the kind, illustrates the point. At a certain Ohio scrap yard some weeks ago an explosion resulted in the death of a workman who was cutting bolt holes in a piece of angle iron. In order to make the work accessible he placed it on a sheet steel drum about three feet high by two feet in diameter. Unintentionally he penetrated the steel sheet of the drum, causing the violent explosion of an unsuspected gas which it contained. Both ends of the drum were blown out, one of the ends and several pieces of angle iron striking the victim of the accident, breaking four of his ribs and puncturing his lungs with fatal effect. An inspection of the drum showed that it had been airtight and had contained a substance resembling sulphur. The dealer stated that he had purchased several of the drums as scrap material some three years previously, and had no idea as to what they had contained.

In many cases the former use of the container may not be suspected, but there are several other instances where it should be obvious to a dealer in scrap. For example, everyone engaged in the production of scrap should recognize instantly cylinders used for the storage and transportation of compressed gases. Such cylinders are usually the property of the companies that produce the gases so stored and transported, and their names are generally conspicuously marked on the container in a manner difficult to efface--commonly by stamping the metal with a die.

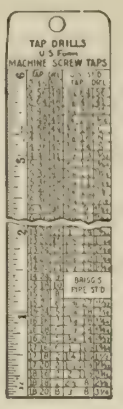
Whenever tanks that have been used for explosive gases, liquids or substances are offered for sale as junk, the person offering them should be advised as to their character and warned not to dispose of them for reduction; and the nearest office of the manufacturer, whenever the name is obtainable, should be notified without delay.

### INACCURATE WITH AGE

Thermometers like everything else become old, and consequently lose their accuracy with age, mercurial instruments reading too high and spirit instruments too low. Scientific American speaking on the subject states that in the former case the bulb appears to shrink, thus forcing the quicksilver too far up the stem. This gradual shrinkage is supposed to be due to the fact that the external pressure on the bulb may be considerably higher then the internal pressure, the air as far as possible having been removed before the glass is sealed off. On the other hand, the spirit thermometer is sealed with the bulb covered in a freezing mixture, in order to lock up in the glass as much air as possible. The instrument thus starts with an internal pressure which in time appears to be reduced either by expansion of the glass under the internal pressure or by leakage.

# Improve Your Powers of Perception—Try This Contest

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.




The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

## What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

Nine contestants submitted correct lists to the May 12th contest, these being: F. E. Regan, Hamilton, Can.; E. N. Mills, Montreal; George Meriden, Paris, Ont.; Angus A. Smith, Mt. Forest, Ont.; E. W. Todd, Penetanguishene; George Land, Peterboro; P. O. Nobes, Molton, N.S.; Colis W. Parent, St. John, N.B., and J. P. Gifford, Providence, R.I.

In view of such an array of talent we had to resort to the elimination process, and F. E. Regan was the lucky one. As stated before, we place the correct lists face down on a table, and get some neutral party to select one from the lot. The list selected is the one considered the winner. In this way it is fair to everyone. Should recent winners not be receiving their scales, notify us at once, as some time ago we had difficulty in forwarding them through the mails.

**CONTEST FOR JUNE 2ND ISSUE**

**Contestants are required to write us, stating to which advertisements we refer in this number.**

1—How to get all kinds of a particular product.

2—An organization that is always at your service.

3—Something that was done for you years ago.

4—A list that is merely an indication.

5—Something that will handle any material.

6—A product that assures proper clearance.

7—Something equally suitable for twist drills, circular saws, or machine knives.

8—How to get more work done in less time.

9—Something that requires no pattern.

10—A product produced from 5/8 in. diameter, and smaller.

11—Something that forms a half nut.

12—A concern that asks to shoulder your problems.

**These are Correct Answers for List from May 12th Issue:**

1—Roelofson Machine Tool Co.

2—Union Mfg. Co.

3—J. Ackworthie, Ltd.

4—E. C. Atkins & Co.

5—John T. Hepburn, Ltd.

6—The Dennis Wire & Iron Works Co., Ltd.

7—Lyman Tube & Supply Co., Ltd.

8—Hoyt Metal Co.

9—Armstrong Bros. Tool Co.

10—Canadian Hanson Van Winkle Co.

11—Crane, Ltd.

12—Brown & Sharpe Mfg. Co.

## Closing Date for This Contest is June 23rd

# Hints on Hardening of Hammer Die Blocks

## A Good Sound Steel of Medium Carbon Content, When Properly Hardened, Gives Good All-round Service—Gas Heated Furnace Very Satisfactory for Die Block Work

By R. B. KERR*

SINCE the introduction of the modern drop forging hammer, the problem of producing and successfully heat treating large dies to get the maximum of service with a minimum of loss has engaged the attention of steelmakers and steel treaters alike.

Early in the game it was found that the percentage of loss from hardening from various causes was heavy. Flaws or pipes in the interior of the blocks resulting from improper casting or forging; steel of too high or irregular carbon content; and more especially inadequate tempering room equipment, are among the chief causes of failure. The unfortunate hardener too often is made the goat for the sins, mostly of omission, of both the steelmaker and the shop foreman.

To get around possible loss in heat treating, various kinds of alloy and so-called heat-resisting steels have been tried, with more or less success. Now it is generally conceded, however, that a good sound steel of medium carbon content, when properly hardened, gives the best all round service. The methods suggested herewith for accomplishing this have been in successful use by the writer for a number of years and are offered not with an idea that they are perfection or the only way, but with the hope that they may be helpful.

While die blocks can be heated successfully in either coke or oil furnaces or even in the smith's forge, a gas heated furnace of the oven type is by far the most convenient and satisfactory for this work.

Coke makes a nice clear fire of fairly simple regulation, and with a skillful heater in charge, good results can be obtained. An objection to its use is the frequent presence of impurities, particularly sulphur.

When heating dies the considerable air pressure required to burn fuel oil makes necessary the most extreme care to prevent scaling or surface decarburization in the parts to be treated. The furnace, therefore, should be of the muffle type, the heating chamber completely inclosed, or, if this is not available, the die should for protection be packed face down in a gas tight box of suitable size half filled with charcoal, and the whole thing heated up. If the piece to be heated is of considerable size, the packing box should be made with hinged ends which fold down out of the way so that the die can be lifted out readily by grab hooks or a sling. This "safety first" method entails some extra work and inconvenience, but the results justify it. Personally, the writer can testify through considerable experience that it is better to go to some extra trouble to assure success, than to have an opportunity later on to frame up excuses that will pass when asked to explain "how it happened."

It might be said in passing that this method of pack hardening is excellent for heating dies and tools of nearly all descriptions. The parts come out of the packing box uniformly heated with a surface perfectly free from scale and in the best possible condition for hardening. The process is an old and successful way of heating steel. It deserves to be more widely known and practised.

### Get a Good Heat

Whatever the type of furnace used or the means employed the all important thing is to get a good heat on the die; a thorough slow soaking, uniform heat, for upon that depends to a great extent the success or failure of the operation. Particularly for the benefit of the younger steel treaters it may be said that thorough careful heating, more especially when handling comparatively large blocks of steel, is most essential. It is the author's opinion, based on a long and varied experience in hardening steel, that more dies and tools are ruined by careless heating than from all other causes combined.

For heating, a gas-fired, oven furnace of ample capacity should be used as being most convenient and suitable for the job. If the oven is already hot so much the better, if not, bring it up pretty well before putting in the work. Dies of any description should not be put into a cold furnace. Nothing is gained in time, and besides some chances of surface decarburization are offered with a rapid rising heat.

Place the die in the furnace face down, unless the nature of the impressions makes this impossible; in which event it is good practice to protect the surface from possible gases by laying a closely fitting piece of asbestos or sheet steel on top while heating. As another precaution, if the die is of considerable size and the impressions are deep or irregular, it is well to bring it up to a dull red heat, about 1,300 degrees Fahr., and let it partly cool off in the furnace before taking the hardening heat.

Heat slowly and regularly. The time required of course will vary in proportion to the heating area of the furnace and the size and shape of the piece to be treated. Usually three to five hours are required for drop forging dies of average size. The most important point is, as already mentioned, to get uniform heat throughout the piece. One of the most valuable assets a steel treater can have is the ability to judge or sense correctly when a large block of steel is heated properly throughout. While a pyrometer or other reliable heat measuring device is a valuable aid and guide, it is not everything, neither can it indicate what is going on inside the mass, and the writer has learned from experience that outward appearances in steel die blocks, as in many other materials, are often times deceptive. The average grade of hammer die steel will harden nicely at around 1,450 degrees Fahr. and the heat always should be held stationary for at least 15 minutes before removing the die from the fire.

The quenching tank should be of ample size and the water supply arranged so that it can be forced upward against the face of the die with considerable force and volume, using an overflow pipe of sufficient size to take it away. In most cases clean fresh water is all that is necessary, but if extreme hardness is required or if the water is soft or muddy, river water as an example, the addition of a little salt will sharpen it. If this is done, a loose woven sack filled with salt, and suspended in the tank, will be found most convenient. Place a resting rack across the top of the tank, arranged at sufficient depth so that the impressions on the face of the die will be well covered with water when the die is laid on it. On flat surfaced dies or on dies in which the impressions are shallow, a depth of from 1 to 1½ inches is about right.

When all is ready get the piece out of the fire. If there are any dangerous looking corners or sharp projections that do not need to be hard, partly cool them off with a water jet or piece of water soaked waste to prevent chipping. Place the die on the resting rack face down and turn on the water. If the piece is wide or flat, prevent warping or crowning by keeping the back slightly cooled off; just enough water and no more. Run the hand over the face frequently to find how it is cooling off.

### A Point to Watch

Never let a die cool off entirely in the water. Whenever the face is cool enough to prevent the temper from

*Presented by title before the Convention of the American Society for Steel Treating.

drawing, get it out as quick as possible and lower it into the oil tank. Keep the die moving or agitate the oil.

The temper should be drawn slightly on all hammer dies, both to relieve strains and to give them resiliency or spring, as well as for better wearing qualities, and the drawing should be begun immediately; even before the die is quite cooled off. If there is an oil tempering furnace at hand large enough, get the piece into it. Raise the temperature to around 400 degrees Fahr. and hold it there for an hour or so. If for any reason this method cannot be used, swab the die with light machine oil and place in a furnace partly cooled off. Leave it there until the oil begins to flash, then remove and allow it to cool off in the air.

A die should never cool off entirely in the water. When a mass of steel at the hardening temperature is plunged into cold water, the grains in its outer surface immediately become set and rigid. A certain amount of contraction and shrinkage also takes place, partly because of the change from high to a low temperature and also because of the hardening of the metal. The amount of this shrinkage is in exact proportion to the surface area of the mass being treated; the greater the area the more the shrinkage. If this change took place all the way through there would be no trouble; but it does not. In the first place, the interior of the piece cools off much more slowly than the outside, and secondly, the setting of the grains due to hardening extend in a depth of only from ¼ to ½ inch at the most. This suddenly chilled outer layer is consequently being forced against the softer mass inside with an enormous pressure, causing distortion and strains which become more marked as the piece cools off. When the temperature recedes to a certain stage, governed partly by the temperature of the quenching water and the air, a violent action takes place. This is the danger point. The friction created by the molecules striving to adjust themselves to the new conditions generates heat inside; heat means expansion, and unless this condition is offset promptly by heat applied to the outside to relieve the strains, the die, particularly if a large one, has about an even chance of bursting open. Whether it does or does not, the strains are there and are just as liable to manifest themselves in service later on as they are to appear immediately after hardening.

Allowing the dies to remain in the water too long and failure to draw the temper promptly after hardening is responsible for considerable breakage. This is partly due to the lack of proper equipment, and also to the fact that the principles involved are not so generally understood as they might be even among steel hardeners. This heat generation by friction, or as some might call it, molecular reaction inside of a body of steel, is no pet theory, but the author has noted its effects during many years of close observation and practice in the heat treating of steel. Furthermore, he believes it will be found in line with the natural laws governing cooling bodies. Be that as it may, the writer has found this method of hardening dies a success and can recommend it to steel treaters who are having trouble.

# The Proper Selection of Chain Gear

IN their book entitled "Notes on the Selection of Chain Gear," the Hans Renold of Canada, Ltd., Montreal, have the following to say regarding the erection and care of chain drives, in so far as their particular style of chain is concerned:

When erecting, watch these points:

The shafts should be horizontal and parallel. The two wheels must be in alignment. Mount all drives as close to bearings as possible. The end play of the shafts should not exceed 0.2 per cent. of the centre distance, and it is preferable to have the driving side of the chain uppermost.

Adjustment of centre distance should, if possible, be provided, more particularly for vertical drives. If the lie of the drive is from the horizontal to about 60 degrees above, it will not be necessary to adjust so frequently as the catenary pull provides a certain amount of automatic adjustment. Failing center adjustment, for vertical drives and all impulsive loads adjustable jockey sprockets should be used.

The chains of all multi-strand drives are marked on an end link with a serial number, and if more than one drive a sub-number, and also direction arrows. The joint bolts must be in line and the arrows must run in the same direction. Before and during starting up, at erection and after cleaning, lubricate freely.

### Jockeys

Never use a jockey where avoidable. Where necessary, the jockey must be a correctly cut sprocket wheel, and should have 25 teeth or over.

It should engage with the slack side of the chain, and to avoid malgearing should have at least three teeth in mesh.

Jockeys should be mounted to be adjustable, but should be locked when adjusted. Spring and weight loaded and other movable jockeys should never be used.

In the matter of maintenance, see that the chains are well lubricated. During the first two weeks after erection, this is of vital importance.

Chains should not be allowed to run too slack. When excessive slackness develops, adjust centres or jockey sprocket, otherwise take out one link of the chain. Chains should be taken down periodically and cleaned thoroughly with paraffin.

It is essential to maintain the chain free from slack in all cases where it is subject to an impulsive load, otherwise slackness permits whipping, which increases the rate of wear, and may cause malgearing. When chains become much worn it is not advisable to attempt to run them too tight. The adjustment should be made to suit, not the stationary, but the running conditions.

It is not generally advisable to run chains with an elongation of over about 3 per cent., which brings the chain out of gear with an 80-T wheel; 120 T permits of about 2 per cent. elongation.

### Lubrication

It is as important to oil the bearings (joints) of a chain as it is to oil the bearings of any other mechanism. This is evident when it is realized that the normal bearing pressures upon the wearing surfaces run from 800 pounds to 2,000 pounds per square inch.

For efficient lubrication the methods in order of merit are:

(1) To enclose the drive in a gear case, and pump a constant stream of oil on to the inside face of the chain from a filter sump.

(2) To enclose the drive in a gear case and run the chain through oil. Where the pinion is below and is too small to allow the chain to run through oil, an oil thrower disc of a larger diameter than the pinion may be mounted on the pinion shaft.

(3) By drip-feed lubricator fixed so that the oil drips regularly on to the inner face of the chain. One drip pipe should be provided for every 3 inches of chain width. A splash guard may be necessary for this method of lubrication.

(4) By wick feed. This method is useful for slow-running bush roller and block chains.

(5) In special cases the chain may be thoroughly impregnated with a suitable grease from time to time, after the periodic washings in paraffin where these are found necessary.

For all drives of over 50 h.p. and particularly for multi-strand drives, we strongly recommend pump and sump lubrication. In drives where the pinion speed is above the normal or where both wheels are small, or where the center distance is below normal, special attention must be paid to lubrication. Where there is any doubt, copious lubrication is desirable.

Drip and wick feeds to roller chains should deliver the oil between the inner and the outer side plates in order that it may penetrate to the working surface between stud and bush. The lubrication of the roller is of secondary importance. The oil used should be a medium heavy,

Continued on page 54



# WHAT OUR READERS THINK AND DO

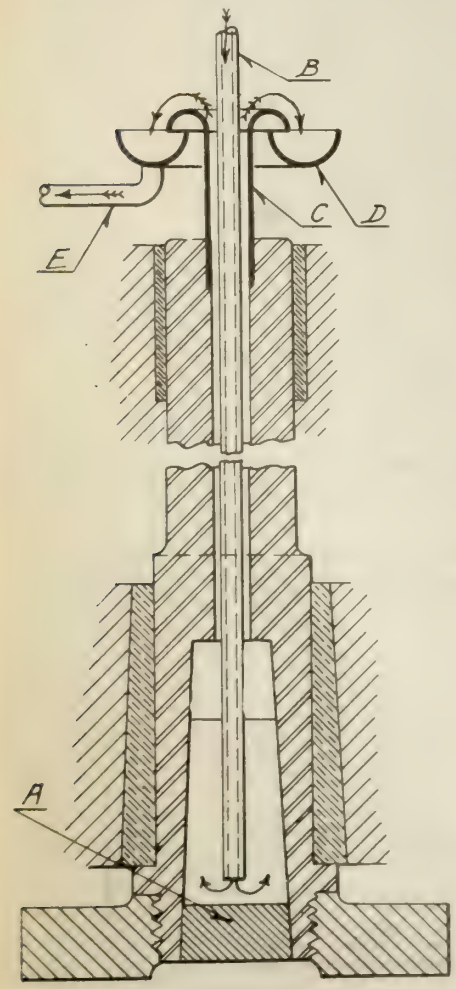


## COOLING SYSTEM FOR VERTICAL MILL

By JOHN HOMEWOOD

When continuous production is required from a vertical milling machine equipped with a revolving table, where the feed and speed are at the maximum, the lateral thrust is so excessive that in the warm months considerable trouble is experienced from overheated bearings. I am referring to that type of machine with plain bearings and a fairly good oiling system. The operation of the machine being continuous, it is almost impossible to feed oil fast enough to keep the heat away. The drawing herewith illustrates a water cooling system that assists greatly in keeping the parts in a reasonably cool condition so as to prevent seizing. Where there is only one machine in the shop of that type it is well to take every precaution so that the repair hours are kept at a minimum. This system can be used only where the spindle is free of inserted parts such as milling cutter tangs.

Where the threaded type of milling cutter is used, the lower part of the spindle can be plugged as shown at (a) and a small water pipe run down through the spindle, small enough to leave a space between the spindle and the pipe to permit the water to flow up the spindle. In the top of the spindle is a flared pipe as shown at (c) screwed into the spindle; this, of course, revolves with the spindle. Fitting underneath of this flare is a trough ring which is connected to a drain and fastened rigid. This ring is shown at (d). The pipe (b) is fastened and does not revolve.



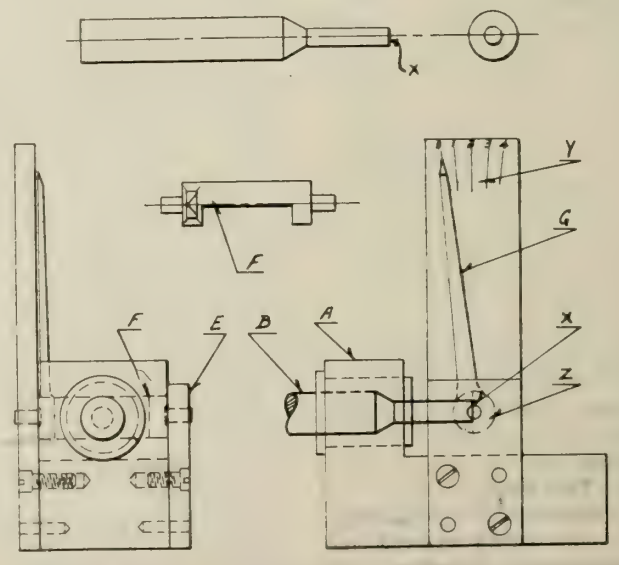

SECTIONAL VIEW THROUGH THE SPINDLE.

## LENGTH GAUGE WITH INDICATOR

By F. S.

A simple arrangement of a gauge for measuring the length from a beveled surface to the end of a part similar to that shown in Fig. 1 is illustrated at Fig. 2. This consists of a base A, containing a bushing B, while attached to base A are steel strips D and E. These steel strips provide a bearing for stud F, which contains an indicating finger G.

The object of the gauge is, that when the small diameter of the part shown in Fig. 1 is pushed in the bushing the end X will come against the rounded corner of the flat on the stud, thus pushing the indicator over, so it will be held somewhere between the indicating lines Y, provided the distance from the shoulder to the end of the work is correct. This lengths, and when reading can be taken from the indicating lines the work is, of course, correctly machined.

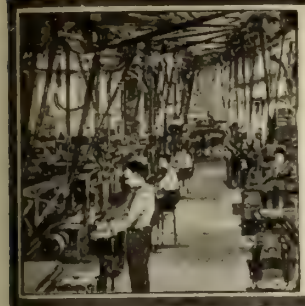



SHOWING WORK TO BE GAUGED, AND METHOD EMPLOYED.

## TURNING TAPERS BY SETTING OVER THE TAIL STOCK

Tapers are usually given in "inches per foot" and include the total taper or difference in diameters unless otherwise noted. In turning tapers in the lathe it is necessary to consider the total length of the bar, whether the taper extends the whole distance or not, and to set the tail stock over just as though the taper extended the whole length.

If the taper is ¾ inch per foot as in pipe threads and the whole bar is 16 inches long, then the total taper is 1 inch and the tail stock must be set over ½ inch. There is nothing to remember except to set the tail stock over half the total amount if the whole bar was tapered at the same rate.



# DEVELOPMENTS IN SHOP EQUIPMENT



### "RAPID" SAWING MACHINE

The latest design of "Rapid" sawing machine manufactured by Edward G. Herbert, Ltd., Levenshulme, Manchester, England, exemplifies the progress that has been made in the development of this type of metal cutting machine. The main features of design are strength, rigidity and an absolute minimum of working parts. The main bearings are of ample length and fitted with renewable gun metal bushes. The slide bearings are of large size, adjustable for wear and pivoted on an independent shaft with bearings wide apart. Connecting rod ends are also adjustable for wear. The saw holders are rectangular and may be adjusted to different lengths of blades and permanently aligned. The saw is set at an angle to the slides and this causes the inclination of the saw to the work to alter during the cut, and rapid cutting is obtained without the use of weights. A distinct feature of this machine is the device employed for altering the pressure on the saw blade. This is accomplished by springs in the body of the machine with a handle at the rear for changing the pressure, and dial for indicating it. By the use of a simple oil dash pot in conjunction with the angular setting of the saw and the changing speed of the crank, a positive lift is given to the saw on the return stroke. The amount of lift can be varied by controlling the flow to the dash pot piston. The dash pot also serves to prevent the saw frame from falling if a blade breaks. Each machine is fitted with an adjustable stop which automatically stops the machine at any required depth of cut. The oil pump is of the new plunger type fitted with air chamber, thus providing a large and steady supply of lubricant. These machines are built in a large variety of types and sizes to adequately handle all classes of work. Williams and Wilson, of Montreal, are Canadian distributors.

### TWIST DRILL GRINDER

The Wilmarth & Norman Co., Grand Rapids, Mich., have embodied several new features to their "Yankee" twist drill grinder. The most important of these is the adaptation of the machine for grinding drills having tapered and collared shanks, as well as those with straight shanks. The long drills having tapered or collared shanks are held as follows:

In addition to the support at the front of the drill, and at the end of the shank, it is also supported at the back end of the fluted section by a V block mounted on a round bar which extends along the holding attachment. This block may be slid along the bar to suit drills of various lengths and when a drill is too short to warrant the use of this support it can be swung out of the way.

In the case of a long straight shank drill the shank end is not supported as in the former case. When the drill is short, the V block support is swung out of the way so that it will not interfere with the tailstock. The machine is made in various sizes, nine belt driven and eight motor driven, these styles having various combinations from four holders having the following drill capacities: No. 52, to ⅝ inch, 3/32 inch to 1½ inches, ¼ inch to 2½ inches and ½ inch to 4 inches. Each style is equipped with means for obtaining different clearance angles on the work, and has a self-contained wheel-truing device.

### SPECIAL PISTON REAMER

A new type of expanding reamer, in sizes varying from ⅝ inch to 1 inch in diameter, designed particularly for the reaming of piston pin holes, is now being manufactured by the Foster-Johnson Reamer Co., of Elkhart, Ind. The cutting blades are expanded by means of an axial screw operated by a knurled head at the outer end, which is graduated for accurate setting to the thousandth part of an inch, the reaming operation being accomplished by the gradual expansion and reaming of the hole until it has attained the desired size.

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# CANADIAN MACHINERY
## AND MANUFACTURING NEWS

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## Getting The Business

ONE of the largest merchandising firms on this continent, having branches in all the principal cities of United States and Canada, has passed through the period of curtailment so far successfully, and in passing through has been gathering much information from experience.

In one of the United States branch offices it was found necessary some time ago to curtail expenses as the overhead was making the place top heavy. So it was decided to take some of the men from the sales force. This was done twice until there were only three salesmen left in the place. Finally word came, after surveying the figures from this office that it would be necessary to cut again, and two of the remaining three would have to go.

The manager of the local branch was faced with a peculiar situation. The three men were counted as good salesmen, and each of them had home and family responsibilities that could hardly be ignored. In order to let himself out and be fair to them all, he called the trio to his office, explained the whole matter, and put the proposition to them that the one showing the best month's business should be retained. They all agreed that such a chance was as fair a bargain as they could ask, and they started out on the trial.

At the end of the month the three men came in and compared figures. It was found that in each case they had piled up business larger than any month preceding it this year, and their sales were so satisfactory that none of them was let go.

That happened just a few weeks ago, and those three salesmen are at it again for another record month. They are not only saving themselves, but they are hunting up business here, there and all over that is going to be the means of keeping other men employed.

They were all of them good salesmen before, but they are better salesmen now, and they will be better still when business conditions improve. Any man who is going through the furnace now is going to come out stronger and more efficient for future business.

The experience of that firm backs up the contention that has been put forward a good many times recently, viz., that right now there is business for the man who goes out to get it. The trouble is there are too many going out with the expectation that they are not going to get anything.

## The Scrapped Battleship

THE House of Commons at Ottawa was interested in discussing prices of scrap metal last week because some vessels the government had sold for scrap had not been paid for promptly.

The chances are that when the Niobe and two submarines were sold for scrap a year or so ago, it looked like a good stroke of business because scrap prices were firm and scrap metal was much in demand.

To-day the position is different. Instead of securing $135,000 as a scrap proposition, it is doubtful if a bid could be secured at any price, unless it should be one so ridiculously low as to make certain its refusal.

It may be that the firm making the offer of $135,000 has not been able to keep pace with the decline in scrap values.

In connection with the same debate one of the members, J. Bureau, made the remark, "a good firm would not repudiate its contracts." As a bald statement this may be very true and very high-sounding, but according to actual practice, it means that Canada must have scores upon scores of very bad companies, for contracts have been cancelled wholesale by all kinds of firms during the last six months.

If the firm that contracted to take the Niobe for scrap is backing up on its contract, it is simply following a practice—a poor one, but popular—that has brought many Canadian firms into disrepute in the Old Country markets, where they still hold to the old but reasonable theory that a contract is a contract.

## Courage Is Needed

WE state it as a new axiom, and without fear of contradiction, that a man is as big as his courage.

Many a man of originality and ability has spent the years of his life in mediocre positions because of the lack of this one thing—the courage to assert himself.

Many a man of superior judgment has trailed along in the wake of someone of lesser gifts and suffered the resulting loss of his real possibilities, why?—because he has lacked faith in himself and the courage to stand up to some other person's aggressiveness, to meet him hand to hand and wrest his true leadership from some pretender.

And many and many a man has been pushed and jostled into the dull, inactive and unprofitable rearguard of life's action, has allowed himself, year after year, to wear deeper into the rut of taking things as they come, has become the disgruntled plaything of cruelly sportive circumstance, because he had not the courage to challenge fate, to seek and demand his birthright of a man's place in the world, to stand up to the punishment with which life tests out its candidates for honors.—Selected.

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In a certain plant where gloves are furnished to workers performing certain operations, it was found that quite often one glove would be completely worn, while the other was still fit for service. These serviceable gloves were gathered, cleaned and matched. By so doing, a saving of 15 to 25 per cent. was obtained.

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According to a recent statement, the average casting loss of five large American foundries was 9.4 per cent. In one foundry nearly 20 per cent. of the rejections when making motor-crank cases were due to cracks. In another foundry the greatest loss was due to trouble arising from sand, whilst in a third "moved cores" was the largest cause of wasters.



# MARKET DEVELOPMENTS



# The Steel Mills are Rolling at a Very Low Rate

## Pittsburgh Believes Things Are About as Low as They Can Get Now, And Any Change Must Be For the Better—Orders Coming In Are For Very Small Amounts in Nearly All Cases

TRADING has fallen off quite sharply in some sections of the iron, steel and machine tool market. Added to the general dullness of machine tool business, a number of firms are placing a quantity of used equipment on the market.

The steel market is getting along on a very small volume of business, some of the orders being for a few pounds of material. One warehouse claims that during last week they received, among other things, twenty orders for sheets, and in the lot there were just twenty sheets. It is hard to imagine a warehouse business getting down to such small limits. It is making it expensive to do business, as it takes almost as much clerical work to attend to all these small orders, while delivery charges are burdensome on these. The trade is not looking for any quick revival of buying. They have this year seen several seasonable lines go past their appointed time for starting to move out, and from this they take it they are in for a poor season right through.

Pittsburgh believes that conditions are about as low as they can get in the steel trade. The Corporation mills are still rolling a little higher than the Independents, but there is the ever-present expectation of lower prices and until this is settled one way or the other, the buyers are not going to move much.

A ten per cent. reduction in the small tool market is noted in the case of taps. Business is dull in this market and the salesmen are not adhering strictly to prices, in fact many low prices are given in order to secure the business. The buyers are still very much in control of the market and are placing their business accordingly.

The scrap metal business shows no signs of improvement. It is about as near a complete standstill as can be imagined and prospects are not bright for an improvement in the immediate future.

## PITTSBURGH PREDICTS THAT THE WORST HAS HAPPENED IN BUSINESS

Special to CANADIAN MACHINERY.

PITTSBURGH, June 2.—July is casting its shadow before. In the past few weeks the steel trade has been expecting July to be a particularly dull month, as July always is, but the particular dullness is already on the market. In other words things have gone from bad to worse, though perhaps it would be more accurate to say that the trade feels things have gone from worse to the worst. That is, the view is entertained that the worst possible conditions now exist as to demand, conditions so bad that they cannot continue. Almost universally an improvement is predicted for August, and then the question would be whether when a start was thus forced the movement would not gain momentum. It is believed that there are still some stocks in process of liquidation in the hands of some manufacturing consumers, though as to jobbers' stocks it is thought they were quite well liquidated several weeks ago. If there is consumption of stock at the present time then there will be heavier demand on mills when these stocks are completely exhausted, provided the consumption continues. In most cases it doubtless would. In the automobile industry there is a question. It is well known that even to-day a very considerable part of the automobile consumption of steel is of stocks which presumably will very soon be almost entirely exhausted, but with automobiles there is the question whether manufacturing will be continued on anything like the present scale, now that the natural spring demand is fairly well filled. Some steel manufacturers believe that certain automobile manufacturers will make sweeping price reductions not long after July 1, and these may start some fresh buying.

### Economic Conditions

In his address last Friday as president of the American Iron and Steel Institute, Judge Gary, chairman of the Steel Corporation, set forth in his usual lucid style, and in the stronger language he has lately used, in discussing the extortion attempted by some sellers of commodities and some groups of workmen, the economic situation as it has lately been generally understood in the steel trade. Prices of some commodities are all right, or nearly all right, while some prices are "unreasonable and unfair, if not extortionate" and much the same is true of some wage rates. Judge Gary says the whole public is holding back from buying, when the means and the inclination exist, because the public feels that a general readjustment is necessary and the readjustment has not been completed. Thus there are some "spoilsports" who are holding back business revival.

Judge Gary seems to hold the opinion that the buying public is holding back its buying power merely from a general disinclination to do anything or make any purchases because it holds that further readjustment is necessary. Perhaps, however, in many cases the buyer's hands are tied because to do a certain thing he needs two or more commodities, and cannot use one without the others, while one of the commodities may be rightly priced and the other unreasonably priced.

The steel trade's view of the future is definite and plainly expressed. It expects some revival in demand in August or soon thereafter, no matter what happens, because even the smallest kind of hard times consumption that can be conceived will in the long run require more steel than is now being purchased or specified for against contracts, and that a fuller revival in steel demand, which hinges upon adjustment of the general economic situation will come later, and not until next year. That adjustment involves the development of fair prices

for all commodities and fair wage rates for all classes of service.

### Operations

It seems quite certain that the steel ingot report for May, when issued, will show an operating rate for the month under 30 per cent., against about 31 per cent. for April, 55 per cent. for January and 80 per cent. for the first nine months of last year, before shortage of orders was felt, but while there was restriction by transportation and other conditions. The average in June and July is likely to be 25 per cent. or less. The Steel Corporation continues to operate at a considerably better rate than the independents, due to its having increased its good will last year by holding down its prices, while it still has large contracts on which customers specify as they need material.

### Prices

In almost every branch the steel market is quite steady at the prices developed about the middle of April. This steadiness may or may not be an actual evidence of inherent strength. There is no real test because the quantities sought by buyers are not of sufficient size individually to tempt a seller to cut regular prices, even though he might be disposed to do so on a good sized order. Another factor is that buyers are making purchases in such extremely hand-to-mouth manner that they hardly have time to shop around. Frequently the order is simply placed with the mill that can make the quickest shipment. This interferes with the policy often practised in dull times, of a mill closing for a time "to accumulate orders." Often if a mill is not going to operate until next week it does not get the order just on that account, and in such circumstances it is obviously difficult to "accumulate" orders.

It is regarded as practically a foregone conclusion that steel prices will be lower before there is anything like a general buying movement. Buyers evidently expect this, while mills would not be averse to lowering prices if they were in line to receive more business and thus be able to operate at a higher rate, thus reducing their costs. With the present very light operation many mills have no profits even at present prices.

### Pig Iron

Pig iron continues, in general, its established practice of yielding a little in price whenever any new business of the least consequence comes out. Basic iron recently declined from $22.50, valley to $22 on a 2,000-ton lot, a few small lots afterwards changing hands at the $22 price, while now on purchases of 2,000 tons $21.75 has been done and it is rumored that the sales were followed by one transaction at $21.50. In somewhat similar manner foundry iron has declined from $23.50 to $23.

Connellsville coke for spot or prompt shipment remains quotable at $3.25 to $3.50 for furnace and at $5 to $5.50 for foundry, per net ton, at ovens. It is understood that on a contract for a furnace supply for about four months $3.75 has just been done, this being on a particularly good grade of coke for making low phosphorus pig iron, the reported buyer being the Robesonia Iron Company.

## POINTS IN WEEK'S MARKETING NOTES

**July bookings are very low in the steel mills, and many of the mills hold that conditions have reached a point as low as it is possible to go.**

—

**Many of the automobile shops have been running on stocks that the firms had on hand some months ago. Now that the spring demand has been attended to, the manufacturing programmes have been seriously curtailed.**

—

**Toronto warehouses are selling in very small quantities, some orders coming in for as low as a few pounds of material.**

—

**Prices of taps have been reduced ten per cent. Dealers admit that considerable price shading is being done in small tools generally in an effort to secure business.**

—

**A few orders for boiler tubes have come in during the week.**

—

**It is freely predicted that automobile prices are going to be cut after July 1, and that some of the cuts may be quite heavy. This may cause fresh buying of steel.**

—

**The Steel Corporation mills continue to operate at a higher rate than the Independents.**

—

**Our Pittsburg correspondent claims, "It is regarded as practically a foregone conclusion that steel prices will be lower before there is anything like a general buying movement."**

—

**Pig iron has touched a new low spot, as some sales as high as 2,000 tons have been done at $21.75.**

## TORONTO HAS A QUIET MARKET

**Machine Tool Dealers Are Receiving Very Few Orders—Steel Dealers Order in Small Lumps**

TORONTO.—There have been a few bright spots in the iron, steel and machine tool markets during the past week, but they are few and rather far between. One of the hardest problems facing many of the firms is to handle profitably the same number of orders representing only a quarter of the usual volume of business. It requires the same amount of clerical work, the same trouble in delivering and the expenses generally are greater in doing business this way.

The machine tool market remains dull, and sales are limited to a single machine here and there, and, as further indicating the tendency of the buying, a used tool at a close price seems to be the easiest to dispose of in the present market. Several firms are letting out quite a lot of equipment at the present time, and this may be having the effect of further depressing the market, although it is doubtful if the sales of new machines are interfered with by this practice.

A number of the machine tool houses are cutting their expenses as closely as possible, trying to keep them in line with the volume of business that is offering. There is a tendency, though, to keep organizations pretty well built up, for, despite the quiet trade, there is a feeling that business is going to improve, and firms want to be in good shape to follow up all the leads showing when the turn of the tide comes.

### The Small Tool Market

Small tools have been fair during the last few weeks. There is a new price out on taps this week which really amounts to a reduction of about 10 per cent. Tehere seems to be a tendency to shade prices on quite a few lines in small tools. For instance, files are listed at 50 off. One dealer found a firm ready to place some business, and in order to make sure of grabbing it he offered 60 off. To his surprise he received word that the buyer—or rather prospective buyer—could do quite a bit better than that. Speaking to this paper the dealer said, "My price on that line is 60 and 10 off, and there was not much left for me when I offered to make the price 60 off. The order must have been taken with no profit at all. The trouble is that when buyers find out they can get such treatment they want it on everything they secure, and when it is necessary to get back to real business, it is hard to convince them that they are not in control of the market any more."

Several dealers claimed that there was considerable shading of prices going on in order to secure business. The odd part of it is that some of those who complain of this sort of business will admit that they themselves are guilty of it. The automobile shops were buying a little a few weeks ago, but they have not come into the market very prominently as buyers of small tools. In fact some of the auto shops were so heavily stocked up a year ago that they can turn around and sell quite an assortment of material to the average dealer, and still

have enough material on hand to go ahead and run the establishment.

### Small Orders For Steel

The steel merchants are getting business handed to them in about as small quantities as could be imagined. Buying from hand to mouth hardly expresses the size of some of the orders that are drifting in to the warehouses just now. It is quite correct to say that these orders are coming in, for it certainly would not pay any steel merchant to go out and seek them. A couple of weeks ago we recounted the case of a firm that sent out a three-ton truck with 47 orders on it, but this week we hear of another that had orders for twenty sheets for twenty people, or one sheet to a customer. The warehouses are talking of coming to some understanding as to what amount they will deliver without making a special charge for handling. Some of them seem to think that 100 pounds should be the limit, and that anything under that should be charged specially for delivery service. There are many orders for lesser amounts, one merchant showing Canadian Machinery a filled out order for some quarter round bars that would weigh between eight and ten pounds.

There have been a few fairly nice orders for boiler tubes, but not many of them. Other lines are moving very slowly, and dealers are not looking for any speedy revival of their business, as several seasonable lines have failed to move at their expected time.

### No Change Here

"You can say there is no change whatever in the scrap metal situation," explained one dealer this week. "The amount of business that is moving is very small, and is only such as some person is anxious to secure for immediate use. Scrap must be piling up in the premises of some of the firms that usually have a pretty fair offering for the market. Very little of it is offered for sale, because the prices are so low that they would rather hold on and see if there will not be something better later on. We are studying the situation closely from day to day, and we cannot find any sign that would lead us to believe we are soon to face any decided improvement in our business."

## REPORTS FROM ONTARIO CENTRES

**How the Bankers Report Conditions In Various Corners of This Province**

A number of reports have been received at the head office of the Imperial Bank regarding conditions in the various centres of the province. A review of some of these shows the following statements:

**Hamilton.**—Generally speaking, the manufacturers of this district are running half-time or less. Two exceptions are the Canadian Westinghouse and the National Steel Car, which are running full time, and working on large orders. Unemployment is about 4 per cent. of the working men of the city, and, as 1 per cent. is the average rate of men out of employment, the situation does not appear to be very serious.

**St. Catharines.**—Steel manufacturers are all working on short time, none of them more than four days a week, and their orders are light. Paper mills seem to be better off than the other manufacturing concerns, and have a lot of orders, but they are not as large as in former years. Customers are buying in small lots and oftener.

**Welland.**—Factories are closed or on short time as a rule. There is quite a number of unemployed, and until their savings are exhausted they appear to be unwilling to go to work on the land.

**Niagara-on-the-Lake.**—Our fishermen have nearly all been obliged to go over to the north shore of Lake Ontario, owing to the state of the lake at the entrance to the Niagara River.

**Niagara Falls.**—Local manufacturers are looking for gradual improvement. Some concerns are operating full time, while others are 50 per cent. of capacity.

**Port Colborne.**—International Nickel Co. is operating 25 per cent. of capacity, and has sufficient nickel to supply a normal year's demand. They are shipping 100 tons a month to Japan, and this order will be completed in June. A resume of the situation would indicate that this town will not suffer to any great extent by the prevailing general depression throughout the country.

**Brantford.**—Some of our manufacturing concerns show an improvement, but, generally speaking, all are running from 50 to 75 per cent. below capacity.

**Galt.**—With the exception of heavy machinery and winter weight textiles, practically all lines of manufacturing show an improvement over the first of the year. The number of orders is back almost to normal, but the size of the orders is very small, and in many cases express shipments are made where carload lots were formerly the rule. This condition indicates a lack of confidence in the stability of present prices, and this lack of confidence cannot but continue until there is a marked reduction in present costs. "The well-meant effort of some municipalities to create work at top prices for the unemployed seems to me to be an unsound policy, which is only postponing the inevitable readjustment into the winter months, when the pinch will be much harder than it is today."

**Woodstock, Ont.**—Knitting and textile factories have been very busy generally and report that orders are coming in freely. The outlook for the next few months is for a gradual improvement.

**Windsor, Ont.**—Mostly all lines of manufacturing are running on short hours with reduced staffs. There has been a vast falling off in business in general throughout Ontario during the past several months, and the same condition prevails here, but I do not believe to as great an extent so far as in some other sections.

## SITUATION BETTER AROUND REGINA

**Imperial Oil Refining Plant is Being Enlarged—Much Residential Building Being Done**

Writing to Canadian Machinery, Charles A. Cooke, secretary-manager of the Regina Board of Trade, says:—

Industrial construction in Regina is somewhat less active than usual, though building permits to date are in excess of the same period in 1920. The great proportion of the work, however, consists of residential property.

Considerable extension is planned by Imperial Oil Limited at their refining plant, and the contract has been awarded for the erection of a large distribution warehouse for McColl Bros. who have established a branch of their oil business here.

Construction will begin at an early date on the new Campion College to be erected by the Roman Catholic community.

A large number of houses are under construction, many of them more than ordinarily costly, but high costs are militating against much needed development along residential lines.

Both wholesalers and retailers report fair conditions generally, and the optimistic reports on seeding operations and crop possibilities are tending to an easier situation.

## GOING TO GIVE THE RETURNS MONTHLY

**Production of Pig Iron In Canada Had Fallen Off Sharply During January**

With seven out of 20 blast furnaces that are installed operating in Canada during January of this year, the total production of pig iron, exclusive of ferro-alloys, was 41,249 long tons, the lowest since 1904, reports the Dominion Bureau of Statistics. Of this amount 28,326 tons were made for the use of firms producing, and the remainder was for sale. All iron produced by firms for their own use was basic; of the remainder, 137 tons were basic; 3,027 foundry, and 9,759 malleable. The furnaces were operated at Sault Ste. Marie, Midland, Port Colborne and Sydney, C. B.

This decline in production was reflected in the steel industry, the output of steel ingots and castings in January amounting to 40,058 long tons, the lowest since 1904. Only 371 tons were for sale.

The Dominion Bureau of Statistics will

produce these figures monthly. Figures for February, March and April will be issued shortly. These returns will be in continuation of the service formerly provided by the mines branch of the Department of Mines. A few changes have been made, notably the reporting on a monthly basis instead of quarterly, the record of pig iron production by grades, and the showing of all quantities in gross tons of 2,240 pounds, whereas formerly the figures of pig iron and steel production were always given in short tons.

# OTTAWA HOUSE DISCUSSES DROP IN SCRAP AND NIOBE CONTRACT

OTTAWA.—Scrap iron prices and Canada's naval policy got all mixed up in the debate on naval estimates in the House.

The scrap iron prices came in the discussion on the sale by the Government of the warships Rainbow and Niobe, and the two submarines. The Niobe cost Canada $1,200,000. She sold by tender for $135,000 along with the two submarines, but the Federal Treasury is only the richer by $10,000. The two submarines included in the same deal, about which there is difficulty now in getting the money, cost Canada $1,500,000. The failure of Hon. C. C. Ballantyne to get the money required about an hour of explanation. The net result of it is that the House was informed that the Department of Justice has the matter in hand, and will try and force the New Brunswick rolling mills, purchasers of the Niobe, to keep the full terms of contract of sale.

### Not Carrying Out Terms

The Niobe was sold last December, and besides the $20,000 paid then, the firm was to pay $10,000 a month. The latter stipulation has not been lived up to by the firm. It was the opinion of the Minister and others that, because of declining prices of steel and brass, the firm, which has already taken the two submarines, is trying to get out of the contract of taking the Niobe.

A. E. Fripp, one of the Government members from Ottawa, sought an explanation of tenders. He stated that an Ottawa firm had tendered for $100,000 cash. He maintained that if they had known the arrangements made with the New Brunswick firm that they would have bid higher and paid cash, which would be a better deal than the present one. He was critical of the whole transaction and wanted to know what security the Government had from the purchasers of the ships.

Mr. Ballantyne explained that the ship itself was the security, whereupon Mr. Bureau remarked that he could not get $20,000 for it now, in view of the declining prices of iron and steel. The Minister persisted that the firm was in a position to pay, and that the Government would insist upon them living up to the contract.

# FIRM IN INDIA IS ANXIOUS TO HAVE TRADE RELATIONS WITH CANADA

Canadian Machinery has received from Lala, Ramdhan & Sons, engineers and contractors, Jullundur City, India, the following list. The firm is anxious to get in touch with Canadian manufacturers who can supply the lines indicated.

Ice making plants—For 20 tons per day, clear and crystal. The temperature of water on hot days is 85 degrees Fahrenheit, and depth of well to be built is 35 feet. Ice blocks to be 3½ ft. x 2½ ft. x 8 in., and 336 pounds in weight. Require complete estimate with cost of boiler and all accessories, including electrical light apparatus.

Steel and iron products—Round, flat and square bars, angles and rolled bars of all sizes, pipes, tubes and bends for water works, plain, corrugated and galvanized sheets, tin plates, wire gauges and wire of all descriptions, bolts, nuts, screws and wire nails, door fittings, scales, weighing machines and other building materials, zinc and lead. Also tools for carpenters, engineers, etc.

Brass and copper products—Sheets of all sizes, door fittings, screws, tubes, locks, cocks, wires and wire gauges.

The quotations may be given f.o.b. Karachi, otherwise the shipment and other charges up to Karachi may be shown separately. State time of delivery from the receipt of orders and the method of payment. In the case of suitable rates we will be prepared to pay 25 per cent., with order and remainder as desired.

We are prepared to take the agency for India for manufacturers who have no representatives in this country. Send samples if possible and full price lists. Our banking references: The Punjab National Bank, Ltd., Lahore; the Alliance Bank of Simla, Ltd., Jullundur; the Lyallpur Bank, Ltd., Bannu. Correspondence can be carried on in the English language.

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**Start Operations.**—The Bluebird Corporation, Brantford, expect to resume operations about the 1st of June, after being closed down for some weeks. In addition to manufacturing the Bluebird washer they will make a new line of electrical appliances.

# ENGLISH ELECTRIC COMING TO CANADA

### Toronto Man to Look After Establishment of Lang Electrical Concern In This Country

Gordon Foxbar Perry, president and general manager of the National Iron Corporation, Limited, Toronto, has been elected president and chairman of the board of directors of the English Electric Company, Limited, a Canadian company incorporated with a Dominion charter to handle the business in this country of the English Electric Company, Limited, of London, England. Mr. Perry was born on November 28, 1883, in Dundas, Ont., and was educated in Toronto. After serving four years' apprenticeship in the foundry and machine shop of the Canada Foundry Company, Limited, now Canadian Allis-Chalmers, Limited, Toronto, Mr. Perry became a salesman for that firm in 1904, and two years later he was promoted to be Ontario sales manager. In 1910 Mr. Perry resigned this position to become general manager of the newly incorporated National Iron Works, Limited, which subsequently became the National Iron Corporation, Limited. Working jointly with the late Cawthra Mulock, Mr. Perry successfully established the modern foundry in the Eastern Harbor Terminal District, Toronto, for the manufacture of cast-iron water and gas pipe, and upon Mr. Mulock's death he succeeded to the presidency of the company. Mr. Perry is vice-president of the National Steamship Company, vice-president, Eastern Construction Company; director, O'Keefe Brewing Company; vice-president of the newly incorporated Drifting Sand Filter Company, Limited, and a director of several other companies. Mr. Perry is also a director of the International De Lavaud Manufacturing Corporation, a company that has been organized to control the patents for the De Lavaud process for casting iron pipe by centrifugal force. He has been been in England for the past three months in connection with the organization of the Canadian subsidiary for the English Electric Company, and on business in connection with the European patents for the De Lavaud process.

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Car Owners Garage Co., Richmond and Maple Sts., London, Ont., will remodel building for garage at Aylmer, Ont.

The general contract for the erection of a warehouse for Bonsall and Mitchell, Coronation, Alta., has been awarded to Ed. Bartlett, Coronation.

The Robin Hood Service Stations, Ltd., 502 Ryrie Building, Toronto, are contemplating the erection of a service station at a cost of $15,000 at Oshawa, Ont.

The Sandwich Foundry Ltd., Sandwich, Ont., has been incorporated with capital stock of $200,000 to carry on business as iron, brass and aluminum

# Serious Problems in the Old Country Centres

## Reductions Have Been Made in a Number of Lines, But Foreign Competition is Still Able to Make Itself Felt—Present Coal Strike is Delaying Progress Very Seriously in All Lines

LONDON, England.—The future of the iron and steel trade in Great Britain is so closely interwoven with the British coal situation that it is impossible to dissociate the two. It is certain that there can be no general or marked improvement in the iron and steel trade until coal is cheaper. Coal miners and operators equally appreciate the importance of this situation. Only recently, Mr. Hodges, secretary of the Miners' Federation, made the statement that a reduction in the price of industrial coal of £1 per ton would mean a reduction in the cost of production of pig iron of £4 per ton, a reduction which in view of foreign competition, is essential to the iron and steel trade if it is to maintain not only its foreign markets but its domestic as well.

For some time it has been realized that British pig iron prices are far too high to maintain a reasonable volume of domestic business as well as export trade, in view of the keen competition from Belgium and Germany. It was felt by the various interests associated that a gradual decline in prices of British pig iron would only serve to confirm the mind of the buyer to delay purchasing in anticipation of further reductions. Therefore it was decided on the part of the producers of Cleveland forge iron to reduce prices on March 1 by a slashing cut of 45s. a ton. This step was taken only after careful consideration, in the expectation, first, that coal and coke prices would soon be lower and, second, that such a drastic reduction would stimulate buying. Nevertheless, in taking this step many of the producers of Cleveland pig iron are obliged to shoulder heavy losses based on production cost until coal and coke are cheaper or orders increase to such an extent as will give them a large volume of trade on a small margin of profit.

### Result of Decline in Price of Cleveland Iron

Cleveland pig iron is now quoted at the following nominal prices: No. 1 foundry, £7 15s. per ton (at normal exchange the pound sterling is equivalent to $4.8665, the shilling to $0.243); No. 2 silicious, £7 15s. per ton; No. 3, G. M. B., £7 10s. per ton, with lower grades correspondingly cheaper. In spite of this extreme and sudden reduction, Belgian foundry iron still undersells it, being obtainable c. i. f. Tyneside at £7 10s. per ton, and an excellent grade of foundry iron offered through Belgium, equivalent in quality to No. 3, Cleveland, at £6 10s. per ton f. o. b. Tyneside. It is genrally believed that this iron was smelted in Germany, hence the great difference in price.

The first and most important result of the lowering of prices was the effect on the producers of hematite iron. The reduction came as a bombshell in this field, and equivalent hematite declined in sympathy 40s. per ton, Cumberland hematite 20s., and Scotch hematite 20s. per ton. This left the market for hematite in a demoralized condition, from which it has not yet recovered. The anticipated new business resulting from the reduction in the price of Cleveland and hematite iron has not yet been realized, and such improvement as is noted is sporadic and scant. British makers point to the fact, however, that continental pig iron producers are fairly well sold ahead, and this leads to the view that there must be in the near future at least a moderate resumption of domestic buying of pig iron in view of the lower prices.

### The Manufactured Iron Situation

The manufactured iron situation throughout the country remains unchanged. If anything, there is a slight falling off in business. Old contracts are being rapidly completed and the tonnage of new orders is far from keeping the volume of business on hand up to a normal figure. The opinion is generally expressed that the finished iron and steel trade has never gone through a period of more complete stagnation. Fresh orders for finished iron are lacking in all branches of production, with a possible exception in connection with marked bars; but here, while makers were well booked at the beginning of the depression, the contracts are being finished off much more quickly than new ones are coming forward. A strange feature of the situation is the fact that finished iron is being displaced by cheaper continental steel where it can be suitably used.

As a result of this, many of the producers of finished iron have been cutting the association price to a substantial extent, provided this would bring them additional business, but in most cases it has proved of little avail. The associated makers, realizing this, have recently reduced their prices £2 per ton for both crown and marked bars. The hopes of an early spring revival in the finished iron trade have not materialized. Certainly if there is to be any improvement this side of fall, it must begin very soon.

In the Scottish district makers of bar iron reduced the price of this commodity to £23 per ton, and are reducing the extras to 100 per cent. over the list prices. Here, too, business is getting quieter each week, and most producers are operating on short time.

### Foreign Competition in Manufactured Steel

In manufactured steel any hope of immediate improvement is overshadowed by foreign competition. Particularly is this true in semi-finished steel. In fact, it is difficult to keep pace with the slump in prices of imported semi-finish. For instance, a great deal of attention was attracted two weeks ago to the fact that Belgian steel bars could be bought at a price which was slightly less than £10 per ton delivered in South Staffordshire, the center of the steel-bar industry, but at the present time Belgian bars are being offered at slightly less than £9 per ton. It is not strange, in view of this fact, that British manufacturers find it impossible and impracticable to book orders for steel from domestic producers.

The reduction in the price of steel sections made last week has done nothing to stimulate domestic trade, and the general feeling is that there must be further and heavier reductions in all lines of steel before bedrock is reached. Scottish steel producers are feeling Belgian and German competition very keenly, and steelmakers generally are finding difficulty in getting orders of sufficient tonnage to make up rollings. The drop in sheet-steel prices has done little to stimulate the trade, and as a result a further slump is anticipated within the next few days.

### Exports of Manufactured Iron and Steel

The most serious phase of the situation is disclosed by the tonnage figures available showing shipments of pig iron and manufactured iron and steel from the Middlesboro district for February, 1921, as compared with January, 1921. January showed considerable strength as far as exports of manufactured iron and steel were concerned, but this was not surprising when one reflects that the shipment represented deliveries on contracts placed during the height of the boom period. Shipments of manufactured iron and steel by water amounted in January, 1921, to 32,900 tons. These shipments fell in February to 21,646 tons. Of this total of 21,646 tons, 333 tons went coastwise and the balance abroad.

It is particularly interesting to note how badly the iron and steel trades have been hit in the Ceylon and Indian markets during the month, probably due to a large extent to the depression in silver. In January, 1921, 15,249 tons of manufactured iron and steel went to India and Ceylon, while in February only 6,959 tons were shipped. The aggregate shipments of pig iron and manu-

# SELECTED MARKET QUOTATIONS

**Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.**

## PIG IRON

| | |
|---|---|
| Grey forge, Pittsburgh | $25 00 |
| Lake Superior, charcoal, Chicago. | 40 50 |
| Standard low phos., Philadelphia. | 41 50 |
| Bessemer, Pittsburgh | 28 96 |
| Basic, Valley furnace | 26 00 |
| Toronto price:— | |
| Silicon, 2.25% to 2.75% | 34 10 |

## IRON AND STEEL

| Per 100 lbs. to Large Buyers | Cents |
|---|---|
| Iron bars, base, Toronto | $3 75 |
| Steel bars, base, Toronto | 3 75 |
| Iron bars, base, Montreal | 3 75 |
| Steel bars, base, Montreal | 3 75 |
| Reinforcing bars, base | 3 75 |
| Steel hoops | 4 50 |
| Tire steel | 4 00 |
| Spring steel | 6 00 |
| Band steel. No. 10 gauge and 3-16 in. base | 4 00 |
| Chequered floor plate 3-16 and heavier | 6 00 |
| Bessemer rails, heavy, at mill | 2 35 |
| Steel bars, Pittsburgh | 2 10 |
| Tank plates, Pittsburgh | 2 20 |
| Structural shapes, Pittsburgh | 2 20 |
| Steel hoops, Pittsburgh | 3 05 |
| F.O.B., Toronto Warehouse | |
| Small shapes | 4 50 |
| F.O.B. Chicago Warehouse | |
| Steel bars | 3 48 |
| Structural shapes | 3 58 |
| Plates | 3 78 |
| Small shapes under 3-in. | 3 48 |

## FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

| | C.L. | L.C.L. |
|---|---|---|
| Montreal | 58½ | 73 |
| St. John, N.B. | 84½ | 106½ |
| Halifax | 86 | 108 |
| Toronto | 38 | 54 |
| Guelph | 38 | 54 |
| London | 38 | 54 |
| Windsor | 35 | 50½ |

Current surcharge, 7 per cent.

## METALS

| | Gross. Montreal | Toronto |
|---|---|---|
| Lake copper | $18 00 | $17 50 |
| Electric copper | 17 50 | 17 50 |
| Castings, copper | 17 25 | 18 00 |
| Tin | 38 00 | 39 00 |
| Spelter | 7 75 | 7 50 |
| Lead | 7 25 | 7 50 |
| Antimony | 8 00 | 8 25 |
| Aluminum | 34 50 | 30 00 |

Prices per 100 lbs.

## PLATES

| | | |
|---|---|---|
| Plates, 3-16 in. | $5 00 | $4 75 |
| Plates, ¼ up | 4 50 | 4 25 |

## PIPE—WROUGHT

**Standard Buttweld Pipe S/C**

Per 100 feet.

| | Steel | | Gen. Wrot Iron | |
|---|---|---|---|---|
| Size | Blk. | Galv. | Blk. | Galv. |
| ⅛ in. | $ 6 50 | $ 8 50 | $ .... | $ .... |
| ¼ in. | 4 89 | 6 99 | 5 91 | 8 01 |
| ⅜ in. | 4 89 | 6 99 | 5 91 | 8 01 |
| ½ in. | 6 50 | 8 03 | 7 95 | 9 48 |
| ¾ in. | 7 99 | 10 96 | 9 95 | 12 02 |
| 1 in. | 11 82 | 14 38 | 14 71 | 17 77 |
| 1¼ in. | 15 99 | 20 13 | 19 90 | 24 04 |
| 1½ in. | 19 11 | 24 06 | 23 79 | 28 74 |
| 2 in. | 25 72 | 32 38 | 32 01 | 38 67 |
| 2½ in. | 40 66 | 51 19 | ..... | ..... |
| 3 in. | 53 17 | 66 94 | ..... | ..... |
| 3½ in. | 67 62 | 84 18 | ..... | ..... |
| 4 in. | 80 12 | 99 74 | ..... | ..... |

**Standard Lapweld Pipe S/C**

Per 100 feet.

| | Steel | | Gen. Wrot Iron | |
|---|---|---|---|---|
| Size | Blk. | Galv. | Blk. | Galv. |
| 2 in. | $29 42 | $36 08 | $35 71 | $42 37 |
| 2½ in. | 44 17 | 54 70 | 54 11 | 64 64 |
| 3 in. | 57 76 | 71 53 | 70 76 | 84 53 |
| 3½ in. | 69 46 | 86 02 | 85 10 | 101 66 |
| 4 in. | 82 30 | 101 92 | 100 83 | 120 45 |
| 4½ in. | 95 89 | 1 20 | 1 30 | 1 54 |
| 5 in. | 1 12 | 1 40 | 1 52 | 1 80 |
| 6 in. | 1 45 | 1 81 | 1 97 | 2 33 |
| 7 in. | 1 89 | 2 37 | 2 53 | 3 01 |
| 8L in. | 1 99 | 2 49 | 2 66 | 3 16 |
| 8 in. | 2 29 | 2 87 | 3 07 | 3 64 |
| 9 in. | 2 74 | 3 43 | 3 67 | 4 36 |
| 10L in. | 2 54 | 3 18 | 3 41 | 4 05 |
| 10 in. | 3 28 | 4 10 | 4 39 | 5 21 |

**Prices—Ontario, Quebec and Maritime Provinces**

## WROUGHT NIPPLES

4-in. and under, 50 per cent.
4½-in. and larger, 40 per cent.
4-in. and under, running thread, 20%.
Standard couplings, 4-in. and under, 20%
Dd., 4½-in. and larger, net.

## OLD MATERIAL

Dealers' Average Buying Prices

Per 100 Pounds.

| | Montreal | Toronto |
|---|---|---|
| Copper, light | $ 8 50 | $ 9 00 |
| Copper, crucible | 11 00 | 11 00 |
| Copper, heavy | 10 50 | 11 00 |
| Copper wire | 11 00 | 11 00 |
| No. 1 machine composition | 9 50 | 9 75 |
| New brass cuttings | 6 00 | 8 00 |
| Red brass turnings | 8 00 | 8 00 |
| Yellow brass turnings | 5 00 | 6 00 |
| Light brass | 4 25 | 5 00 |
| Medium brass | 4 50 | 6 00 |
| Scrap zinc | 4 00 | 4 00 |
| Heavy lead | 4 25 | 4 00 |
| Tea lead | 2 25 | 2 00 |
| Aluminum | 12 00 | 10 00 |

| | Per Ton | Gross |
|---|---|---|
| Boiler plate | $10 00 | $12 00 |
| Heavy melting steel | 9 00 | 14 00 |
| Axles (wrought iron) | 20 00 | 20 00 |
| Rails (scrap) | 12 00 | 14 00 |
| Malleable scrap | 12 00 | 20 00 |
| No. 1 machine cast iron | 22 50 | 25 00 |
| Pipe, wrought | 8 50 | 8 00 |
| Car wheel | 22 00 | 25 00 |
| Steel axles | 18 00 | 18 00 |
| Mach. shop turnings | 5 00 | 6 00 |
| Stove plate | 17 00 | 20 00 |
| Cast boring | 3 00 | 7 00 |

## BOLTS, NUTS AND SCREWS

| | Per Cent. |
|---|---|
| Carriage bolts, 7-16 and up | Net list |
| Carriage bolts, ⅜" and less | 15 |
| Coach and lag screws | —20 |
| Stove bolts | 55 |
| Wrought washers | —25 |
| Elevator bolts | Net |
| Machine bolts, 7-16 and over | —5 |
| Machine bolts, ⅜-in. and less | —30 |
| Blank bolts | Net |
| Bolt ends | —5 |
| Machine screws, fl. and rd. hd., steel | 27½ |
| Machine screws, o. and fil. hd., steel | +25 |
| Machine screws, fl. and rd. hd., brass | Net |
| Machine screws, o. and fil. hd., brass | Net |
| Nuts, square, blank | +25 add $2 00 |
| Nuts, square, tapped | add 2 25 |
| Nuts, hex., blank | add 2 25 |
| Nuts, hex., tapped | add 2 75 |
| Copper rivets and burrs, list less. | 27½ |
| Burrs only, list plus | 10 |
| Iron rivets and burrs | 37½ and 5 |
| Boiler rivets, base ¾" and larger | $8 50 |
| Structural rivets, as above | 8 40 |
| Wood screws, O. & R., bright | 67½ |
| Wood screws, flat, bright | 67½ |
| Wood screws, flat, brass | 55 |
| Wood screws, O. & R., brass | 55½ |
| Wood screws, flat, bronze | 50 |
| Wood screws, O. & R., bronze | 47½ |

## MILLED PRODUCTS

(Prices on unbroken packages)

| | Per Cent |
|---|---|
| Set screws | Less 40% |
| Square and hexagon head cap screws | Less 30% |
| Round head cap screws | Plus 10% |
| Fillister head cap screws | Less 10% |
| Flat head cap screws | Net list |
| Button head cap screws | Plus 10% |
| Studs | Less 20% |
| Semi-finished nuts up to and including 1-in. | Less 35% |
| Semi-finished nuts 1⅛ to 1½" | Less 30% |
| Semi-finished nuts 1⅝ to 2 in. | Net list |
| Coupling bolts | Plus 10% |
| Taper pins | Less 40% |
| Planer bolts without fillet | Plus 40% |
| Planer bolts with fillet | Pus 50% |
| Patch bolts | Plus 80% |
| Hollow set screws | Plus 20% |
| Thumb screws | Less 35% |
| Thumb nuts | Less 65% |

## BILLETS

F.O.B. Pittsburgh.

| | Per gross ton |
|---|---|
| Bessemer billets | $43 50 |
| Open-hearth billets | 43 50 |
| O.H. sheet bars | 39 00 |
| Forging billets | 48 50 |
| Wire rods | 48 00 |

## NAILS AND SPIKES

| | |
|---|---|
| Wire nails, base | $4 50 |
| Cut nails, base | 5 10 |
| Miscellaneous wire nails | 50% |

## ROPE AND PACKING

| | |
|---|---|
| Plumbers' oakum, per lb. | 0 10½ |
| Packing, square braided | 0 38 |
| Packing, No. 1 Italian | 0 44 |
| Packing, No. 2 Italian | 0 36 |
| Pure Manila rope | 0 26 |
| British Manila rope | 0 20 |
| New Zealand hemp | 0 20 |

## POLISHED DRILL ROD

| | |
|---|---|
| Discount off list, Montreal and Toronto | Net |

# LeBLOND
## HEAVY DUTY
## Universal Millers

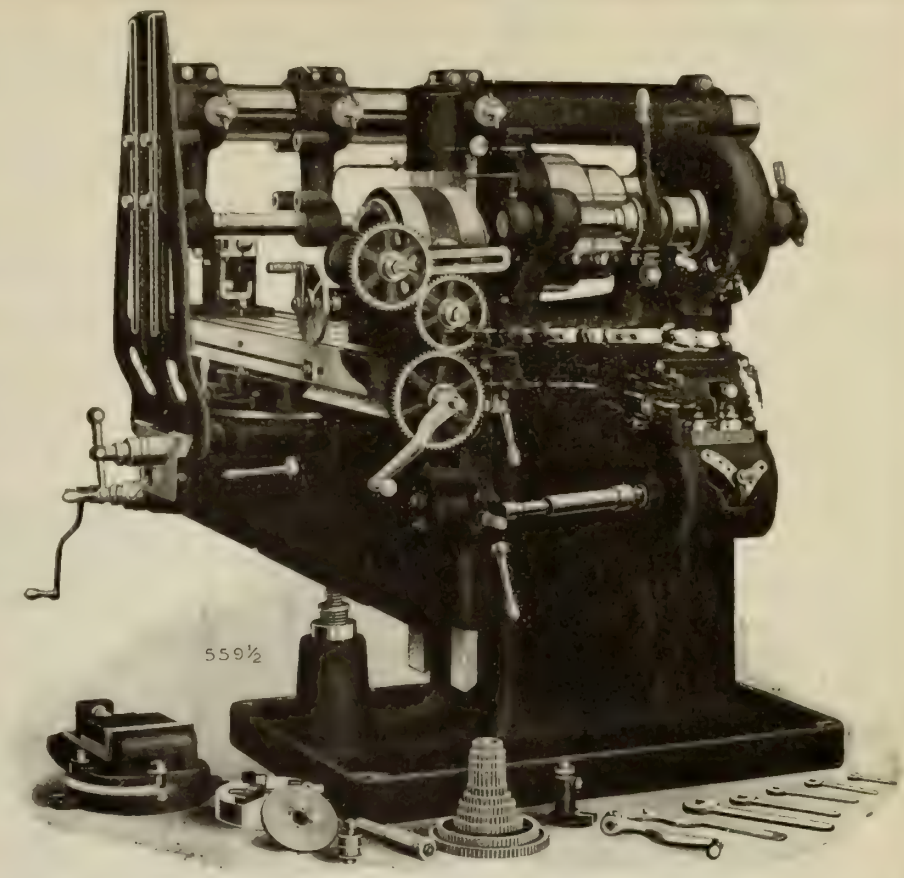
Are not only Tool Room Machines, but as a manufacturing proposition appeal to the careful buyer.

Their long life insures ample returns for the investment made.

May we explain to you their many advantages and the convenience of their control?

**Carried in Stock by**

## The A. R. Williams Machinery Co.
LIMITED
TORONTO





actured iron and steel during February om the Middlesboro district amounted 34,447 tons, as against 44,688 tons in anuary.

In view of the general economic and dustrial situation, and in particular to he great uncertainty of the result of he present coal crisis, it is difficult to nd substantial evidence of any lasting or appreciable change for the better in the British iron and steel situation before next autumn. In the event, however, that the coal crisis should develop into a severe and long drawn out struggle, we may see the resumption of normal conditions in the iron and steel trade delayed a much longer period.

# PLANNING TO MAKE USE OF THE IRON ORE DEPOSITS OF CANADA

N view of the heavy imports of iron ore into Canada and the relatively mall use being made of the native eposits, the question of developing the ater on a large commercial scale is tracting increased attention. The ques- on has been taken up energetically by he Ontario Mining Association, and hile the solution of the matter has not et been reached, emphasis is placed on he results of recent experiments in reating what is considered to be sim- ar ore in the Western States. It has een suggested that a bonus be granted y the Government to encourage this ndustry, but it is not certain that this s the only or best method of achieving he result. Research is apparently ecessary, and it is contended that pri- ate enterprise would solve the matter vith reasonable Government support. One advocate of action took the ground hat a small bonus from the Government would put the industry over the hill, and make available Canadian iron at a cost no greater than American ore, allowing for the exchange which must be paid on imports from that country. This argument, he considered, was all the stronger because of the probability that exchange will be a relatively high addition to cost of imports from the United States for an indefinite time to come.

### Possibilities of Industry

It is pointed out by the Ontario Mining Association that the annual output of pig-iron in the United States has a greater value than any other single manufactured product, and greater also than all other metals combined. Starting with practically nothing at the beginning of last century, the production has increased at an average rate of 100 per cent. each decade until it is now the most important single industry in the United States, with an output of 40,000,000 tons of pig-iron per year, and furnishing, approximately, one-fifth of the total tonnage handled by the United States railways. It is maintained that a great steel industry has been built up in Canada, with an average production of about 1,000,000 tons of pig-iron per year, largely by reason of the bounty paid for a number of years on pig-iron produced in this country. Unfortunately, however, year by year the proportion of domestic iron ore used in Canada's present production of pig-iron has grown less and less, and at the present time not one ton of iron ore is supplied from Canadian mines. It is estimated that Canada has iron ore resources posi ively proven to the extent of well over 500,000,000 tons, and a smelter capacity of, approximately, 2,000,000 tons of pig-iron per year, and yet the country is at present importing every pound of iron ore smelted in Canada.

### Results in U. S. Experiments

Already, in the United States, preparations are being made for the time when the high-grade iron deposits will be exhausted, and important studies of the treatment of other deposits are under way. An immense plant costing $3,000,000 has been almost completed by Hayden, Stone & Co., at Babbit, Wis., after exhaustive experiments at West Duluth for the purpose of beneficiating taconite or low-grade iron ore deposits. Ore running from 32 to 38 per cent. is

### MISCELLANEOUS

| | |
|---|---|
| Solder, strictly | $ 0 25 |
| Solder, guaranteed | 0 27 |
| Soldering coppers, lb. | 0 62½ |
| White lead, pure, cwt. | 17 00 |
| Red dry lead, 100-lb. kegs, per cwt. | 13 00 |
| Linseed oil, boiled, single bbls. | 1 03 |
| Wood alcohol, per gal. | 2 75 |
| Whiting, plain, per 100 lbs. | 3 00 |

### CARBON DRILLS AND REAMERS

| | |
|---|---|
| S.S. drills, wire size | 40 and 5 |
| Can. carbon cutters, plus | 10 |
| Standard drills, all sizes | 40 and 5 |
| 3-fluted drills, plus | 10 |
| Jobbers' and letter sizes | 40 and 5 |
| Bit stock | 50 |
| Ratchet drills | 10 |
| Pure turp., single bbls., gal. | 1 20 |
| Linseed oil, raw, single bbls. | 1 00 |
| S.S. drills for wood | 40 |
| Wood boring brace drills | 25 |
| Electricians' bits | 30 |
| Sockets | 50 |
| Sleeves | 50 |
| Taper pin reamers | 25 off |
| Drills and countersinks | Net |
| Bridge reamers, carbon | 50 |
| Centre reamers | 5 |
| Gasoline, per gal., bulk | 0 42 |
| Chucking reamers | Net |
| Hand reamers | 10 |
| High speed drills, list net to plus | 20 |
| Can. high speed cutters, net to plus | 10 |
| American | plus 40 |

### COLD ROLLED STEEL

[At Warehouse]

| | |
|---|---|
| Rounds and squares | $7.00 base |
| Hexagons and flats | 7.00 base |

### IRON PIPE FITTINGS

| | Black | Galv. |
|---|---|---|
| Class A | 60 | 75 |
| Class B | 26 | 36 |
| Class C | 17 | 26 |

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

### SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, black, No. 28 | $ 6 00 | $ 6 50 |
| Sheets, blue ann., No. 10 | 5 25 | 5 50 |
| Canada plates, dull, 52 sheets | 7 50 | 13 00 |
| Can. plates, all bright | 14 00 | ..... |
| Apollo brand, 10¾ oz., galvanized | ..... | ..... |
| Queen's Head, 28 B.W.G. | 10 75 | ..... |
| Fleur-de-Lis, 28 B.W.G. | 10 00 | ..... |
| Gorbal's Best, No. 28 | ..... | ..... |
| Colborne Crown, No. 28. | ..... | ..... |
| Premier, No. 28, U.S. | 8 25 | 8 50 |
| Premier, 10¾-oz. | 8 25 | 8 90 |
| Zinc sheets | 13 00 | 15 00 |

### PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13; 5-16, $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

### ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13; 5-16 in., $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

**Prices per 100 lbs.**

### FILES AND RASPS

| | Per Cent. |
|---|---|
| Globe | 50 |
| Vulcan | 50 |
| P.H. and Imperial | 50 |
| Nicholson | 32½ |
| Black Diamond | 27½ |
| J. Barton Smith, Eagle | 50 |
| McClennand, Globe | 50 |
| Delta Files | 20 |
| Disston | 40 |
| Whitman & Barnes | 50 |
| Great Western-American | 50 |
| Kearney & Foot, Arcade | 50 |

### BOILER TUBES

| Size | Seamless | Lapweld |
|---|---|---|
| 1 in. | $26 00 | $..... |
| 1¼ in. | 27 25 | ..... |
| 1½ in. | 26 25 | 29 50 |
| 1¾ in. | 29 75 | 27 00 |
| 2 in. | 29 25 | 24 50 |
| 2¼ in. | 33 00 | 28 50 |
| 2½ in. | 44 75 | 32 50 |
| 3 in. | 49 25 | 40 00 |
| 3¼ in. | ..... | 48 50 |
| 3½ in. | 63 50 | 43 50 |
| 4 in. | 85 00 | 55 50 |

Prices per 100 ft., Montreal and Toronto

### OILS AND COMPOUNDS

| | |
|---|---|
| Castor oil, per lb. | — |
| Royalite, per gal., bulk | 28 |
| Palacine | 31 |
| Machine oil, per gal. | 58 |
| Black oil, per gal. | 27 |
| Cylinder oil, Capital | 1.01 |
| Petroleum fuel oil, bbls., net | 11.2 |

### BELTING—No. 1 OAK TANNED

| | |
|---|---|
| Extra heavy, single and double | 15% |
| Standard | 15 and 10% |
| Cut leather lacing, No. 1 | 2 00 |
| Leather in side | 2 40 3 00 |

### TAPES

| | |
|---|---|
| Chesterman Metallic, 50 ft. | $2 00 |
| Lufkin Metallic, 603, 50 ft. | 2 00 |
| Admiral Steel Tape, 50 ft. | 2 75 |
| Admiral Steel Tape, 100 ft. | 4 45 |
| Major Jun. Steel Tape, 50 ft. | 3 50 |
| Rival Steel Tape, 50 ft. | 2 75 |
| Rival Steel Tape, 100 ft. | 4 45 |
| Reliable Jun. Steel Tape, 50 ft. | 3 50 |

### PLATING SUPPLIES

| | |
|---|---|
| Polishing wheels, felt | $4 50 |
| Polishing wheels, bull-neck | 2 00 |
| Emery in kegs, Turkish | 8¾ |
| Pumice, ground | 06 |
| Emery glue | 30 |
| Tripoli composition | 9½ |
| Crocus composition | 12 |
| Emery composition | 11 |
| Rouge, silver | 64 |
| Rouge, powder, nickel | 38 |

**Prices per lb.**

### ARTIFICIAL CORUNDUM

| | |
|---|---|
| Grits, 6 to 70 inclusive | 8½ |
| Grits, 80 and finer | 6 |

### BRASS—Warehouse Price

| | |
|---|---|
| Brass rods, base ½ in. to 1 in. rod | 30 |
| Brass sheets, 24 gauge and heavier, base | 38 |
| Brass tubing, seamless | 42 |
| Copper tubing, seamless | 44 |

### WASTE

| | | | |
|---|---|---|---|
| XXX Extra | 21 | Atlas | 19 |
| Peerless | 22 | X Empire | 15 |
| Grand | 21½ | Ideal | 18 |
| Superior | 21½ | X Press | 13½ |
| X L C R | 16½ | | |

**Colored**

| | | | |
|---|---|---|---|
| Lion | 13½ | Popular | 10½ |
| Standard | 12 | Keen | 9 |
| No. 1 | 14 | | |

**Wool Packing**

| | | | |
|---|---|---|---|
| Arrow | 35 | Anvil | 22 |
| Axle | 28 | Anchor | 17 |

**Washed Wipers**

| | | | |
|---|---|---|---|
| Select White | 17 | Dark colored | 13 |
| Mixed colored | 14 | | |

**This list subject to trade discount for quantity.**

### RUBBER BELTING

Standard 10% Best grades 15%

### ANODES

| | |
|---|---|
| Nickel | .55 to .60 |
| Copper | .38 to .40 |
| Tin | .70 to .70 |
| Zinc | .16 to .17 |

**Prices per lb.**

### COPPER PRODUCTS

| | Montreal | Toronto |
|---|---|---|
| Bars, ½ to 2 in. | $30 00 | $34 00 |
| Copper wire, list plus 10 | | |
| Plain sheets, 14 oz., 14x60 in. | 32 00 | 38 00 |
| Copper sheet, tinned, 14 x 60, 14 oz. | 38 00 | 42 00 |
| Copper sheet, planished, 16 oz. base | 44 00 | 48 00 |
| Braziers', in sheets, 6 x 4 base | 36 00 | 41 00 |

### LEAD SHEETS

| | Montreal | Toronto |
|---|---|---|
| Sheets, 3 lbs. sq. ft. | $ 9 50 | $14 50 |
| Sheets, 3½ lbs. sq. ft. | 9 25 | 14 00 |
| Sheets, 4 to 6 lbs. sq. ft. | 9 00 | 13 50 |

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

### PLATING CHEMICALS

| | |
|---|---|
| Acid, boracic | $ .25 |
| Acid, hydrochloric | .03½ |
| Acid, nitric | .10½ |
| Acid, sulphuric | .03½ |
| Ammonia, aqua | .20 |
| Ammonium, carbonate | .23 |
| Ammonium, chloride | .22 |
| Ammonium, hydrosulphuret | .75 |
| Ammonium sulphate | .30 |
| Arsenic, white | .18 |
| Copper, carbonate, annhy. | .35 |
| Copper, sulphate | .10 |
| Cobalt, sulphate | .20 |
| Iron perchloride | .62 |
| Lead acetate | .30 |
| Nickel ammonium sulphate | 16½ |
| Nickel carbonate | .30 |
| Nickel sulphate | .17½ |
| Potassium sulphide (substitute) | .40 |
| Silver Chloride (per oz.) | 1.15 |
| Silver nitrate (per oz.) | 1.10 |
| Sodium bisulphate | .13 |
| Sodium carbonate crystals | .04 |
| Sodium cyanide, 127-130% | .39 |
| Sodium hyposulphite per 100 lb. | 6.50 |
| Sodium phosphate | .15 |
| Tin chloride | .80 |
| Zinc chloride, C.P. | .30 |
| Zinc sulphate | .08 |

**Prices per lb. unless otherwise state**

# Ordered By The Million

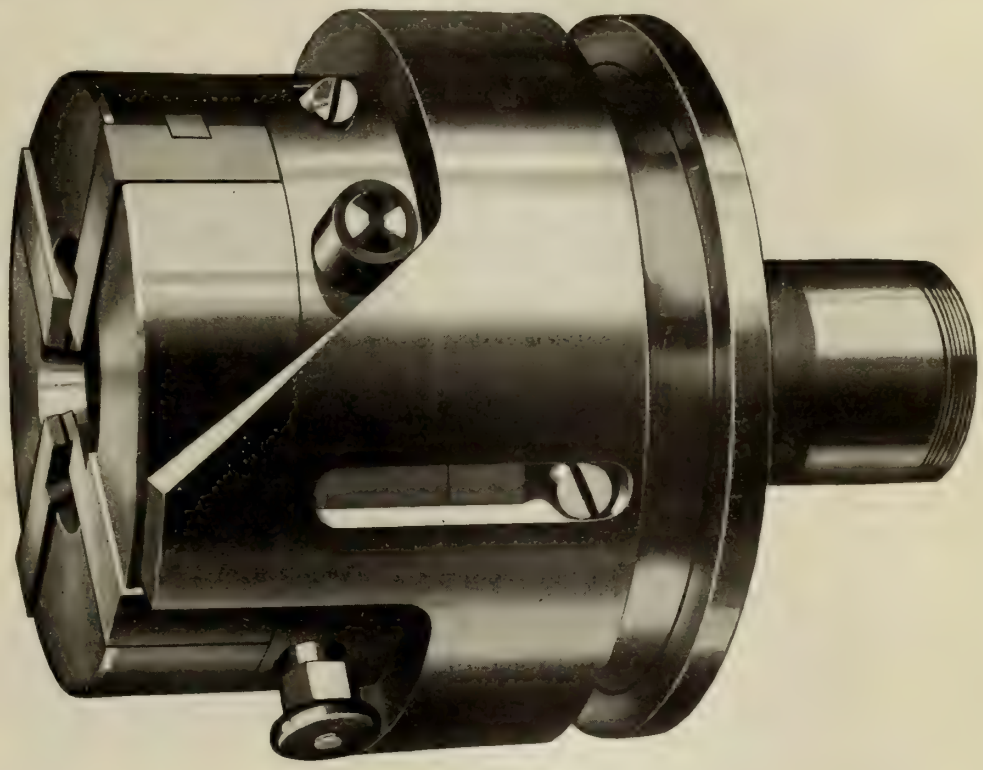
That's the way Studs for Automobiles are ordered from the Chapman Service Company. An order for one million Studs at one time is no novelty to these people, who specialize on Automobile Studs.

## They Have To Get Quick Production Without Waste

***How Do They Do It?***

Geometric 9-16-inch Rotary Die Heads are the means they use for cutting ½-inch diameter, 20-pitch thread on alloy steel studs.

**A Geometric Rotary Die Head Self-Opening and Adjustable**



Tested for accuracy, there were only nine rejections out of 4,500 Studs, threaded at both ends.

WELL, THEY ARE GEOMETRIC DIE HEADS—
THAT TELLS THE STORY OF THEIR WORTH.

GEO MET RIC

*Right on the Lead*

**THE GEOMETRIC TOOL COMPANY**
**NEW HAVEN CONNECTICUT**

*Canadian Agents :*

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Toronto, St. John, N.B., Halifax, N.S.

*If interested tear out this page and place with letters to be answered.*

concentrated to 60 per cent., or better. It is claimed that the result of these experiments would justify action on the lower-grade Canadian iron ores, with a view to securing use of the home product at a great saving to the country as a whole. It is pointed out that Canada is wealthy in water-powers, and that the success in developing other mineral deposits would justify entering earnestly upon the solution of the iron problem.

# THE MAN WHO WANTS BUSINESS MUST FIGHT FOR IT THIS SEASON

Lloyd Harris, former trade commissioner, paid his respects to government methods of conducting business, and also to the way that business was to be secured, in a recent address in Toronto.

"The government is so inefficient that it has less business understanding and tact than the boy in the street," declared Mr. Harris. "Wherever there is a business in good shape it withers immediately when the government meddles with it," he said.

"We knew this depression was coming, we hoped against hope that it would not come, and now it is here," he said, "and the best thing is to face it, and to take drastic steps to overcome it. To that end it is necessary that in the period of readjustment all will accept their losses.

"We know that one of the worst things the government could do was to impose the business profits tax," said Mr. Harris. "There is nothing like this vicious tax which helped to bring about present conditions.

"I am not looking for any great revival within a month or two. I think that next spring will be the time when things start to pick up. In the meantime we should get our houses in order and our organizations in shape, if we want to start in on a sound basis when business goes back to its former prosperity," the speaker declared.

### Must Fight For Business

"During the coming months you men who go out for orders will not have them handed to you on silver platters—you will have to fight for your orders," he said. "I cannot see any great reduction in the cost of living yet," the speaker continued. "The cause of it is that our distribution system is all wrong. Our retailers and labor will have to do their share in accepting the losses which this period of reconstruction necessarily brings along with it," he said.

"The labor situation is a serious obstacle in the way to bring things back to a normal basis," he said.

"One thing that would help the situation in rapidly returning to normal conditions would be the harvesting of a bumper crop in the West this year, as in 1915," Mr. Harris thought. "The Canadian West is in a bad shape today," continued the speaker. "Prices were the lowest paid for years; many of the farmers had to borrow money, and got behind. A bumper crop will save us."

---

**Has the Agency.**—R. S. Griffith, 371 St. James St., Montreal, has obtained the Canadian selling rights for Vickers Limited, of London, England, manufacturers and distributors of Vickers-Petter oil engines for marine and stationary purposes, in sizes from 10 to 450 B.H.P. Other lines handled will be the Moler sound-proof building bricks made by the associated firm of Moler Fireproof Brick and Partition Company. Another line will be that of Vickers files made at the River Don Works at Sheffield.

### THE END OF THE CHASE




**It cost a lot of money to bag that rabbit.**

—Collier's Weekly.

## Trade Gossip

**The Ontario Flax Mills**, Exeter, Ont., were destroyed by fire recently.

**Ontario Flax Mills** are likely to build a factory at Exeter, which will cost at least $10,000.

**Wants a Drill.**—W. H. Mortimer of Walkerton, Ont., is in the market for a drilling machine.

**Fire damaged** the premises of the Chew Lumber Company at Vancouver to the extent of $25,000.

**The Prairie Cold Storage** Company, of Winnipeg, are planning to erect a branch plant at Dauphin, Man.

**Want Engineer.**—Oshawa is advertising for a town engineer. F. E. Hare is the town clerk, and applications should be sent in at once.

**The Sydney Foundry & Machine** Works, Ltd., Pitt Street, Sydney, N. S., are constructing docks and warehouses at a cost of $60,000.

**Wants Equipment.**—Edgar B. Rolston, Kerrobert, Sask., wants to purchase a small sawmill outfit and planer, also water wheel equipment.

**The woolen mill** of Brown and Wigle, which was destroyed at Kingsville some time ago, will be rebuilt. The cost is estimated as being close to $40,000.

**Cut Coal Rates.**—The Board of Railway Commissioners have cut the rate on coal moving in the Canadian West ten per cent., the time limit to be from June 1 to August 21.

**Build Machine Shop.** — The erection of a machine shop is under consideration by Warren Bros., 314 Talbot Street London. The cost is likely to be in the neighborhood of $25,000.

**J. E. Tremayne**, of the city architect' department, Toronto, has been appointed as engineer to succeed E. R. Grang who resigned recently to take a positio as inspector of qualifications with th Air Board, Ottawa.

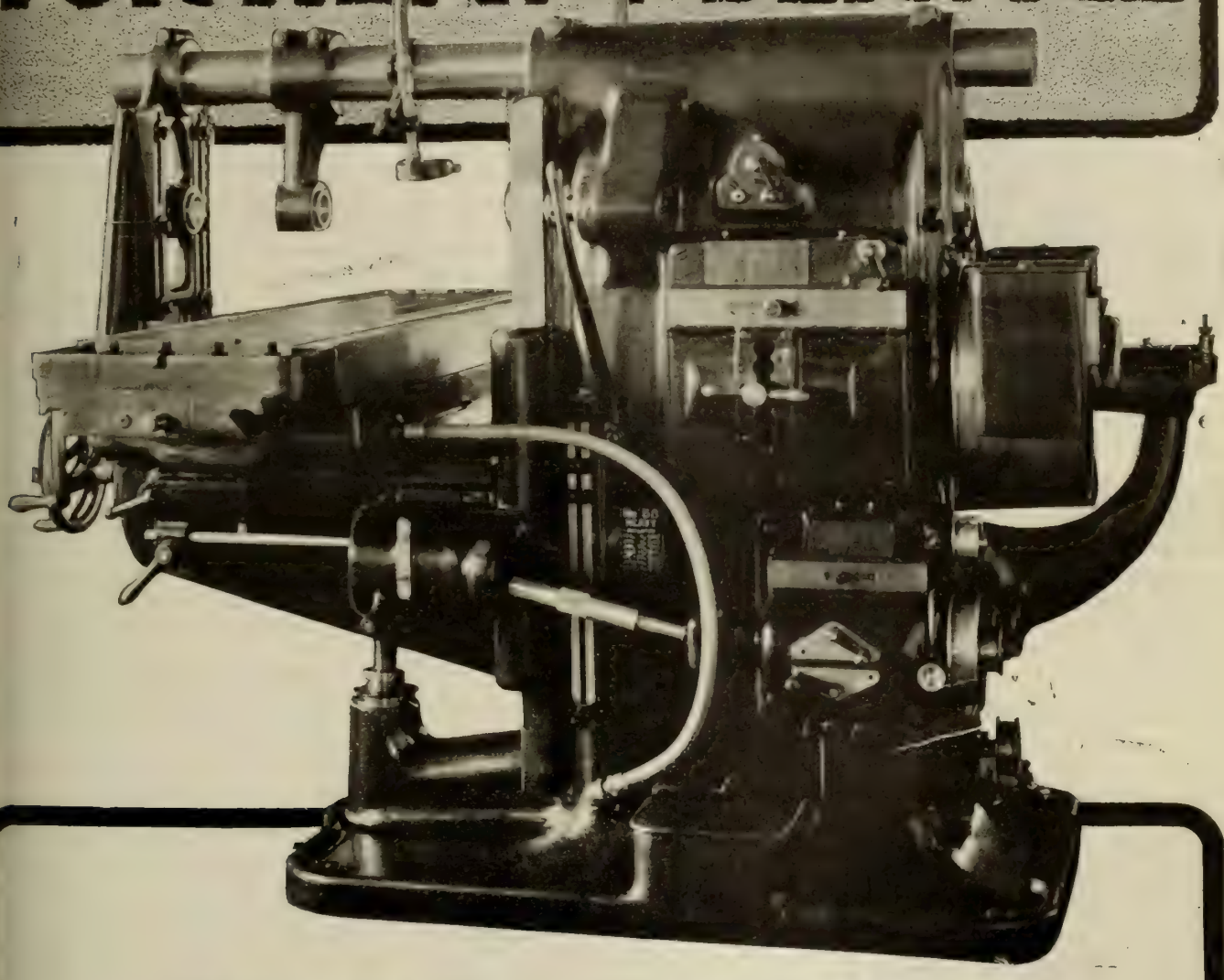
**Enlarge Station.**—The town of Antig onish, N.S., will probably construct pumping station at a cost of about $15 000. Other improvements are also unde consideration, including the enlargemer of the reservoir.

**Building Mill.**—A large pulp mill is t be a reality on the shore of Lake Tim iskaming, at a point about two or thre miles north from Haileybury. A forc of men has been engaged and is alread at work excavating for the foundation

**Roy W. MacKeen** has been appointe general sales agent of the Dominic Iron and Steel Co., Ltd., succeeding th late P. G. McNaughton. Mr. MacKee has been with the company for 21 year and until recently he was assistant ge eral sales agent at Montreal.

**Selling Machinery**—A number of dea ers and others have been at the pla of Armstrong-Whitworth at Longueu

# FOR HEAVY SERVICE



# BROWN & SHARPE

## HEAVY SERVICE

# MILLING MACHINES

are massively built but well proportioned. The strongly braced column with thick walls and internal supports is cast solid with the bare base providing a firm foundation for these rugged machines. The extra thick front wall and rigidly designed knee with its liberal extension of bearing at the top—the point of greatest stress—successfully resist all stresses that might tend to produce vibration. Accurate milling on the heaviest work that comes within range of a column and knee machine is thus assured. The powerful drive with efficient speed and feed changing mechanism, handy arrangement of all operating levers, handwheels, etc., permit quick setting up and rapid operation.

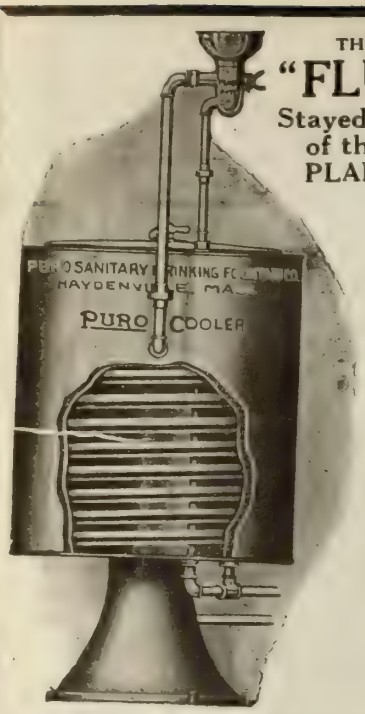
***Send for our Milling Machine Book describing these machines in detail.***

## BROWN & SHARPE MFG. CO.

**PROVIDENCE, R.I., U.S.A.**

***Canadian Representatives:*** CANADIAN FAIRBANKS-MORSE CO., LTD.

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THE "FLU" Stayed out of this PLANT

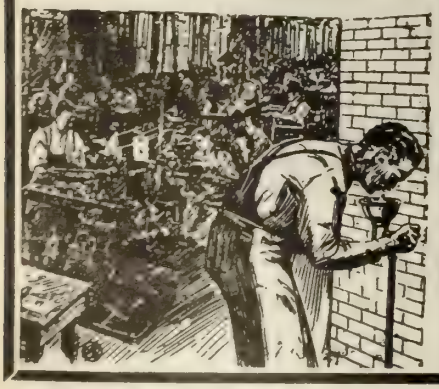
PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)

The only fountain with a bowl that prevents lips touching the bubbler paid its moderate cost over and over in all those well-ordered plants whose precautionary measures successfully barred the Spanish influenza. PURO saves lives, time and water. Write

**Puro Sanitary Drinking Fountain Co.**

888F St. Andre St., Montreal, P.Q.



RATE FOR CLASSIFIED ADVERTISING

Rates (payable in advance): Two cents per word. Count five words when box number is required. Each figure counts as one word. Minimum order $1.00. Display rates on application.

DOES ADVERTISING PAY?

USE THIS SPACE AND SEE


where they are selling their equipment. Some fairly large purchases have been made already, a portion of the buying being done by dealers from Toronto and district.

**Company Appeals.**—Emile Belanger, 26 years of age, who lost both his arms as a result of an accident while operating a machine belonging to the Consolidated Rubber Company at Montreal, has been awarded $17,500 by a judgment of the Superior Court, to compensate him for his loss. The company is appealing.

**Propose Another Reduction.**—The Dominion Steel Corporation of Sydney, N. S., has made a proposition to the steel workers to resume operations at full time if the men will accept a further wage cut of ten per cent. Several months ago the wages were cut 20 per cent., and the men have been working only one to three days a week.

**Open Montreal Branch.**—The Dominion Steel Products Co., Brantford, have opened a sales branch at 418 St. James Street, Montreal, to handle the various lines made by this company. The new branch in Montreal will be in charge of Maurice P. Shea, who has had considerable experience in machinery and engineering lines. During the war he was overseas in command of a submarine chaser.

**Cut the Wages.**—A cut will be effected in the wages of Winnipeg sheet metal workers to the extent of 7½ cents an hour as a result of a finding handed down by the Joint Council of Industry which has completed the hearing of the trade's wage dispute. The men were previously receiving 90 cents an hour. Officials of the sheet metal workers' union stated that members of the local had expressed their willingness to abide by the council's award.

**Australian Contract Awarded.** — The International General Electric Company, New York, a subsidiary of the General Electric Company, according to report, has been awarded a $1,875,000 contract for switch gear, transformers and other equipment let by the Victorian Electricity Commission for development of coal near the city of Melbourne, Australia. The International bid, according to advices, was $1,000,000 below the lowest combination of British sectional bids submitted.

**Will Extend Plant**—During the visit of the governor-general to Toronto, a visit of inspection was paid to the Baldwin Canadian Steel Corporation plant at Ashbridge's Bay. Responding to the remarks of the visitor regarding the extent of the plant, Mr. Cound, the managing director of the Canadian plant, said it was the intention of the company to make Toronto the greatest tin plate manufacturing centre in the world, plans having been already made for the establishment of a number of additional steel mills at a cost of many millions of dollars.

**New Pumping Station.**—As soon as approval is given by the Administration Commission to the plans for the new pumping station in connection with the Montreal Water Works, construction operations will be commenced. The location for the new station will adjoin that of the one now operating and near the new filtration plant. The building will be amply large to provide for future growth of the city, the initial installation being six 30,000,000 gal. electric pumps, two of which are now in service in the old plant. Room for six additional pumps will be provided in the plans. This new pumping station is to be completed within a year and a half.

**Getting Tenders.**—On behalf of the Chinese Government the Chinese Banking Group is advertising for tenders for the supply of 30 locomotives of the Prairie type, 2 locomotives of the Mikado type, 3 locomotives of the Pacific type, 6 locomotives of the English type, 200,40. Metric-ton all-steel covered wagons and 100,40-Metric-ton all-steel high side open wagons for the Peking-Hankow, Peking-Suiyuan, Tientsin-Pukow and Shanghai-Hangchow-Ningpo Railways. Regulations, drawings and specifications for tenders may be obtained from the head office of the Chinese Banking Group. Tenders will be opened 15th June, 1921, at the head office, Peking Bankers' Association, Chienmen, Peking.

**Want Tenders.**—Tenders are being received by W. W. Pearse, Sec-Treas. of the Board of Education, 155 College St., Toronto, for the following trades for constructing the Riverdale Technical School: (1) Masonry, including concrete work; (2) cut stone; (3) structural steel; (4) ornamental iron; (5) steel sash; (6) carpentry work; (7) roofing and sheet metal work; (8) plastering; (9) marble and tile and terrazzo; (10) linoleum; (11) mastic flooring; (12) painting and glazing; (13) plumbing; (14) heating and ventilating; (15) heat regulation; (16) refrigeration; (17) hydraulic ash hoist; (18) dumb waiter (electric); (19) electric work, including wiring for power and light; telephone system and signal system. Time limit is June 15.

## CHAIN HINTS

Continued from page 39

non-acid, mineral oil which does not dry in the air.

A pure non-acid mineral grease is recommended for chains. In general it is not found advisable to use graphite greases, as they are liable to leave a deposit on the surface of the chain which prevents the entry of further lubricant. On the other hand, excellent results have been obtained with "Gredag." If impregnation is efficient, drives may be run for comparatively long periods after each application of "Gredag." The temperature to which "Gredag" is heated should not exceed 170 degrees F.

**Have Placed Business.**—The Toronto ansportation Commission at its meet- g completed contracts for the air-brake d electrical equipment on the new cars w being built in Montreal. The total ice of the order given is slightly under ,000,000. The order for the electrical uipment was divided as follows: Can- ian General Electric Co., 50 cars; Can- ian Westinghouse Co., 50 cars and nglish Electric Co., 40 cars. With re- rd to the English Electric Co., the or- r given to this firm was for all it was a position to handle at the prsent time. is expected that the company will es- olish a plant on the industrial area at hbridge's Bay, where 48 acres of land ve been acquired. The entire order e air-brake equipment was given to e Canadian Westinghouse Co. The cars ll be installed with four motors of 50- rsepower each, giving ample power r rapid acceleration and high-speed ser- e. Work on the motors has already ogressed so that there will be no de- y in having the cars completed on hedule time.

**China Wants Equipment.**—According information received from the Gov- nment Bureau of Economic Informa- n, 6 Hua Yuan Ta Yuan, Peking, the nistry of communications has notified e Chinese delegate to the Internation- Communications Conference, that ina earnestly welcomes foreign assist- ce in the development of her railways. e Chinese delegate is also instructed emphasize China's strong opposition international control of any Chinese ilways. The Peking-Hankow Railway dministration invites tenders for the llowing equipment: 6 first class sleep- g cars; 6 second class sleeping cars; composite first and second class pas- ger cars; 6 dining cars; 6 third class ssenger cars with restaurant; 10 third ss passenger cars. Drawings and spe- fications may be obtained from the ad office of this railway upon payment the sum of Mex. $25.00. Terms of yment and date of delivery must be early stated in all tenders. Tenders two envelopes sealed and labelled on e outside, "Quotations for 40 passen- r and dining cars," should, by regis- red letter, be addressed to the manag- g-director, Peking-Hankow Railway dministration, not later than June 30, 21. The tenders will be opened before e public at 3 p.m., July 1, 1921.

## Personals

Mr. Logan Waterous, of the Waterous gine Works, Ltd., will sail next week r England. When interviewed by Can- ian Machinery he stated that he is ng to make a study of business meth- s and conditions in the Old Country l does not expect to return to Canada l August.

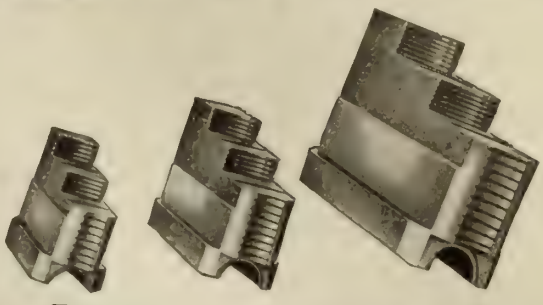
Sir Joseph Flavelle, Bart., of Toronto, s been elected chairman of the recon- ituted all-Canadian Board of Directors the Grand Trunk Railway. Howard G. Kelley was reappointed director and president of the company. The other directors elected were: J. Narcisse Dupuis, Montreal; E. L. Newcombe, K.C., Deputy Minister of Justice, Ottawa, and Alfred J. Mitchell, financial vice-presi- dent of the Canadian National Railways, Toronto. It is further understood that when the consolidation of the Grand Trunk and Canadian National Railways is finally completed Sir Joseph Flavelle will be appointed chairman of the board which will direct the management of the combined roads.





DOMINION CHUCKS

STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY



The Jaws Are Extra Strong

THEY are drop forgings, made of best quality steel, heat-treated and hardened. The threaded portion of jaws form a half nut for the setting-up screws. Have stood the test of heavy duty work in our own shops where accuracy was the only accepted standard.

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LIMITED
*Engineers • Manufacturers*
BRANTFORD, CANADA

3

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The old established firm. Patents everywhere. Head office, Royal Bank Bldg., Toronto. Ottawa office, 5 Elgin St. Offices throughout Canada.
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OVENS
Japanning and Varnishing Ovens heated by Gas, Electricity, Steam or Coal. Kernchen Siphonage Ventilators, Bakers' Ovens, trucks, casters, etc. Write for Booklet
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LIMITED
*Consulting and Designing*
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WANTED—BY AN ESTABLISHED CONCERN. Twelve to fifteen thousand dollars for a period of from one to three years, to take care of business expansion. This concern will stand the fullest investigation. 8% is offered with ample security to principals only, with an opportunity of becoming permanent associates with the partners, if mutually satisfied. Box 767, Canadian Machinery. (etfm)

## SALESMAN WANTED

WANTED — BY WELL-KNOWN AMERICAN manufacturers of pneumatic tools enterprising salesman for Canadian field. Reply giving full experience, present connection, etc. All replies will be treated in confidence. Box 782N, Canadian Machinery.

## MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (etfm)

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UP-TO-DATE MACHINE SHOP FOREMAN desires change, as foreman, general foreman or superintendent. Age 37. Apply Box 783, Canadian Machinery.

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Turret Lathe and Automatic Screw Machine a Specialty. Let us quote on your work.

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Expert Metal and Wood Pattern Work. Our advice and estimates will save you money.
Semi-finishing operations on Lathe or Grill on Castings supplied if required.
ASK US.

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## REGO WELDING *and* CUTTING APPARATUS

Oxygen, Acetylene, and a complete line of Welding and Cutting Supplies.

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Will handle medium Specialty Line — Manufacturing and Selling

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BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine work—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (etfm

## FOR SALE

ELECTRIC STORAGE BATTERY LOCOMOtives for sale. Two. 36-inch gauge. Complete and in good condition. R. T. Gilman & Company, Dept. "E," 211 McGill Street, Montreal (etfm

MOTORS FOR SALE — 5 H.P. CAN. GEN Electric, 2-phase, 60-cycle, 1800 r.p.m., switch starter; 20 h.p., Fairbanks-Morse, 2-phase, 60 cycle, 1200 r.p.m., Auto starter (without low voltage release); 25 h.p., Can. Gen. Electric, phase, 60-cycle, 1000 r.p.m., no starter; 30 h.p. Westinghouse, 2-phase, 60-cycle, 945 r.p.m., Auto starter (without low voltage release); 3 h.p. Westinghouse, 2-phase, 60 cycle, 1700 r.p.m. switch starter; 1 Smart-Turner Triplex Belt driven Pump, 2 x 3. Box 780J, Canadian Machinery.

### Used Machinery For Sale

1—24″ x 24″ x 6′ Putnam Planer.
1—20″ x 8′ C.M.C. Lathe (Rebuilt).
1—15″ x 6′ Cisco Lathe.
1—No. 3 Landis Universal Grinder.
1—No. 10 Brown & Sharpe Plain Grinder.
1—No. 3 Greenard Arbor Press and Stand.

CHARLES P. ARCHIBALD & CO.,
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Machine Shop and Foundry for sale, St. Catharines, Ont. In the centre of the Welland Ship Canal and Hydro activities. Going concern capable of handling all classes of work. Turnover $60,000 a year. Good reasons for selling. Box 777, Canadian Machinery. (c5m)

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**The Boiler Compound That Has No Equal.**

**Oils, Soaps, Greases, Roofing Paint, Machinery**

1—Belliss & Morcom Engine, 750 H.P.
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2—Wheelock Engines. Each 75 H.P. One with Heater and Pump attached.
1—30 x 6 Upright Boiler, complete.
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Numerous other Boilers and Engines on hand.

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If you have a lathe
a drill
a milling machine
a planer
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a chuck
a motor
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a stock of belting
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a compressor

or any other machine shop equipment for which you really have no further use, why not turn it into *cash?*

Someone may be looking for just the machine you may want to sell. Let us bring you together.

A "classified" ad. in CANADIAN MACHINERY, costing a few cents per issue, has done wonders for others. Why not try it?

Turn to the "Classified" section in this issue and see what is being offered and what is wanted at present.

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3—350 H.P. Stirling Boilers—125 lbs. pressure.
1—Spare water column for boilers.
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**If you want Machinery Equipment, send us your enquiries.**

**A few Machines from our Toronto stock at exceptionally attractive prices are:—**

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1—144" x 12' Berg Pit Lathe (used).
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1—24" x 10' Milwaukee (new).
1—20" x 6' Le Blond Heavy Production (used).
1—18" x 8' Bertram (rebuilt).
1—18" x 8' Rae (new).
1—16" x 6' Reed (used).
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1—8" Rivett, Bench, Cabinet and Attachments (used).
1—7" Cataract Precision, Standard Equipment.

**GAP LATHES**
1—22" x 40" x 16' McDougall (used).
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1—18" x 24" x 10' Rahn Meyer (used).

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Several No. 4 Millhollands, Davis, Oliver, Garvin, Warner & Swasey, and National Acme.

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1—16" Rae B. G. Crank Shaper (new).
1—24" McGregor-Gourlay Crank Shaper (used).

**PLANERS**
1—42" x 42" x 20' Putnam, 1 Head (used).
1—48" x 48" x 14' Patch, 4 Heads.
1—36" x 36" x 24' Sellers, Open Side (3 Heads).
1—30" x 30" x 10' Pond, 1 Head.

**MILLING MACHINES**
1—Briggs High Duty Type "A", 22" Traverse (new).
1—Briggs High Duty Type "B" 42" Traverse (new).
1—Ryerson-Owen No. 3, Universal (new).
1—Ford-Smith, No. 3 Universal (used).
Several Plain and Small Hand Millers.

**DRILLS**
1—10" Burke Sensitive Bench (new).
1—15" Rockford (used).
1—16" No. 2B Edlund H. S. Sensitive (new).
20" "Sibley," "Champions," "Rockwell" and "Silver" (new and used).

**BORING MILLS**
1—Universal No. 2½ Horizontal, Table 42" x 22" (used).
1—Bullard "New Era" Type Vertical Turret, 36", Complete Equipment (new).

**POWER HACK SAWS**
1—No. 10 Racine 8" x 8" Cap. (new).
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1—Landis No. 4 Universal (used).
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1—8" x 8" Sullivan, Class W.G.-3, belt driven (used).
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1—12" x 18" Ingersoll-Sargent, belt drive (used).
1—12" x 12" Can. Ingersoll-Rand, N.-E.-1 (used).

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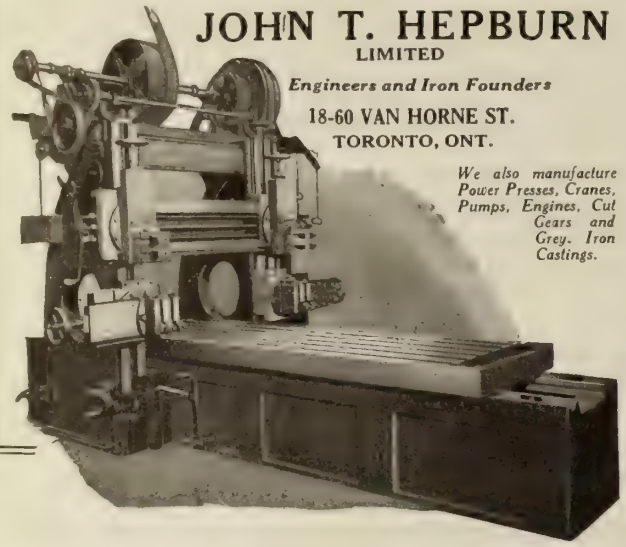
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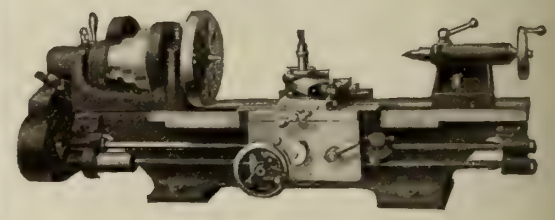


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*"The Small Lathe for the Big Job"*

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We would like to receive, therefore, the names of any firms who might be interested in inquiries of this kind. We desire the following information:

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Particulars regarding regular line, if any.

Class of work interested in securing and best equipped to handle.

Foundry equipment or connection.

This information will be filed and other necessary particulars forwarded to American manufacturers who are likely to be interested.

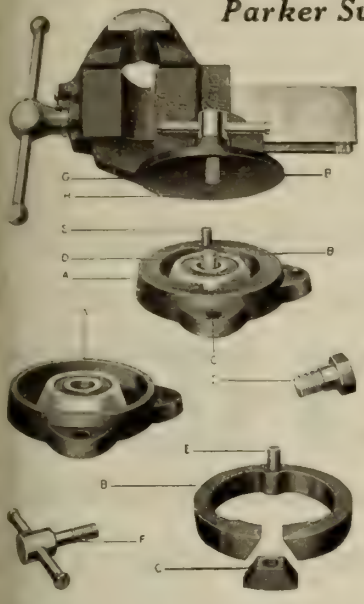
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A handy, capable tool, particularly designed for use on hard, coarse or large wheels where it often proves more economical than a diamond or Diamo-Carbo. It is provided with a safety hood which protects the eyes from flying particles.

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The following brands do not get dull quickly, they give maximum service:

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GREAT WESTERN
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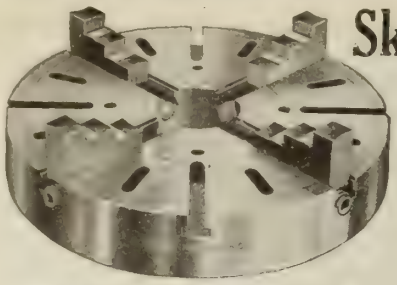
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Trade Mark



In this type of chuck, the jaws are reversed by running off the screw and turning end for end

# Skinner Independent Chucks—4-Jaw

**Sturdy—Dependable—Accurate**

In the independent type of chuck 4 jaws are naturally preferable. This type of chuck is most adaptable for all regular machine shop practice. Adjustable to the greatest variety of work. Illustrated literature and catalogue upon request.

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If you are scrapping your taps when the cutting edge becomes worn you're not getting real Tap Economy.

Murchey Solid Adjustable Taps do not have to be scrapped when the cutting edge is worn. You simply buy a new set of chasers for a comparatively small sum and you have a new tap, equal in accuracy to the best solid tap and at a much lower cost. We give special service in supplying chasers.

Let us send you this tool on approval.

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**75 Porter Street : : Detroit, Michigan**

The Coats Machine Tool Company, Ltd., 14 Palmer St., Westminster, London, S.W., England.
Fenwick Freres & Company, 8 Rue de Rocroy, Paris, France.

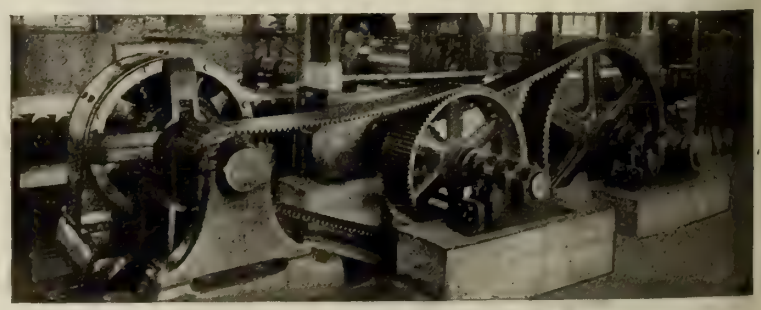
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**Largest Manufacturers in the world**
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**High Speed Silent Chains**

**Why?**

**Morse Chain possesses the exclusive**
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**Frictionless—Requires no Oilbath.**

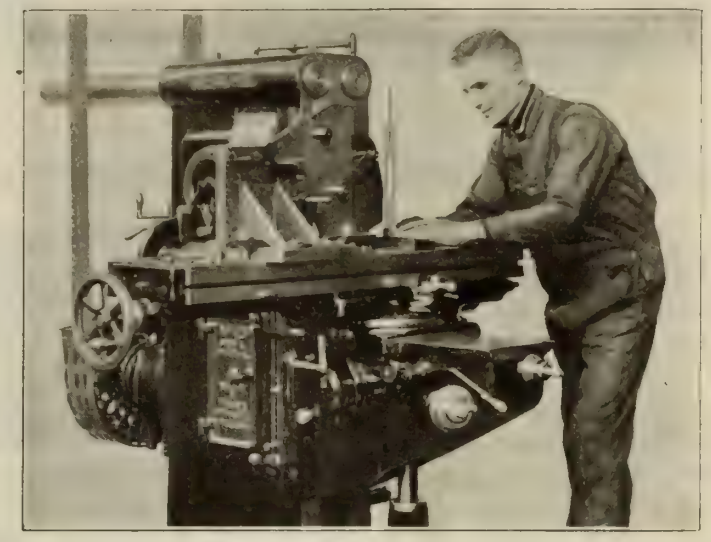
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**80 H.P. Morse Drive to Rolls, reverses direction every 45 seconds**

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# MILWAUKEE MILLING MACHINES



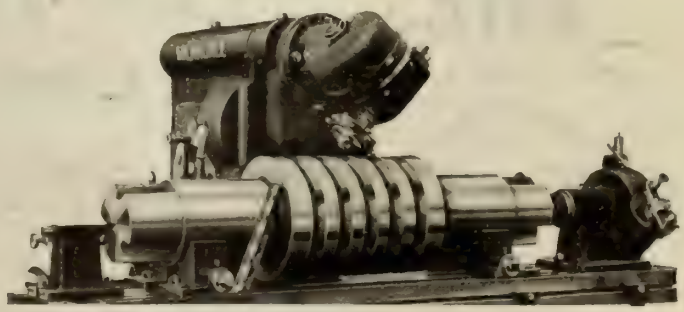
## Efficient on Light and Heavy Milling

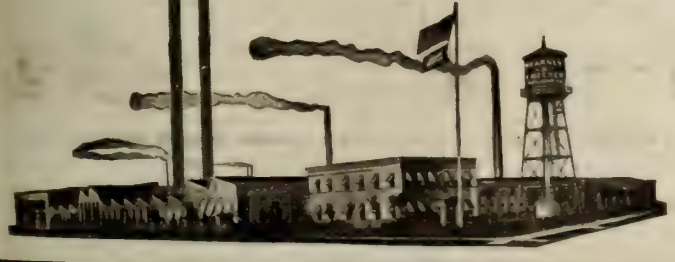
Heavy milling jobs are not unknown to Milwaukee Universal Milling Machines, while delicate and intricate ones are efficiently performed with little effort.

Both light and heavy milling operations are handled with such smoothness and accuracy that the finest results are obtained. Because Milwaukee Universal Milling Machines perform such a wide variety of work, they are particularly well adapted for the tool-room.

The jobs shown in the two illustrations are representative of "Milwaukee" adaptability. The upper illustration shows a jig being bored with a fly cutter. The lower illustrates the milling of a chilled roll with the use of a Universal Milling Attachment.

**Write for Catalogue—NOW.**





KEARNEY & TRECKER
CORPORATION
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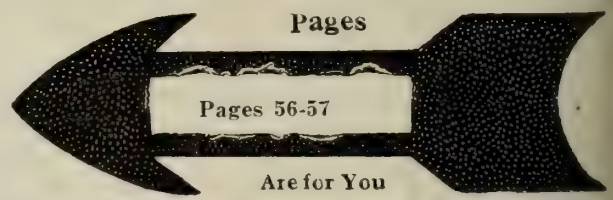
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Heavy Duty Draw Cut Shapers, Special Heavy Duty Draw Cut R.R. Shapers, Special Locomotive Cylinder Planers, Traveling Head Planers, Special Roll Wobble Planers, Portable Planers, Stationary and Portable Keyway Cutters, Finished Machine Keys. See our full page advertisement in the first issue each month of "Canadian Machinery."

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## Do Your Castings Cost Too Much?

A rearrangement of your patterns might cut their cost 25 per cent.; a different method of molding them might double your production at no increase in molding cost. We can advise you and we have expert metal and wood patternmakers who are able to make any changes that may commend themselves to you.

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send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.

We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us. **Ask us.**

***We have for our and your requirements, a large stock of assorted White Iron Stars, suitable for light agricultural to medium weight machinery castings, while they last, at 8 cents per lb. F. O. B. Galt.***

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# Canadian Machinery BUYERS DIRECTORY

**If what you want is not here, write us, and we will tell you where to get it. Let us suggest that you consult also the advertisers' index—last page of book, after having secured advertisers' names from this directory. The information you desire may be found in the advertising pages. This department is maintained for the benefit and convenience of our readers. The insertion of our advertisers' names under proper headings is gladly undertaken, but does not become part of an advertising contract.**

**rasive Discs**
orton Co. of Can., Ltd., Hamilton, Ont.
akey & Sons, Ltd., John London S.E., Eng.

**rasive Materials**
Hart Products, Ltd., Hamilton, Ont.
ont. Abrasive Wheel Co., Ltd., Mimico, Ont.
orton Co. of Can., Ltd., Hamilton, Ont.
akey & Sons, Ltd., John, London, S.E., Eng.
altham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**tylene, Dissolved**
Air Liquide Society, Toronto, Ont.

**cumulators, Hydraulic**
an. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
dewart & Co., Duncan, Glasgow, Scot.

**Cocks**
uro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Lifts**
an. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
ndependent Pneumatic Tool, Chicago, Ill.

**alyses, Chemical**
oronto Testing Laboratory, Toronto, Ont.

**gle Bars**
teel Co. of Canada, Ltd., Hamilton, Ont.

**vils**
ikenhead Hardware Ltd., Toronto, Ont.
tkins & Co., Inc., E. C., Indianapolis, I.
olumbia Hdwe. Division, Cleveland, O.
etrie, Ltd., H. W., Toronto, Ont.

**ives**
tkins & Co., Inc., E. C., Indianapolis, I.
rown & Sharpe Mfg. Co., Providence, R.I.
leveland Twist Drill Co., Cleveland, O.
ord-Smith Machine Co., Hamilton, Ont
ngersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
acobs Mfg. Co., Hartford, Conn.
earney & Trecker Co., Milwaukee, Wis.
empsmith Mfg. Co., Milwaukee, Wis.
ratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
kinner Chuck Co., New Britain, Conn.

**les, Car**
om. Foundries & Steel, Hamilton, Ont.

**Babbitt Metal**
tkins & Co., Inc., E. C., Indianapolis, I.
ritish Smelting & Refining Co., Ltd., Montreal, Que.
anada Metal Co., Ltd., Toronto, Ont.
imber Motor Co., Ltd., Orillia, Ont.
ioyt Metal Co., Toronto, Ont.
agnolia Metal Co., Montreal, Que.

**ds, Brass, Bronze and Steel**
anada Foundries & Forgings Co., Welland, Ont.
anadian SKF Co., Toronto, Ont.
ominion Foundries & Steel, Ltd., Hamilton, Ont.
ilot Steel & Tool Co., Montreal, Que
allway Roller Bearing Co., Syracuse, N.Y.

**rrels, Tumbling**
cDougall Co., Ltd., R., Galt, Ont.

**rs, Boring**
rmstrong Bros. Tool Co., Chicago, Ill.
ertram & Son Co., Ltd., The John, Dundas, Ont.
isholt Machine Co., Madison, Wis.
adison Mfg. Co., Muskegon, Mich.

**rs, Boring, Portable**
nderwood Corp., H. B., Philadelphia, Pa

**rs, Bronze Cored**
loore & Son, Thos., Montreal, Que.

**rs, Iron**
teel Co. of Canada, Ltd., Hamilton, Ont.

**rs, Steel**
lgoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
rmstrong-Whitworth of Canada, Ltd., Montreal, Canada.
anada Foundries & Forgings Co., Welland, Ont.
an Steel Foundries, Montreal, Que.
om. Foundries & Steel, Hamilton, Ont.
. S. Steel Co., Ltd., New Glasgow, N.S.
ntario Metal Products Co., Ltd., Toronto, Ont.
ilot Steel & Tool Co., Montreal, Que.
teel Co. of Canada, Ltd., Hamilton, Ont.
nited Alloy Steel Corp., Canton, Ohio.
anadium Alloys Steel, Latrobe, Pa.

**arings, Ball**
anadian SKF Co., Toronto, Ont.
hapman Double Ball Bearing Co., Toronto, Ont.
ang Mfg. Co., Guelph, Ont.
ylman Tube & Supply Co., Montreal, Que.
orrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Railway Roller Bearing Co., Syracuse, N.Y.

**Bearings, Bronze**
Railway Roller Bearing Co., Syracuse, N.Y

**Bearings, Die-Cast**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Tallman Brass & Metal Co., Hamilton, Ont.

**Bearings, Journal**
Fisher Motor Co., Ltd., Orillia, Ont.

**Bearings, Roller**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

**Belt Cement**
McLaren Belting Co., J. C., Montreal, Que.

**Belt Dressings and Fillers**
Aikenhead Hardware Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.

**Belt Fasteners**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
...r Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Belt Hooks**
Torrington Co., Ltd., Upper Bedford, Que.

**Belt Lacing**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

**Belt Lacing, Steel**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing, Hinged**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing, Flexible Steel**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing Machines**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
McLaren Belting Co., J. C., Montreal, Que
Petrie, Ltd., H. W., Toronto, Ont.

**Belt Joiners, Conveyor**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Tools**
Graton & Knight Mfg. Co., Worcester, Mass

**Belting, Chain**
Can Link-Belt Co., Toronto, Ont.
Jones & Glasseo, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Belting, Fabric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Consolidated Rubber Co., Ltd., Montreal Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
McLaren Belting Co., J. C., Montreal, Que.
Sumner & Co., New York City

**Belting, Leather**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que
Smith Belting Co., Toronto, Ont.
Sumner & Co., New York City.
Tullis & Son, Ltd., John, Glasgow, Scot.

**Belting, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.
Quaker City Rubber Co., Philadelphia, Pa.

**Belts, Abrasive**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.

**Bench Countershaft Standards**
Ford-Smith Machine Co., Hamilton, Ont.

**Benches, Work**
Aikenhead Hardware Ltd., Toronto, Ont.

**Bending Machines, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bertrams Ltd., Edinburgh, Scotland.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Bins, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Blocks**
Ford Chain Block Co., Philadelphia, Pa.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Chain (See Hoists, Hand)**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**For list of Dealers see the last page of This Buyers' Directory**

Ford Chain Block Co., Philadelphia, Pa.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Die**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Blocks, Pillow**
Can. Link-Belt Co., Toronto, Ont.

**Blowers**
Can Blower & Forge Co., Ltd., Kitchener.
General Combustion Co. of Can., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Sturtevant Co., B. F., Boston, Mass.

**Bolt and Nut Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Bolt and Nut Machinery, Automatic**
National Acme Co., Cleveland, Ohio.

**Bolts and Nuts**
London Bolt & Hinge Works, London, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Petrie, Ltd., H. W., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Bolt Threading Die Heads**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa

**Boosters**
Sturtevant Co., B. F., Boston, Mass.

**Boring and Turning Mills, Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.

**Boring, Drilling and Milling Machines, Horizontal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa.

**Boring, Drilling and Milling Mach., Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy. Co., Toronto, Ont
Herbert Ltd., Alfred, Toronto, Ont
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich
Petrie, Ltd., H. W., Toronto, Ont.

**Boring Heads**
Aikenhead Hardware Ltd., Toronto, Ont

**Boring Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill
Gisholt Machine Co., Madison, Wis.

**Brakes, Magnetic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Brass**
Brown's Copper & Brass Rolling Mills Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Brass Valves**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Brass Pipe Fittings**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Bricks, Fire**
Elk Firebrick Co. of Can., Ltd., Hamilton, Ont.

**Bridges**
Hamilton Bridge Works Co., Ltd., Hamilton Ont.
MacKinnon Steel Co., Sherbrooke, Que

**Broaching Machines**
Bilton Machine Co., Bridgeport, Conn
Garlock-Walker Mchy. Co., Toronto, Ont

**Bronze**
Brown's Copper & Brass Rolling Mills Ltd., Toronto, Ont.
Walker & Sons Metal Products, Ltd. Hiram, Walkerville, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bronze, Phosphor**
British Smelting & Refining Co. Ltd Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bucket Carriers, Pivoted**
Can. Link-Belt Co., Toronto, Ont

**Buffing or Polishing Machines (See Polishing and Buffing Machines)**
Blount Co., J. G., Everett, Mass
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Petrie, Ltd., H. W., Toronto, Ont.
U S. Electrical Tool Co., Cincinnati, O

**Bulldozers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont

**Burners, Oil and Gas**
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

**Bushings**
Fisher Motor Co., Ltd., Orillia, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Cabinets, Oil**
S. F. Bowser & Co., Ltd., Toronto, Ont

**Calipers**
Brown & Sharpe Mfg. Co., Providence, R.I
Starrett Co., L. S., Athol, Mass

**Cams**
Canada Foundries & Forgings Co., Welland, Ont.

**Can-Making Machinery (See Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y
Brown, Boggs & Co., Ltd., Hamilton, Ont
MacKinnon Steel Co., Sherbrooke, Que

# BUYERS' DIRECTORY

Union Carbide Co. of Can., Ltd., Welland, Ont.

**Cars, Ore**
MacKinnon Steel Co., Sherbrooke, Que

**Castings, Aluminum**
Canada Electric Castings Co., Ltd., Orillia
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Brass and Bronze**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Copper**
Can. Hanson & Van Winkle Co., Toronto, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Marine**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Castings, Die Molded**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Ferro-Alloy**
Can. Steel Foundries, Montreal, Que.

**Castings, Iron**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Hyd. Press**
Can. Steel Foundries, Montreal, Que.

**Castings, Monel Metal**
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

**Castings, Naval Bronze**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Nichrome**
Can. Driver-Harris Co., Walkerville, Ont.

**Castings, Nickel**
Can. Hanson & Van Winkle Co., Toronto, Ont.

**Castings, Semi-Steel**
Davidson Mfg. Co., Thos., Montreal, Que.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

**Castings, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

**Cements, Iron**
Smooth Mfg. Co., Jersey City, N.J.

**Centering Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Chains (See Sprockets and Chains)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chains, Driving**
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chasers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chemists**
Toronto Testing Laboratory, Toronto, Ont.

**Chucking Machines**
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Chucks, Drill**
Jacobs Mfg. Co., Hartford, Conn.

**Chucks, Drill and Tap**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Lathe**
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Magnetic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**
Columbia Hdwe. Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

**Cleaners, Metal, Waste, General**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Clocks, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Clutches, Friction**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**
Can. Link-Belt Co., Toronto, Ont.

**Cocks and Faucets**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Collars, Shaft or Set**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

**Collets**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**
Can Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compressors, Air**
Curtis Pneumatic Machinery Co., St Louis, Mo.

**Compressors, Air and Gas**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**
Ford-Smith Machine Co., Hamilton, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Conveyor Belt Joiners**
Flexible Steel Lacing Co., Chicago, Ill.

**Copper**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Cored Bronze Bars**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Cotter Pins**
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Counterbores**
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Countershafts**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Couplers, Car and Locomotive**
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Couplings, Flexible**
Holden Co., Ltd., Montreal, Que.

**Couplings, Rigid**
Bernard Industrial Co., A., Fortierville, Que.

**Couplings, Shaft**
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

**Cranes, Electric**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.

**Cranes, Hand (See Hoists, Hand)**
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

**Cranes, Locomotive**
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Cranes, Traveling**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Crank Pin Turning Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia, Pa.

**Cutters, Flue**
Holden Co., Ltd., Montreal, Que.

**Cutters, Gear**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.

**Cutters, Milling**
Armstrong-Whitworth of Canada, Ltd Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence R.I.
Butterfield & Co., Inc., Rock Island, Que
Can. Fairbanks-Morse Co., Ltd., Montrea
Cleveland Milling Machine Co., Clevelan
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wi
Morse Twist Drill & Machine Co., Ne Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que

**Cutters, Stay Bolt**
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, P
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.

**Cutters, Thread**
Butterfield & Co., Inc., Rock Island, Qu
Greenfield Tap & Die Corp., Galt, Ont
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, P

**Cutting-Off Machines**
Bertram & Son Co., Ltd., The John Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R
Etna Machine Co., Toledo, Ohio.
Garlock-Walker Mchy. Co., Toronto, On
Greenfield Tap & Die Corp., Galt, Ont
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Cutting-Off Machines, Pipe (See Pi Cutting and Threading Machine**
Landis Machine Co., Inc., Waynesboro, P
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Cutting-Off Tools**
Armstrong-Whitworth of Canada, Ltd Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, I
Pilot Steel & Tool Co., Montreal, Que.

**Cutting Oil Filters (See Oil Filteri Systems)**
Bowser, S. F., & Co., Ltd., Toronto, C
Cataract Refining Co., Toronto, Ont.

**Cutting, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, O

**Cutting, Oxy-Hydrogen**
National Electro Products, Ltd., Toron Ont.

**Dealers, Machinery (See Searchli Section)**
Ford-Smith Machine Co., Hamilton, C
Petrie, Ltd., H. W., Toronto, Ont.

**Deckle Straps**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Diamonds, Black and Rough**
Joyce-Koebel Co., Inc., New York, N.Y

**Diamond, Carbon and Bortz**
Joyce-Koebel Co., Inc., New York, N.Y

**Diamond Tools**
Aikenhead Hardware Ltd., Toronto, O
Can. Desmond-Stephan Co., Hamil Ont.
Ford-Smith Machine Co., Hamilton, C
Wheel Trueing Tool Co., Detroit, Mich

**Diamond Crossings**
Can. Steel Foundries, Montreal, Que.

**Die-Castings**
Tallman Brass & Metal, Ltd., Hamil Ont.

**Dies, Pipe-Threading**
Jones & Lamson Machine Co., Springfield, Vt.

**Die Sinking Machines, Automati**
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

**Die Sinkers**
Kimber & Hillier, St. Catharines, On

**Dies, Screw and Thread Cutting**
Ackworthie, Ltd., John, Birmingham,
Butterfield & Co., Inc., Rock Island,
Greenfield Tap & Die Corp., Galt, On
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro,
Murchey Machine & Tool Co., Det Mich.
National Acme Co., Cleveland, Ohio.

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**
Armstrong-Whitworth of Canada, Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton,
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton,
Toledo Machine & Tool Co., Toledo, Oh

# BUYERS' DIRECTORY

**Dies, Forging**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Brown, Boggs & Co., Ltd., Hamilton, Ont
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont
Kimber & Hillier Mfg. Co., St. Catharines, Ont

**Dies, Hammer**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Self-Opening, Adjustable**
Can. Fairbanks Morse Co., Ltd., Montreal.
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Dies, Threading-Opening**
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Disc Cement**
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Dividing Heads**
Ackworthie, Ltd., John, Birmingham, Eng.
Dickow, Fred. C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Dogs, Lathe and Milling Machine**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drafting Boards and Tables**
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Drafting Materials**
American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Dressers, Grinding Wheel**
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Drill Holders**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drill Rods**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Alkenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Drill Speeders**
Canada Machinery Corp., Galt, Ont.

**Drilling Machine Heads**
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

**Drilling Machines, Automatic**
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind

**Drilling Machines, Bench**
Beacon Engineering Co., Tipton, England.
Can Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Electric and Hand**
Alkenhead Hardware Ltd., Toronto, Ont
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Gang**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drilling Machines, Heavy Duty**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy Co., Toronto, Ont
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Multiple Spindle**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

**Drilling Machines, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Drilling Machines, Portable**
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Radial**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Drilling Machines, Sensitive**
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Turret**
Gisholt Machine Co., Madison, Wis
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

**Drilling Machines, Vertical**
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont
Can. Blower & Forge Co., Ltd., Kitchener
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng
Streetinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Drills, Center**
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drills, High Speed Twist**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland, O
Can Detroit Twist Drill Co., Walkerville, Ont
Foss Machinery & Supply Co., Geo F., Montreal, Que.
Garlock-Walker Mchy Co., Toronto, Ont
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Lyman Tube & Supply Co., Montreal, Que
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que
Sheffield Twist Drill & Steel Co., Sheffield, Eng.

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island Que
Cleveland Twist Drill Co., Cleveland, O.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Drills, Twist and Flat**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.

**Dust Handling Equipment**
Can. Blower & Forge Co., Ltd., Kitchener.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Electrical Instruments**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Electrical Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O.

**Elevating Trucks (See Trucks)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Elevators and Conveyors**
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Jones & Glassco, Montreal, Que
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Emery Wheels (See Grinding Wheels)**
Alkenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I
Can. Hart Products, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont
Ford-Smith Machine Co., Hamilton, Ont
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Engines, Capstan**
Kennedy & Sons, Wm., Owen Sound, Ont

**Engineers, Mechanical**
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif

**Expanders, Tube**
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont

**Eyeglasses, Safety (See Goggles, Safety)**
Prest-O-Lite Co. of Can., Toronto, Ont
Willson Goggles, Inc., Reading, Pa.

**Fans, Electric**
Can. Blower & Forge Co., Ltd., Kitchener
Can. Fairbanks-Morse Co., Ltd., Montreal
Northern Electric Co., Montreal, Que
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Sturtevant Co., B. F., Boston, Mass.

**Fans, Exhaust**
Can. Blower & Forge Co., Ltd., Kitchener
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Sturtevant Co., B. F., Boston, Mass.

**Fans, Ventilating**
Can. Blower & Forge Co., Ltd., Kitchener
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que
Petrie, Ltd., H. W., Toronto, Ont
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Sturtevant Co., B. F., Boston, Mass

**Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**File Handles**
Ingersoll File Co., Ltd., Ingersoll, Ont.

**Files and Rasps**
Atkins & Co., Inc., E. C., Indianapolis, I
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont
Simonds Canada Saw Co., Montreal, Que.

**Filing Machines**
Garlock-Walker Mchy. Co., Toronto, Ont
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Filler, Iron (See Cements, Iron)**
Smooth Mfg. Co., Jersey City, N.J.

**Fire Extinguishers**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Fittings, Pipe**
International Malleable Iron Co., Guelph, Ont.

**Flexible Shafts**
Alkenhead Hardware Ltd., Toronto, Ont

**Flux, Galvanizing**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Fluxes, Welding**
L'Air Liquide Society, Toronto, Ont.

**Forging Machinery**
Acme Machinery Co., Cleveland, Ohio
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot
Steel Co. of Canada, Ltd., Hamilton, Ont

**Forgings, Drop**
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd., Toronto, Ont.

**Forgings, Hammer**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Dom. Foundries & Steel, Hamilton, Ont
Hepburn Ltd., John T., Toronto, Ont
N. S. Steel Co., Ltd., New Glasgow, N.S.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Foundry Equipment**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Foundry Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Frogs, Spring or Rigid**
Can. Steel Foundries, Montreal, Que.

**Fuel Oil Burning System**
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Coal**
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City

**Furnaces, Heat Treating Oil and Gas**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Bellevue Industrial Furnace Co., Detroit.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces and Ovens, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces, Tempering and Annealing**
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furniture, Machine Shop**
Garlock-Walker Mchy. Co., Toronto, Ont.

**Gages, Comparator**
Jones & Lamson Machine Co., Springfield, Vt.
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont
Perdue, W. B., San Francisco, Calif
Starrett Co., L. S., Athol, Mass.

**Gages, Measuring (See Tool Work)**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Q.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont
Starrett Co., L. S., Athol, Mass.

**Gages, Recording**
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.

# BUYERS' DIRECTORY

Ackworthie, Ltd., John, Birmingham, Eng
Brown & Sharpe Mfg. Co., Providence, R I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Standard**
Armstrong Whitworth Co. of Can., Lt. Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis,
Johansson Inc., C. E., Windsor, Ont.

**Gages, Thread**
Ackworthie, Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Garnet, Emery and Flint Paper and Cloth**
Ritchey Supply Co., Toronto, Ont.

**Gas, Coal Compressed**
L'Air Liquide Society, Toronto, Ont.

**Gas, Compressed**
Prest-O-Lite Co. of Can., Toronto Ont.

**Gaskets**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

**Gear Blanks**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear-Cutting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I
Can. Fairbanks-Morse Co., Ltd., Montreal.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

**Gear Testing Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.

**Gears, Cast**
Can. Link-Belt Co., Toronto, Ont
Can. Steel Foundries, Montreal, Que.
Dom Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

**Gears, Cut**
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hamilton Gear & Machine Co., Toronto, Ontario
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Gears, Dressed**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Gears, Forged**
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Gears, Herringbone**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

**Gears, Machine Moulded**
Can. Steel Foundries, Montreal, Que.

**Gears, Rawhide (See Gears, Cut)**
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear, Silent Chain**
Gardner & Son, Robt., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Can. Link-Belt Co., Ltd., Toronto, Can
Hans Renold of Canada, Ltd., Montreal, Quebec.

**Gears, Worm**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.

**Generators, Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Generators, Electric**
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Goggles, Safety**
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

**Grab Buckets**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Grease Cups, Pressed Steel and Brass**
Can. Winkley Co., Ltd., Windsor, Ont.

**Greases, Lubricating**
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

**Grinding Discs**
Ritchey Supply Co., Toronto, Ont.

**Grinding Machines**
Brown & Sharpe Mfg. Co., Providence, R I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**Grinding Machines, Abrasive Belt**
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Automatic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Bench**
Aikenhead Hardware Ltd., Toronto, Ont.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Grinding Machines, Center**
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines Chaser**
Jones & Lamson Machine Co., Springfield, Vt.

**Grinding Machines, Cutter and Reamer**
Cincinnati Milling Machine Co., Cincinnati, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Cylindrical**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Die**
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

**Grinding Machines, Disc**
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Drill**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Face**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Floor and Tool**
Beacon Engineering Co., Tipton, England.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Grinding Machines, Internal**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Portable**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Power Oscillating Tool**
Herbert Ltd., Alfred, Toronto, Ont.

**Grinding Machines, Ring Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Snagging**
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Surface**
Garlock-Walker Mchy. Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machinery, Tool Post**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Universal**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.

**Grinding Wheels**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Guards, Emery Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Guards, Machinery and Window**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Guards, Electric Lamp**
Flexible Steel Lacing Co., Chicago, Ill.

**Gun-Barrel Machinery**
Steinle Turret Machine Co., Madison, Wis.

**Hack Saws, Power**
Ackworthie, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Hamilton, Canada.
Garlock-Walker Mchy. Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hammers, Chipping**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hammers, Drop**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

**Hammers, Electric**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Hammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Hammers, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hammers, Riveting**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hangers, Shafting**
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F. Montreal, Que.
Terry & Co., John C., Birmingham, Eng.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hardening, Case-Hardening and Tempering**
Hamilton Gear & Machine Co., Toronto, Ont.

**Hardness Testing Apparatus**
Shore Instrument Co., Jamaica, N.Y.

**Heating**
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.

**Hobbing Machines**
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hobs**
Armstrong-Whitworth of Canada, Ltd. Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R.I
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd. Dundas, Ont.

**Hoists, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy. Co., Toronto, Ont
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Shepard Electric Crane & Hoist Co. Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

**Hoists, Hand**
Lyman Tube & Supply Co., Montreal, Que
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Hoists, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Curtis Pneumatic Machinery Co., St Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Il
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, On

**Holders-On, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrook Que.
Cleveland Pneumatic Tool Co., Toront Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Il

**Hose, Flexible Steel**
Can. Fairbanks-Morse Co., Ltd., Montrea
Ontario Metal Products Co., Ltd., To onto, Ont.

**Hose, Industrial**
Dunlop Tire & Rubber Goods Co., Ltd Toronto, Ont.
Goodyear Tire & Rubber Co. of Can Ltd., Toronto, Ont.

**Hose, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Foamite Firefoam Co., Hamilto Ont.

**Hydraulic Leather**
Graton & Knight Mfg. Co., Worcest Mass.

**Hydraulic Machinery**
Bertram & Son Co., Ltd., The Jo Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbroo Que.
Garlock-Walker Mchy. Co., Toronto, O
Stewart & Co., Duncan, Glasgow, S

**Hydrogen**
National Electro Products, Ltd., Toro Ont.

**Index Centers**
Dickow, Fred. C., Machinery Co., C cago, Ill.

**Igniters, Gas Engine**
Canada Foundries & Forgings Co., W land, Ont.

**Indicators, Speed and Test**
Aikenhead Hardware Ltd., Toronto, O
Atkins & Co., Inc., E. C., Indianapoli
Brown & Sharpe Mfg. Co., Providence.

**Insulation**
Diamond State Fibre Co. of Can., L Toronto, Ont.

**Iron Valves**
Puro Sanitary Drinking Fountain Haydenville, Mass.

**Jacks, Hydraulic**
Norton, A. O., Boston, Mass.

**Jacks, Planer**
Armstrong Bros. Tool Co., Chicago, I
Starrett Co., L. S., Athol, Mass.
Bilton Machine Co., Bridgeport, Conn
Burgess & Marchand, Montreal, Que
Crescent Machine Co., Ltd., Montreal

# BUYERS' DIRECTORY

**tgs and Fixtures (See Tool Work)**
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**.yseating Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**.eys, Machine**
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

**.nives, Machine**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Simonds Canada Saw Co., Montreal, Que.

**.nurl Holders**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**.acing Leather**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

**.amps, Electric**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**.athe Attachments**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.

**.athe Pans, Portable**
Canada Machinery Corp., Galt, Ont.

**.athe Tools**
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

**.athes, Automatic and Semi-Automatic**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**.athes, Bench**
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**.athes, Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

**.athes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont
McDougall Co., Ltd., R., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**.athes, Engine**
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Sidney Machine Tool Co., Sidney, Ohio.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**.athes, Extension and Gap**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**.athes, Heavy Duty Projectile Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blaskill Wire Machy. Co., Ltd., Montreal.
Sidney Machine Tool Co., Sidney, Ohio.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio.
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Polishing (See Polishing and Buffing Machines)**
Ford-Smith Machine Co., Hamilton, Ont.

**Lathes, Relieving**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Lathe, Universal Hand**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Lathes, Screw-Cutting**
Jones & Lamson Machine Co., Springfield, Vt.

**Lathe, Speed and Hand**
Blount Co., J. G., Everett, Mass.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich

**Lathes, Spinning**
Terry & Co., John C., Birmingham, Eng.

**Lathes, Threading**
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

**Lathes, Vertical Turret**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

**Lathes, Wood Turning**
Blount Co., J. G., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Lead Pipe**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Lighting Fixtures**
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont

**Linoleum Mill Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Liquid Air Plants**
L'Air Liquide Society, Toronto, Ont.

**Lockers, Clothes**
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

**Lubricants**
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Lubricating Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Machinists' Small Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Mandrels, Expanding**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Mandrels, Solid**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Measuring Machines**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Metals, Alloy**
British Smelting & Refining Co., Ltd. Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Tallman Brass & Metal, Ltd., Hamilton, Ontario.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Metalite Cloth**
Ritchey Supply Co., Toronto, Ont.

**Micrometer Calipers**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Milling Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Milling Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**Milling Machines, Automatic**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Bench**
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Hand**
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

**Milling Machines, Horizontal and Planer Type**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Milling Machine Co., Cleveland
Ford-Smith Machine Co., Hamilton, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Milling Machines, Plain**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cleveland Milling Machine Co., Cleveland
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Milling Machines, Universal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Milling Machines, Vertical**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

**Monel Metal**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Motors, Electric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Moulded Rubber Goods**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Nail Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Nails and Staples**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Nickel, Bars, Sheets, Wire, Etc.**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Nickel Plating Outfits**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Nickel Silver**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Nitrogen**
L'Air Liquide Society, Toronto, Ont.

**Nut Tappers (See Bolt and Nut Machinery)**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

**Nuts, Finished and Semi-finished**
Galt Machine Screw Co., Galt, Ont.

**Nuts, Machine Screw**
Torrington Company, Ltd., Upper Bedford, Que.

**Nuts, S.A.E., Plain and Castellated**
Galt Machine Screw Co., Galt, Ont.

**Oil Cocks and Burners**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Oil Filtering and Storage Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oil Storage Engineers**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oils**
Canadian Oil Companies, Ltd., Toronto, Ont.
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Hole Covers**
Can. Winkley Co., Ltd., Windsor, Ont.

**Oils, Soluble**
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oxygen**
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

**Oxy-Acetylene Apparatus**
L'Air Liquide Society, Toronto, Ont.

**Packing, Hydraulic**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

**Packing, Steam**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

**Paper Mill Conveyors**
Bertrams Ltd., Edinburgh, Scotland.

**Patents**
Fetherstonhaugh & Co., Ottawa, Ont.
Marion & Marion, Montreal, Que.

**Pans, Wet and Dry**
Frost Mfg. Co., Chicago, Ill.

**Pattern-Shop Machinery (See Woodworking Machinery)**
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich

**Patterns, Wood and Metal**
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont
Wraggis Pattern Works, Galt, Ont.

**Penstocks, Steel**
MacKinnon Steel Co., Sherbrooke, Que

# BUYERS' DIRECTORY

**Phosphor Tin**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Photographic Duplicating Machines**
Commercial Camera Co., Providence, R.I.

**Pig Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Bending Machines**
American Pipe Bending Machine Co., Boston, Mass.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

**Pipe Couplings**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Cutting and Threading Machines**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**
Landis Machine Co., Inc., Waynesboro, Pa.

**Pipe Fitters' Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa.

**Piston-Ring Machines**
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Planers, Parallels**
L. & P. Mfg Co., Niagara Falls, Ont.

**Planing Machines**
Bertram & Son Co., Ltd., The John Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Planing Machines, Rotary**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Plumbers' Brass Goods**
Pure Sanitary Drinking Fountain Co., Bridgeville, Mass.

**Pneumatic Tools**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**
Ackworthle, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas P., Montreal, Q.
Blount Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Pots, Steel**
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Pressed Steel Parts**
Ackworthle, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich.
Can. Fairbanks-Morse Co., Ltd., Montreal
L. & P. Manufacturing Company, Ltd., Niagara Falls, Ont.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strellnger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Presses, Drop and Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Toledo Machine & Tool Co., Toledo, Ohio

**Presses, Foot and Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

**Presses, Forcing**
Atlas Press Co., Kalamazoo, Mich.
Stewart & Co., Duncan, Glasgow, Scot.

**Presses, Hydraulic**
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

**Presses, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**
Brown, Boggs & Co., Ltd., Hamilton, Ont
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Protractors**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Propellers**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Pulleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal and Fibre**
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Pulp and Paper Mill Equipment**
MacKinnon Steel Co., Sherbrooke, Que.

**Pumps, Automobile Tire**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Pumps, Barrel and Boiler-feed**
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coalant**
Trahern Pump Co., Rockford, Ill.

**Pumps, Geared and Hand**
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**
Can. Fairbanks-Morse Co., Ltd., Montreal
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

**Pumps, Lubricant and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can Blower & Forge Co., Ltd., Kitchener
Jardine & Co., A. B., Hespeler, Ont.

**Punches, Power**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont
Toledo Machine & Tool Co., Toledo, Ohio

**Punching Machines, Horizontal**
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Racks, Cut**
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**
Holden Co., Ltd., Montreal, Que.

**Reamer Holders**
Cleveland Twist Drill Co., Cleveland, O
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

**Reamers, Expanding**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Reamers, Solid**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Reamers, Taper**
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Recorders, Temperature**
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Recorders, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Rheostats**
Northern Electric Co., Montreal, Que.

**Resistance Materials**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Respirators**
Willson Goggles, Inc., Reading, Pa.

**Rivets**
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

**Rivet Heaters**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**
Acme Machinery Co., Cleveland, Ohio
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.

**Riveting Machines**
Bilton Machine Co., Bridgeport, Conn.
Can. Fairbanks-Morse Co., Ltd., Montreal
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**
Stewart & Co., Duncan, Glasgow Scot.

**Rolls (Rubber Covered)**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rudder Frames, Steel**
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Rubber Goods, Mechanical**
Quaker City Rubber Co., Philadelphia, Pa.

**Rules, Steel**
Chesterman & Co., Ltd., J., Sheffield, Eng

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R.I

**Rust Preventatives**
Oakley Chemical Co., New York, N.Y.

**Sand Equipment**
Can. Link-Belt Co., Toronto, Ont.

**Sand Mills**
Frost Mfg. Co. Chicago, Ill.

**Sanding Machinery**
Oliver Machy. Co., Grand Rapids, Mich.

**Sand Rammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Cleveland Pneumatic Tool Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Saw Frames and Blades, Hack**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que

**Sawing Machines, Metal**
Atkins & Co., Inc., E. C., Indianapolis, I
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que

**Sawing Machines, Power Hack**
Ackworthie, Ltd., John, Birmingham, Eng
Atkins & Co., Inc., E. C., Indianapolis, I
Can. Fairbanks-Morse Co., Ltd., Montreal
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Saw Sharpening Machines**
Atkins & Co., Inc., E. C., Indianapolis, I
Oliver Machinery Co., Grand Rapids, Mich

**Saw Tables, Universal**
Atkins & Co., Inc., E. C., Indianapolis, I
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Oliver Machinery Co., Grand Rapids, Mich
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**
Atkins & Co., Inc., E. C., Indianapolis, I
Simonds Canada Saw Co., Montreal, Que
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I
Simonds Canada Saw Co., Montreal, Que

**Saws, Hot and Cold**
Atkins & Co., Inc., E. C., Indianapolis, I
Simonds Canada Saw Co., Montreal, Que
Stewart & Co., Duncan, Glasgow, Scot

**Saws, High Speed Steel**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I
Butterfield & Co., Inc., Rock Island, Que
Clemson Bros., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd. Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que

**Saws, Metal Band**
Atkins & Co., Inc., E. C., Indianapolis, I
Oliver Machinery Co., Grand Rapids, Mich

**Saws, Metal, Power**
Clemson Bros., Inc., Hamilton, Ont.

**Saws, Metal Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I
Brown & Sharpe Mfg. Co., Providence, R.I
Butterfield & Co., Inc., Rock Island, Que
Clemson Bros., Inc., Hamilton, Ont
Lyman Tube & Supply Co., Montreal, Que
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que
Starrett Co., L. S., Athol, Mass.

**Saws, Milling**
Atkins & Co., Inc., E. C., Indianapolis.
Butterfield & Co., Inc., Rock Island Que
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada Ltd Dundas, Ont.

**Saws, Screw Slotting**
Atkins & Co., Inc., E. C., Indianapolis.
Butterfield & Co., Inc., Rock Island, Que
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.
Simonds Canada Saw Co., Montreal Que

**Saws, Swing Cut-off**
Oliver Machinery Co., Grand Rapids, Mich

**Scales**
Brown & Sharpe Mfg. Co., Providence, R
Can. Fairbanks-Morse Ltd., Montreal.

**Screens**
Can. Wire & Iron Goods Co., Hamilton Ont.

**Screw Drivers, Optical, Jewelry and Novelty**
Torrington Co., Ltd., Upper Bedford, Que

**Screw Driving Machine**
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago.

**Screw Extractors**
Cleveland Twist Drill Co., Cleveland.

**Screw Machine Work**
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
Tallman Brass & Metal Co., Hamilton Ont.

# BUYERS' DIRECTORY

**Screw Machinery, Wood and Lag**
Cook Co., Asa S., Hartford, Conn

**Screw Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Screw Machines, Automatic**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

**Screw Machines, Plain or Hand**
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio.

**Screw Machine Products**
Torrington Company, Ltd., Upper Bedford, Que.

**Screw Plates**
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

**Screws, Cap and Set**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Lock Cap**
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Machine**
Barnes Co., Wallace, Bristol, Conn.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Safety Set**
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Screws, Side Knob**
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Thumb**
Torrington Company, Ltd., Upper Bedford, Que

**Second-Hand Machinery**
See last page of directory
Petries Ltd., H. W., Toronto, Ont.

**Separators, Moisture and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can Ingersoll-Rand Co., Ltd., Sherbrooke, Que

**Separators, Oil and Waste**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Shafting**
Canada Foundries & Forgings Co., Welland, Ont
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Shapes, Cold-Drawn Special Steel**
Union Drawn Steel Co., Hamilton, Ont.

**Shaping Machines**
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Wabott Lathe Co., Jackson, Mich
Williams Machinery Co., A. R., Toronto, Ont.

**Shapers, Wood**
Oliver Machinery Co., Grand Rapids, Mich.

**Shears, Hand**
Can. Blower & Forge Co., Ltd., Kitchener.

**Shears, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont
Can. Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y.
Wm. & Co., Duncan, Glasgow, Scot
Toledo Machine & Tool Co., Toledo, Ohio
Williams Machinery Co., A. R., Toronto, Ont.

**Shearing Machines, Angle, Iron Bar and Gate**
Bertrams Ltd., Edinburgh, Scotland.

**Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio

**Sheets, Nickel, Resist, Alloy**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Sheets, Nickel, Monel and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Side Frames, Locomotive**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont

**Slotting Attachments**
Ford-Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis
National Acme Co., Cleveland, Ohio.

**Slotting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

**Solders**
British Smelting & Refining Co., Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Canada.

**Snap Flasks**
Oliver Machy. Co., Grand Rapids, Mich

**Special Machinery and Tools**
Brown Engineering Corp., Ltd., Toronto
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Specialties, Swaged and Headed Work**
Torrington Company, Ltd., Upper Bedford, Que.

**Spectacles, Industrial**
Willson Goggles, Inc., Reading, Pa

**Springs**
Barnes Co., Wallace, Bristol, Conn
Cleveland Wire Spring Co., Cleveland, O
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

**Spring-making Machinery**
Sleeper & Hartley, Inc., Worcester, Mass

**Sprockets and Chains**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glasseo, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Squares**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Stamping, Metal**
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont
Keller Pneumatic Tool Co., Grand Haven, Mich
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton Ont.

**Stamps, Steel**
Diamond Saw & Stamping Works, Buffalo, N.Y.

**Stairways, Wrought Iron**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Steam Specialties**
Crane Ltd., Montreal, Que.

**Steel Plate**
Dom. Foundries & Steel, Hamilton, Ont.

**Steels, Tool**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel Blooms and Billets**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steel, Cold-Rolled Strip**
Andrews Steel Co., Newport, Ky
Barnes Co., Wallace, Bristol, Conn.
Can. Driver Harris Co., Walkerville, Ont
Firth & Sons, Ltd., Thos., Montreal Q
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Steel Castings**
Dom. Foundries & Steel, Hamilton, Ont

**Steel Forgings**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Sheets, Open Hearth Steel**
Steel Co. of Canada, Ltd., Hamilton, Ont

**Steel, Shafting and Free Cutting Screw**
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont
Union Drawn Steel Co., Hamilton, Ont

**Steel, Sheet**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal Q
Ontario Metal Products Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont
Steel Co. of Can., Ltd., Hamilton, Ont
Toronto Iron Works, Toronto, Ont.

**Steel, Tanks**
Can. John Wood Mfg. Co., Toronto, Ont.

**Steel, Stainless**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont
Vanadium Alloys Steel, Latrobe, Pa

**Steel Wire Rods**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steels, Alloy, Open Hearth and Electric**
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
United Alloy Steel Corp., Canton, Ohio

**Steels, Alloy and Carbon**
Algoma Steel Corp., Ltd., Sault Ste Marie, Ont
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steels, High-Speed**
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel, Magnet**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel, Structural**
MacKinnon Steel Co., Sherbrooke, Que.

**Steel Tubing, Close Joint and Welded**
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

**Stern Frames, Cast Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Straightening Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Studs**
Galt Machine Screw Co., Galt, Ont.

**Surface Plates**
Bilton Machine Co., Bridgeport, Conn.

**Swaging Machines**
Atkins & Co., Inc., E. C., Indianapolis, I
Etna Machine Co., Toledo, Ohio

**Swaging Machine Parts**
Etna Machine Co., Toledo, Ohio

**Switches, Railway**
Can. Steel Foundries, Montreal, Que.

**Switches and Switchboards**
Northern Electric Co., Montreal, Que

**Tablets, Bronze, Memorial**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Tachometers**
Aikenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

**Tanks, Steel**
MacKinnon Steel Co., Sherbrooke, Que

**Tanks and Pumps, Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

**Taper Cutting Dies**
Jones & Lamson Machine Co., Springfield, Vt

**Tap Holders**
Greenfield Tap & Die Corp., Galt, Ont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont

**Taper Pins**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont

**Tapes, Measuring**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass.

**Tapping Machines and Attachments**
Ackworthie, Ltd., John, Birmingham, Eng
Archibald & Co., Chas. P., Montreal, Q
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn
Greenfield Tap & Die Corp., Galt, Ont
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Taps and Dies**
Ackworthie, Ltd., John, Birmingham, Eng
Butterfield & Co., Inc., Rock Island, Que
Can. Fairbanks Morse Co., Ltd., Montreal
Geometric Tool Co., New Haven, Conn
Greenfield Tap & Die Corp., Galt, Ont
International Machinery & Supply Co Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.

**Taps, Collapsing**
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio
Victor Tool Co., Waynesboro, Pa.

**Teeth, Dredge Bucket**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Testing Metals and Materials**
Toronto Testing Laboratory, Toronto, Ont.

**Thermometers**
Bristol Co., Waterbury, Conn.
Taylor Instrument Companies, Rochester, N.Y.

**Thread-Cutting Tools**
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Galt, Ont
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Thread Cutting Machines**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa

**Threaded Wires**
Torrington Company, Ltd., Upper Bedford, Que.

**Threading Machines**
Acme Machinery Co., Cleveland, Ohio.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Thread Lead Testing Machines**
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Thread-Rolling Machines**
Bliss Co., E. W., Brooklyn, N.Y.

**Tongs**
Hepburn Ltd., John T., Toronto, Ont.

**Tool Cases**
Rice Lewis & Son, Ltd., Toronto, Ont.

**Tool Holders**
Armstrong Bros. Tool Co., Chicago, Ill
Bilton Machine Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Markers, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Tool Posts, Lathe**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Steels for all Purposes**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Tools, Small (See Machinists' Small Tools)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Armstrong Bros. Tool Co., Chicago, Ill.
Bertrams Ltd., Edinburgh, Scotland.
Burgess & Marchand, Montreal, Que
Can. Fairbanks-Morse Co., Ltd., Montreal
Chesterman & Co., Ltd., J., Sheffield, Eng.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield T & Die Corp., Galt, Ont.
Hamilton engineering Service, Ltd., Hamilton, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.
National Machine Tool Co., Racine, Wis
Rapid Tool & Machine Co., Lachine, Que
Rice Lewis & Son, Ltd., Toronto, Ont
Rockford Milling Machine Co., Rockford, Ill
Starrett Co., L. S., Athol, Mass.
Streiinger Co. of Can., Ltd., Chas. A. Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Tool Work**
Brown Engineering Corp., Ltd., Toronto
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont

# BUYERS' DIRECTORY

**Torches, Blow**
National Electro Products, Ltd., Toronto Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Trackwork, Railway**
Can. Steel Foundries, Montreal, Que.

**Trackwork, Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Transformers**
Northern Electric Co., Montreal, Que.

**Transmission Machinery**
Bernard Industrial Co., A., Fortierville Que.
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Jones & Glassco, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Toronto, Ont.
Renold (Hans) of Canada, Ltd., Montreal Que.

**Transportation Systems (See Trucks)**
Mathews Gravity Carrier Co., Port Hope, Ont.

**Treated Bits**
Can. Atlas Crucible Steel Co., Toronto Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Trolleys and Tramways**
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Wright Mfg. Co., Lisbon, Ohio.

**Trucks**
Can. Fairbanks-Morse Ltd., Montreal Q
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Maple Leaf Mfg. Co., Montreal, Que
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Trucks, Industrial Motor**
Maple Leaf Mfg. Co., Montreal, Que.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Tube, Products**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Electric Welded or Oxy-Acetylene Welded**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Flexible**
Dunlop Tire & Rubber Goods Co., Ltd Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Tubing, Seamless Steel**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Seamless Steel, Brass and Copper and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Steel Products Co., Brantford, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Tubing, Welded**
International Nickel Co of Can., Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto; Ont.

**Tubing, Welded Steel**
Tube Co. of Canada, Toronto, Ont.

**Turbines, Water**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Turret Heads**
Ackworthie, Ltd., John, Birmingham, Eng.
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Turret Machines (See Lathes, Horizontal Turret)**
Acme Machine Tool Co., Cincinnati, Ohio
Cook Co., Asa S., Hartford, Conn.
Gisholt Machine Co., Madison, Wis
Jones & Lamson Machine Co., Springfield, Vermont.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis
Warner & Swasey Co., Cleveland, Ohio

**Turrets, Tool Post**
Gisholt Machine Co., Madison Wis

**Unions, Pipe**
Crane Ltd., Montreal, Que.

**Universal Joints**
Ford Smith Machine Co., Hamilton, Ont
Holden Co., Ltd., Montreal, Que.

**Valves**
Can. Fairbanks-Morse Ltd., Montreal Q
Cleveland Pneumatic Tool Co., Toronto, Ont.
Crane Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd. Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Vises, Drilling Machine**
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
Charles Parker Co., Meriden, Conn.

**Vises, Metal Workers'**
Aikenhead Hardware, Ltd., Toronto, Ont.
Columbia Hdwe. Division, Cleveland, O.
Charles Parker Co., Meriden, Conn.

**Vises, Milling Machine**
Brown & Sharpe Mfg. Co., Providence, R.I.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Charles Parker Co., Meriden, Conn
Oliver Machy. Co., Grand Rapids, Mich.
Charles Parker Co., Meriden, Conn.
Victor Tool Co., Waynesboro, Pa.
Parmenter & Bulloch Co., Gananoque Ont.

**Voltmeters**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Wagon Loaders**
Can. Link-Belt Co., Toronto, Ont.

**Washers**
Barnes Co., Wallace, Bristol, Conn.
Diamond State Fibre Co., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

## DIRECTORY OF DEALERS

THE Buyers' Directory of CANADIAN MACHINERY was originally intended to contain information regarding lines actually manufactured by our advertisers. We now carry the advertising of leading machinery dealers, some of whom represent scores of manufacturers in addition to being manufacturers themselves in some cases. This necessarily widened the scope of our Directory, but it would be impracticable to list all the lines handled by all the dealers. We recommend, therefore, if our subscribers cannot find what they want in our Directory that they communicate with the dealers whose names appear herewith.

### MACHINE TOOLS AND METAL WORKING EQUIPMENT

Chas. P. Archibald & Co., Montreal, Que.
The Canadian Fairbanks-Morse Co., Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
H. W. Petrie Limited, Toronto, Ont.
The Standard Equipment & Tool Co., Montreal, Que.
Chas. A. Strelinger Co. of Canada, Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Wilson-McGovern Limited, Toronto Ont.
Yeates Machinery Co., London, Ont.

### MACHINE SHOP AND FACTORY SUPPLIES

Chas. P. Archibald & Co., Montreal Que
The Canadian Fairbanks-Morse Co. Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
H. W. Petrie Limited, Toronto, Ont
The Standard Equipment & Tool Co., Montreal, Que.
Chas. A. Strelinger Co. of Canada, Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Wilson-McGovern Limited, Toronto Ont.
Yeates Machinery Co., London, Ont.

### POWER EQUIPMENT AND SUPPLIES

The Canadian Fairbanks-Morse Co Montreal, Que.
MacGovern & Co., Montreal, Que.
H. W. Petrie Limited, Toronto, Ont.
The Standard Equipment & Tool Co Montreal, Que.
Wilson-McGovern Limited, Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.

### WOODWORKING MACHINERY

Chas. P. Archibald & Co., Montreal, Que.
The Canadian Fairbanks-Morse Co., Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
H. W. Petrie Limited, Toronto, Ont.
Chas. A. Strelinger Co. of Canada, Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Yeates Machinery Co., London, Ont.

**Vises, Pipe**
Columbia Hdwe. Division, Cleveland, O.
Greenfield Tap & Die Corp., Galt, Ont.
Charles Parker Co., Meriden, Conn.

**Vises, Planer and Shaper**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Superior Machine Co., London, Ont.

**Vises, Wood Workers'**
Columbia Hdwe. Division, Cleveland, O.
Doss Machinery & Supply Co., Geo. F., Montreal, Que.

**Washers, Rubber**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Welding Apparatus, Oxy-Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Welding, Electric**
All-Weld Company, Toronto, Ont.
Carter Welding Co., Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.

**Welding Filler Rods**
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

**Welding Machines, Oxy-Acetylene**
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

**Welding, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Prest-O-Lite Co. of Can., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

**Welding Rod, Tobin, Manganese Bronze and Aluminum**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Welding Supplies**
British Smelting & Refining Co., Ltd., Montreal, Que.
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Canada, Ltd., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

**Wheels, Cast, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Wheels, Industrial**
American Pulley Co., Philadelphia, Pa.
Hull Iron & Steel Foundries, Hull, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.

**Winches, Electric**
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

**Winches, Headgate**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Winches, Stoplog**
Kennedy & Sons, Wm., Owen Sound, Ont

**Wire**
Barnes Co., Wallace, Bristol, Conn.
Canada Metal Co., Ltd., Toronto, Ont.
Dennis Wire & Iron Works, London, Ont
Greening Wire Co., B., Hamilton, Ont.
Northern Electric Co., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Wire Cloth**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Wire Coiling Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Wire Rope**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Wire Straightening and Cutting Machinery**
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Schuster Co., F. B., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

**Wire, Welding**
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Wires, Special**
Dennis Wire & Iron Works, London, Ont
Greening Wire Co., B., Hamilton, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Woodworking Machinery**
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Wrenches, Drop Forged**
Armstrong Bros. Tool Co., Chicago, Ill.
Canada Foundries & Forgings Co., Welland, Ont.

**Wrenches, Machinists'**
Armstrong Bros. Tool Co., Chicago, Ill
Canada Foundries & Forgings Co., Welland, Ont.

**Wrenches, Pipe**
Canada Foundries & Forgings Co., Welland, Ont.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.

**Wrenches, Tap**
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Galt, Ont.

**Wrought Iron Pipe**
Steel Co. of Canada, Ltd., Hamilton, Ont


## CANADIAN MACHINERY AND MANUFACTURING NEWS

143 UNIVERSITY AVE., TORONTO, CANADA

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## *Everybody Knows*

Those who have had anything to do with Hendeys know that they are right from experience—the rest know from hearsay.

Take the Hendey 18-inch Engine Lathe for example. It has 36 different threads and speeds through the mounted change gearing, each change being quickly made through controlling handles in the gear boxes.

The apron has double plate construction with safety interlock which prevents the simultaneous operation of the longitudinal feed and screw cutting.

You **know** that these features are well worth while just because they are to be found on a Hendey!

## The Hendey Machine Company

**Torrington, Conn., U.S.A.**

**Canadian Agents:**

A. R. Williams Machinery Co., Toronto
A. R. Williams Machinery Co., 260 Princess St., Winnipeg
A. R. Williams Machinery Co., Vancouver
A. R. Williams Machinery Co., St. John, N.B.
Williams & Wilson, Montreal

**LATHES, SHAPERS, MILLERS, AND CENTERING MACHINES**


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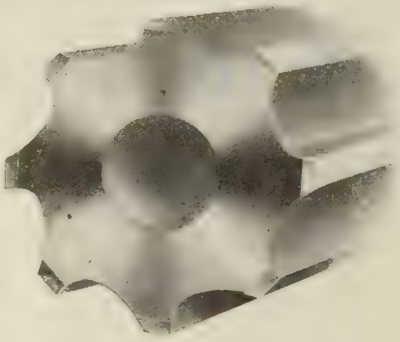
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# IMCO TOOLS



Imco Flute Depth



Average Flute Depth

## *A Twice as Deep Reamer*

### For a Twice as Long Life

THE deeper the flutes in a reamer the longer its life and the more holes it will ream before being scrapped. The flutes in "Imco" Reamers are milled almost twice as deep as those in average reamers. Consequently their economical value is nearly twice as great.

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## U.S. STANDARD CAP AND SET SCREWS



**STANDARD**

V. & U.S.S. Semi-Finished Nuts
V., U.S.S. & S.A.E. Cap Screws
V. & U.S.S. Set Screws
S. A. E. Plain & Castellated Nuts

**SPECIAL**

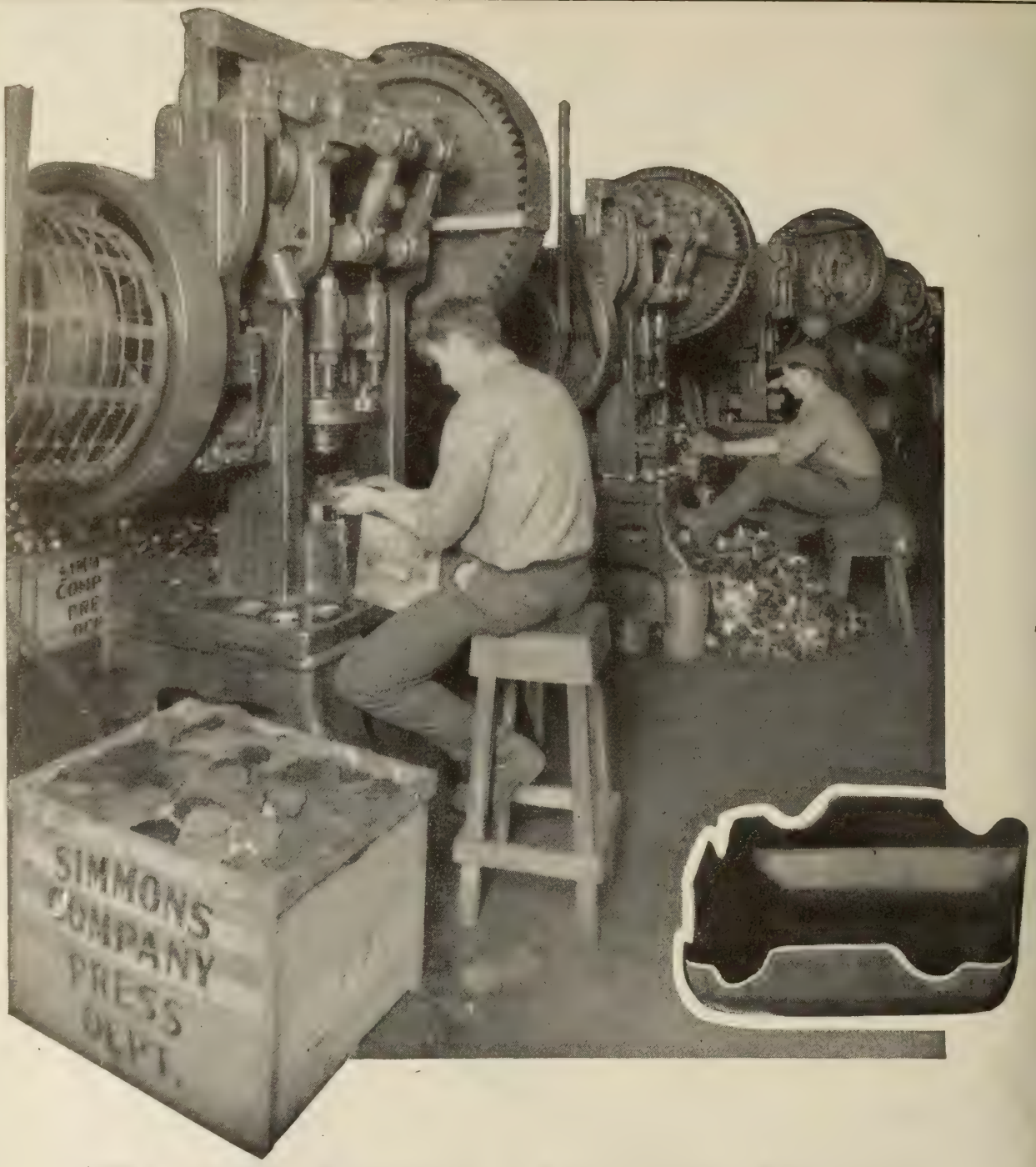
Screw Machine product up to 2¼ diam.—to specifications
Hardened and ground screw product—to specifications.

## THE NATIONAL ACME COMPANY

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# "BLISS" Toggle Drawing Presses

at work in the plant of the Simmons Company, Kenosha, Wis., making parts for Brass Beds. The one in the foreground is drawing the part shown in the insert—a neck for top mount of square bedpost. Material is sheet steel, .350 in. thick. Production rate is 9,000 per 8 hours.

No. 113

BLISS

1857

## E. W. Bliss Company

*Main Offices:* BROOKLYN, N. Y., U. S. A.

*American Factories:* BROOKLYN, N. Y.; HASTINGS, MICH.; CLEVELAND, O.; SALEM, O.

BLISS

1921

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LONDON, ENGLAND, Pocock Street, Blackfriars Road, S. E. PARIS, FRANCE, 100 Boulevard Victor-Hugo, St. Ouen

# CANADIAN MACHINERY AND MANUFACTURING NEWS

Vol. XXV., No. 23 | Published by the MacLean Publishing Company, Limited, Toronto | June 9, 1921 | $4.00 a Year Subscription Price


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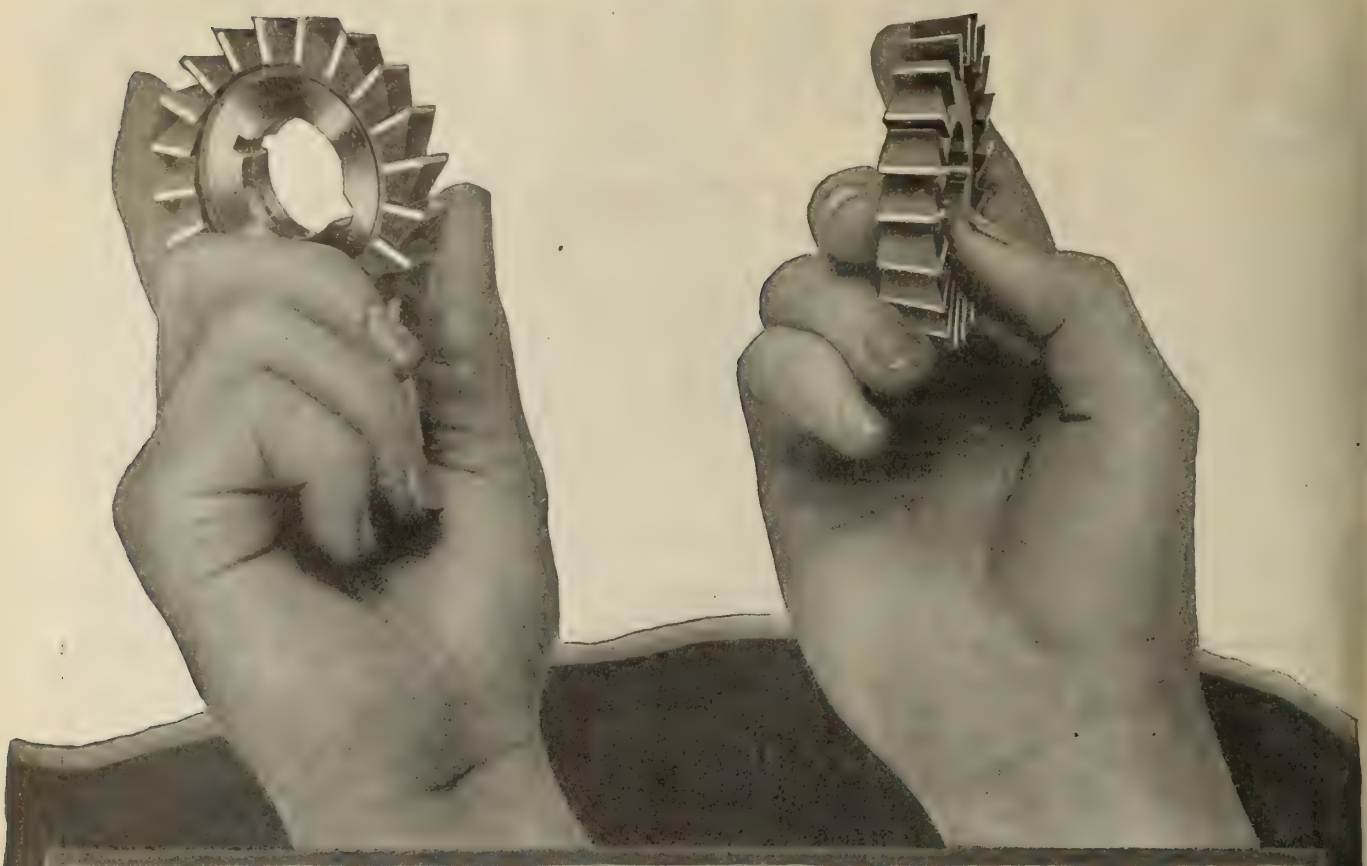
SaBeN ExTrA
HIGH SPEED STEEL

The Highest Achievement of British Tool Steel Metallurgy

*The Product of Sanderson Bros. & Newbould, Ltd., Sheffield, Eng.*

H. A. DRURY COMPANY LIMITED

TORONTO MONTREAL VANCOUVER



# *If it's speed you need--*

One trial will prove the advantage of Pratt & Whitney Milling Cutters. No matter what the nature of the work they will give you the highest production the machine is capable of.

They're designed for free, fast cutting. And tempered and seasoned to last longer.

## PRATT & WHITNEY MILLING CUTTERS

Ask us for prices and details on Plain Milling Cutters, Side Milling Cutters. Inserted Blade End and Side Cutters, Screw Slot Cutters, Coarse Tooth Side or Plain Milling Cutters, Involute Gear Cutters, Concave, Convex and Double Angle Cutters, Cutters for Spiral Mills, Roll Thread Die Hobs, Key-Seating and Slotting Cutters. Straight and Spiral Cut End Mills (B. & S. and M. T. Shank), Spiral and Straight Shell End Mills, etc.

And we make formed cutters for special work also. All are backed by the guarantee for goodness that the P. & W. trademark indicates.

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HALIFAX
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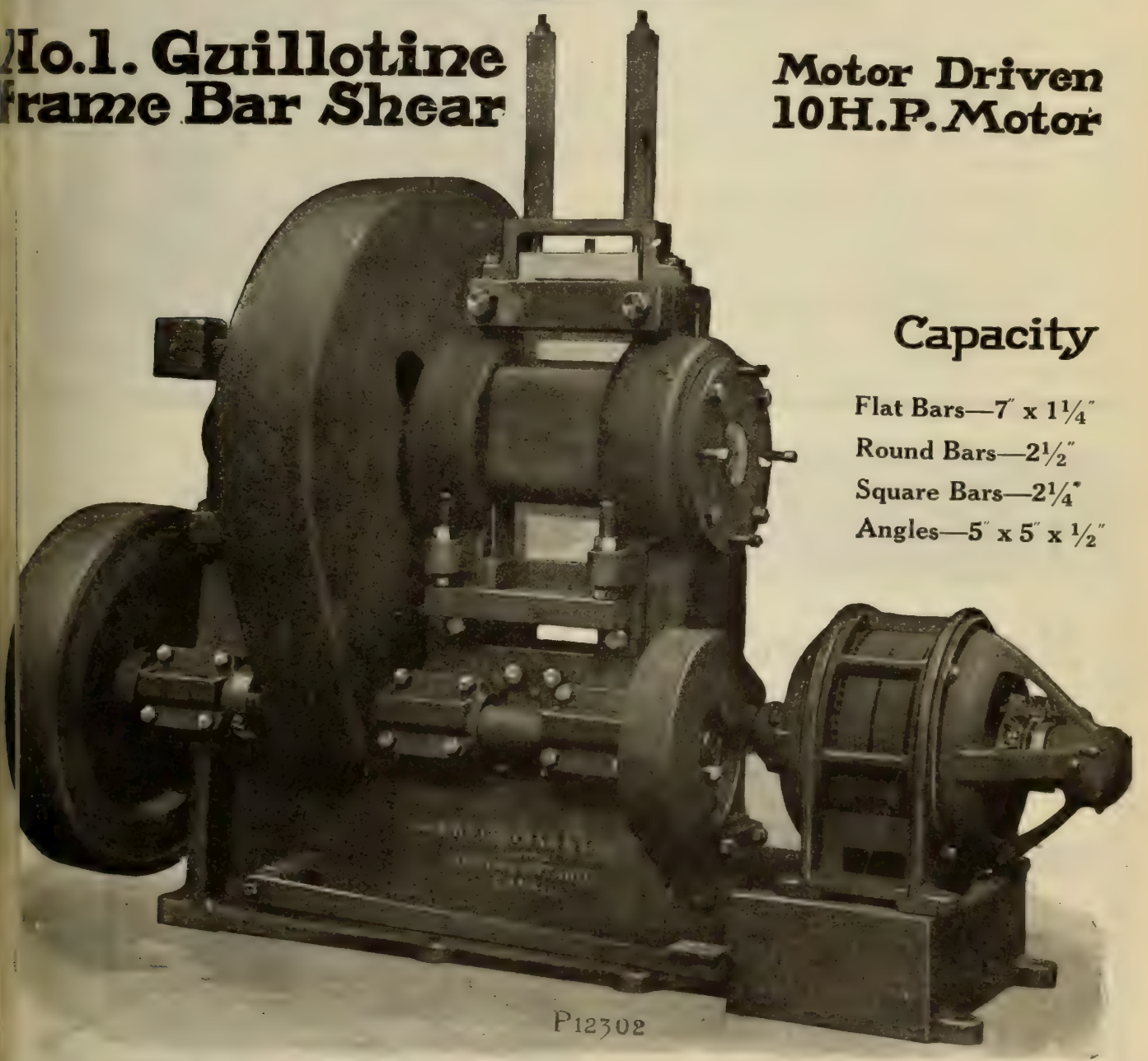
# The BERTRAM Page

## MACHINE TOOLS

JBB&Co

## No. 1. Guillotine Frame Bar Shear

## Motor Driven 10 H.P. Motor




### Capacity

Flat Bars—7″ x 1¼″
Round Bars—2½″
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# Bilton

## GEAR MILLERS

WHEN you think of cutting small gears of every description, associate the name of **"Bilton."**

Bilton Automatic Gear Millers conform to almost every phase of small milling work. Their speed, positive and accurate indexing, and easy control make them economy tools on work such as cutting spurs, bevel metres, taps, cylinders, angle gears, and many other operations.

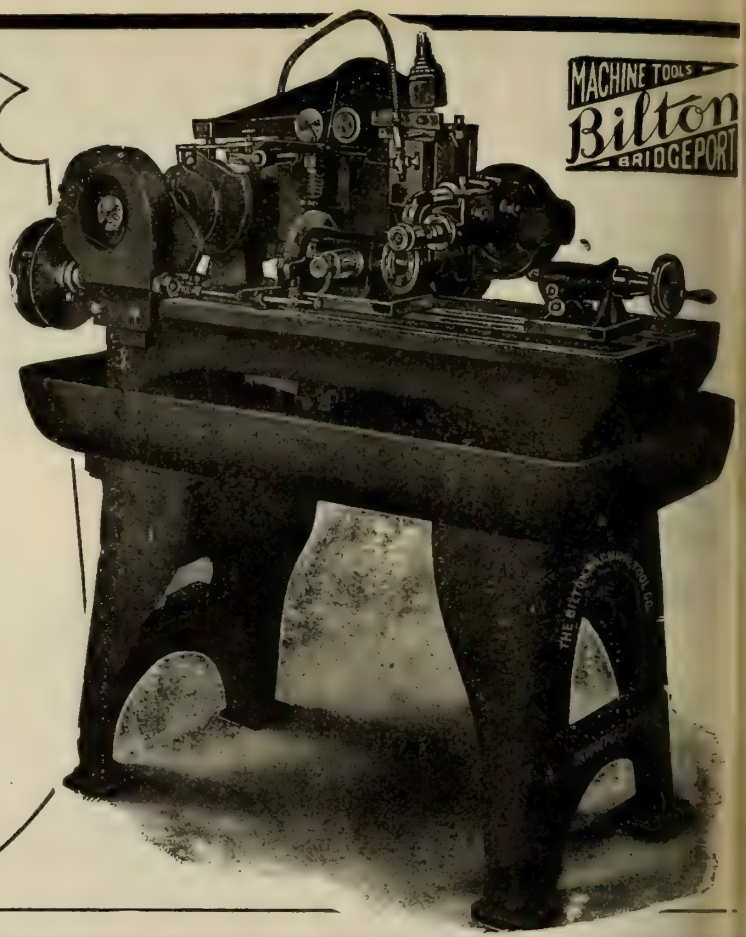
Big business everywhere is adopting the Bilton for high production on accurate work.

**May we send you our catalogue?**

Bilton Machine Tool Company

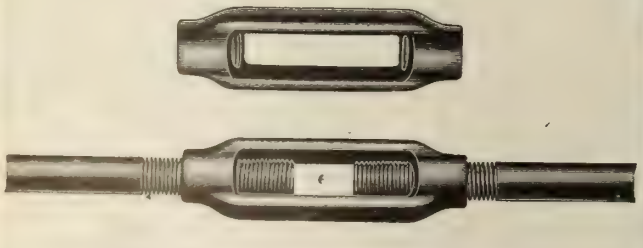
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M. Mett Engineering Co.




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LIMITED

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**ALL STEELHARDENED**

Spindle, Nut and Screw made of Bar Steel. Body drop-forged. Long lasting under hardest use.

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*"The Tool Holder People"*

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# *Announcement*

## Walker Twist Drill & Tool Company,
**Limited**

The Walker Twist Drill & Tool Company, Limited, of Walkerville, Ontario, have purchased the plant, equipment, and all unfilled orders of the Wilt Twist Drill Company of Canada, Limited. An entirely new organization is doing business under the name of the Walker Twist Drill & Tool Company, Limited, their products being known as the Walker brand.

The Walker guarantee of quality, efficiency, and service stands behind every Tool manufactured.

May we not be favored with your orders and inquiries for Drills, Reamers, Cutters, and Special Tools in both Carbon and High Speed Steels?




# ALGOMA STEEL PRODUCTS

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## ALLOY STEELS

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**CHROME-NICKEL**

**NICKEL**

All of these Steels are supplied in

**HOT ROLLED BARS.**

We also furnish in BLOOM, BILLET AND SLAB FORM

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Open Hearth Quality (All Sections from 12 lbs. to 100 lbs. per yard).

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**STEEL TIE PLATES**

**PIG IRON**
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**MALLEABLE**

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For the better convenience of customers who may find it necessary to secure rush shipments of particular items, we are keeping a large stock of all the various standard sections constantly on hand, and to this end extensive warehouse facilities are being prepared. Your enquiries and business will be appreciated.

*May we have your next order?*

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Quantity Production of Shafts in Automatic Heat Treatment Furnace.

## PRODUCTION MANAGERS

**The following advantages are secured by the Continuous Method of Heat-Treatment :**

Increased production per unit of floor space.
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Uniformity of product, resulting in decreased scrap, following less dependence upon the human element.
The fuel economy that naturally follows the direct transfer of heat in spent gases to incoming material.
Improvement in working conditions by cooler shop.

**In short, the saving in cost of the finished product due to economy in labor, time, fuel, floor space, decreased rejections, etc.**

Do these advantages appeal to YOU?

*Write nearest branch for Bulletin 217-T and learn whether this method is adaptable to your product and manufacturing conditions.*

**W. S. ROCKWELL COMPANY**
Furnace Engineers and Contractors
50 CHURCH ST. (Hudson Terminal Bldg.), NEW YORK
WE MAKE INDUSTRIAL HEATING FURNACES
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**Steel Shelving**

This floor-space saving, fire-proof equipment is a genuine labor saver. It means less steps for your men—more time for production

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**Ornamental Iron and Bronze. Commercial Wirework of all kinds. General Builders' Ironwork.**

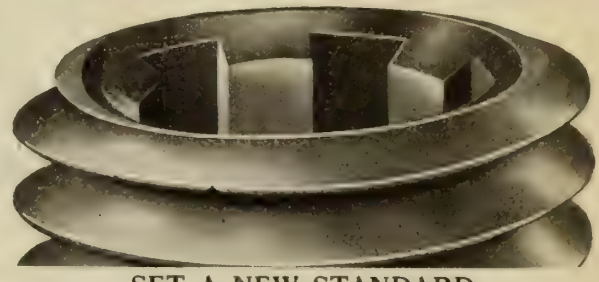
*Write for folders.*

Halifax, Montreal, Ottawa, Toronto — THE DENNIS WIRE AND IRON WORKS CO. LIMITED, LONDON, CANADA — Hamilton, Winnipeg, Calgary, Vancouver



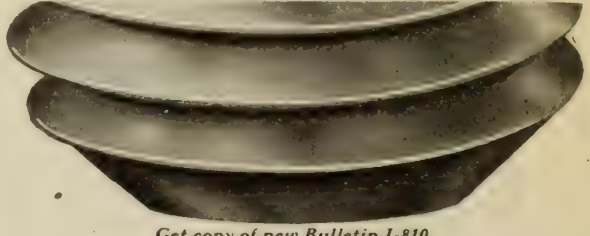

TRADE MARK
## BRISTO
REG. U. S. PAT. OFFICE

## PATENTED SAFETY SET SCREWS



**SET A NEW STANDARD**

The distinctive dove-tail slots or flutes of the "Bristo" safety set screw are one of the features which put "Bristo" in a class by itself. "Mushrooming," for instance, is impossible, and splitting or cracking have been removed from the list of your manufacturing worries. As the wrench turns, the unique "Bristo" design contracts the screw; on releasing the pressure the screw tends to expand—a tremendous gripping factor.



*Get copy of new Bulletin 1-810.*

**THE BRISTOL COMPANY**
Waterbury, Conn., U. S. A.

# HANNA

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## REMOVE ALL GREASE AND DIRT WITH

# Roylite Cleaner

### CLEANS ALL METALS

ORDER a barrel of Roylite Cleaner and watch how speedily and how effectively it removes oil, grease, enamel, paint or any kind of dirt from metal in the quickest and and most economical manner. Never before have you been able to obtain a cleaner which works so quick, retains its strength so long and costs so little as Roylite.

**Lasts Longer**
**Works Quicker**
**Costs Less**

The new Roylite process emulsifies mineral oil and heavy greases which cannot be saponified, by lifting them from the work to top of solution, thereby avoiding the precipitate action, making it unnecessary to throw out solution but merely add small quantities to sustain its strength.

Roylite is the best for preventing rust. It will not discolour or tarnish the brightest surface,

*Our men will gladly give you demonstration*

**Manufactured by**

## CANADIAN HANSON & VAN WINKLE CO., LTD.

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*"MADE IN CANADA"*



## THE ACKWORTHIE TAPPING ATTACHMENT.

**BRITAIN'S PREMIER CHUCK**

**Made in 6 sizes.**
**To tap from ⅛ in. to 1¼ in. Whit.**

We have made some thousands of these Chucks during the last 11 years, every one of which has given satisfaction. For tapping holes there is nothing to equal them for speed and handiness.

*Shall we mail you particulars?*

**J. ACKWORTHIE, Ltd.**
**Coleshill Street,**
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**Our Brands:**
**"Elkco"**
**"Elkco" Special**
**"Elk Steel"**
**"St. Marys"**
**"Keystone"**
**"M.D. Elk"**
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## *Elk Service Means Lower Costs*

There are two important things to consider in buying firebrick—**price and quality.** When you buy ELK BRAND FIREBRICK we take a keen, unprejudicial interest in seeing that you get the class of firebrick you need. If a moderate-priced brick fills the bill we never recommend a brick of higher quality at higher price.

We make bricks in all standard sizes and shapes.

Elk Brands Firebrick are reliable. Specify them in your next order.

## Elk Fire Brick Company of Canada

**Limited**

**Sun Life Building, HAMILTON, ONTARIO**

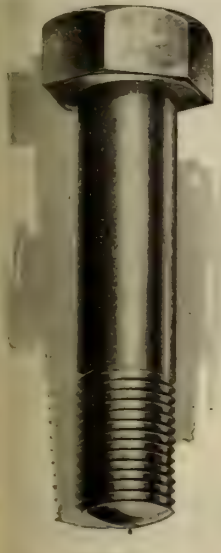
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## Have You Need for a Factory to Make Special Machinery for You ?

We make an exceptionally high-grade phonograph motor requiring skillful workman, working to close limits. They are considered standard in the Phonograph Trade. We can manufacture complete or parts for anything you may need.

## W. H. BANFIELD & SONS, LIMITED

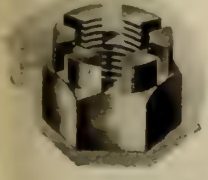
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# ACCURACY

Just now all jobbers should have a complete stock of SAE Cap Screws, Plain and Castellated Nuts and Taper Pins to meet the automobile repair trade requirements.

Your rush orders filled promptly by



## The Galt Machine Screw Co., Limited

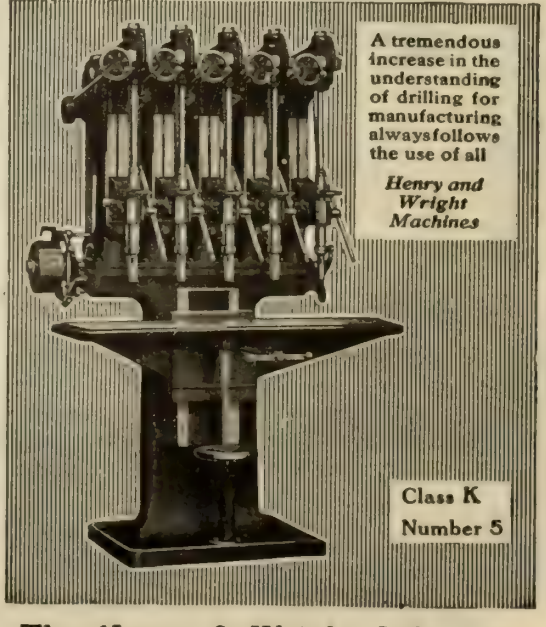
GALT, ONTARIO

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*Western Representative:*
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## HENRY & WRIGHT

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## The Henry & Wright Mfg. Co.

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Canadian Fairbanks-Morse Co., Montreal, Toronto, Winnipeg; A. R. Williams Machinery Co., Toronto, St. John, N.B.; H. W. Petrie, Ltd., Toronto; Williams & Wilson, Montreal; Rudel-Belnap Machinery Co, Montreal; Canada Machinery Corp., Galt, Ont.; Geo. F. Foss Machinery & Supply Co., Montreal; General Supply Co., Montreal.

# THE JOHNSON FRICTION CLUTCH

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The old familiar countershaft drive, through cross belts and tight and loose pulleys, stands accused of the following offences against efficiency:

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2. Costs too much to set up.
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4. Operates sluggishly.
5. Multiplies belt troubles and the resultant cost of upkeep.

**Modern practice has discarded the antiquated countershaft for the simplicity and efficiency of the clutch drive direct from lineshaft.**

### Adopt the Johnson Lineshaft Drive

The economical, efficient and durable method of power transmission through friction control.

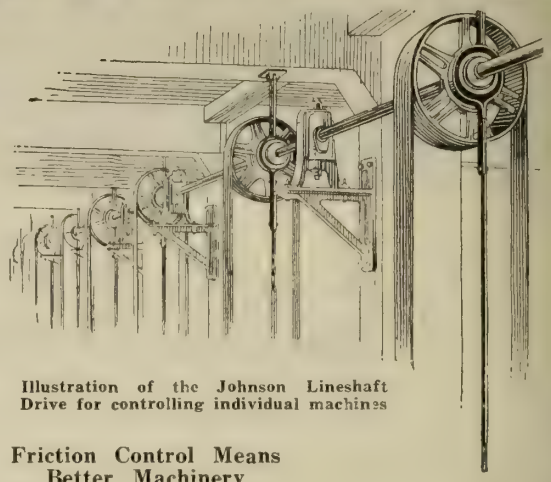


Illustration of the Johnson Lineshaft Drive for controlling individual machines

**Friction Control Means Better Machinery**

Whether it is applied overhead or in the machine itself.



**Write for our Booklet "Clutches as Applied to Machine Building" and our Yellow Catalog.**

CANADIAN AGENTS:
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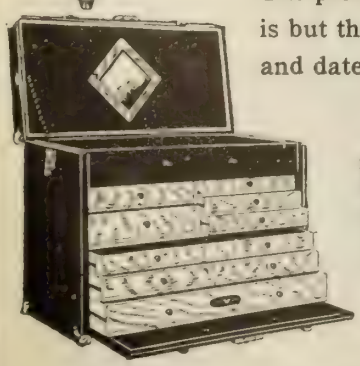
**THE CARLYLE JOHNSON MACHINE CO. MANCHESTER, CONN.**

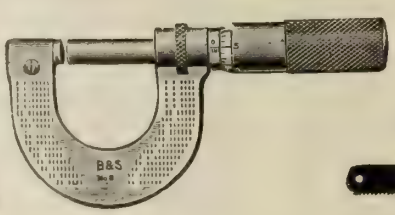


# Supplies for Machine Shops, Foundries Factories and Construction Purposes

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The prompt, courteous service and dependable goods for which Rice Lewis is noted, is but the development of a policy commenced 74 years ago. Full particulars, prices and dates of delivery of any of our supplies are yours for the asking.










## Rice Lewis and Son, Limited, Toronto

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# CANADIAN STEEL FOUNDRIES LIMITED

## AMONG OUR PRODUCTS

**O. H. STEEL**
- Bolsters
- Couplers
- Draft Arms
- Locomotive Side Frames
- Machinery Castings
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- Rolling Mill Rolls
- Wheel Centres

**FERRO-ALLOYS**

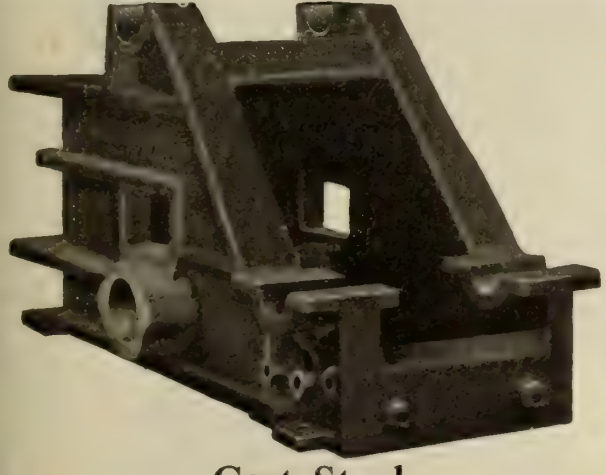
**MANGANESE-STEEL**
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- Crank Shafts
- Locomotive Frames
- Rolls
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- Crosses
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- Switches
- Rail Braces
- Guard Rail Clamps
- Complete Intersection

This list is merely an indication

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Cast Steel
Stone Crusher Frame

# Machinery Parts
of every description
in
# Cast Steel

# Chrome-Nickel
and other forged gear blanks

# Forged Shafts

## Dominion Foundries & Steel Limited
Hamilton, Canada

# NUTS

## S·A·E and A·L·A·M

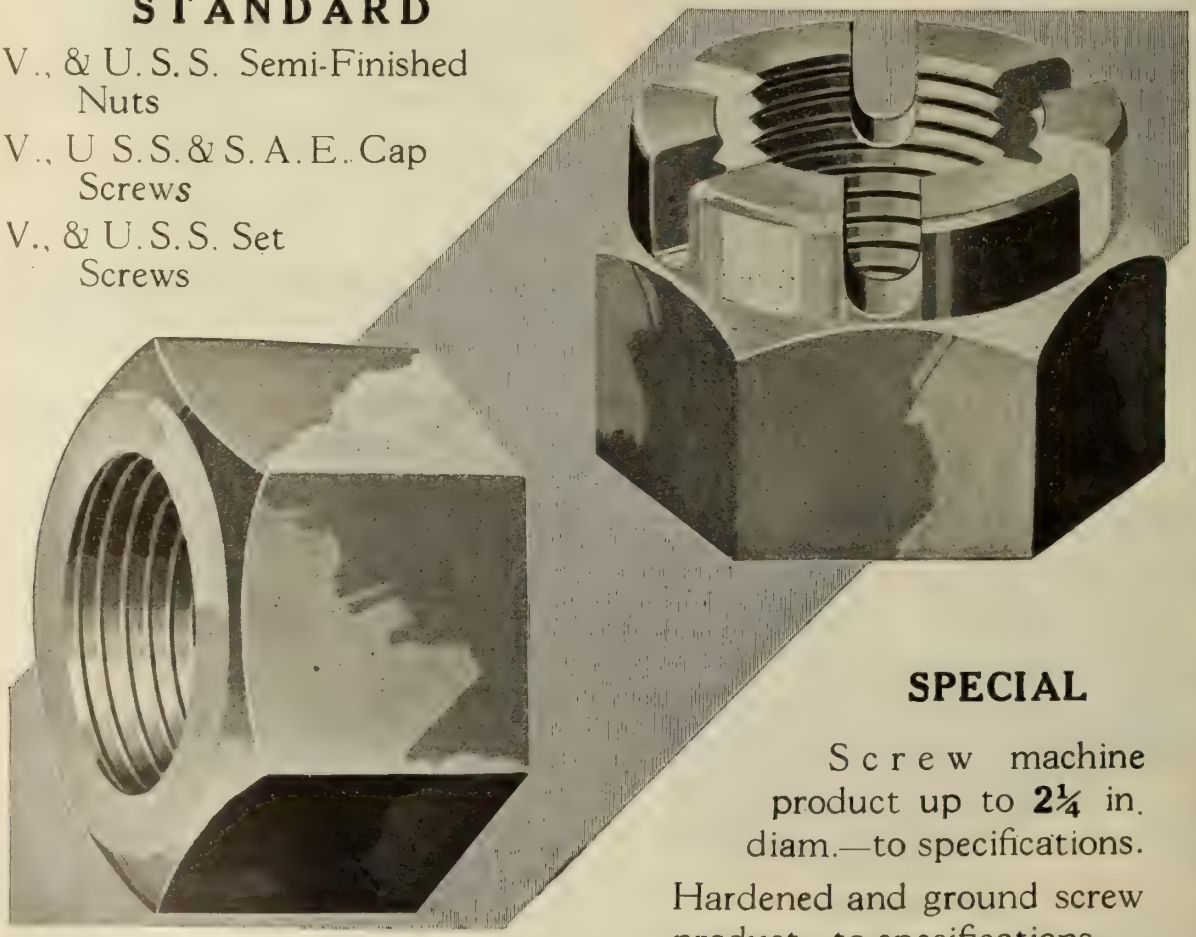
## PLAIN OR CASTELLATED

**STANDARD**

V., & U.S.S. Semi-Finished Nuts

V., U S.S.& S.A.E. Cap Screws

V., & U.S.S. Set Screws



**SPECIAL**

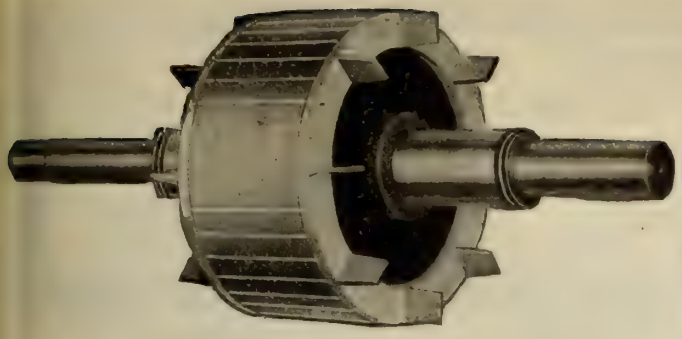
Screw machine product up to **2¼** in. diam.—to specifications.

Hardened and ground screw product—to specifications.

## THE NATIONAL ACME COMPANY

**MONTREAL, QUE.**

**De Courcelles** **G. T. R. R.**



## No Soldered Joints or Bolted Connections in—

# Canadian Crocker-Wheeler Rotors

¶The greatest improvement in modern induction motor design—no soldered joints to melt and cause arcing or open circuit and no bolted connections to work loose.

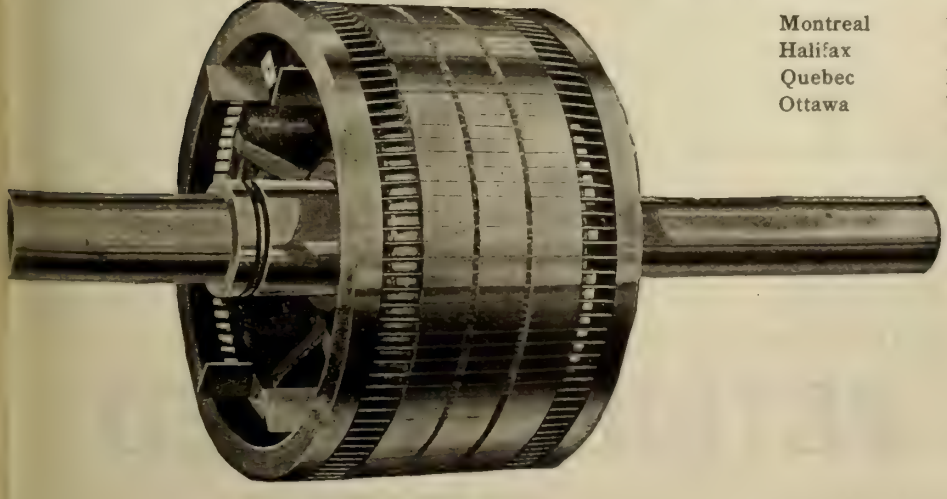
¶The entire Rotor Winding of small squirrel-cage induction motors is cast of aluminum alloy—in one operation. Thus, the complete winding is one integral structure.

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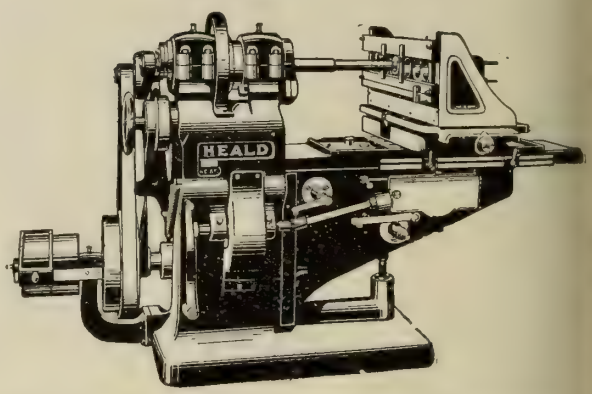
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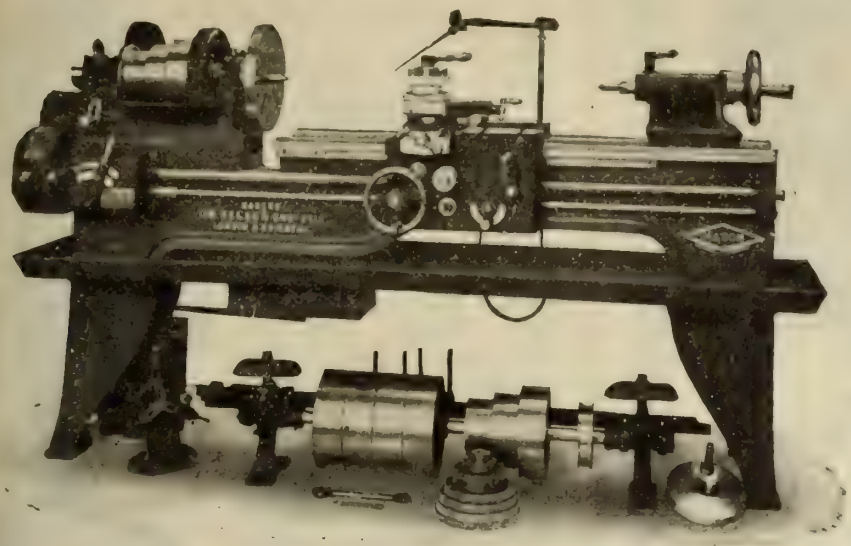
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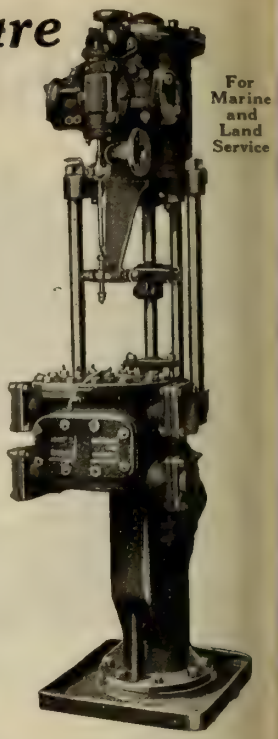
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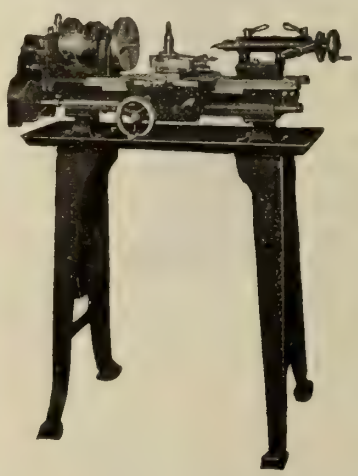
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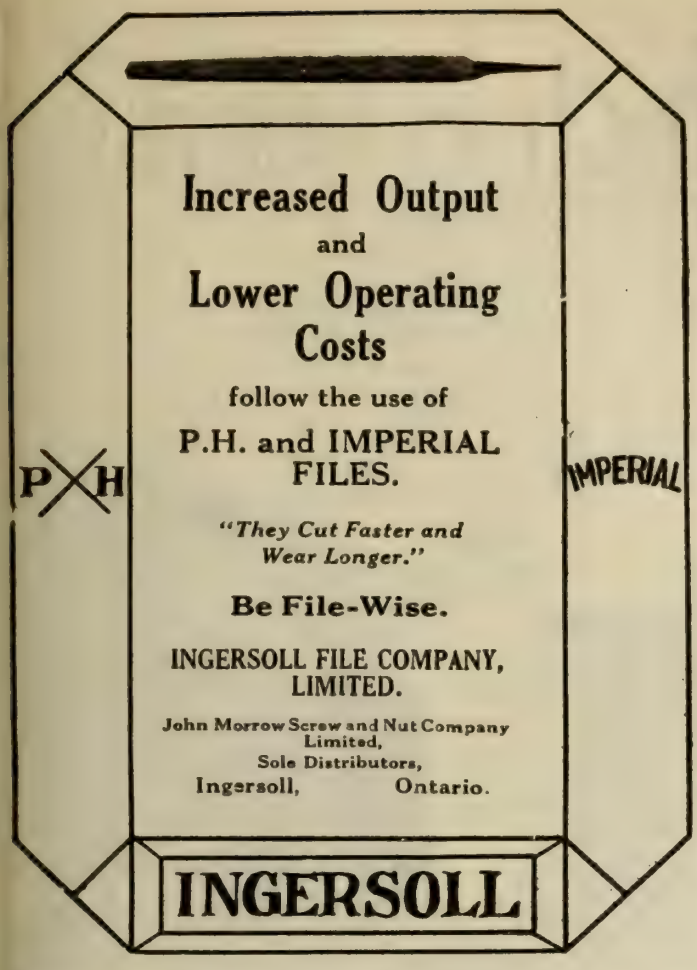
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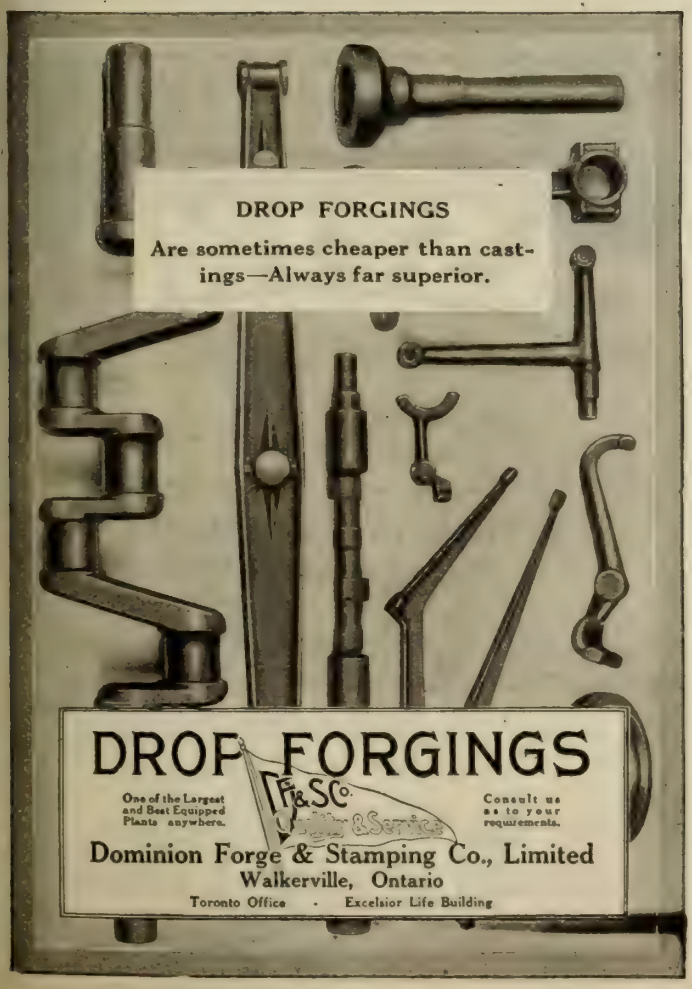
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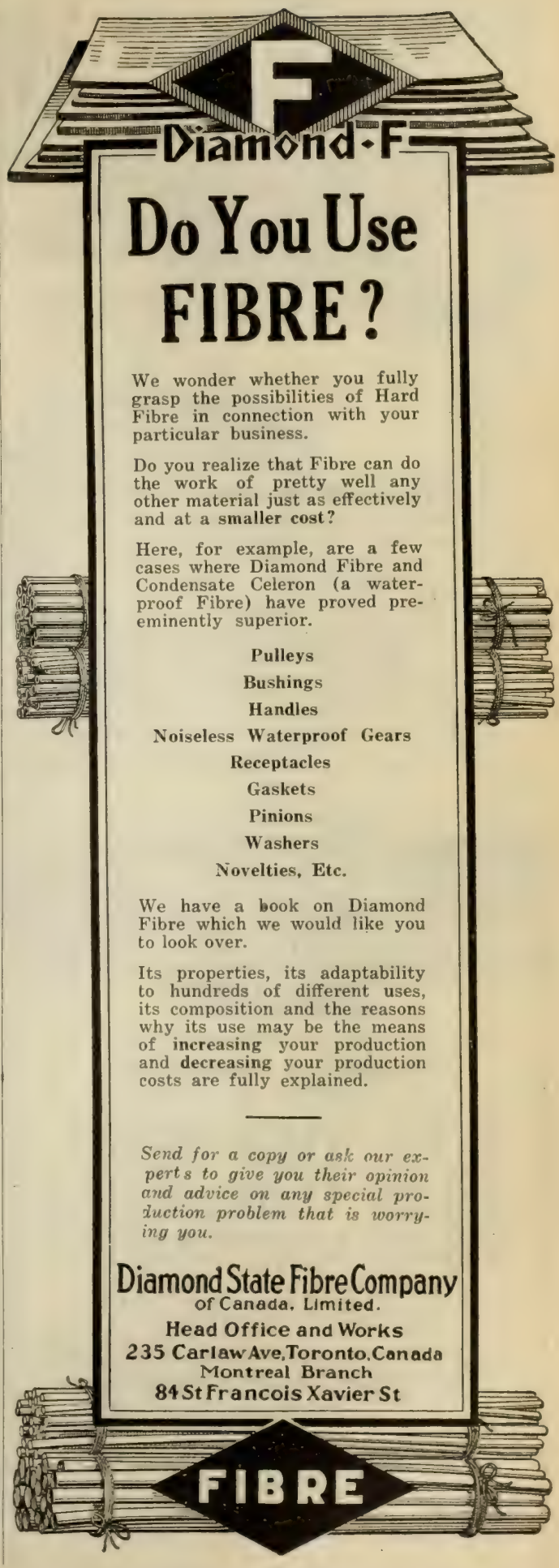
*Write for Bulletin BC-650*

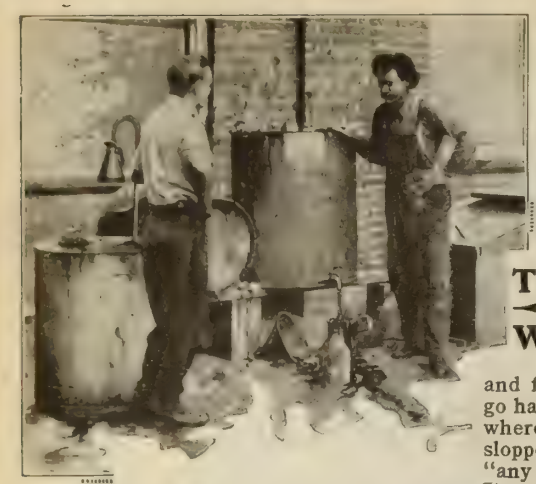
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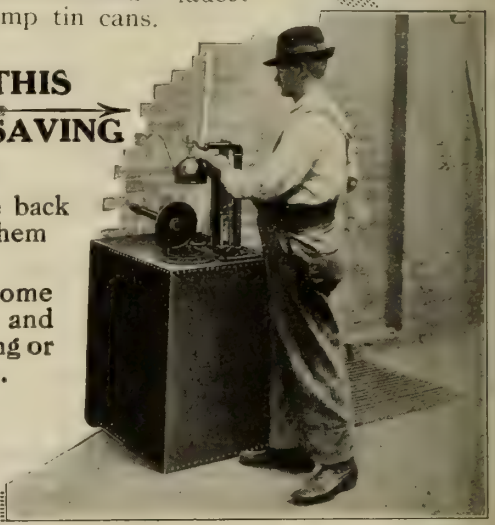
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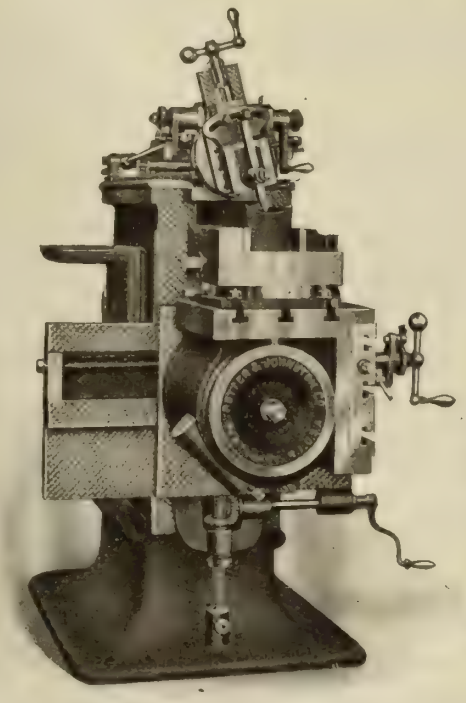
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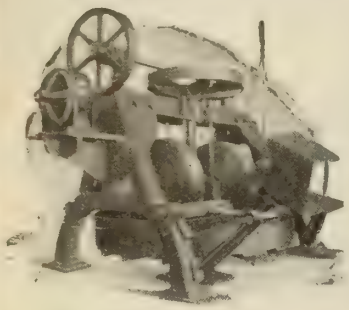
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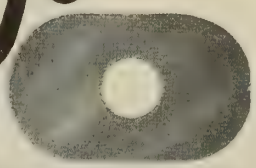
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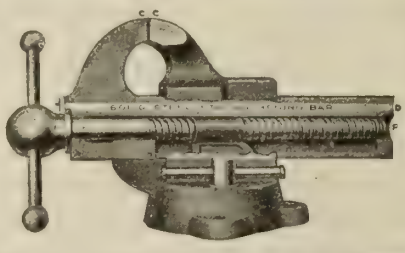
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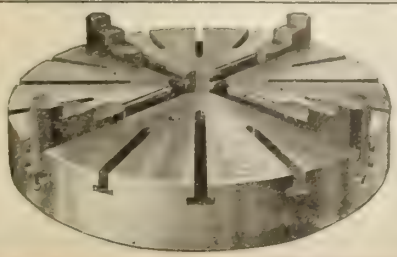
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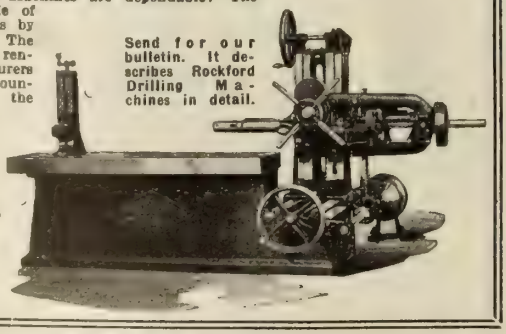
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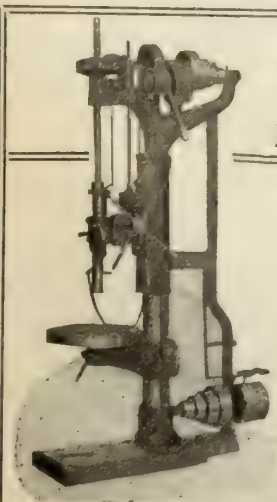
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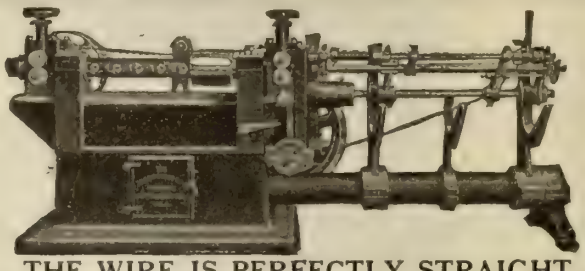

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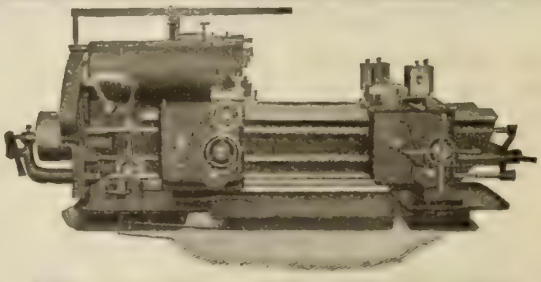
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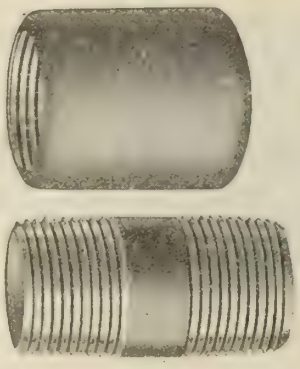
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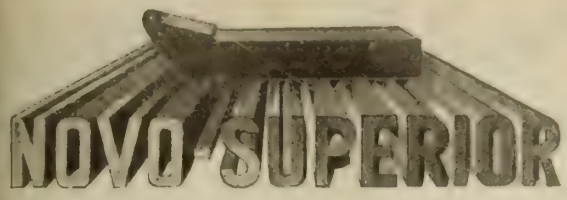
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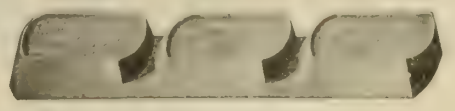

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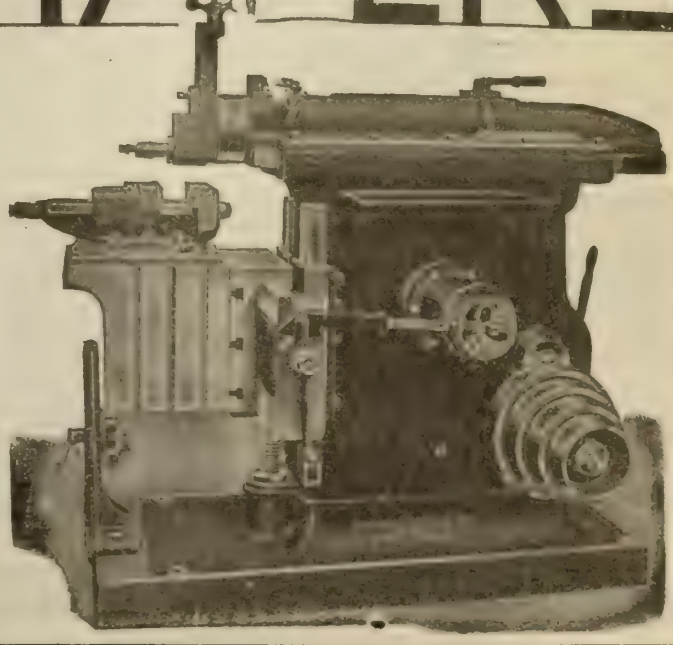
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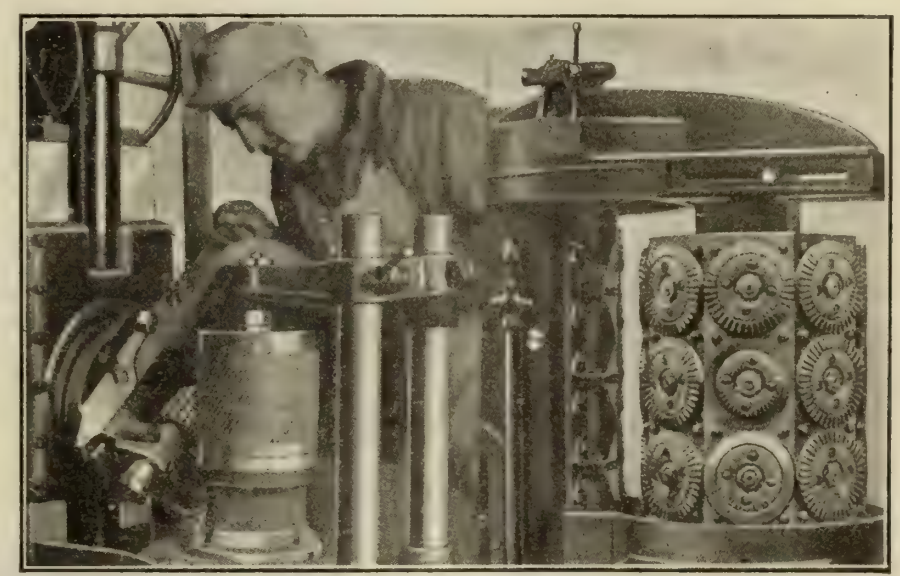
VOL. XXV. No. 23. June 9, 1921

# Generating Gear Teeth For Industrial Uses

Gear cutting has been reduced to a carefully planned operation —Methods of cutting spur-helical, bevel, and worm gears, also splines—Continuous type of gear cutting machine.

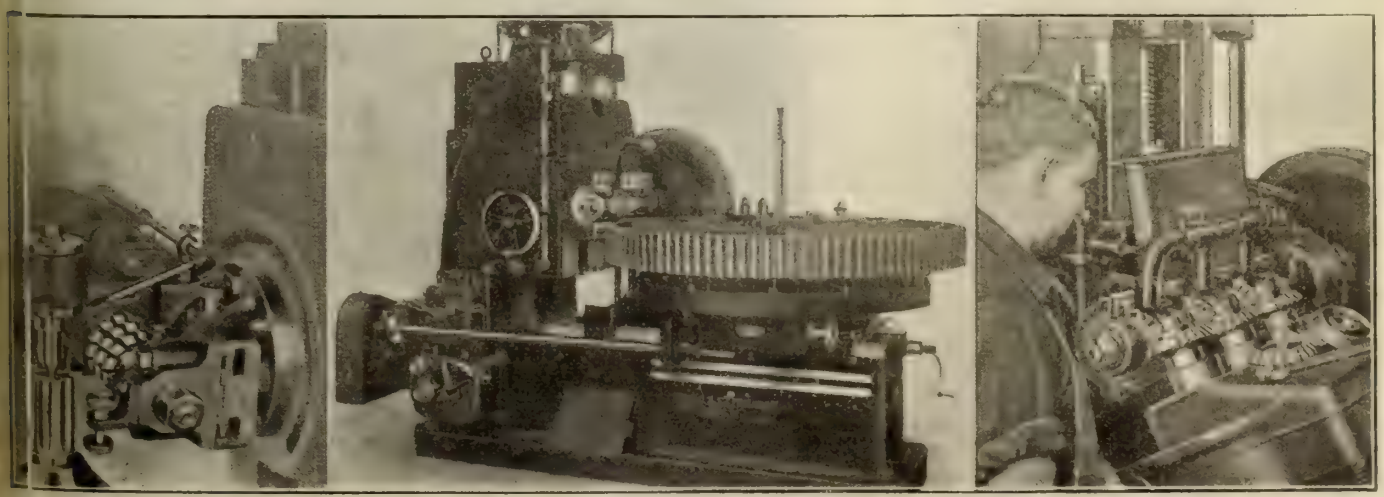
By J. H. MOORE

SINCE E. Bodmer in 1839 invented a certain style of milling cutter and hob to cut gear-toothed wheels, the development of the gear cutting art has been a romance in itself. If Mr. Bodmer were alive to-day and were taken through a modern manufacturing plant where a considerable quantity of gears were being cut, he would be apt to exclaim, "Did I actually start all this?" I'm not that he would be flattering himself considerably, for the present method is far removed and improved over his former humble efforts. We now have various methods of producing gears, such as shaping, hobbing, milling, etc., but in all systems the idea aimed at is the same, viz., the turning out of accurate gears in the shortest possible time. In the present article we will consider only one system of gear cutting, that of the Gould & Eberhardt Co., Newark, N.J. To this concern we are indebted for the use of the various illustrations.



LEFT VIEW, FIG. 1.—GEAR HOBBING MACHINE CUTTING SIX HELICAL TIMING GEARS.
RIGHT VIEW, FIG. 9.—A SPECIALLY DESIGNED CONTINUOUS RING GEAR CUTTING MACHINE.

The machines developed by this firm vary in character. There is the automatic gear hobbing machine used for cutting spur, helical and worm gears. These machines are used in both single and multiple spindle type depending upon the nature of the work. Another style is for spur gear cutting only, and is known as the vertical cutting type. A machine of the same vertical cutting type, but having a disc cutter, is used



READING LEFT TO RIGHT, FIGS. 2, 5 AND 6.—FIG. 2 DEPICTS THE CUTTING OF SPLINES; FIG. 5 SHOWS CUTTING A 108 TOOTH 1¾ D.P. GEAR, WHILE FIG. 6 ILLUSTRATES THE ROUGHING OUT OF THREE BEVEL GEAR BLANKS

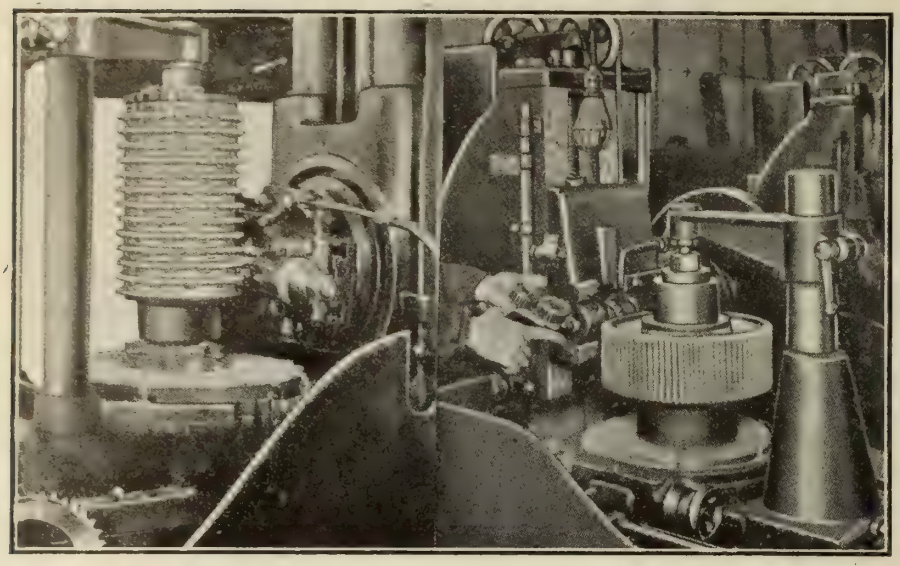


FIG. 3.—CUTTING TWELVE MOTORCYCLE SPROCKETS.
FIG. 4.—CUTTING TWO SPUR GEARS AT ONE TIME.

for cutting spur and bevel gears, while another style of multiple spindle machine roughs out one or more spur or bevel gears at one time.

Ther are also automatic gear hobbing machines for spur, helical and worm gears, while other styles are used for rack cutting. Then there is the bevel gear roughing shaper, and the worm wheel generating machine, the latter type being used for worms only. These, briefly, illustrate the various style machines produced by this one company for the cutting of gears, so that when one considers the other numerous varieties on the machine tool market, the art of gear cutting has indeed been reduced to a carefully planned operation.

At Fig. 1 is shown a gear hobbing machine cutting six helical timing gears. This type of machine is especially designed to cut spur, helical or worm gears, such as are used in the manufacture of automobiles, machine tools and textile machinery. This includes such parts as flywheels, starter rings, steering and transmission gears, helical gears, cam and magneto shafts, splines, speedometer gears, etc.

Fig. 2 depicts the cutting of splines on an automobile driving shaft. The six-tooth spline is on the end of a long shaft, this being inserted in a compression chuck on the machine. A special formed hob is used, and the six teeth are automatically generated. When the hob has fed down the proper distance the machine is automatically stopped. The chief benefit in cutting splines in this manner is that the teeth will not only be accurately divided but identical in shape.

Fig. 3 depicts the cutting of twelve motorcycle sprockets. The diameter of these wheels is 7.490 inches, and they are ⅝-inch pitch, with 36 teeth. The average output per day on one of these machines is 80 sprockets.

An example of spur gear cutting is shown at Fig. 4. Two gears are mounted on the one arbor, each gear being 16.666 inches outside diameter with 2½-inch face. Ninety teeth are cut, the pitch being 6. The blanks are completed in a roughing and finishing cut and are held to a .001 inch tolerance. The two midget gears shown in the operator's hand were cut on the same machine, so this will give readers a fair idea of the range of such machines.

The next photograph, Fig. 5, shows the heavier type of vertical gear cutting machine producing a 108-tooth, 1¾ D.P., 6-inch face steel gear. This type of machine is used for spur gear cutting only, but, owing to its construction, even large gears such as shown can be rigidly supported, and it can be noted from the illustration that there is practically no overhang.

Fig. 6 depicts the roughing out of three bevel gear blanks on an automatic multiple spindle machine. This type of gear cutter is arranged with adjustable workhead, and two or three gears can be roughed out at one time. It can handle a wide range of various angles yet the machine can be arranged with fixed angle head for roughing out spur gears only if so desired. On certain styles of this machine there is a revolving turret, and the operator can unload and reload blanks, while one set of work spindles are in cutting position.

Fig. 7 shows a worm wheel generating machine finishing a worm wheel blank that has 35 teeth of 1.20 inch circular pitch. The blank is made of aluminum bronze, and has the teeth roughly cast to shape to begin with. The output of these gears is 60 every eight hours. Another case of worm wheel cutting that is worth referring to is that of a 28-tooth, 1½-inch circular pitch gear, this gear being completed in 4 minutes' actual cutting time.

At Fig. 8 is shown a rather nice example of worm cutting. In this case the worm is being cut with a special patented hob, but although the finish of the worm speaks for itself, we are unable to give the production time on the piece.

Another interesting case where a certain concern solved the problem of hobbing worm wheels can be told without illustration.

The work in question was the hobbi

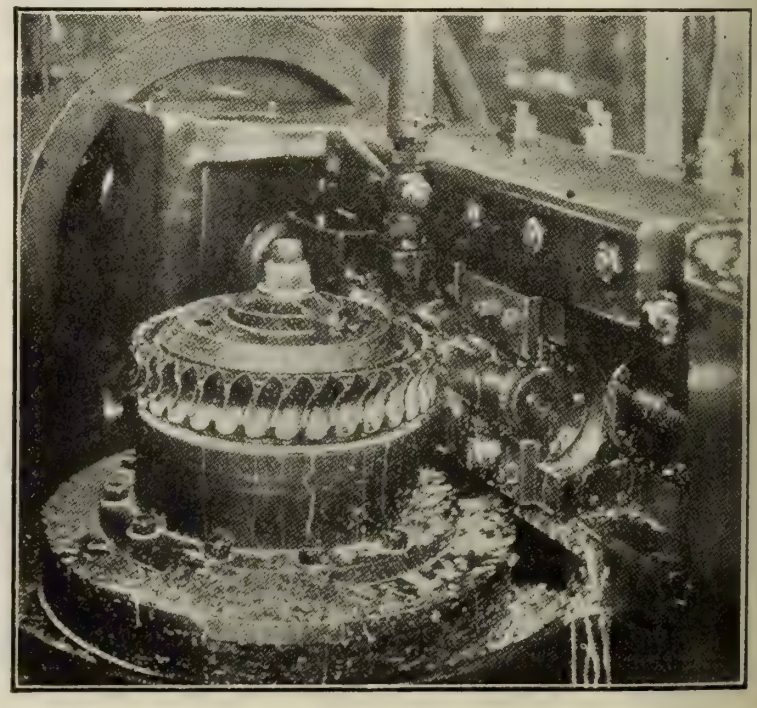


FIG. 7.—FINISHING A WORM WHEEL ON A GENERATING MACHINE.

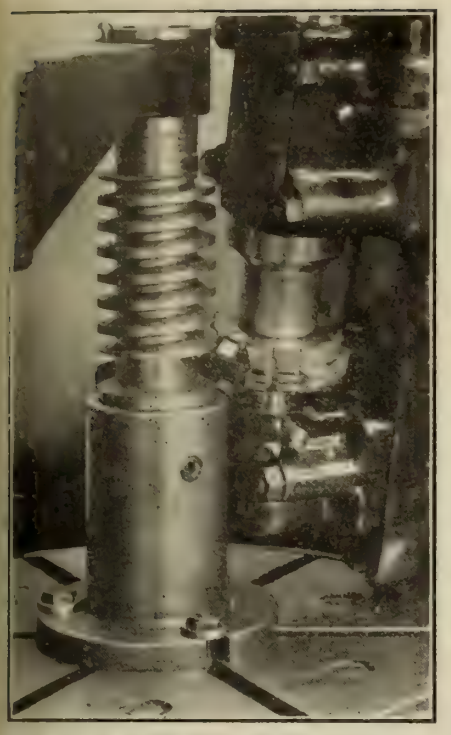


FIG. 8.—A NICE EXAMPLE OF WORM CUTTING.

a very large quantity of worm wheels at necessitated using a very small ameter hob. Due to the diameter of e wheels it was necessary to do the rk in a large gear cutter which was signed for the use of a very large tter and would not permit the use of e very small diameter hob that was cessary in this instance.

They found that the 72 in. G. & E. ar cutter that they had was so well lapted for this work that with the ap- ication of a special cutter spindle drive ey were enabled to handle the job much better than could ordinarily be done. It was necessary to bring the hob spindle forward and this was accomplished by designing and making a special spindle consisting of bearings that fitted into the cutter spindle bearings of the machine and acted as an auxiliary arbor that was driven from the main arbor by a suitable train of gears to maintain the proper direction of rotation of the arbor. The hob was made 2½ in. in diameter, yet cut a worm wheel having 160 teeth, 2½" pitch.

The concluding illustration, Fig. 9, shows a specially designed continuous ring gear cutting machine. This type of gear cutter is of patented design and was made for cutting Ford ring gears. It has an octagon revolving turret head that holds 24 bevel gears at one time. The operation is continuous. The gears being roughed out have 40 teeth and 1-inch face. Two minutes to each gear is the production time. By roughing out a bevel gear preparatory to finishing, much time is saved, not to speak of the easier task it is for the finishing

From the foregoing it will be noted that gear cutting has greatly developed from the days when the old-time mechanic used a single milling cutter to produce his gears. If we had to revert to this process, the present price of automobiles would be sure to take a decided upward trend, but fortunately such a possibility is very remote, in fact we can still look forward to still further development as time goes on.

## HEATING BY ACETYLENE

According to a recent report, acetylene as a substitute for coal in domestic heating in Switzerland has given great satisfaction. For several months, the Palace Hotel, a block of five houses at Lausanne, has been heated by hot water from a central station, where acetylene is generated in a stationary apparatus, mixed with air, and burned in a coil system. In 20 minutes the entire hot water service for the five houses can be raised to 160 to 175 degrees F. Heating the building in midwinter would require nearly a ton of coal per day, but in mild winter weather a comfortable temperature is maintained with a daily consumption of 200 to 500 pounds of carbide.

## WELDING MONEL METAL

Monel metal is not difficult for the operator who knows how to weld cast iron or aluminum and how to take care of expansion and contraction. First of all, use a soft flame with an excess of acetylene, so that the second cone extends about ⅝ inch beyond the small flame. The pieces must be beveled and welded as fast as possible, so that the mtal does not get too hot and form blow holes. Use Monel welding flux or borax. Also use rather heavy monel welding rods. When welding sheets of Monel, continues Welding Engineer, bevel the edges and then add enough metal to more than fill up the groove so that the seam becomes heavier than the sheet itself. Try to melt the metal only once, that is, do not go back over your work to try to fill up the cracks. If a crack occurs in the weld do not go over it while hot. Finish up the seam you are welding, then let it cool; take a hammer and bump the place where the crack is, over a width about three or four times the thickness of the metal, then weld over. When cool beat th esheet back as it was, but never attempt to hammer the sheet while hot.

# *Transmission Problems*

## *FINDING SPEEDS OF BELTING AND SHAFTS*

Belt speeds are controlled by the speeds of the shafting and the diameters of the pulleys. If the speed of one shaft and the diameters of all the pulleys in the train are known, the r.p.m. of any of the other shafts may be determined, or vice versa.

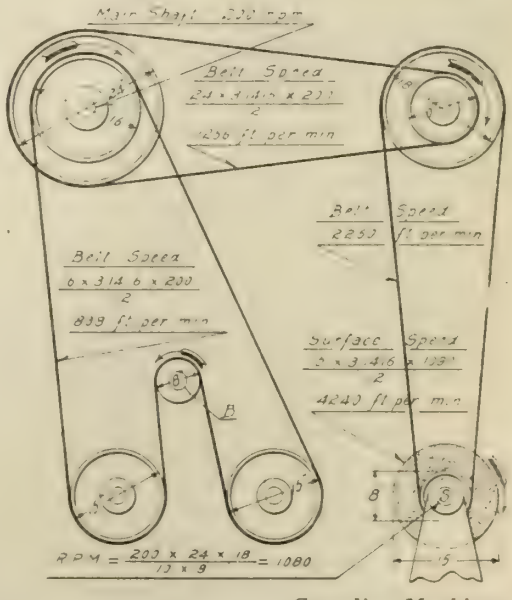
The r.p.m. of the driving shaft multiplied by the diameters of all the driving pulleys will equal the speed of the final shaft multiplied by the diameters of all the driven pulleys.

The belt speed in ft. per min. is equal to the circumference of the pulley in feet times the r.p.m. of the shaft.

Example: To find the surface speed of the grinding wheel in the sketch, when the main shaft is running at 200 r.p.m., multiply the r.p.m. (200) of the main shaft by the diameters of the driving pulleys (24 and 18) and by the circumference of the grinding wheel (15 x 3.1416) and divide this by the diameters of the driven pulleys (10 and 8) multiplied by 12, to get the answer in feet.

$$\frac{200 \times 24 \times 18 \times (15 \times 3.1416)}{10 \times 8 \times 12} = 4241.16 \text{ ft. per min.}$$

$$\text{Speed of shaft B} = \frac{200 \times 16}{8} = 400 \text{ ft. per min.}$$




*Canadian Machinery*

# Making A Combination Drill and Countersink

Details of construction—Operation list with tools used—Eight operations necessary to complete the drill—Special fixtures used in various operations—Description based on requirements for local plant use.

By F. SCRIBER

ALL machine work turned on centers requires center holes on the ends in order that the work may run true after each machine operation. Numerous methods are employed in accomplishing this object, but the general practice is centering by means of what is known as the combination drill and countersink. The purpose of this article is to describe a convenient method for the small shop for manufacturing this serviceable tool in reasonably large quantities for local plant needs.

Views of the centering tool are shown in detail in Fig. 1, and features of construction are emphasized that are not generally appreciated by the average user. These tool bits are usually made from semi-high or high speed steel. They are machined on both ends, very often one end being larger than the other, hardened and ground to the desired angle and dimension. In Fig. 1 is also shown an end and sectional view of the tool. These views are given more particularly to show the milling, two grooves being milled opposite through the drill diameter X. The extreme end of the drill, for a length equal to B, is milled straight. From there on, for a distance C, the bottom of the groove is tapered with an increasing thickness at the bottom, while the radius A is equal to the radius of the milling cutter. The flutes of the tool point are milled helical, and the cone portion Y, representing the countersink, is backed off so that the front edge of the groove will form a cutting edge. The parallel portion of the small drill end is also backed off. Re-grinding of the drill point is necessary owing to the wear, but it is essential that care be taken not to get the drill too short, as it will destroy the accuracy of the center in the work, owing to the fact that the lathe center will bear against the end of the hole and not on the countersunk portion. This is shown at the extreme right of Fig. 1.

While apparently a very simple tool, it is one which is nevertheless rather difficult to make without the aid of special tools. The number to be made will determine the extent of the tool equipment. While machinery of special design would be employed when making these center bits in large numbers, the tools and fixtures here described would be quite adequate for making sufficient for a factory using them in large quantities. A sequence for machining these combination drills is shown on the chart Fig. 2. This list gives the operation

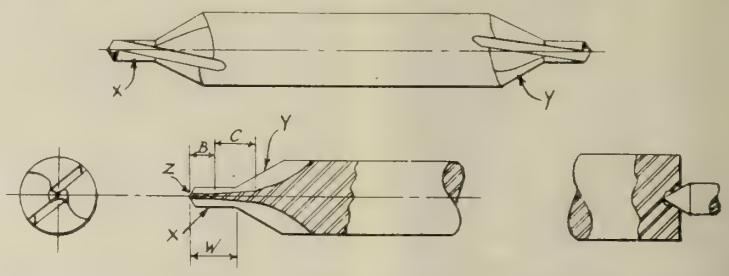



FIG. 1.—DETAILS OF COMBINATION DRILL AND COUNTERSINK.

number, the name of the operation, a column of "tools used" with brief description. The fourth column gives the various tool numbers, the fifth column gives the number of the machine on which the tools are to be used, while the last column indicates the department in which the work is performed. It will be noted from this sheet that the first operation is to cut the combination drills and countersinks to length and point; this is done on a speed lathe equipped with a collet, cutting-off tool, and a center rest for supporting the blanks while being cut off. This machining arrangement is shown in Fig. 3, where the work A is held in the collet B in the lathe spindle. The rods are fed through the spindle in the usual manner and fed against the stop or center C held in the tail stock of the lathe. The work is cut off by the form cutter supported in the block D on the cross slide. The jaw X in the steady head E is adjusted to support the work when cutting off.

The second operation, that of turning one end and relieving the angle, and also the third operation performed on the opposite end, are accomplished on a lathe with a turret carrying a roughing and a finishing tool, the former being shown in Fig. 4. The work is mounted in a collet A, with the work projecting out sufficiently to permit the hollow mill B to operate on the work. On the nose of the lathe spindle is attached a simple fixture that carries on its face a flange in the form of a cam, the contour of which corresponds to the relief to be given to the countersink of the drill bit.

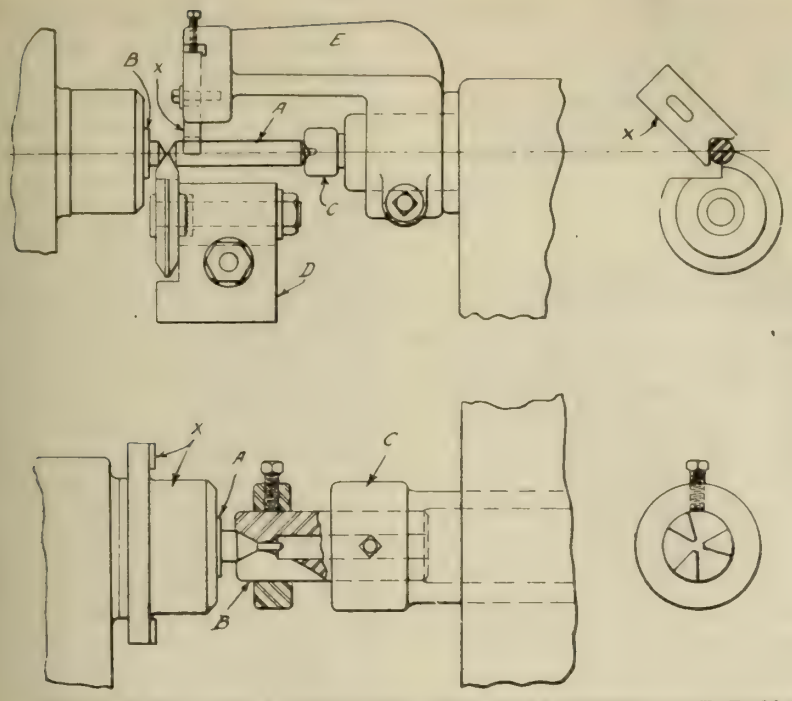
OPERATION LIST.

By F. S. DRG. P-391

For Combination Drill & Countersink

| Op. No. | Oper. Name. | Tools Used. | T. No. | Mch. No. | Dept. |
|---|---|---|---|---|---|
| 1 | Cut to length & point | Speed lathe<br>Collett<br>Cut-off tool<br>Centering rest | --<br>Std.<br>T-312<br>T-313 | 713 | 4-[illegible] |
| 2 | Turn one end & relieve angle | Chucking lathe<br>Roughing tool<br>Finishing & relieving tool<br>Collet & spindle fixture | <br>T-314<br>T-315<br>T-320 | 840 | 4-C |
| 3 | Turn opposite end & relieve angle | Chucking lathe<br>Roughing tool<br>Finishing & relieving tool<br>Collet & spindle fixture | <br>T-314<br>T-315<br>T.320 | 840 | 4-[illegible] |
| 4 | Mill grooves | Hand milling Mach.<br>Special cutters<br>Sp. milling head | <br>T-316<br>T-317 | 407 | 3-[illegible] |
| 5 | Relieve small Dias. | Filing block | T-318 | Bench | 3-D |
| 6 | Harden & temper | | | | 7-[illegible] |
| 7 | Polish | | | Belt | |
| 8 | Grind point | Bench Grinder attachment | T-319 | 1030 | 3-E |

FIG. 2.—OPERATION LIST SHOWING VARIOUS TOOLS USED.




UPPER VIEW, FIG 3.—SHOWING THE ARRANGEMENT OF TOOLS FOR CUTTING OFF BLANKS.
LOWER VIEW, FIG. 4.—TOOL FOR ROUGHING TURNING POINT HELD IN CHUCKING LATHE.

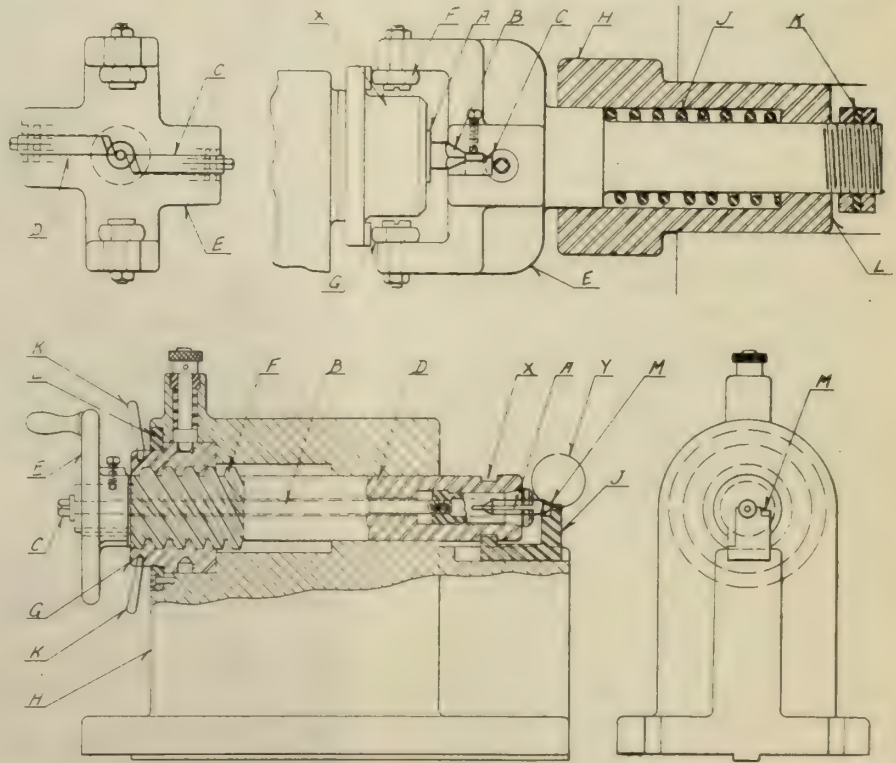
The purpose of this cam will be better understood by reference to Fig. 5, which shows the finishing tool in operation, the roughing tool being used for cutting away the bulk of the metal while the finishing tool completes the relieving of the tapered portion. In Fig. 5, A and X represent the chucking members. The drill is being turned by the two cutters C and D; these tools are adjusted and are mounted in the body of the holder E and held by set screws. The two rolls F and G are supported on the outer forks of the tool holder on studs, as shown. The shank of the holder is held in the sleeve H, which is supported in one of the holes of the turret in the usual manner. The compression spring J keeps the working end of the tool in a forward position, the check nuts K limiting the travel of the holder. In operation the tools C and D commence turning the drill portion of the bit, and when doing so the turning head E is in the expanded position. When sufficiently forward the rollers F and G come in contact with the cam surface, and the head begins to oscillate back and forth, and this goes on until the countersink is finished with the desired relief. This motion, it is understood, has no effect on the parallel portion of the work.

The fourth operation, that of milling the grooves, is accomplished by means of the special fixture shown in Fig. 6, which is mounted on the table of a hand miller. The work is held in a collet, operated by means of the draw rod B passing through the spindle. At the rear of the spindle is the hand wheel E secured to the spindle D by a suitable set screw. The spindle has a coarse pitch thread F that engages with the nut G. The tool steel block J, used for supporting the outer end of the work, moves laterally with the movement of the spindle, the groove X allowing the spindle to revolve while retaining the relative position of the block J. The circle Y represents a cutter in position for cutting one of the flutes in the work.

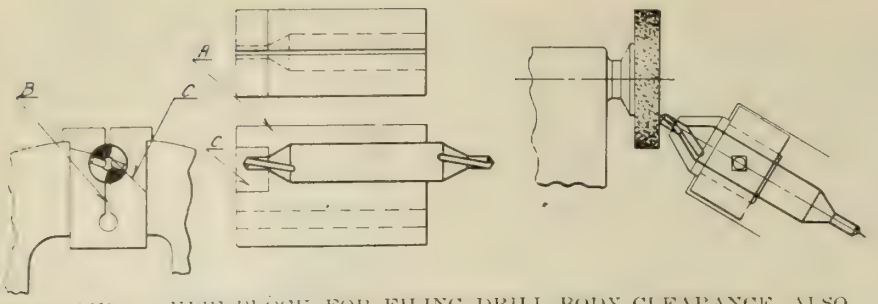
In operation the hand wheel E is turned, thus advancing, and at the same time revolving the work through a certain distance and angle, to cut the desired helical groove in the drill and countersink.

To mill the groove at the opposite end the bushing G is indexed 180 degrees, the index pin locking the nut in either position. The handles K are used for this purpose, the ring L retaining the nut in a fixed lateral position. Provision is made on the hand miller for the simultaneous lowering of the knee of the machine after the straight portion of the flute has been milled, giving the rear portion of the groove a reducing depth. The lowering of the table is controlled by a beveled portion M on the side of the sliding block J coming in contact with a roll on the cutter arbor. The machine is locked against longitudinal feed during these operations.

The combination drill and countersink is now practically completed, the remaining operations simply consisting of filing the relief on the drill diameter, hardening, tempering, polishing and grinding the point. To relieve the drill diameter a filing block as shown in Fig. 7 is employed. The block A is held in a bench vise and is split at B and hardened so that it will have sufficient spring for self relief. For backing off the drill the block is cut away at C to serve as a guide. It will be noted that when the work is placed in the machine for milling or in the vise for filing, it should be located radially with the relief of the countersink; this can be done by




UPPER VIEW, FIG. 5.—TURNING AND RELIEVING TOOL USED IN CHUCKING LATHE.
LOWER VIEW, FIG. 6.—FIXTURE IN WHICH COMBINATIONS ARE MILLED.




FIGS. 7 AND 8.—VISE BLOCK FOR FILING DRILL BODY CLEARANCE, ALSO METHOD USED TO GRIND THE DRILL POINT.

setting the high point of the relief tangent with a line on the sliding block in the case of milling, or in line with the surface C when using the filing block. Hardening and tempering is accomplished in much the same manner as is customary for small tools having similar characteristics.

Fig. 8 shows a suitable arrangement for grinding the point of the drill; this consists of a bushing mounted in a rotary fixture, similar to those of regular drill grinders, where the drill is oscillated across the side of a wheel, resulting in an accurately ground point.

These tools would by no means give the maximum amount of production for a job of this kind, but what they are intended for, and do provide, is a good method of making this particular tool, and still keeping within theoretical limits of accuracy. They will do this economically, may be used for various sizes with slight modification of holding fixtures, and are of that type of tools found most useful in plants making their own small tools used for production manufacture.

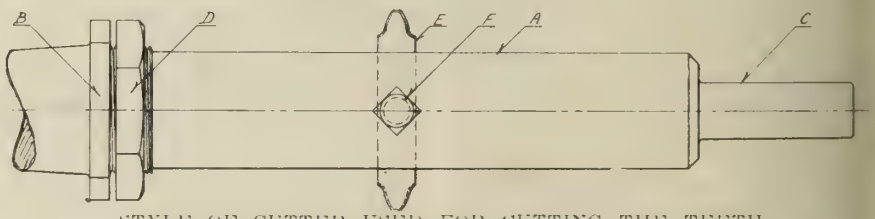
## MILLING ON A SLOTTING MACHINE

By J. H. R.

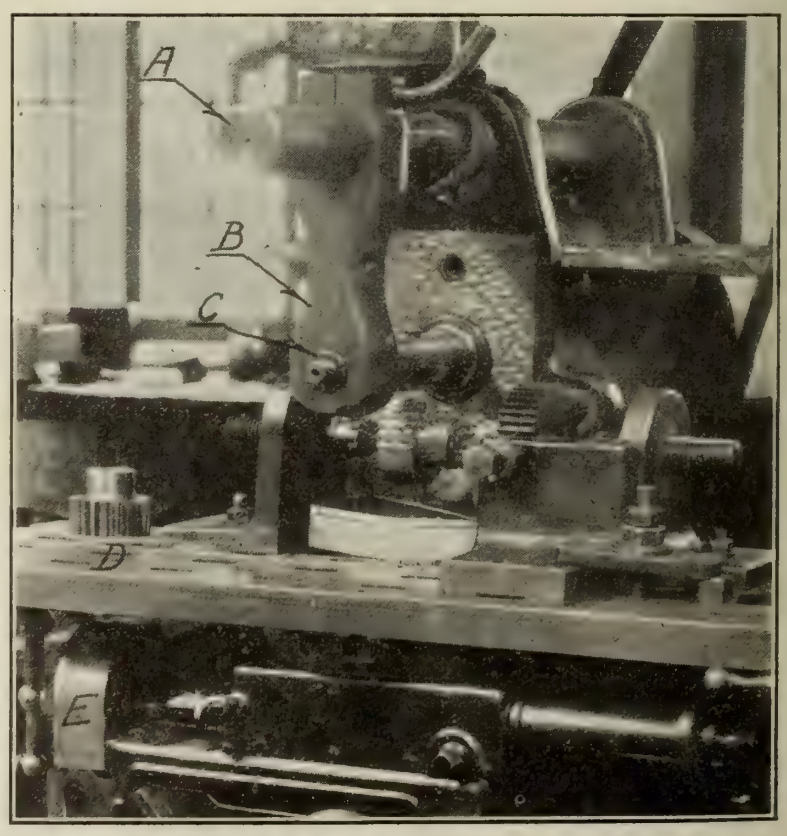
The accompanying article illustrates and describes a very interesting method adopted by the superintendent of a Montreal shop for meeting the needs of milling requirements without the purchase of a milling machine. While the range of work possible with this device will be considerably less than on a standard miller, it enables the shop to perform a lot of odd jobs that would otherwise be very difficult to accomplish. As will be seen from the cut, a small tool room Dill slotter has been utilized as a basis for the "milling" machine.

The crank shaft of the slotter was removed and a parallel bar A, inserted, this bar being extended at the front to carry the swinging arm support B, which may be clamped at any desired position. In place of the pinion drive shaft of the slotter a special spindle was used in the same bearings, but of additional length to carry the small feed cone on the rear end. The front end of the spindle has a tapered hole to receive the end of the boring bars or cutter arbors. Owing to the spindle being solid the bars or arbors are provided with special facilities for removing same from the bland tapered hole. The end of all bars are made to fit the hole in the adjustable split bush C. The work table D, is bolted to the regular circular table of the slotter. Power feed has been provided by means of the worm and worm wheel E, the latter being fitted with a special friction clutch, operated by a knurled nut on the feed screw. A bracket is secured to the lower part of the frame at the rear to support the back end of the telescopic shaft connecting the feed cone with the worm shaft. The short vertical feed screw of the slotter was replaced by one of sufficient length to raise the table high enough for milling operations, a hole in the base permitting the lowering of the table to its lowest extremity.

The illustration shows the machine set up to cut teeth in small pinions, the blank being held on a short arbor supported on centers specially made for this work from old angle brackets. These brackets were bored and threaded in the same jig to assure identical center height. Indexing is obtained by the use of a gear on the work arbor, with the same or divisable number of teeth. The indexing "finger" is a pointed screw held in an angle plate clamped to the work table. The cutting of the small pinion was performed by means of the double-ended fly-cutter E, shown in the line sketch, the shapes of the ends varying slightly to provide a roughing and finishing cutter. The collar B, is provided with flats which fit a corresponding slot in the nose of the spindle. Removal of bar is accomplished by means of the nut against the face of the spindle.




STYLE OF CUTTER USED FOR CUTTING THE TEETH.




GENERAL VIEW OF THE MACHINE IN OPERATION.

# Canadian Machinery Drafting Course, Part 2

The block type of lettering—Sections and section lining—Geometrical drawing—Various geometrical definitions—Six problems in geometry, including how to construct an angle equal to a given angle.

By J. H. MOORE

N the previous article, appearing in the June 2nd issue of Canadian Machinery, we discussed briefly the subject of mechanical drawing; the use of various instruments, and the making of plain Gothic style of lettering. We will next consider the block type of lettering shown at Fig. 1. At first sight this looks like a difficult style, but in reality it is very simple, for it is a mechanically produced style of lettering. The T-square and triangle are all that are required. For illustrative purposes we will suppose the letters are to be 5-16 inch high, and ¼ inch wide, except M, which is 5-16 inch wide, and W, which is ⅜ inch wide. The thickness of the lines in all cases will be 1-16 inch and the distance between any two letters of a word will be 1-16 inch, except when A follows P or F; where V, W or Y follows L; where I follows F, P, T, V, W or Y; where T and A are adjacent, or A and V, W or Y are adjacent. In these cases the bottom extremity of A and the top extremity of P, T, V and W are in the the eye will largely decide and discover same vertical line, etc. In other words, the proper spacing to use in such cases.

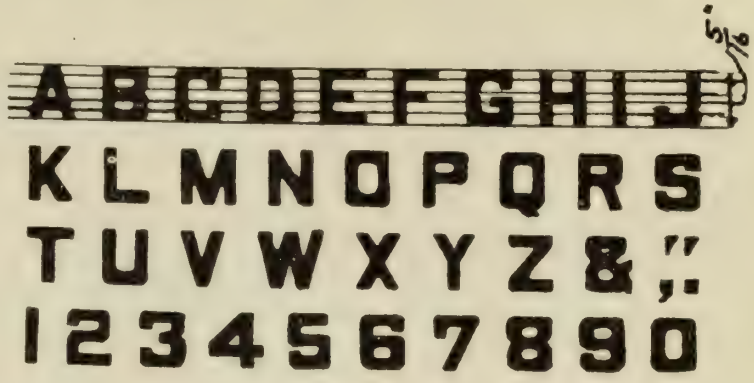



FIG. 2. PRACTICE THIS STYLE OF LETTERING CAREFULLY.

The letters being composed of straight lines, they can be made with the T-square and triangle. Draw six horizontal lines 1-16 inch apart, to represent the thicknes of the lines at top, center and bottom; then draw vertical lines with the triangle; these lines also being 1-16 inch apart. Having drawn the guide lines, proceed to construct the different letters, but in pencil only. After laying out the letters, start to ink in, using the regular ruling pen. It is a wise plan to ink all vertical lines first, then the horizontal lines, and last of all the oblique lines. By doing so, the chances of blotting are less, at the same time the letters are built up in their natural sequence. After the outline is completed, fill in the letters with an ordinary pen nib. Before leaving the subject of lettering, we feel that the necessity of care

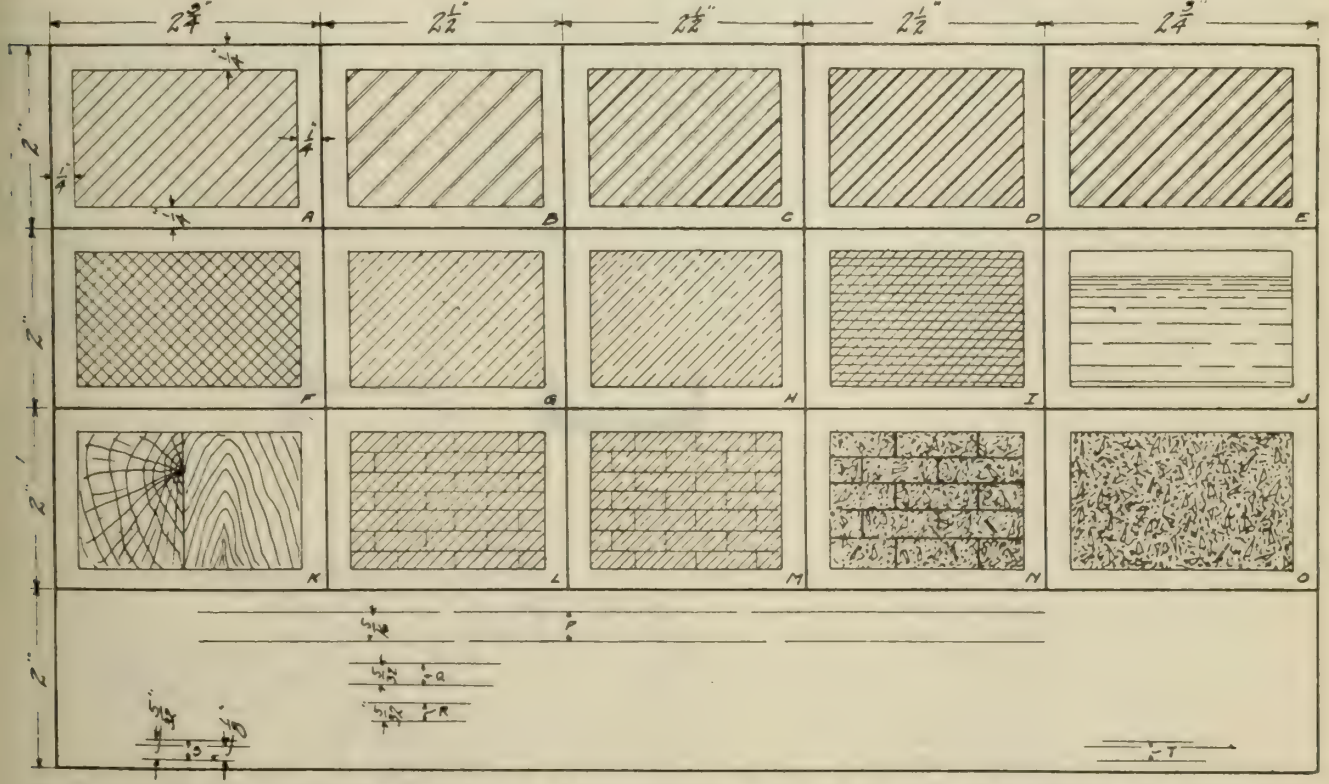
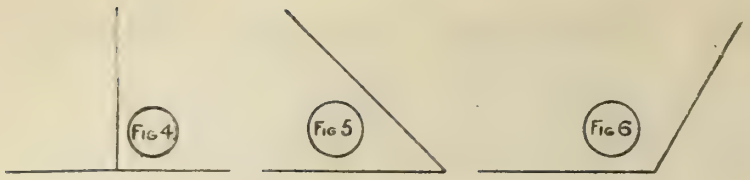


FIG. 2.—STUDY THE DIFFERENT MATERIALS REPRESENTED. MEMORIZE THEM IF POSSIBLE. IN LOWER PORTION OF THE PLATE LAY OFF SPACES AS SHOWN AND PRACTICE PRINTING. PRINT THESE WORDS, "CANADIAN MACHINERY DRAFTING COURSE." PRACTICE PLATE ON SECTIONING, ALSO PRACTICE IN GOTHIC STYLE LETTERING. PUT THE DATE IN LEFT HAND LOWER CORNER AND NAME IN RIGHT HAND LOWER CORNER. KEEP THE DRAWING AS A RECORD OF YOUR ADVANCEMENT.




FIGS. 4 TO 6. SHOWING VARIOUS TYPE ANGLES.

and practice should be emphasized. It is only by practice that you can make perfect.

### Section and Section Lining

When we speak of a section through a piece of work, who do we mean? Simply this, that to show clearly what otherwise would be hidden, and represented on the drawing by dotted lines, we cut clean through the center of things, or in fact through any portion of an object or objects to show its various details. To make such points as clear as possible, the various parts are section lined, these lines representing the material from which the parts are made. Unfortunately there is no universally adopted standard, thus a combination of lines in one drawing office may mean steel, while in another office the same lines might represent cast iron. In the majority of drawing rooms, however, the combinations are alike; and Fig. 2 illustrates 15 of these so-called standard shading or section lines.

Students should study these various materials closely, so that they can tell immediately, from memory, the material that any section lining represents. Following are the materials shown in Fig. 2. A represents cast iron, B cast steel, C malleable iron, D wrought iron, E wrought steel, F copper or zinc, G brass or aluminum, H composition, I insulating material, J water, L brick, M fire brick, N concrete blocks, and O represents concrete. Students should make it a point to lay out this exercise to scale, drawing in the various sectional blocks, for it will not only be good practice, but will help them remember the style of sectioning used for the different materials. Where lines are too near each other to be sectioned, they are simply blackened in as shown at Fig. 3. This style of sectioning is most frequently used for sectional views of structures composed of plates, rolled sections such as I beams, angle irons, etc.

On entering further into the question of sections we find that the lines do not always run in the same direction. For example, refer to Fig. 3. Here we note a sectional view that shows more than one piece. It is a general rule among draftsmen that each part of the same piece is section lined in the same direction, irrespective of its continuity. By this means, after one has grasped the principle of sectioning, they can easily ascertain if at various parts of the section the same piece appears. In a later lesson we shall tell the student how to make sections from sketches and objects, but the chief idea at present is to get a good grasp on the real principle of sectioning.

Referring again to Fig. 3, let us discuss it in detail. The line A B is of course the center line, threfore this view would be termed section through A B. It will be noted that portion C is shaded similar to section A, Fig. 2; this we find to be cast iron. Parts D and E are sectional similar to section B, Fig. 2, and on looking this up we discover the material is cast steel. Note, however, that the section lining on these two parts run in opposite directions. This shows that they are two separate pieces. Thus we arrive at the conclusion that the view shows three different pieces: a cast iron holder C; a cast steel bushing D; and a nose piece E. In planning to make a sectional view, about the best method to tackle the proposition is as follows: Imagine you have a saw in your hand and that instead of the materials being various steels, iron, etc., they are all of soft wood. You are about to saw through some determined portion of the assembled pieces, calling the line of direction A B. Start work (that is, in your imagination) and wherever your saw touches that is where section lining must go. Thus, if you suddenly hit a hole with your saw, the section lining will show all around the hole, but not at the hole. This explains why a portion of the piece C is not section lined, for there is a hole running through the part up to the bushing D. Let us impress on students the necessity of neat work. Space the shading equally, for nothing looks worse on an otherwise well prepared drawing than poor section lining.

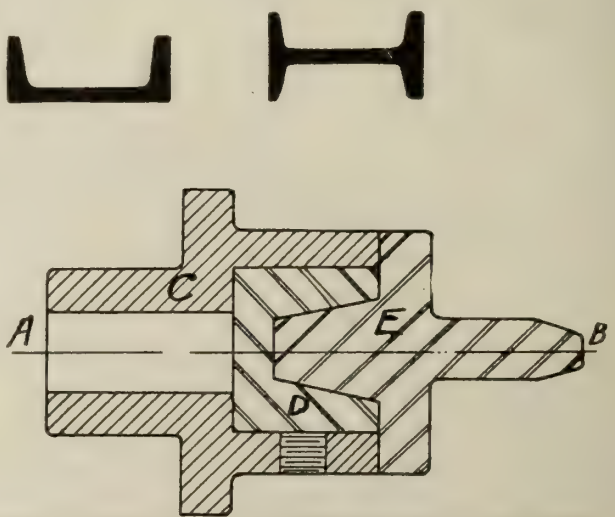



FIG. 3.—THE IDEA OF SECTIONING IS APPARENT FROM LOOKING AT THESE SKETCHES.

### Geometrical Drawing

For the sake of the average student we would like to omit the subject of geometrical drawing, but believing that a groundwork on the subject is absolutely essential, we will take up a few of the more important problems. The average mechanic may not see the force of learning this subject as part of mechanical drawing, but let him rely on our judgment, read about these problems, and later on he will find out why we included them in the course.

Geometrical drawing is the art of becoming acquainted with the various lines and figures; what particular properties these figures have, and what bearing they have on mechanical drawing. One of the main ideas in geometric drawing is accuracy, so be sure you follow the problems carefully, drawing up the examples accurately, otherwise the benefit of this section of the course is lost. In geometrical drawings we speak of definitions which of course mean an explanation of the various lines and figures involved in the study.

### Geometric Definitions

For example, a point is used to mark a position and has neither length breadth nor thickness.

A line has length only. It is produced by the motion of a point.

A straight line is one that has the same direction throughout. In other words it is the shortest distance between any two points.

A curved line is one that constantly changes its direction. Sometimes it is termed a curve.

A broken line is one made up of several straight lines.

A horizontal line is one that has the direction of a line drawn upon the sur

face of water which is at rest. In other words a line parallel to the horizon.

Parallel lines are lines which lie in the same plane, and are equally distant from each other at all points.

A vertical line is one that lies in the direction of a cord suspended from its upper end, having a weight at its lower end. It is a line which is perpendicular to the horizon.

An oblique line is one that neither conforms to the vertical nor horizontal.

Examples of lines already spoken of are as follows:

Lines drawn with the T-square are all parallel to each other. A line drawn by means of the triangle on its straight side, together with the aid of T-square, is a vertical line. A line drawn with the sloped side of triangle with same conditions as above will be an oblique line.

If two lines cut each other they are called intersecting lines, and the point where they cut is called the point of intersection.

An angle is the measure of the difference in direction of two lines. The lines are called sides and the point of meeting the vortex. The size of an angle is independent of the length of the lines.

If one straight line meets another, as in Fig. 4, so that the two angles thus formed are equal, the lines are termed perpendicular to each other, and the angles formed are known as right angles.

Should the angle be less than a right angle it looks like Fig. 5 and is termed an acute angle.

Should the angle be greater than a right angle it is termed an obtuse angle and appears as shown at Fig. 6.

Before going further into the other various definitions let us consider these already given as sufficient for this first portion on geometrical drawing. In this way the student will not have to carry in his head too many definitions at once, but will be able to concentrate on the particular ones he requires.

For the sake of practice, prepare the plate shown in Fig. 7, making the border lines of the drawing 8 inches by 13 inches. Divide this space into six spaces as shown. Commencing at problem 1, here are the methods of working out these problems.

### No. 1—To Bisect a Straight Line

To construct: First draw a straight line AB 3¾ inches long. With A as a center and a radius greater than one-half of the length of the line, describe an arc of a circle on each side of this line AB. With B as a center and the same radius, describe arcs as before, intersecting the first two at the points C and D. Join C and D by the line CD, when the point E, when it intersects AB, will be the required point. In other words, AE=EB, as E is the middle point of AB.

This problem could also be termed erecting a perpendicular line to a straight line from its middle point, for the line CD is in the middle of AB and is perpendicular to it.

The next problems, Nos. 2 and 3, can be classed under the one heading, namely, to erect a perpendicular to a given line from a point in that line. We will take up two cases. In problem 2 we will consider the task when the point is near the center of the line.

Draw AB 3¾ inches long. Let C be the given point on the line. With C as a center and any radius, such as CD, describe two short arcs cutting AB at the point D and E. With D and E as centers, and any convenient radius greater than CD, describe two arcs intersecting at F. Draw CF and that line will be perpendicular to AB at the point C.

In problem 3 we take up a case where the point is near the end of the line.

Draw AB 3¾ inches long. Suppose C about ½ inch from the end of the line as shown. With any point D as a center and a radius DC, describe an arc cutting AB at C and E. Draw ED and produce it until it intersects the arc at the point F. A line drawn through F and C will be perpendicular to AB at the point C.

### Problem 4—Through a Given Point to Draw a Straight Line Parallel to a Given Straight Line

First, let AB be the given line 3¾ inches long. Let C be the given point. With C as a center and any convenient radius, describe an arc DE intersecting AB at E. With E as a center, and the same radius, describe the arc CF intersecting AB at F. With E as a center and a radius equal to the chord of the arc CF, describe an arc intersecting DE at D. A straight line drawn through D and C will be parallel to AB.

### Problem 5—To Bisect a Given Angle Where the Sides Intersect Within the Limits of the Drawing

To construct. Let ABC be the angle to be bisected. Draw the sides AB and BC 3¾ inches long. With B as a center and any convenient radius describe the arc DE intersecting AB at D and BC at E. With D and E as centers, and a radius greater than the chord of half the arc DE, describe two arcs intersecting at F. A line drawn through F and B will bisect the angle. In other words, ABF will equal FBC.

### Problem 6—To Construct an Angle Equal to a Given Angle

Draw AB 2½ inches long, and the line BC 2½ inches long. The angle formed by these lines may be any convenient size; in this case we will call for 45 degrees. This angle ABC is the given angle.

Now draw DE, a horizontal line 2½ inches long, and let D, the left-hand extremity be the vortex of the angle to be constructed. With B as a center and any convenient radius, say about 1½ inches, describe the arc FG, cutting both AB and BC. With D as a center, and the same radius, draw the indefinite arc HJ. Next set the compass so that the distance equals the chord FG. With H as a center and a radius equal to FG, draw an arc, cutting HJ at J. Through D and J draw a straight line. The angle JDE will now be equal to the angle ABC.

In drawing these exercises use a good 4H or 6H pencil, making sure it is perfectly sharp. Draw the pencil lines lightly, then after completion ink them in as shown at Fig. 7. Memorize the problems if posible, and above all, be accurate, as otherwise you may as well not do them at all. In our next lesson we will go further into the subject.

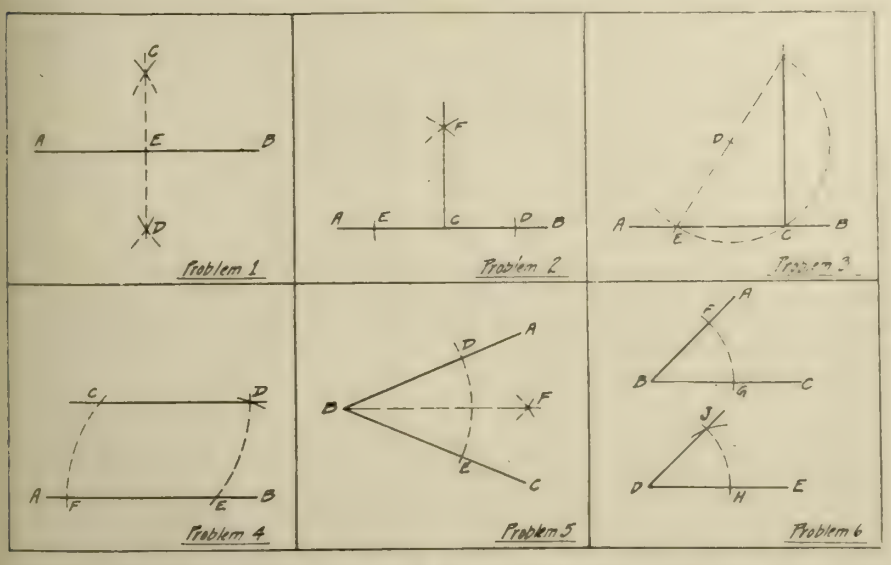



FIG. 7.—TO BE OF ANY VALUE, THIS PLATE MUST BE ACCURATELY DRAWN.

# One Method of Manufacturing Ball Bearings

The plan adopted by an English concern—Description includes annealing—Removing of fins—Lapping—Inspection, and other interesting operations. Method of inspecting balls especially noteworthy.

THE manufacture of ball bearings is at all times an interesting study; in fact very little is known about the process. In a recent article in Engineering, the method employed by the Ransome & Marles Bearing Co., Ltd., Newark-on-Trent, is discussed, and following are some of the interesting points brought out, the subject being confined in this case to the manufacture of the balls themselves.

The greatest interest for the ordinary engineer lies in the manufacture of the balls themselves as the product is unique amongst engineering articles and the methods of manufacture have been heretofore considered as trade secrets. The raw material is in the form of wire or rod according to the size of ball required. It consists of chrome steel, the proportion of chromium varying with the size of the ball. For a ½-inch ball the percentages of the important alloys would be about as follows: Chromium 1.28, carbon 1.06, manganese 0.5 per cent. Originally it used to be the custom for the first operation to consist in turning the balls from the rod in a lathe, and this practice is still followed by some makers.

This concern, however, always forge their balls, as this not only saves material, but improves the quality of the material by reason of the mechanical work done upon it. If balls of both respective kinds are strongly etched with acid, the forged balls are attacked less severely and over a smaller area, the difference in the corrosion being sufficient to enable the method of manufacture to be determined with practical certainty. The corrosion is always worst on the end grain of the material, and the areas of the grain are smaller in the case of the forged balls, while the grain is denser because of the deformation of the metal by the dies.

The material from which the balls are to be made is of course put through the usual chemical and physical laboratory tests before it is issued to the works. It has to be correct as to composition and crushing strength, and furthermore a piece cut from the bar, one and a half diameters long, has to stand crushing cold to two-thirds of its original length without showing any sign of flaw or splitting. Balls of ½ inch diameter, and over, are forged hot, the first operation being to shear the bar into slugs, each of sufficient length to make one ball. This is done cold. These slugs are then heated in a gas-fired muffle, and placed one by one in the fixed hemispherical die of the stamping press. The ram contains an exactly similar die, and one blow converts the slug into a sphere with a thin fin of extruded metal round its equator. The ball is ejected from the die and rolls down an inclined chute into a tray beneath the adjoining press. The operator here picks it up with tongs while still red-hot and places it on the flashing die. The descending ram forces it through this die, thus shearing off the "flash" and leaving the ball practically spherical. These presses will turn out about 3,600 one-inch balls in a day of eight hours.

### Annealing

The forged balls are next annealed in gas-fired muffle furnaces and then rough-ground all over. This is one of the most interesting processes from the manufacturing point of view. The machines on which the operation is performed have a vertical spindle carrying a large annular grinding wheel, the upper flat face of which does the work. Immediately above this wheel is a fixed annular plate, the inner edge of which is bevelled to an angle of about 45 degrees. When the machine is working a circular bevelled plate occupies a position centrally in the fixed outer ring, so that between the edges of these plates there remains an annular vee-shaped groove, open at the bottom. The annular groove is filled with a row of the forged balls, upon the top of which a heavy horizontal wheel descends, pressing them into the groove. This wheel rotates, causing the balls to roll round and round the groove, and the portion of them which projects through the open bottom of the groove is acted on by the grinding wheel running at a high speed immediately beneath. The grinding wheel is fed upwards by a micrometer feed, which is automatically tripped at a predetermined point. The spindle of this wheel is mounted eccentrically to the ball groove, so that the wear on the wheel takes place evenly across its face. The eccentricity of the grinding wheel together with the fact that the path of the ball on the inner side of the groove is longer than its path on the outer side causes the ball to spin about a vertical axis as well as roll about a horizontal one, and the consequence is that it is effectively ground all over. The work is done dry, the dust being removed by an exhausting arrangement fitted to each machine. Each machine will take about one hundred ½-inch balls, and will rough grind them in about twenty minutes. They are removed by lowering the centre bevelled plate by means of a lever at the side, when the balls of course run out. The next operation is to finish-grind them, which is done on precisely similar machines using a finer grade of stone. The balls are then about 0.006 inch over the finished size and are, of course, in the soft condition.

To make the account of ball-making complete, we must now return to the manufacture of the smaller sizes of ball, which, as we have said, are not hot forged. The steel for these balls is used in the form of coils of wire or rod, and the balls are first formed on cold-heading machines. The wire, which for the ⅜-inch ball suitable for the bearing which we have previously described would be 0.275 in diameter, is automatically and intermittently fed through the machine by means of a ratchet device. It emerges through a quill, and the projecting end is sheared off by a knife fitted with spring fingers which hold the slug and carry it forward to the dies. As these close on it, the fingers are withdrawn, and the slug is pressed into a ball having a fine fin around its centre. The balls, so formed, drop into a tray as the dies separate, and are then annealed in gas-fired muffles.

### Removing Fins

The next operation is to remove the fins, or flash as it is termed. For this purpose the balls are put into a knurling machine in which they are repeatedly rolled between the fixed and moving faces of a pair of case-hardened steel plates. The opposing faces of these plates are furnished with annular semi-circular grooves having knurled concave surfaces, between which the balls roll. The plates are mounted on a horizontal axis, one being stationary and the other driven by the machine. The stationary plate has a parallel gap from the edge to the centre, this gap being horizontal when the plate is mounted. The balls being rolled round the grooves by the motion of the running plate, descend to the top of the gap and escape from the machine into a spiral chute, down which they flow and are conducted to the ends of the grooves on the lower side of the gap. They become mixed in the chute so that they enter different grooves for their next revolution, and this process is continued until they have all their fins and scale removed. These same machines are used for the subsequent lapping or the balls, the knurled gap-plate being then replaced by a gap-plate with plain grooves and a grinding wheel being substituted for the running plate.

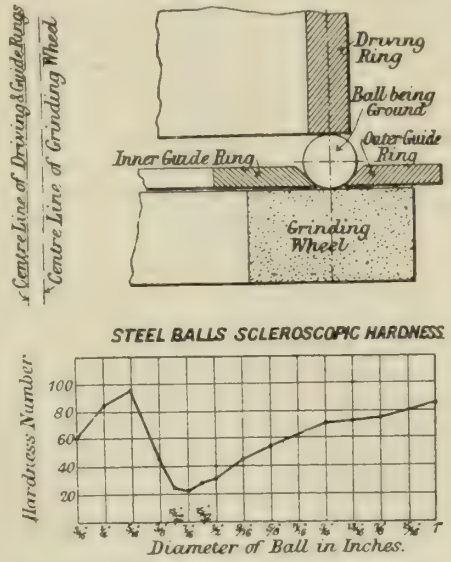
After knurling, the cold forged balls

are rough-ground, and finish-ground exactly as described in the case of the hot-forged balls, and from this point onwards the operations carried out on both types are identical.

The next operation is to harden the balls. They are heated in rotary furnaces by a continuous process. These furnaces have in their interior a hollow spiral pipe, and at every revolution the inlet end of the pipe receives a certain number of balls which gradually roll towards the outlet end as the furnace rotates. The principle is in fact similar to that employed in the Archimedean screw. The spiral pipe is kept heated by gas flames playing into the interior of the furnace, and the balls traverse the furnace so slowly that they remain for a long time at the "soaking" heat, and finally fall out into a bath of oil or water according to size, in which they are quenched. An electric pyrometer enables the temperature of the furnaces to be maintained at a degree which has been found experimentally to suit the size of ball and the class of steel of which they are made, the usual temperature being in the neighborhood of 800 degrees C.

After hardening, the balls are tempered by being boiled in oil or water, according to the size, and the results required. They are then descaled by being run in tumbling barrels along with a mixture of potash and grit, and a second course of barrelling with potash and fine abrasive finishes their surfaces sufficiently for the hardness test. This test consists of crushing to destruction in a hydraulic press ten balls from every batch. Each ball is crushed separately between a pair of hardened steel dies, the pressure required to do this being noted on the hydraulic gauge. Bags are wrapped around the dies before the pressure is put on and the operators are further protected by means of a movable steel guard as a properly hard ball bursts under the pressure with almost explosive force, and the flying fragments might cause serious injury. Should any of the balls be soft, or should they not all show the same hardness within reasonable limits, the whole batch is rehardened.

It is curious to note that should a ball be subjected to pressure greater than about half the ultimate crushing pressure, and then be removed from the machine, it will almost certainly fly to pieces suddenly and spontaneously within a space of time varying from a few minutes to a few hours. An examination of the fragments of a crushed ball is also interesting. At the points between which the pressure is applied a sharp pointed cone of crushed metal seems to be formed, and the driving of these cones into the body of the ball appears to be the ultimate cause of its bursting. It may be mentioned at this point that the scleroscope hardness test conveys practically no useful information as to the hardness of a ball. The rebound of the hammer, which gives the scleroscope reading, is much more dependent upon the size of the ball than upon its hardness, and in fact if a series of balls of equal hardness be tested under the scleroscope, the size of any ball can be fairly confidently stated if the respective scleroscope reading is known. The scleroscope number, moreover, is not by any means a simple func-




UPPER VIEW.—METHOD OF GRINDING THE BELLS.
LOWER VIEW.—ACTUAL SCLEROSCOPE READING OF A SERIES OF BALLS OF GRADUALLY INCREASING SIZES.

tion of the size of the ball. Small balls give a high scleroscope number which diminishes to a minimum for balls of about 7-16 inch diameter, and then increases more slowly as the size of the ball tested increases.

The sketch with this article shows the actual scleroscope readings of a series of balls of gradually increasing size, from 3/16-inch diameter to 1-inch diameter, and all of equal hardness within commercial limits. The shape of the curve is very curious. The value for a 7/16-inch ball is just about the same as would be obtained for a ball of equal size, but in the soft state. The reason for the strange results of the scleroscope test when applied to balls is not yet fully explained. It appears to be due to the reflection back of the pressure wave produced by the blow, the reactive effect on the hammer depending upon the phase of the returning wave. This will, in turn, depend upon the size of the ball.

### Lapping

Returning once more to questions of manufacture, the balls when passed for hardness have next to be "lapped." This word is really a misnomer, or at any rate it does not convey any idea of the process to an ordinary engineer. The lapping machines are the same machines as used for the knurling process, described above. The plates used are of chilled cast-iron and the grooves are semi-circular in cross-section, with a narrow rectangular trench cut back into the plate at the centre of each of them. The grinding wheel is a disc, one of the flat faces of which presses the balls into the grooves and drives them round the fixed plate by its rotation. As in the case of knurling, the balls escape at the place where the slot occurs in the fixed disc, and pass down a spiral chute to re-enter the grooves below the slot. A stream of paraffin plays on the balls passing down the chute. The grinding wheel is forced against the balls with a pressure of from 400 to 600 pounds, the exact pressure being indicated by a gauge on each machine.

There are altogether three separate lapping operations, all exactly similar to each other, except that the stones are successively of finer grade. The balls leave the first lapping machine from three to ten thousandths of an inch over size. They leave the next machine about one ten-thousandth of an inch over size and leave the last machine practically dead to size and with a high finish. A good deal more has to be done to them, however, to obtain the perfect polish which is characteristic of the commercial article. The operation next after lapping consists in tumbling the balls in a barrel containing rouge powder and scraps of leather. This is continued for many hours and the balls emerge from the process highly polished. They are next given a final shine in another tumbling barrel containing a solution of potash, remaining in this barrel for perhaps eight hours to sixteen hours. There is, however, a limit to this treatment because a too long-continued immersion in the potash solution spoils their color by developing a brownish tinge. The final treatment which they undergo consists in being tumbled in yet another barrel along with leather and sawdust, which dries them and gives them the very last touch in polish.

During the later stages of the lapping processes and also during the tumbling operations, the balls are very carefully gauged, as the object of all these operations is to produce a batch of balls not only as perfectly polished as it is possible for them to be, but also all of exactly the required size. In this connection it must be remembered that "exactly" has a meaning which verges upon that of "absolutely," for in a ball-bearing factory a ten-thousandth of an inch is regarded as a "door step." The final gauging of the balls cannot take place until they have had twelve hours or so to lose the warmth which they contain upon removal from the drying barrel. During this interval they are visually inspected for cracks, flaws or soft spots.

This work is done by girls who acquire a most remarkable skill in detecting instantly any defect which could hardly be seen by the untrained eye even when pointed out. It might be thought that there was a likelihood of defects of the kind we have mentioned escaping notice, but it is found that the results of the visual inspection are perfectly reliable as a second inspection by a different operator will produce identical results.

### Inspection

Inspection is carried out in a well-lighted room, the girls being seated at a table and each provided with a light shallow rectangular tray into which ten or a dozen balls are placed simultaneously. The bottom of the tray is lined with white paper, the surface of which is reflected on the underside of the polished balls, and renders any defect in them visible to the trained eye. A momentary glance at the row of balls suffices, and then they are rolled about by the motion of the tray, so as to present a fresh part of their surfaces for inspection. When the whole of the surface has been examined and any defective ball picked out, the remainder are tipped into a box for gauging. One of the defects which the visual inspection has to reveal is the presence of soft spots in the otherwise hard balls. It is not clear how these can occur, but they do. Their existence is shown by a kind of brown cloudiness on the surface of the ball, which would never be noticed, or its significance suspected, except by the trained inspector. The softness is only relative to the glass-hard surface of the rest of the ball, but if the ball be tried for hardness with a file, it can be seen under the microscope that while the normal surface is absolutely unaffected, the soft spot has been marked by the file teeth. The microscope also shows the reason for the visibility of a soft spot. The surface there is minutely pitted, and lacks the high polish which the various operations have produced on the harder parts. It need hardly be said that absolute cleanliness is necessary for visual inspection to be practicable. The inspectors all wear gloves of soft chamois-leather, and also have chamois-leather cloths to place the balls on, as the slightest trace of grease would make examination impossible. A girl will inspect about 5,000 ½-inch balls in an eight-hour day, and the number found imperfect may be estimated from the fact that in a batch of 20,000 which had just been inspected at the time of our visit, 344 were rejected for soft spots, 81 for cracks and 247 for surface defects. This, however, is somewhat more than the usual percentage of rejections.

The balls which have passed visual inspection are next sent to the gauging room, which is kept at a constant temperature. The actual process of gauging consists in passing every individual ball through a ring gauge, which is set by a standard ball known to be accurate within the limits of possible measurement. Every ball which leaves the works is guaranteed to be within plus or minus 0.0001 inch of standard size. The girls who do the gauging push the balls through the plate, and determine by the sense of touch whether they are within permissible limits of size. Those thrown out, or about which there is any doubt, are tested on a minimeter which gives a highly magnified reading of the measuring points by means of a long pointer.

Although the guaranteed accuracy of the balls is within plus or minus 0.0001 inch of size, the actual variation in size between the balls in any bearing manufactured by Ransome and Marles is very much less than this. The balls are graded into a total of eight sizes intermediate between the limiting permissible sizes. The difference in size between the balls of any two successive groups is therefore only 0.00002 inch, or one fifty-thousandth of an inch, and all the balls in one bearing are taken from the same group. This almost incredible accuracy is of course not guaranteed, but it is aimed at and practically attained in the works we are dealing with. The method of grading is for the gauger to place all acceptable balls in one or other of three different heaps, according to the ease or otherwise with which they pass through the ring. There is thus an over-size heap, an under-size head and a standard heap. The two former heaps are then passed again through ring gauges, the latter being set to sizes fractionally higher or lower than the standard size. By repeating this process the whole of the balls are sorted into groups of size, varying, as we have said, by only about one fifty-thousandth of an inch. On the occasion of our visit to the works of the Ransome and Marles Bearing Co., Ltd., we picked out three balls at random from one of the boxes into which they were being sorted, and we saw them afterwards measured on a Societé Genevoise measuring machine, when they were found to be all exactly 0.00002 inch less than standard size.

## CAPACITY OF ROUND TANKS.

$D$ = Diameter in Ft. $H$ = Height in Ft.

Area of Segment $= \frac{4H^2}{3}\sqrt{\frac{D}{H} - .608}$

Vol. of $H = \frac{4H^2}{3}\sqrt{\frac{D}{H} - .608} \times L = X$

$H$ Capacity in U.S. Gal. $= X \times 7.48$

$H$ Capacity in Br. Imp. $= X \times 6.23$

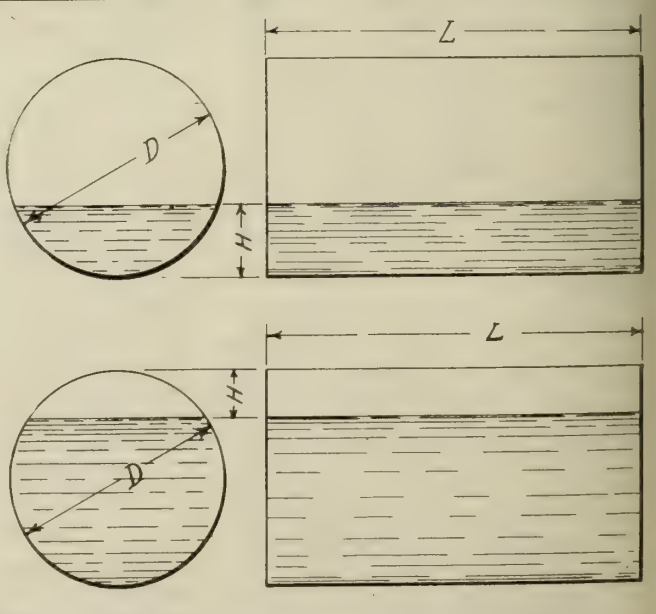
This Formula Is Good Up To Half The Tank.

FOR TANKS OVER HALF FULL.

Vol Contained In Tank.

U.S. Gal. $= \left(.7854 \times D^2 - \frac{4H^2}{3}\sqrt{\frac{D}{H} - .608}\right) \times L \times 7.48$

Br. Imp. $= \left(.7854\ D^2 - \frac{4H^2}{3}\sqrt{\frac{D}{H} - .608}\right) \times L \times 6.23$




Canadian Machinery.

IT WILL BE GOOD POLICY TO CUT OUT THESE CHARTS, USING THEM FOR FUTURE REFERENCE PURPOSES.

# Improve Your Powers of Perception—Try This Contest

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.




The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

## What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

Six contestants submitted correct lists to the May 19th contest, these being Peter Hubert, Sydney, Cape Breton; J. R. Smith, Montreal; A. J. Murray, North Sydney, N.S.; George Land, Peterboro, Ont.; B. Back, Hamilton, Ont.; and J. A. Scarsbrook, Winnipeg, Man. By our elimination method, Peter Hubert, 70 Park St., Sydney, Cape Breton, was declared the winner. Who will be the next?

**CONTEST FOR JUNE 9TH ISSUE**

**Contestants are required to write us, stating to which advertisements we refer in this number.**

1—Something that skilled machinists prefer
2—Where time is expensive.
3—Five accusations against a familiar sight in the machine shop.
4—Something noted for its uniformity.
5—How to secure increased production per unit of floor space
6—A method of getting over the rush order problem.
7—Something that is merely an indication.
8—A product said to cause lower operating costs.
9—Something said to be always superior
10—How to make every dollar a judicious investment.
11—A product that has a part, that is said will not work loose.
12—Something that represents strength and economy.

**These are Correct Answers for List from May 19th Issue:**

1—C. E. Johansson, Inc.
2—Hodge Mfg. Co. of Canada, Ltd.
3—John Bertram & Son Co., Ltd.
4—H. W. Petrie, Ltd.
5—Alfred Herbert, Ltd.
6—Nova Scotia Steel & Coal Co., Ltd.
7—Canadian Ingersoll Rand Co., Ltd.
8—Ford-Smith Machine Co., Ltd.
9—Brown-Boggs Co., Ltd.
10—Canadian S. K. F. Co., Ltd.
11—Canadian Hart Products, Ltd.
12—Canadian Link Belt Co., Ltd.

## Closing Date for This Contest is June 30th

# How To Select The Proper Broach For The Work

SOME very interesting points are brought out on the use and care of broaches in a recent booklet issued by the Velco Manufacturing Co., Greenfield, Mass. Here are some of the paragraphs included:

The field for the application of broaching is wide, and a great increase in production follows its adoption. When there has been dissatisfaction it is likely to have arisen from misapplication or misunderstanding of the requirements, on the part of the broach maker. The broach is in every sense of the word a production tool. Under proper working conditions and with careful use, a broach will produce a large number of accurate holes at a very low cost per piece. Being a delicately hardened tool, the broach is easily broken by careless or improper use. Frequent breakage causes serious loss and inconvenience. Production must be held up until replacements can be secured, and the broken broach has no salvage value.

Care in selecting the proper broach for the work at hand, proper preparation of the piece to be broached and a correct set up of the broach in the broaching machine will go far toward reducing breakage to a minimum.

### Selecting the Proper Broach

In designing a broach it is essential that the manufacturer know fully the conditions under which the broach is to operate. If the information tabulated below is given, a satisfactory broach should result:

(a) Kind of material broach is to cut. (b) Length of the work, i.e., length of surface actually to be broached. (c) Method of preparing the work for broaching. Whether drilled, bored or cored. (d) Size of the smallest hole in which broach must start. (e) Give every dimension of the finished hole desired, and the limits of accuracy expected. Note —A broach should be made to the high limit as it may be ussed longer before wearing undersize. Very close limits of accuracy increase the cost of the broach due to increased cost to manufacture. (f) The make and size of the broaching machine on which the broach is to be used.

It is desirable that the manufacturer be supplied with a blue print or sketch of the piece to be broached. When possible send a few sample pieces so that the broach may be tested before shipment. If it is impossible to send a sample of the work, should the limits be close, the gauge which will be used in the broacheld hoe will aid the manufacturer. Upon receiving the broach do not attempt to judge its accuracy by measurement of the broach itself. The accuracy can be correctly determined only by measuring the hole produced. Experience and experiment have taught the broach maker that certain allowances must be made for the spring of the metal. This differs with various metals and is often allowed for in the design of the broach. Hence the dimensions of the broach may differ from those of the hole it will produce.

A broach should be used only in the work for which it was designed. If the broach is to be used for several lengths of work, the maker should have this information. Then, if the variation is not too great, the broach may be designed to meet the conditions. If the piece to be broached is greater than that for which the broach was designed there will not be sufficient chip clearance. The teeth will fill with chips and rough up the surfaces of the hole. If the strain becomes too great, a broken broach will result. On the other hand, if work is much shorter than the intended capacity of the broach is attempted, there will not be enough teeth in the work at one time. The broach will drift, or crawl, and produce an off-size hole.

Short pieces may be stacked on the broach until the necessary length is reached. This is dangerous practice, unless the length of each piece is greater than that of the tooth pitch of the broach (the distance between tooth faces) a piece may drop down between the teeth of the broach and cause breakage. In stacking work it is very important that both faces of each piece are finished true with the bore.

### Preparing the Work

The hole in which the broach is to start should be drilled or bored. It is possible to start from a cored hole, but the sand and scale soon impair the accuracy of the broach. The face of the work that rests against the face plate should be finished, and be true with the bore. Accurate results are impossible if the latter rule is not observed. Certain soft "stringy" steels often tear out at the edge of the hole. This can be eliminated and the finish improved by heat treating so that a Scleroscope reading of from 25 to 30 is obtained. If material much harder than this is encountered excessive wear on the broach will result, and can be avoided by annealing the work.

### Lubrication

The cutting lubricant plays an important part in the broaching operation. There is a wide difference of opinion as to the best lubricant for the various metals. Those mentioned have been found successful in many plants. Soda and water will improve the finish of cast iron and wash the chips from the broach teeth. For steel a soluble oil of the following composition is popular and inexpensive: 2½ pounds soda ash, 3 gallons mineral lard oil, 50 gallons water. Mix soda and lard oil together in ten gallons of water, then add 40 gallons of water. Kerosene is frequently added to this mixture if the steel is very tough. In broaching aluminum, turpentine or gasoline have proved satisfactory.

The method in which the cutting lubricant is applied is important. The stream of lubricant should be directed into the hole at the top, so that as much as possible will enter with the broach. Square broaches should be pulled with a corner upward. The cutting lubricant then flows down and aroundboth sides and does not spatter off, as would be the case if the flat surface were upward. Spline broaches should be so slotted that the channel between two of the splines will be at the top. The channel then serves to conduct the cutting lubricant into the hole with the broach.

### Broaching "Kinks"

As a broach becomes dull a tendency to drift may develop. This is overcome by sharpening the teeth on the opposite side from that toward which the broach tends to drift. Dull broaches may be greatly improved by sharpening with an oil stone. Very dull broaches should be returned to the maker for re-grinding.

It is difficult to re-grind a broach without special equipment. Even with a suitable grinder it is seldom that a satisfactory cutting edge is obtained unless the operator understands fully the proper cutting angles of the teeth and relieving to prevent back taper. The operator should be provided with a stiff bristle brush with which he may remove the chips from the broach teeth as they emerge from the work. See that all chips are removed from the teeth before attempting to place a new piece on the broach.

Should a piece become stuck on the broach during the cut, by the breaking of the broach teeth or crowding of chips in the teeth, further damage to the broach may be avoided by placing the broach in a lathe and turning the piece away. If the broach has no centers, or it is more convenient, the piece may be sawed through on a milling machine or with a hack saw.

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The Building Products and Fuel Co. Saskatoon, Sask., will receive tenders for the erection of metal-clad warehouse estimated to cost $6,000 and also for office building.



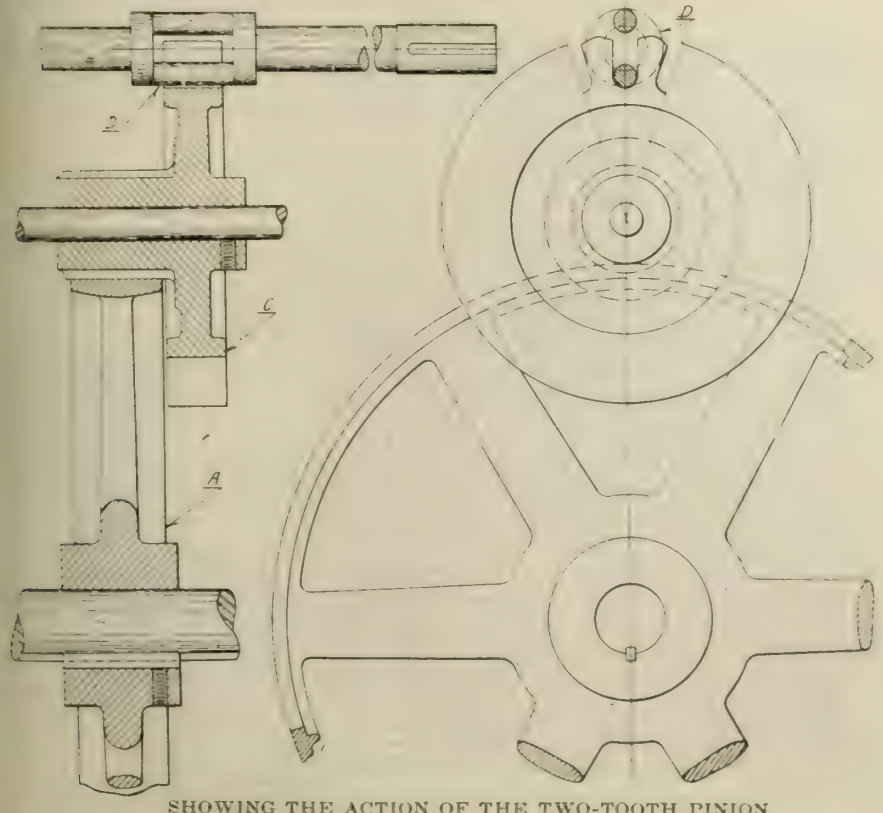
# WHAT OUR READERS THINK AND DO



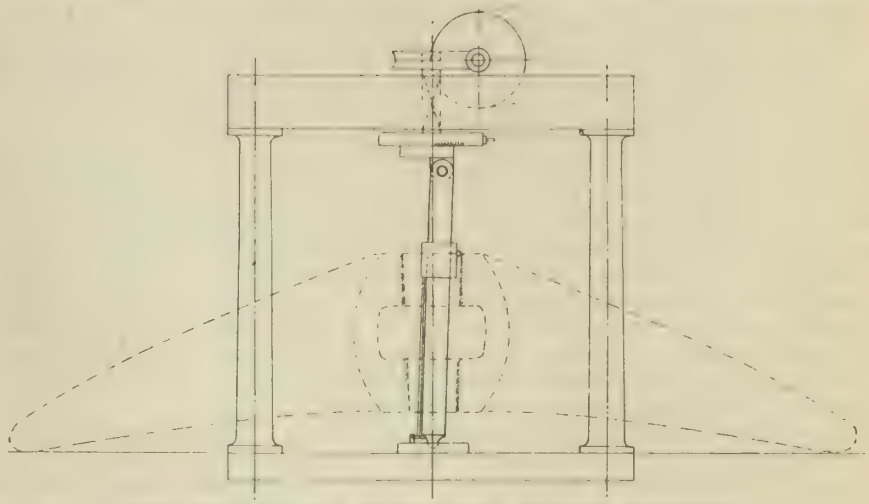
## INTERESTING TWO-TEETH PINION

By G. LAIDLER.

In handling molten metal in large adles it is frequently difficult, owing to he changing centre of gravity of the nass, to maintain the tilt of the ladle by the use of the ordinary gears. With worm gearing this is possible but very difficult when using spur gears. The accompanying sketch illustrates a gear and pinion of interesting design that eliminates the tendency to assume a normal position, and acts as a positive lock when in any position. The large 72-teeth gear A, keyed to the ladle trunnion, is of the usual design, with teeth of shallow depth. The intermediate 13-teeth pinion is integral with the gear C, which has 21 teeth of special shape meshing with the 2-teeth machine-steel pionion D, cut from the solid shaft on which the 18-inch operating hand-wheel is located. It will be seen that for every half-turn of the handwheel the 21-teeth gear is revolved one tooth and the meshing tooth becomes locked between the diametrically opposed teeth of the 2-teeth pinion, thus eliminating the "tangential component" of the ordinary spur gear. This interesting type of gear makes a simple and safe device for holding the ladle at any angle.




SHOWING THE ACTION OF THE TWO-TOOTH PINION.



OUTLINE OF THE PROPELLER BORING MACHINE.

## PROPELLER BORING MACHINE.

By JOHN S. WATTS

In the shop where I served my apprenticeship, we had many large propellors to bore out, and for this purpose we used a machine which was, I believe, a home- made one, at least I have never since come across one at all resembling it.

The accompanying line drawing gives a general idea of its construction, but as it is drawn from memory only, and it is now some twenty years since I last saw it, this sketch is not to be taken as a correct scale drawing. In all these years I have not seen a machine that could compete with the one shown, when all the factors that affect a machine's efficiency are taken into account.

Being a single purpose machine, it is useful only to those shops that have, or can get, sufficient propellor work to pay for its keep, but its first cost is very small, and it will handle the largest propellors quite easily, the only limit being in small propellors having too small a bore to get the boring bar through.

Referring to the drawing, the machine consists of a base plate, to which are bolted a pair of columns, which support the cross beam carrying the driving mechanism. A tight and loose pulley, driven by a belt from the line shaft, forms the drive. On the pulley shaft is a worm, which drives a worm wheel, this wheel being keyed to the vertical shaft.

At the lower end of the vertical shaft is fitted a head, with a carriage which can be slid back and forth by a screw in a manner similar to the cross slide of a lathe.

This carriage has a single eye which takes the top end of the boring bar, the eye connection permitting the bar to be bolted to the carriage, and driven by it, when the bar is at any inclination desired.

The boring bar itself is, in the main, the same as the regular boring bars used for boring out cylinders, having a sliding sleeve to hold the cutting tool, and a screw and star wheel to feed the sleeve along the bar. The lower end of the boring bar is fitted with a ball-shaped end to work in the cup-shaped depression in the base casting, permitting the bar to run when its axis is at an angle the axis of rotation.

The operation of the machine is quite simple. The boring bar being removed, the propellor is lowered into place, and set central over the center in the base, and levelled up. A few clamps are put on the propellor blades, only a few being necessary to prevent a movement of the propellor by the cutting tool.

The boring bar is now dropped through the hole and bolted to the sliding carriage, which is then screwed to the position which will give the bar the inclination corresponding to the desired taper of the bore. To facilitate this the carriage has graduations cut in it for the various tapers in inches per foot length, and can, owing to the greater length of the bar, be set very accurately. Everything is now ready for the tool to commence boring, and it only remains to continue boring out until the diameter at the top is the finished dimension, when we are assured of a good fit.

To face off the ends of the boss, another arm is fitted to the bar, this arm being exactly the same as is used on all boring bars for facing flanges, etc., and requires no description here. The only machine which can compete with this one in facility of handling the work is a horizontal boring machine, which to be large enough to handle sixteen feet diameter propellors would mean a very heavy investment. Further, the boring machine has to revolve the propellor, and to revolve a propellor weighing anywhere up to twelve tons consumes quite an appreciable amount of power. In the machine illustrated herewith, the moving parts are small and light, and the power consumed is very slightly more than that required to do the actual cutting.

The usual way is to bore the propellor out in a large face plate lathe, which constitutes a very difficult piece of work. The propellor has to be lifted from the floor, where it lies horizontal, into a vertical position, and clamped to the face plate. I know of no more difficult shape to hold in a lathe and the heavy weight makes it dangerous to handle, a job to be entrusted only to the best mechanic available.

To set up a propellor in a lathe will take between ten and twenty hours of a highly paid mechanic and three or four helpers, and will tie up the crane service for a good many hours. This is all avoided in the machine I have described, and even if the machine is used only a few times a year, the saving in cost of operation will soon repay the small capital expenditure.

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The West Window Regulator Co., has been incorporated with head office at Toronto, and capital stock of $100,000.

## ENGINE PERFORMANCE

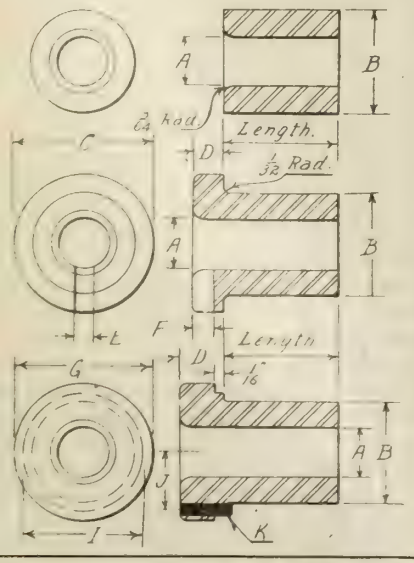
In replying to the discussion of his paper on "The Present Position of the Marine Diesel Engine," Mr. James Richardson said, at a meeting of the Institution of Engineers and Shipbuilders in Scotland, that theoretically it should be possible to produce a Diesel engine of small power for approximately 10 pounds weight per brake horse-power developed. The actual weight of the lightest engine as yet constructed is, however, between 50 pounds and 60 pounds per brake horse-power. The highest speed of revolution at which the Diesel engine can be run is an unknown quantity. When, during the shop trials of a high-speed engine the governor broke down, the speed of the engine, which was normally 450, rose to nearly 700, and the engine continued to run for the twenty-four hours necessary to complete the trial, as steadily and as well as at the lower speed. It has been proved, he said, that piston speeds can be increased to 1,400 feet or even 1,500 feet per minute for high-speed engines, without seriously affecting the performance.

## DRILL JIG BUSHINGS.

By F. S.

In the designing of jigs, the proper dimensions of drill bushings is frequently a serious problem. The table shown in the accompanying chart is one not often seen in text books. It will be noted that three different styles of bushings are shown, a plain straight bush, a permanent fixed bush, and a slip bushing. Where these bushings are made in quantities and stocked, the center hole is generally made smaller than the normal size to allow for subsequent grinding to suit the working requirements.

## DRILL JIG BUSHING DATA




| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | 60 .04 | 55 .052 | 52 1/16 | 30 1/8 | 12 3/16 | 1/4 | 5/16 | 3/8 | 7/16 | 1/2 | 9/16 | 5/8 | 11/16 | 3/4 | 13/16 | 7/8 | 15/16 | 1 | 1 1/16 | 1 1/8 | 1 3/16 | 1 1/4 | 1 5/16 | 1 3/8 | 1 7/16 | 1 1/2 | 1 9/16 | 1 5/8 | | | | |
| B | 1/8 | 3/16 | 1/4 | 5/16 | 3/8 | 7/16 | 9/16 | 5/8 | 11/16 | 13/16 | 7/8 | 15/16 | 1 | 1 1/8 | 1 3/16 | 1 5/16 | 1 3/8 | 1 1/2 | 1 9/16 | 1 11/16 | 1 3/4 | 1 7/8 | 1 15/16 | 2 | 2 1/16 | 2 3/16 | 2 1/4 | 2 3/8 | | | | |
| C | 3/16 | 1/4 | 3/8 | 7/16 | 1/2 | 9/16 | 11/16 | 3/4 | 13/16 | 15/16 | 1 | 1 1/16 | 1 1/8 | 1 1/4 | 1 5/16 | 1 1/2 | 1 9/16 | 1 11/16 | 1 3/4 | 1 7/8 | 1 15/16 | 2 1/16 | 2 1/8 | 2 3/16 | 2 1/4 | 2 3/8 | 2 7/16 | 2 9/16 | | | | |
| D | 1/16 | - | 3/32 | - | - | 1/8 | - | - | 5/32 | - | - | 3/16 | - | - | 7/32 | - | - | 1/4 | - | - | - | - | - | - | - | - | 5/16 | - | | | | |
| E | | | | 5/64 | - | 9/64 | - | - | - | - | - | - | - | - | - | - | - | 11/64 | - | - | - | - | - | - | - | - | - | | | | |
| F | | | | 5/64 | - | 3/32 | - | - | 1/8 | - | - | - | - | - | - | - | - | 3/16 | - | - | - | - | - | - | - | - | 1/4 | - | | | | |
| G | 7/16 | 1/2 | 9/16 | 11/16 | 3/4 | 13/16 | 1 | 1 1/16 | 1 1/8 | 1 5/16 | 1 1/2 | 1 9/16 | 1 11/16 | 1 7/8 | 1 15/16 | 2 1/8 | 2 3/16 | 2 3/8 | 2 7/16 | 2 5/8 | 2 3/4 | 2 15/16 | 3 | 3 1/8 | 3 3/16 | 3 5/16 | 3 3/8 | 3 1/2 | | | | |
| H | 5/16 | - | - | - | - | - | - | 3/8 | - | 7/16 | - | 1/2 | - | 9/16 | - | 5/8 | - | 11/16 | - | 3/4 | - | - | - | - | 13/16 | - | 7/8 | 7/8 | | | | |
| I | 5/16 | 3/8 | 7/16 | 9/16 | 5/8 | 11/16 | 7/8 | 15/16 | 1 | 1 3/16 | 1 5/16 | 1 3/8 | 1 1/2 | 1 11/16 | 1 3/4 | 1 15/16 | 2 | 2 3/16 | 2 1/4 | 2 7/16 | 2 1/2 | 2 11/16 | 2 3/4 | 2 7/8 | 2 15/16 | 3 1/16 | 3 1/8 | 3 1/4 | | | | |
| J | 3/32 | 1/8 | 3/16 | 7/32 | 1/4 | 9/32 | 11/32 | 3/8 | 13/32 | 15/32 | 1/2 | 17/32 | 37/64 | 41/64 | 43/64 | 47/64 | 49/64 | 53/64 | 55/64 | 59/64 | 31/32 | 1 1/32 | 1 1/16 | 1 3/32 | 1 1/8 | 1 3/16 | 1 7/32 | 1 9/32 | | | | |
| K | 1/16 x 23/64 | 1/16 x 23/64 | 1/8 x 3/32 | - | - | 1/8 x 5/16 | - | 1/8 x 1/2 | - | 1/8 x 9/16 | - | 1/8 x 5/8 | 3/32 x 11/16 | 3/32 x 3/4 | - | 5/32 x 13/16 | - | 5/32 x 7/8 | 5/32 x 15/16 | 5/32 x 1 | 3/4 x 1 | - | - | - | 3/4 x 1 1/16 | - | 3/4 x 1 1/8 | - | | | | |

A - Nominal Size.
If made up in quantities & kept in stock, make hole small as follows:-
Up to 1/2" 1/32" small 1/2" to 1 1/2" 1/64" small 1 1/2" up 1/16" small.
Canadian Machinery

THIS CHART SHOULD BE VERY VALUABLE TO TOOLMAKERS AND DESIGNERS.



# DEVELOPMENTS IN SHOP EQUIPMENT



## ELECTRIC BABBIT HEATER

The Volta Manufacturing Company, Limited, Welland, Ont., have developed and placed on the market an electric furnace for melting babbit and similar metals, which will be known to the trade as the "Ideal electric babbit heater."

This furnace has been in continuous service over a twelve-month period and has been subjected to all sorts of tests which has shown results to the entire satisfaction of the company, who are now putting it on the market.

For commercial purposes it is intended that the current used in heating the furnace shall be taken off the lighting circuit in the plant. To start, all that is necessary is to charge the furnace with the cold metal and turn on the switch. No volatilization of metal occurs as the temperature is such as to eliminate any chance of overheating. Metal can be poured into ladles, or, in the case of valve bearings, the pot can be hung from the hook of a crane, or other appliance, and carried directly to the job, if desired. On account of the heavy heat insulation the molten metal will hold its melting temperature for about two hours, which allows ample time for transportation without chilling of the metal.

Every precaution has been taken to make the furnace simple and convenient, and as near fool-proof as possible. The heating element is of a substantial design and is said to be easily changed. It carries current at a low density, and, on account of the fact that it covers a large surface of the pot, the heat is quickly conducted to the metal.

## DRILL GRINDING MACHINE

The Bellevue Industrial Furnace Co., of Detroit, Mich., have brought out a semi-automatic drill-grinding machine, which is a self-contained unit with the motor located in the pedestal of the machine. The drills are ground on the periphery of the wheel and not on the side, and can be equipped for the grinding of left-hand drills as well as right. Drills with any number of lips can be ground, an index being provided, and no more stock is ground from the drill than is absolutely necessary. The machine is made in two sizes, the maximum drill size handled on either machine being 1½ inches and 3 inches respectively.





DETAIL VIEW OF HEATER, ALSO PHOTOGRAPH SHOWING IT IN OPERATION.

## INSERTED TOOTH FACE CUTTER

The Alfred Herbert, Ltd., Coventry, England, Toronto office at 1-3 Jarvis St., Toronto, are now in a position to supply their patent high duty inserted tooth face cutters in smaller sizes than formerly. The 3, 4 and 5-inch diameter respectively are available, and these cutters are interchangeable on the arbors of the same size solid face cutters to the B. E. S. A.

Since the introduction of this design, the cutters have been supplied for use on all classes of work and materials, and have proved uniformly successful. They are said to be capable of standing up to the heaviest cuts without any movement of the teeth. The latter are fixed in reamed holes and have serrations milled transversely on a flat, being locked in position by a tool-steel bush having similar serrations milled on a tapered flat. In addition to the teeth being held very solidly, they can be removed quickly, and a large amount of adjustment is provided before they have to be discarded.

## IMPORTED FIREPROOF BRICK

A new line of English fireproof building brick now being imported into this country is that manufactured by the Moler Fireproof Brick and Partition Co., an associated firm of Vickers, Limited. This product is burnt brick manufactured from Moler diatomaceous earth, a deposit of marine origin containing sufficient proportion of clay to enable it to be readily converted into plastic form suitable for brickmaking. The raw material is very porous, being able to absorb its own weight of water, and this porosity largely accounts for the lightness, sound-proof and heat insulating qualities of the finished products. It is stated that solid Moler bricks are about half the weight of ordinary bricks, the specific gravity being approximately 0.85. It is claimed that Moler bricks will withstand a crushing load of one ton per square inch. These bricks are particularly suitable for interior work, such as, partition slabs and linings floors, roofs and arches in all classes of buildings. R. S. Griffith, 371 St. James St., Montreal, is the Canadian representative.

# NEW THINGS IN MACHINE TOOLS

### RIVET HEATER

A new electric rivet heater has recently been introduced by the General Electric Company, Schenectady, New York. The heater consists of an air-cooled transformer, with a single turn short-circuited secondary, in which the rivets to be heated form a part of the secondary circuit. The primary winding is designed for operation on 220, 440, or 550 volts, single-phase circuits of 40, 50, or 60 cycles. Tappings are brought out from the primary winding on a drum controller, so that six different voltages can be obtained on the secondary, and the adjustment for various sizes of rivets or rates of heating is obtained simply by setting the handle on the drum controller.

### SELF-CENTERING DRILL HOLDER

A self-centering drill and reamer holder that is intended for use on drilling machines, lathes and screw machines, has been placed on the market by the Woodall-Basch Tool Company of Syracuse, N.Y. The purpose of the device is to grip the drill or the reamer and prevent it from turning, at the same time centering it. The drill is kept in proper alignment by means of a center entering the center in the end. The driving dog which is secured to the drill by means of headless screws, is of the floating variety, being driven by the action of T-slot and bar in the head of the fixture. When used in the drill press the holder revolves with the drill, while it is held stationary when used in a lathe.

### SENSITIVE RADIAL DRILLING MACHINE.

The Crescent Steel Company of Cincinnati, Ohio, are now manufacturing a 2½ foot sensitve radial drilling machine, which is intended for high speed, heavy duty work. The tool is made either with hand or power feed and is geared throughout. Control is by means of a lever and clutch pulley, the machine being belt driven. Six spindle speeds are provided, ranging from 130 to 1,100 r.p.m. The radial arm is supported on steel balls. Radial adjustment of the drilling head is by means of rack and pinion. Similar adjustment, with the addition of a worm and wheel, are provided for the elevation of the table. All gears are of steel, change feed gears running in oil.

### AUTOMATIC CHAMFERING AND THREADING MACHINE

The Grant Manufacturing & Machine Co., of Bridgeport, Conn., have added a new line of double-spindle automatic chamfering and threading machine to their line of machinery. The machine is provided with two cutter spindles, a magazine, a work holder and feeding table. Control of the automatic movements of the machine is by means of a lever located at the front and within easy reach of the operator. Only slight modifications are required for changing the machine for threading both ends of small studs simultaneously. It may also be equipped for the drilling or countersinking both ends of pieces at the one time.

### MULTIPLE-SPINDLE DRILLING HEAD.

To meet the requirements of manufacturers desiring the drilling of a number of small holes closely grouped together in the one piece, John H. Dorman and Son, of West New York, N.J., have developed a special multiple-spindle drilling head, in which the special arrangement of the drill spindles and the driving gears permits of compact construction. The housing is made of aluminum and the main spindle carries, on its lower end, the large gear that drives the intermediate pinions, that in turn mesh with the different gears on the small drilling spindles, these latter gears overlapping owing to the closeness the drill centres. The upper end of spindles are carried in a bronze pla and the thrust bearings are of fibre

### SMALL INDEXING FIXTURE.

M. B. Hill, of 10 Eden street, Worcester, Mass., is placing on the market specially designed indexing fixture use when cutting the squares of hegons on bolts or on the ends of rou stock of any kind. The tool is not tended to replace a more elaborate ture, but it is claimed that it is v serviceable for use in small repair a jobbing shops. The indexing device quite simple, two rows of holes be provided, each in a different plane, where the holes are placed 90 degr apart and the other 60 degrees ap The spring operated locking pin is s contained and there is no danger of l ing any of the parts. It is a very sim matter to change from one setting another.

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2866. Vises. — The administrator one of the South African provinces sires to secure from Canadian manufturers of wood work vises (instantaous grip) and metal work bench vi samples or catalogue illustrations, gether with prices f.o.b. Atlantic po Replies to give the fullest informat as to packing and delivery.

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# CANADIAN MACHINERY
## AND MANUFACTURING NEWS

Published in the Interests of the Machinery, Manufacturing, Iron, Steel, and Metal Working Industries.

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## A Great Labor Leader

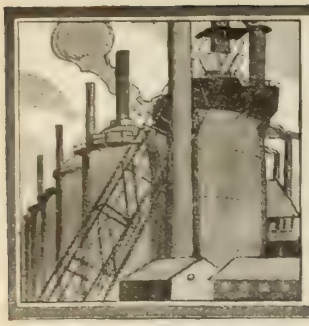
THE death of William Crooks in London, England, at the age of 69, marks the passing of a very fine character from the field of the industrial workers organizations. His life is a further proof that character and ability may win out aginst very adverse circumstances, though of course that is not an invariable rule. Crooks was born in one of the worst slum districts in old London, and in 1852, the time of his birth, that was probably the worst in the world. He was forced to commence work at the early age of nine, so it can be imagined what opportunity for education came his way. After doing odd jobs for a time he finally became apprenticed to a cooper, and from then on worked his way forward. After becoming identified with trade unionism, his sterling worth was soon recognized, and his powers of organization were well displayed in the great dock strike, as well as his moderation and absolute dependability. One of the greatest virtues of a gentleman was his, in that his word was binding on him as an oath, and it was said that in the course of his career that word was never broken. He became Mayor of his native borough, then a Guardian of the Poor Law, of which in early days he had been a beneficiary, and finally a member of Parliament. He represented Woolwich, which is by virtue of the arsenal there, a great centre of skilled workmen. His passing will be regretted by employers and workmen alike, for unfortunately his type is rare. If there were more of them, Great Britain would not be in the industrial turmoil that she is in to-day.

## An Interesting Experiment

THE economic situation of the railways of this continent has been causing considerable thought during the last year or two. The U. S. have had their period of Government ownership, with its accompanying muddle and loss, and the Canadian people are more or less cheerfully stumping up to pay the deficits on their railway possessions. Great Britain has also had a period of Government control of railways, and the losses achieved assume very serious proportions. The Government control comes to an end in August next, and Sir Eric Geddes has introduced a bill in the House of Commons which will usher in a new experiment in railway operation. The railways have been granted a sum of practically 300,000,000 dollars to compensate them for losses while under the control of the government, and this sum will be paid in two instalments. In order to put the various lines on a paying basis and bring back the same facilities or something like the same facilites that were enjoyed before the war, the country has been divided into six groups, and all the railways with lines in these different groups are to amalgamate. There will thus be six controlling companies or groups of companies. The various lines will be allowed to arrange their own terms of amalgamation, but if they cannot agree the case will be put before a specially appointed tribunal for adjustment. The groups have been arranged solely with an eye to economic operation and financial position. Provision is made for fixing rates that will bring in a revenue based on that of 1913, with an additional amount that will yield 5% on capital expenditure made while under government control, with other additions to cover capital investments that did not yield interest in the pre-war period. If these fixed rates yield more than the standard aimed at, the excess will be divided between reducing the rates and assisting the revenue of the company. That is, the company will receive 20% of the excess and the balance will be applied to reducing the freight rates. There will be a wage board composed of representatives of the men and the company, and this board will have recourse to a central wage board. The experiment is a far reaching one, but it seems to be based on a common sense viewpoint. There is no doubt that great economies in management are possible under such a scheme, and the resumption of the travelling facilities for which Great Britain was famous before the war will undoubtedly be a help to the general business prosperity of the country. The experiment should be watched with interest by the people of Canada. There is, of course, no parallel between the two situations as far as numbers of roads and density of population is concerned. There is this parallel, however, that Canada, Great Britain, and the United States have all tried a measure of Government control of railways, and two of them have finally handed back the roads to their owners, to the great relief of all parties concerned. Canada seems to be wedded for the present at least to Government ownership of railroads, with all that is incurred therewith. An amalgamation of the railroads of this country under a competent managership in which there was no hint of government control might be the best solution to our difficulties.

## The Signs Are Hopeful

NO less a prophet than Judge Gary has been giving his views recently at the annual meeting of the American Iron and Steel institute, of which he is president. The general trend of the eminent Judge's rmarks was that there was plenty of business ready to be placed, and willingness to place it, if further adjustments were made, leading to lower prices. Judge Gary made the statement that as usual many people would wait too long. There is a good deal in this viewpoint. While there has been a considerable drop in many articles, and in many cases reductions in wages, there is not much chance of any wholesale reduction in the latter item, nor should such a consummation be wished for. Probably in no industry more than in the building industry has the policy of waiting been carried out, especially in this country. While the shortage of homes continues, we are forced into paying exorbitant rents, and to the man who contemplates building a home for himself, it would seem wise to build now and pay the slight extra cost that might be incurred than to continue paying through the nose for the privilege of living in another man's property. If all the prospective home builders who are waiting for further drops in prices were to decide to start in right away, what a difference there would be in the outlook. If on top of this every man who is waiting to place an order for something he wants, but is waiting for a further drop, made up his mind to purchase right away, we should have made the start back to normal times, and be a considerable distance on the road before very long.



# MARKET DEVELOPMENTS



## Buying Continues—But in a Cautious Manner

Business is still placed sparingly, many firms ordering only what they immediately require. There is some talk about the price of steel dropping around August, but nothing definite.

THE market still continues to mark time. Things have not improved, nor are they any worse. The best news from the East is the re-opening of some railroad shops after a ten-day closure, although no assurance of steady work is given. Some dealers claim that good business will come when consumers are in a position to buy in advance of their immediate requirements.

There has been quite an effort in a number of quarters to show that the steel prices developed about the middle of April were being cut, but as some candidly state, "the market is too dull even to allow price cutting." Operations are around 25 per cent., and when a buyer does place an order he wants practically immediate shipment. The order simply goes to a mill that chances to be in operation, and the regular price is charged and paid.

Buyers of steel expect prices to be materially lower in the not distant future, somewhere around August 1st, and while the mills make no effort to controvert the view, they are making no definite statements in this respect.

There has been no change in the Pig Iron market, and one concern purchased 500 tons of basic iron at $23.00 delivered. This would be equivalent to $21.00 Valley furnace. A fair average can be struck around $22.00. Orders however, are only for immediate requirements. Buffalo feels that better business is in sight, the month of May being better than any other months this year. Malleable iron in small tonnage was sold at $24.00.

The scrap metal market is very weak, although some dealers claim they see a chance of improvement. In fact in some quarters it is at present starting to show signs of life. The mills at Cleveland are accepting no shipments of heavy melting steel, while in New York dealers are receiving few calls from brokers with intent to buy.

## RAILROAD SHOPS AGAIN WORKINC. NO ACTUAL PRICE CUTTING EXISTING

Special to CANADIAN MACHINERY

MONTREAL, Que., June 9.—All lines of industrial activity continue to show more or less dullness with general buying on a quiet scale. The local railroad shops are again working after a ten-day closure; but no assurance is given of steady work. Steel merchants very light sales and in small quantities. Orders for single tools and a few small supplies is the extent of the machinery business. Old material is quiet. In all instances price quotations are firm but shading is frequently done to obtain business.

### Some Price Shading.

The local steel situation offers little in the way of feature this week. The light volume of material that is passing into the hands of the consumer makes it difficult for the dealer to figure out the amount of stock he should carry, particularly at a time when the market is so uncertain and when prices are wavering. When speaking of price tendencies and the possibility of cutting to secure business, one dealer remarked that:—"We have heard from some sources that this has been done in the States, but it is our opinion that no actual price cutting is taking place. The quotations generally given at the present time are based on current cost of production plus a reasonable profit on the sale of the material, but it is doubtless true that many producers and dealers are taking advantage of the situation to obtain business, even though a large percentage of the profit is given to the purchaser. On this basis listed quotations must be taken as those that should obtain rather than those actually figuring in a sale." The dealer admitted that price shading was quite common and many believed that small or no profit was better than no business. The situation here may be told in the remark of a dealer. "Buying," he said, "is done in small quantities, and in some cases very small. The movement of plates has shown slight improvement, but other lines are very quiet. We continue to quote 4½ to 5 cents on plates."

### Slight Signs of Improvement.

Some undercurrents of coming developments in automobile activity in this district has awakened the interest of machine tool dealers, but other than this the movement of equipment has been very light. One dealer stated that a slight betterment might be noted and that he believed that now we were on the return to normal, but it would probably be weeks before any outward sign was noted. "We have turned over a fair volume of business during the past week, but the orders generally are for small quantities and pretty well distributed. This" said the dealer, "gives promise of good business when consumers are in a position to buy in advance of their immediate requirements. Just now we must be content wth the wishes of the purchaser in his conservative needs."

### Some Machinery Scrap Moving.

"Apart from one or two consumers that are regularly taking fair quantities of machinery scrap," stated a dealer here, "the trade generally is very dull, so much so, that at times we can hardly realize that we are in business at all. We are not enthusiastic about taking on more stock, and when material is offered our quotations are so low that the holder refrains from selling the stuff at such figures, retaining it in the hope that a better price will prevail at some advanced date. It would not alter the situation to change quotations, as actual price figures are determined at the time of the sale." Dealers here do not anticipate an early revival of activity.

## MABBINE TOOLS LISTLESS DEMAND FOR RE-CUT FILES

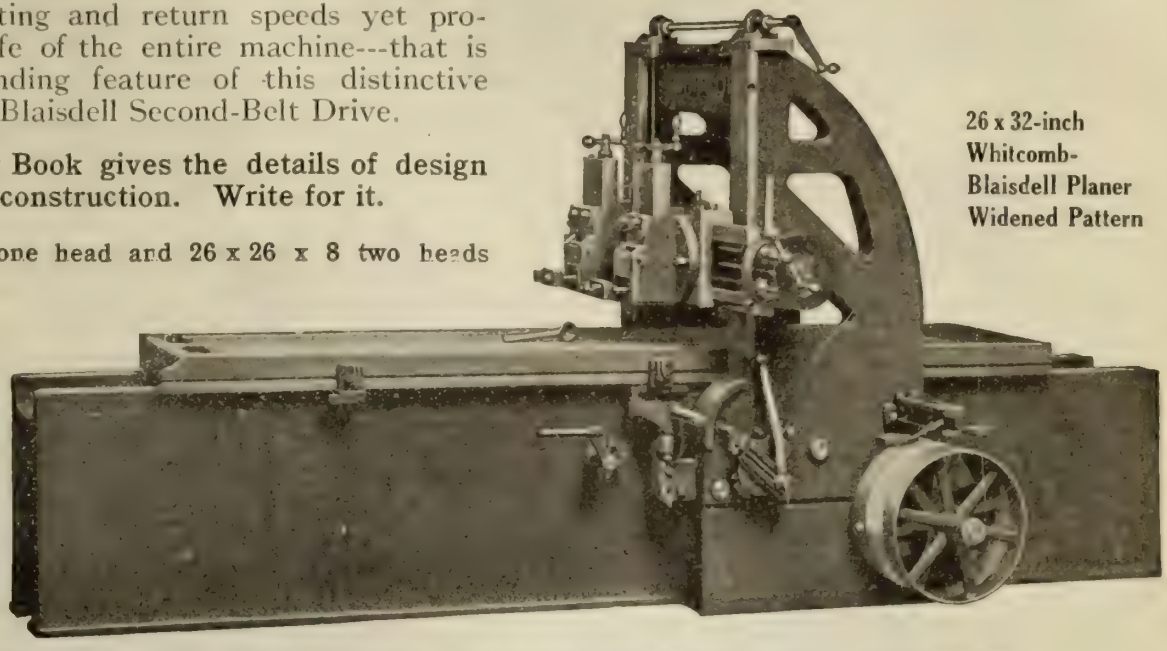
TORONTO.—The slight increase that has been noted in industrial activity during the past week has been taken by some to indicate an improvement in business. This is no doubt true on the face of it, but too much value cannot be placed on a development of this character, as it is not difficult to see that some lines of activity cannot be carried on successfully unless continuous operation is carried on. This is particularly true in relation to steel production, the volume of certain sizes of steel determining to a large extent, the duration of the operating period of the mill. While nothing definite can be said on any market under existing circumstances, the optimism expressed by some machine tool dealers gives slight cause for encouragement.

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**24 x 24 x 6 one head and 26 x 26 x 8 two heads in stock.**



**26 x 32-inch Whitcomb-Blaisdell Planer Widened Pattern**

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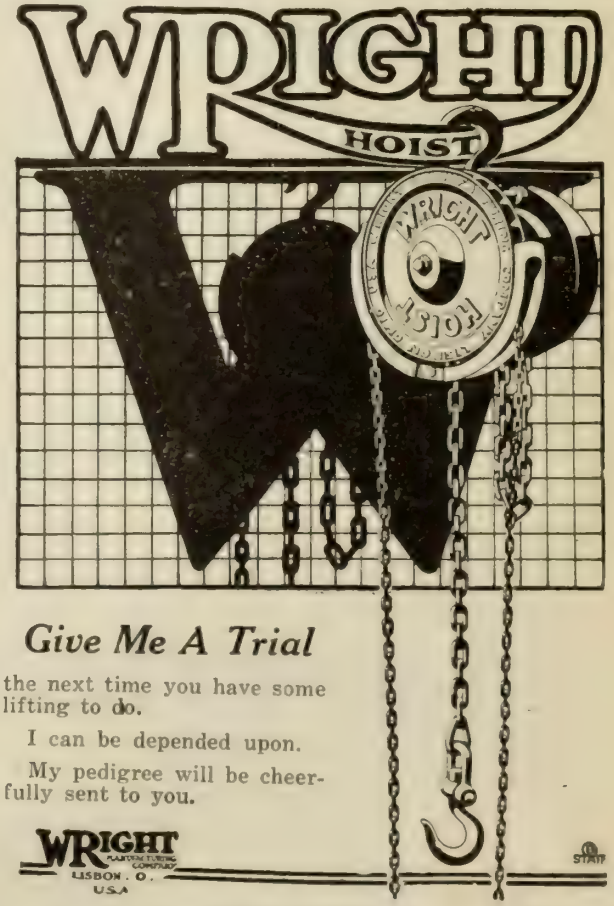
# WHAT IS YOUR ADVERTISING DOLLAR BUYING?

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*Canadian Distribution:*
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### Steel Movement Light.

The reopening of a number of shops in this district has given a tone of optimism to the industrial situaton, but while improvement has been reported in some lines, the volume is so light that it is difficult to determine whether this current activity is more than the dissemination of accumulated orders. It is true that some plants have been operating additional hours but it is stated that this has resulted from business that has been coming in, and which it has been unprofitable to produce in small quantities. The steel market still reflects the conservative attitude that has dominated the buying market for many months. "At the present time," stated one dealer here, "it is a very rare thing to get orders running into tonnage. The usual practice is for the consumer to buy just what he absolutely needs for the day, or at most the current week. We had an order the other day for five light sheets of steel from one of the largest manufacturers in the country, and by the instructions issued with the placing or the order one would think they were taking on considerable tonnage." While in this office this week we heard an order come in over the phone for a piece of sheet 6 ft. long by 6 inches wide, by ⅛ inch thick, to be delivered. The cost of the material was little more than it would cost to deliver it, so one can readily see where some of the profit goes in selling steel. "There is little or no change in the situation," said the dealer, "prices as quoted are in keeping with costs plus profit, but prices are by no means fixed when sales are actually made. Few dealers are letting business go by when a little shading will clinch the sale. The profits are cut but the sale results in added turnover." One distressing feature just now, incidental to small orders, is the relative percentage of increase in overhead when compared with business carried.

### Second Hand Sales Maintained.

The week has been a listless one in machine tool circles. What little business is being done is largely confined to trading in used equipment. "It has been our experience," said a tool dealer, "that users of machinery and supplies are not buying equipment when they are able to utilize available machinery, taking from one department to build up another. When it is necessary to acquire machinery, the usual practice is to look around for second hand tools that will fill the bill, and even then they endeavor to secure the very lowest price before the sale is closed." One promising condition that will eventually react to the benefit of business generally is the cleaning up process that many jobbing houses and machinery dealers are carrying out. The representative of a large engineering supply house, that has branches across the Dominion, has been conducting a policy of interorganized co-operation in liquidating their entire stock. Speaking on this subject the dealer said: "For many months now we have concentrated on the problem of reducing stock to the minimum without actually running ourselves short. By this we mean that all the branches are considered collectively and where a surplus of a certain line is carried at one branch all orders for that particular line are forwarded and shipment made from the stock on hand. When a line is getting low we secure new supplies and distribute among the various centers according to the estimated demand. In every way we are getting stocks down to the lowest possible working basis."

One small tool dealer here has found that there is a good demand for recut files and he has opened a small plant in Toronto for this purpose and reports good business. This dealer stated that turnover for the past several months has been quite steady but below normal.

### Scrap Still Dull.

It would be difficult to make a statement that would differ from those of previous weeks in regard to old materials. The market is virtually stagnant, just sufficient moving to make dealers realize that they are still in business. Prices on all lines are unchanged and nominal.

## POINTS IN WEEK'S MARKETING NOTES

**Points in Week's Marketing Notes.**

**The Boston market reports a slight improvement in the demand for cast scrap, while Pittsburgh claims that interest on the part of melters is again at low ebb.**

—

**Dealers in New York are receiving few calls from brokers with intent to buy. In Buffalo the only activity is the efforts of a few dealers to buy heavy melting steel at a price that will enable them to turn it over for $13.**

—

**There is no visible change in the Pig Iron market at Pittsburgh. Some of the merchant producers express the belief that prices will not go much lower in the immediate future.**

—

**Salesmen covering the New England territory within the past few days report that foundries are operating at about 20 per cent. of capacity, and many of them are well supplied with pig iron and do not expect to be in the market for months.**

—

**The feeling on the Buffalo market is that better business in Pig Iron is in sight. The same market at Philadelphia is weak with irregularity in prices. The sales in pig iron at Cleveland have been light and the market weak.**

—

**Pittsburgh reports that practically all buyers of steel expect prices to be materially lower in the not distant future. Aug. 1st is quoted in some cases. The mills make no effort to controvert this view, though of course they do not definitely predict that prices will be lower.**

## Scrap Metal Markets

BOSTON reports that the demand for cast scrap continues to show a slight improvement although prices in many cases show softness. During the week an eastern Massachusetts consumer bought 300 tons of a special grade of No. 1 machinery scrap at $22 delivered. Another consumer bought two cars at $18.50 delivered and these two sales probably represent the range of the present market. Small dealers watching declining pig iron prices are more inclined to dispose of their stocks than they were heretofore.

Interest in the Pittsburgh market on the part of melters again is at a low ebb and this find reflection in a slightly weaker undertone. There has been no change in prices of the heavier lines of open-hearth grades, but dealers are finding some difficulty in obtaining recent prices on such material as turnings and borings. One Pittsburgh district steel company claims to have bought fair sized tonnages of machine shop turnings the past week at $8.25 and is offering that price on such lots of this grade as are being offered.

At New York an indication of dullness is the fact that dealers are receiving but few calls from brokers with intent to buy. Three Eastern Pennsylvania mills are buying small quantities of heavy melting steel, paying no more than the equivalent of $7.50 New York.

Some of the dealers on the Cincinnati market report the market is picking up slightly. There have been some small inquiries for heavy melting steel and prices are being firmly held. A pipe company in this district was in the market last week for a small tonnage of cast scrap. Local foundries are not showing much interest.

At Buffalo the only activity is in the efforts of a few dealers to buy heavy melting steel at a price which will enable them to turn it over for $13. This is difficult as the $13 price is firm.

Cleveland market reports that prices are weaker on cast iron borings, mixed borings and short turnings now that the local consumer who recently purchased considerable scrap in these grades is out of the market. Dealers who have been paying $8.25 for these grades are now offering only $7.50 to $8. Local mills are accepting no shipments of heavy melting steel.

## Pig Iron Markets

THERE has been no visible change on the pig iron market at Pittsburgh during the past week. Business is very limited and very few inquiries are on the market. It has been reported that the West Penn. Steel Co. has bought 500 tons of basic iron at $23 delivered. This would be equivalent to about $21, Valley Furnace, as the freight from the Valley district to Brackenridge, Pa., is $1.96. Some of the merchant producers express the belief that prices will not go much lower in the immediate future because the position of the market at least as far as stocks of foundry are concerned, is much stronger than it was a few weeks ago.

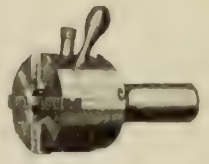
New York reports that the largest inquiry reporter is for 1,200 tons, half No. 2 plain and half No. 1, which comes from a New Jersey melter. Salesmen covering the New England territory within the past few days, report that foundries are operating at about 20 per cent. of capacity and many of them are well supplied with pig iron and do not expect to be in the market for months.

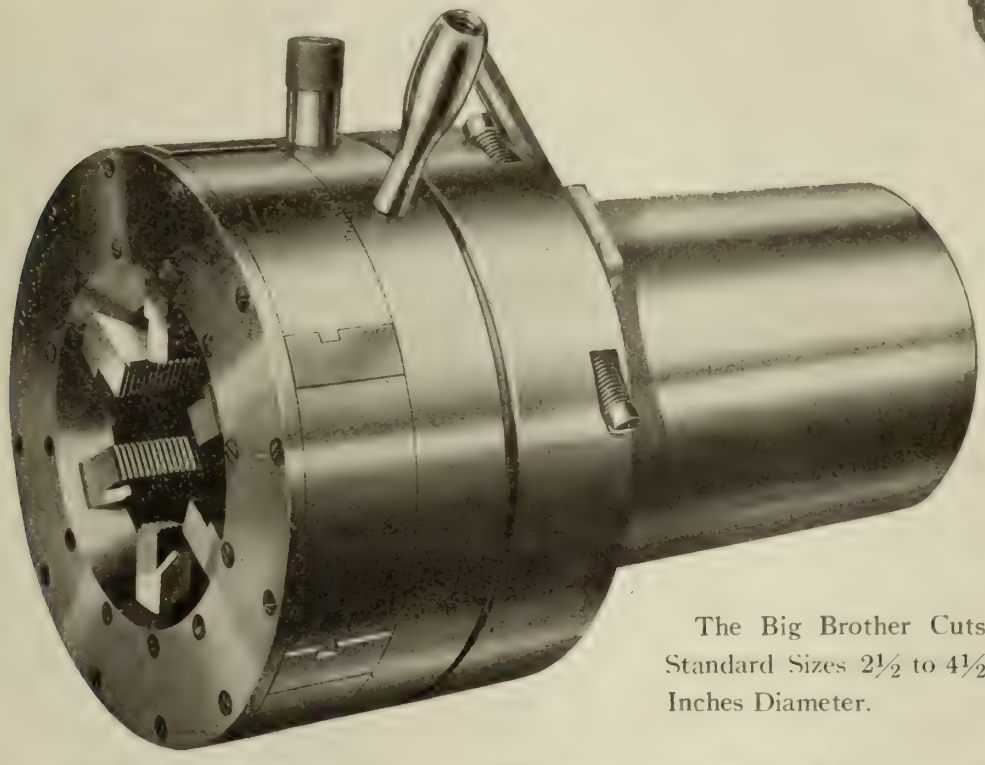
The past week has been very dull in the Birmingham district. Lots of 500 and 100 tons by different makers for Southern delivery were sold at $22.50.

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Real tonnage can be placed at $22. Inquiry is much more brisk. Additional foundries find themselves out of iron, but order only what is needed now. The rate on pig iron has been reduced from $1 to 90c, on billets, from $1.50 to $1.05 and on cast iron pipe, from $1.50 to $1.05 in minimum lots of 60 000 pounds, and $1.25 on minimum lots of $40,000 pounds.

The demand for pig iron at St. Louis has shown no particular change during the past week and there has been no improvement in the tone or quotations. Sales and melting are at a very low ebb and while the distant future is regarded hopefully, the immediate present is still of the hesitant character that has prevailed in the market for many months. While No. 2 Southern may be regarded now as practically on a basis of $22 per ton for 1.75 to 2.25 silicon, it is not selling in competition at this point with the Northern and local irons.

The feeling on the Buffalo market, is that better business is in sight. Two interests find shipping on old contracts considerably better and the month of May will show a greater tonnage on old contracts than any months this year. One producer has in his hands an export inquiry of 1,500 tons of foundry iron, but it is not expected the order will be placed there, the belief being that some foreign furnace will get the business. A small tonnage of malleable was sold for $24. One furnace finds increasing activity with small foundries which have lately resumed.

Boston states that New Sloss-Sheffield Alabama prices are announced with silicon 1.75 to 2.25 at $22.50 furnace and 50c differentials on each higher silicon content. No sales are reported at the new schedule nor has Buffalo iron sold since last reports.

The market at Philadelphia is weak with irregularity in prices. $23 furnace has been done on No. 2 plain iron on shipments bearing a high freight rate, whereas $24 furnace would be quoted on shipments into this immediate district. Some consumers have stated that they can buy eastern Pennsylvania No. 2 plain iron for $22 furnace, but no sales are reported on this basis. There is nothing to test the price of basic iron, but it is intimated that fair sized inquiry would find furnaces willing to sell at $24 furnace.

At Cleveland the sales in pig iron have been light and the market weak. Orders for foundry iron placed during the week were mostly at $23 for No. 2 and higher quotations have about disappeared. An inquiry from the American Radiator Co. for 350 tons of foundry iron for its Springfield, Ohio, plant brought out a quotation below $23, the low price evidently not having been named by a lake furnace. Locally there is no demand for foundry iron and local prices have declined 50c.

# BUYERS WANT IMMEDIATE SHIPMENT ARE STEEL PRICES TO BE LOWERED?

PITTSBURGH, June 9.—Each week the steel market gives a fresh exhibition of how dull it can be. All conceivable limits have already been transgressed. Some of the large steel interests report that they are in receipt of practically no inquiry at all. Some sales of course are being made, but they are in unprecendentedly small quantities, carload order predominating. This is the case quite generally with the independents. The Steel Corporation may be receiving a slightly larger proportion than the independents, in new orders, but this is quite doubtful. Apart from new business, the Steel Corporation has its large volume of contract business with regular customers, on which there is always some specifying, but the specifications are very small. In many cases the contracts now in force are contracts that were made originally to be completed by the end of last year. The corporation could not make full deliveries last year, its operations being restricted by railroad conditions, and the tonnage held over to this year has not all been worked out yet.

In other cases some fresh contracts were made for this year, and they are largely to be specified still. Last January the condition with a number of Steel Corporation customers was that they had contracts which in normal times would give them their needed tonnage to July 1, while at their then rate of consumption the contracts would take care of their requirements through the whole year. In present conditions the contracts will last longer still. The condition can be seen from the corporation's reports of unfilled obligations, which amounted May 1 to 5,845,224 tons.

The figure for June 1, not yet announced, will be about 5,500,000 tons. The corporation's capacity, in steel products for sale, is about 52,500 tons a day, and the present outlook is that the corporation's rate of operation for a few weeks will not be over about 35 per cent., which would give it shipments of 18,400 tons a day. At this rate it would require 300 working days to equal 5,500,000 tons, or practically a whole year.

As previously reported, the steel mills all told, corporation and independent, operated at 30 or 31 per cent. in April. The May average was less. If operations are not already down to a 25 per cent. rate they will be very shortly, and according to the present outlook the average for June and July will be under 25 per cent. July being always a particularly dull month in the steel market, and orders being extremely light already, no increase in operation can reasonably be expected this side of August.

### Prices.

In the past few weeks there has been quite an effort in a number of quarters to show that the steel prices developed about the middle of April were being cut. This effect was due to theory rather than actual experience. The market was dull, hence it was assumed that prices ought to be cut, therefore were being cut. The fact is that the market is duller than that. It is too dull for price cutting. With operations as a whole around 25 per cent., and with the corporation operating at a higher rate than the independents, and not cutting prices, the position of the average independent mill is that it is closed. Orders when offered at all are for carload lots. Is a mill going to cut the price on a carload order and then go to the expense of starting a department to fill a carload order? When the buyer does take hold he wants practically immediate shipment and will not wait for a mill to start next week or week after. The order simply goes to a mill that chances to be in operation, and the regular price is charg and paid.

Undoubtedly there is price cutting some lines, where occasionally an or much larger than a carload is to placed. Such cutting is not uncomm even in an apparently strong market. is the rule rather than the exception line pipe, for ir . Another c is that of tin plate. It has been m or less of a trade practice to shade regular market price on odd lots out mill stocks. Just now some of the m have large stocks and of course they disposed to make the usual or a grea concession on sales out of stock, if buyer can use the particular size av able.

It appears that practically all buy of steel expect prices to be materia lower in the not distant future, say about August 1. The mills make effort to controvert that view, thou of course they do not definitely pred that prices will be lower. The ch questions are when, by what procedu and by how much, will prices decli As to the method of procedure, at beginning of last February the in pendents began cutting the Steel C poration prices and the corporation the thing go on for over two mont Other things being equal, the same thi might occur again, but there is defin information that the corporation wo not at this time wink at price cutti by independents, and that as a mat of fact the independents have been formed as to this attitude. If they prices the corporation will follow the If the independents do not, then th will be a general cut all at once, not the very near future but probably tween August 1 and September 1.

As to the extent of the decline seems like a fair guess that it will erage about $10 per ton in the differ products. This guess is not based any inside information and it is not mere stab in the dark, but is based u proportions to pre-war prices, as f lows: A weighted average of all important finished steel products sho that the average in the ten years bef the war, 1904 to 1913 inclusive, v $36 per net ton. The war control pri averaged about $76 a ton, or $40 mo The reduction in December, 1918, v about $4 a ton, while the Industr Board reduction of March 21, 1918, v about $7, and the reduction past A from Industrial Board prices avera about $6. Thus the total decline fr war control prices has been about $1 ton, leaving the average to-day ab $59. That is 60 per cent. above the p war average.

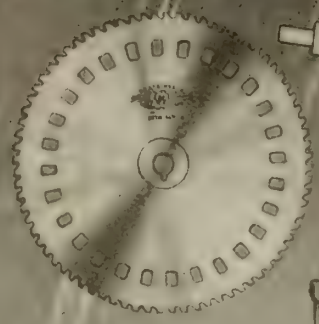
To cut this in half, to 32 per ce would make the average $47.50, about $11.50 decline from the prices veloped last April. It seems altoget improbable that the mills could or wo go much farther than that, consider the higher wages and freights and fact that they cannot get an economi operation at best because there is hope within the next few months of ting even a 75 per cent. operation e if the steel was given away. On other hand, the mills want to stimul business and to cut less than $10 a would probably cause buyers simply fold their arms to wait for "the n cut."

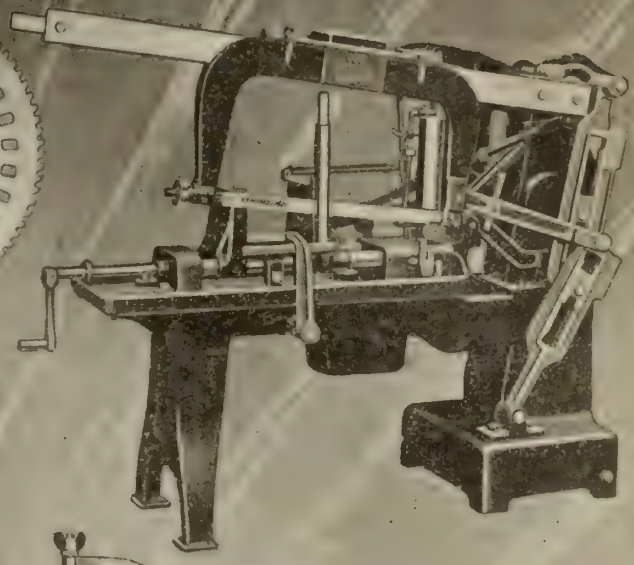
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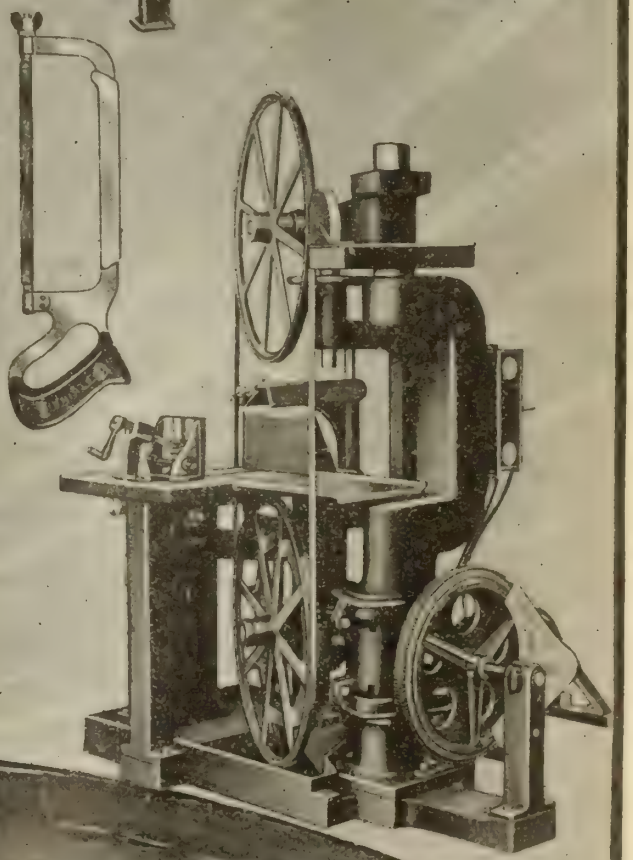
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It is common knowledge that the union printers in many towns and cities in Canada and the United States are on strike. For the first time in its 35 years history The MacLean Publishing Company is involved and we believe you will be interested in receiving a statement as to what the printer's unions are striking for and why their demands cannot be granted.

A year ago (although the wage agreement at that time had over a year to run) the Toronto Publishers and Master Printers gave their employees voluntarily a 10% advance in wages, making the minimum wage $35.20 for a 48-hour week. This was given in recognition of the fact that living costs were then advancing. This voluntary agreement for $35.20 a week expired June 1st. Notwithstanding that the cost of living has declined 22% since March 1920, the printers' union demanded a 44 Hour week and a wage of $44.00. This means four hours per week less work and an increase in rate of pay per hour of over 33%. Employing printers can grant neither shorter hours nor higher wages and the saner printers realize that their union's demands are unreasonable. A large percentage of our own men did not want a strike, but the union leaders in the United States have ordered it and the strike is on.

Negotiations have been carried on for months. The employing printers have been tireless in their efforts to bring about a settlement without a strike. They are now engaged in a fight, not only for their existence but for a principle in which every business man is interested. If the unions secure their unreasonable demands then the fight would surely be carried to other industries. Business men with whom we have discussed the matter have been most emphatic in urging us to take a most determined stand. "Stay with it and we'll stand with you", they say.

And so we shall "carry on". We shall be somewhat handicapped, especially at first there may be occasions when you can extend your co-operation and support and we feel that we can count on you. It is our intention to issue our publications regularly and as promptly as possible. There will be difficulties to be overcome, and for a short term our service may not be up to its usual high standard. If, therefore, your publication does not reach you on time, if we have to repeat a former advertisement, if proofs are not submitted, or if we fall short of full efficiency in any way, we ask your kind indulgence. We are fighting for greater efficiency at a critical juncture in the world's history, and your co-operation and moral support will help.

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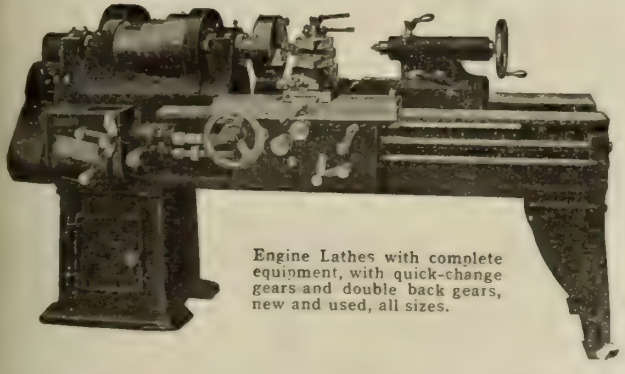


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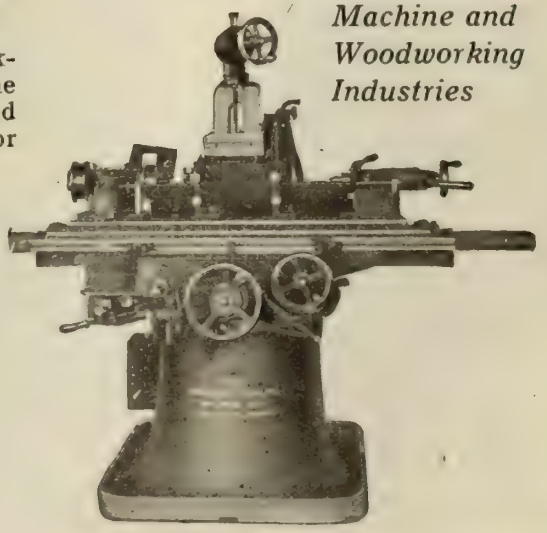
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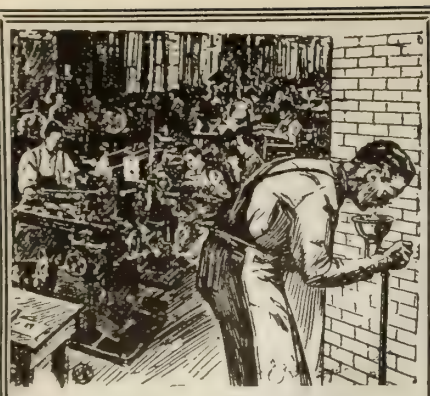
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# INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES

## INVENTORS MAY AT LAST GET A CHANCE TO PROVE THEMSELVE

THE patent offices at Ottawa, Washington and other capitals of the world are stacked with models of inventions, which represent the ambitious, but usually disappointed hopes of thousands of people who were ready to revolutionize industry and incidentally make a fortune for themselves. Some of them deserved well and made good, others have been the bas's of sales of stock on an unbusinesslike basis, which never brought results. The relation between the inventor and the public is chaotic and it often leads to great waste of money by investors who are led into supportin; a project regarding which they have insufficient information. These conditions has led to the proposal that the ideas of the dreamy inventor shou have a better method of testing out, that the world in general may deri the proper benefits from new ideas. has been suggested that a Developme Corporation be formed, which should semi-public in its ownership and contr The stockholders might include the Ir and Steel Institute, the Federation Construction Industries, American E gineering Council, National Electr Light Association, the textile associ tions, and many others of organiz groups. The use of the larger technic schools might be secured for laborato purposes, and model shops, and it shou not take much further expense to te out inventions in a practical way.

## TRADE GOSSIP

The Toronto Asphalt Roofing Mfg. Co., Ltd., who are building a new factory at Mount Denis, state that they expect to install machinery about the end of June. From present outlook actual production will be started some time in August, when they will manufacture a complete line of roofing materials, including slate, roll, etc. The plant being erected is of steel, brick and concrete construction and will be modern in every respect.

The Bell Asbestos Co., Thedford Mines, Que., has dismissed 40 of its employees in the mines and has cut the wages of the rest by from 75 cents to $1.25 a day. No work is being done on Saturdays.

After a strike lasting since May 1st, the 100 employees in the stone-cutting trade in Montreal have accepted the scale of wages offered them last March. Rates agreed are 75 cents an hour for stone-cutters and 60 cents an hour for machine operators, to be in force until May, 1922.

The Local Hydro-Electric Commission, Walkerville, Ont., are planning to erect a modern office building and store.

The Brown Wigle Woollen Mills, at Kingsville, Ont., were destroyed by fire recently.

The Kemp Metal Auto Wheel Co., Ltd., has been incorporated with a capital stock of $1,000,000 and head office at Toronto, to manufacture automobile and metal wheels, machinery, metal goods, etc.

The Dominion Steel Plant, Sydney, N.S., have announced a wage reduction, taking place on June 5th. On the same date, the plant are commencing a 40,000 ton rail order for the C. N. R.
2-column head

The Canadian Edison Appliance C Ltd., Stratford, will have about $30,0 worth of die work to give out duri the year and desires to get in touch wi firms who can handle this kind of wor Edison, Hotpoint and Hughes lines electric goods are manufactured.

The Canadian Locomotive Co., Kin ston, Ont., has closed its works as had no orders on its books. The co pany intend, however, to begin imme ately the erection of an addition to plant which will cost approximate $110,000, to provide greater faciliti for handling material and future bu ness.

### NEW PLANT NOW OPERATING.

The Walker Twist Drill & Tool C Ltd., Walkerville, Ont., have purchas the plant, equipment, stock, and all u filled orders of the Welt Twist Drill C of Canada.

The products of the new organizati are known as the Walker brand, a under the new company, a modern pla is now in operation on high standa drills, reamers, cutters, and special to in carbon and high speed steels.

### VARIED LINES.

The Eclipse Counterbore Co., Lt Walkerville, Ont., have issued th catalogue No. 9, this book containi a full description of their varied line taper shank holders; adjustable s collar holders; safety holders; adju able length holders; counterbore c ters; countersinks; combined core dr and facers; pilots; interchangea drills; inverted counterbores; and s cial tools.

The Providence Engineering Co Providence, R. I., have forwarded various circulars on their lines of corp ball bearing drilling machines. T circulars are well illustrated, and f specifications are given.

### BOOK ON BRASS ROD.

The Bridgeport Brass Co., Bridgeport Conn., have issued an interesting book on the manufacture of brass rod for use in screw machines, with particular reference to certain improvements which they have originated. This book, which consists of 16 pages, makes very interesting and instructive reading.

### FLEXIBLE SHAFT BOOK.

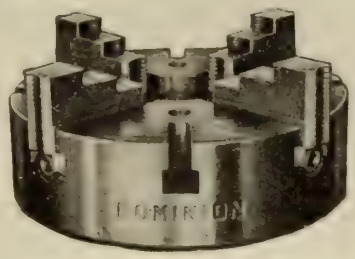
The Herzi Mfg. Co., Bridgeport, Conn., have sent us a catalogue which describes their line of flexible shaft equipment. Numerous photographs of installations and uses are shown, together with detail of the different equipment.

### VARIED MACHINE TOOLS.

The Selson Engineering Co., Ltd., London, England, have forwarded us their catalogue, No. 103, which contains details of various of their lines, these including screw cutting lathes; brass turners' lathes; shaping machines; radial drilling machines; mitreing and slotting machines; tool grinding machines; high speed metal saws, and other allied lines. Specifications and descriptions are given in each case, and the catalogue is well illustrated throughout its 8 pages.

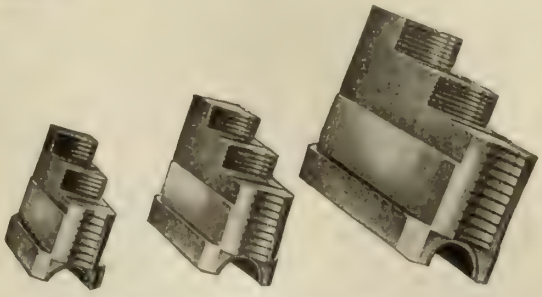
### GRINDER BOOK.

The Grand Rapids Grinding Machine Co., Grand Rapids, Mich., have issued a grinder book that discusses and illustrates various styles of their grinders. Helpful hints regarding the care and use of twist drills is also included, together with details of the machines they make for grinding such drills. Tap grinders conclude this interesting book.

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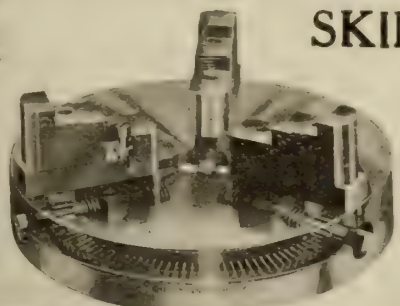
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New York Office 94 Reade St. — San Francisco Office Rialto Building — Chicago Office 552 W. Washington Blvd. — London Office 139 Queen Victoria St. E.C. 4
ESTABLISHED 1887

# Classified Opportunities

## MOTORS WANTED

WANTED—ONE 10 H.P., 3 PHASE, 25 CYCLE, 220 volts; one 25 h.p., 3 phase, 25-cycle, 220 volts. Complete with low voltage release starter, base and pulley. Box 781J, Canadian Machinery.

## SALESMAN WANTED

WANTED — BY WELL-KNOWN AMERICAN manufacturers of pneumatic tools enterprising salesman for Canadian field. Reply giving full experience, present connection, etc. All replies will be treated in confidence. Box 782N, Canadian Machinery.

## MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (etfm)

## POSITION WANTED

UP-TO-DATE MACHINE SHOP FOREMAN desires change, as foreman, general foreman or superintendent. Age 37. Apply Box 783, Canadian Machinery.

## MACHINE WORK WANTED

We are equipped to handle all kinds of general or special machine work. All operations in our plant are done under the most careful supervision and we can satisfy you as to price. Always available for consultation.

**PERFECT MACHINE COMPANY, GALT**

Builders of Reliable Machinery.

Phone Park. 3550

## A. AUSTIN

GENERAL MACHINE WORK

Turret Lathe and Automatic Screw Machine a Specialty. Let us quote on your work.

*With:* Garlock, Walker Machinery Co. 163 Dufferin Street.

## SUNCLO BRAND

WIPING CLOTHS
COTTON WASTE
WOOL WASTE

*Prepared By*

**THE LEVI'S**

98 John Street
TORONTO, ONT.

*Prices on application*

## PATTERNS

TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (otfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (etfm)

## Used Machinery For Sale

1—36" Yeates Band saw.
1—No. 103 Rivet Internal Grinder.
1—No. 199 Wells Universal Cutter Grinder.
1 Cincinnati Slab Miller.
1 No. 3 Greenard Arbor Press and Stand.
1—18"x8' Cincinnati Lathe.
1—24"x24"x6' Putnam Planer.

**CHAS. P. ARCHIBALD & CO.**
285 Beaver Hall Hill. Montreal

## REGO WELDING *and* CUTTING APPARATUS

Oxygen, Acetylene, and a complete line of Welding and Cutting Supplies.

**Carter Welding Co.**
of Toronto, Limited
7-11 Sheppard St., Toronto, Ont.
Phones: Adelaide 2841 and 1524
(TF)

## Modern Marine Machinery

Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

## Used Machinery For Sale

1 21" x 24" x 6' Putnam Planer.
1 20" x 8' C.M.C. Lathe (Rebuilt).
1 15" x 6' Cisco Lathe.
1 No. 3 Landis Universal Grinder.
1—No. 10 Brown & Sharpe Plain Grinder.
1 No. 3 Greenard Arbor Press and Stand.

CHARLES P. ARCHIBALD & CO.,
285 Beaver Hall Hill - - MONTREAL

Machine Shop and Foundry for sale, St. Catharines, Ont. In the centre of the Welland Ship Canal and Hydro activities. Going concern capable of handling all classes of work. Turnover $60,000 a year. Good reasons for selling. Box 777, Canadian Machinery. (c5m)

## BUSINESS CHANCES

WANTED—BY AN ESTABLISHED CONCERN Twelve to fifteen thousand dollars for a period of from one to three years, to take care of business expansion. This concern will stand the fullest investigation. 8% is offered with ample security to principals only, with an opportunity of becoming permanent associates with the partners, if mutually satisfied. Box 767, Canadian Machinery. (etfm

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ELECTRIC STORAGE BATTERY LOCOMOtives for sale. Two. 36-inch gauge. Complete and in good condition. R. T. Gilman & Company, Dept. "E," 211 McGill Street, Montreal (etfm

MOTORS FOR SALE — 5 H.P. CAN. GEN Electric, 2-phase, 60-cycle, 1800 r.p.m., switch starter; 20 h.p., Fairbanks-Morse, 2-phase, 60 cycle, 1200 r.p.m., Auto starter (without low voltage release); 25 h.p., Can. Gen. Electric, 2 phase, 60-cycle, 1000 r.p.m., no starter; 30 h.p. Westinghouse, 2-phase, 60-cycle, 945 r.p.m., Auto starter (without low voltage release); 3 h.p. Westinghouse, 2-phase, 60 cycle, 1700 r.p.m. switch starter; 1 Smart-Turner Triplex Belt driven Pump, 2 x 3. Box 780J, Canadian Machinery.

## Grey Iron Castings

Light and Medium-Bench and Floor Repetition Castings; Capacity 15 tons per day.
Expert Metal and Wood Pattern Work. Our advice and estimates will save you money.
Semi-finishing operations on Lathe or Grill on Castings supplied if required.
ASK US.

**THE KATIE FOUNDRY, GALT, ONT.**

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**Metal Stampings, Limited**
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(C 26 M)

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## Machine Shop Equipment

*At Extremely Low Prices*

LATHES—All sizes and lengths of Leland Special price quoted on rebuilt 20 in. x 8 ft C.M.C.

AIR COMPRESSOR 8 in. x 8in. Chicago Pneumatic.

TANKS—10 Tanks 10 ft. 6 in. diam. x 29 ft. 6 in. long. 19,000 gals.
3 Tanks, 10 ft. 0 in. diam. x 39 ft. 0 in long. 3/8 in. Heads. 22,893 gals
Full line of other Steel Storage Tanks, open and closed, all sizes.

PUMPS—1 Triplex Power Pump, 1½ in. x 6 in. Hydraulic Machy. Co. Also 1 in x 5 in. West Tire Setter.
1—Centrifugal Pump, 2½ in. x 1½ in. Gould.
1—Gould Triplex Power Pump, 2 in. x 3 in.

Milling Cutters and Reamers, full assortment, all sizes and shapes, at less than half price. Send us your enquiries.
Dept. K. 307 St. James St. (29)

**STANDARD EQUIPMENT & TOOL WORKS**
Dept. K. 307 St. James St
Main 2286 MONTREAL
(20)

MACGOVERN & COMPANY INCORPORATED POWER MACHINERY

We have for sale the following

## Small Sized A.C. Generators

### 3 Phase, 60 Cycle

| K.W. | Volt. | Make | P.M.R |
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| 15 | 2300 | Ft. Wayne | .... |
| KVA 20 | 2300 | Fairbanks-Morse | 1800 |
| 25 | 2300 | Ft. Wayne | 1800 |
| 30 | 2400 | Westinghouse | 1200 |
| KVA 30 | 2300 | Fairbanks-Morse | 1200 |
| KVA 35 | 2300 | Allis-Chalmers | 1200 |
| 37½ | 2300 | Westinghouse | 1200 |
| 42 | 2300 | Electrical Machinery | 1200 |
| 45 | 1150 | General Electric | 1200 |
| 50 | 550 | Crocker-Wheeler | 1200 |
| 50 | 2300 | Fairbanks-Morse | 300 |
| 50 | 2300 | General Electric | 900 |
| 60 | 2200 | Warren | 600 |
| KVA 60 | 2300 | Electrical Machinery | 900 |

**MacGOVERN & COMPANY, INC.**
285 BEAVER HALL HILL, MONTREAL

Offices: New York, Pittsburgh, Seattle. Plant: Linden, N.J.

Buyers and Sellers of New and Used Machinery

STOCK SHIPMENTS

# Auto Body Steel

Deep Drawing Crown Fender Stock—Deoxidized—Oiled.

10,200 lbs., 23 Ga., 30" x 96" Primes
5,785 lbs., 23 Ga., 30" x 96" Seconds

Deep Drawing Hood and Fender Stock—Oiled.

8,265 lbs., 22 Ga., 30" x 96" Primes
1,435 lbs., 22 Ga., 30" x 96" Seconds

Regular Auto Body Stock—Oiled.

20,765 lbs., 20 Ga., 30" x 96" Primes
6,935 lbs., 20 Ga., 30" x 96" Seconds
3,220 lbs., 18 Ga., 39" x 96" Primes

Cold-Rolled Strip Steel and Bars.

Sheets—Black, Galvanized, Brass, Copper Aluminum.

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**Your enquiries are solicited.**

## Ontario Metal Products Co.
Limited
237 Dufferin St. - Toronto, Canada

## THE MACHINE YOU WANT AT A LOW PRICE

**VERTICAL BORING MILLS**

2 30" London Machine Tool.
1 42" Bullard.

**HORIZONTAL BORING MILLS**

1 4" Bar Beaman & Smith Floor Type.
2—4" Bar Bertram Elevating Table.
1—8" Bar Barrett Cylinder Boring.
1—8" x 7' Canada Fdy. Co. Boring Bar.

**DRILLING MACHINES**

1 12" Perfect Sensitive.
1 14" Excelsior Sensitive.
1 0 to ½" Capacity, National Sensitive.
1—20" Prentice, Geared Drill, Plain Lever Feed.
1—20" Bertram, Sliding Head, B.G., P.F.
1 25" Barnes, Stationary Head, B.G., P.F.
2 20" Style F Baker.
1 3' Gang Radial.
1 5' Western Radial.
1—6' Western Radial.
1—5' Bickford Full Universal Radial.
1 4' London Semi-Universal Radial.
1 12' MacGregor-Gourlay Plate Radial.
1—3' MacGregor-Gourlay Wall Radial.
1—6-spindle Crosby Mud Ring Drill.
1 13' MacGregor-Gourlay Radial and Countersinking.

**LATHE**

1—Brown & Sharpe Bench Lathe.
1 12" x 5' W. P. Davis.
2—14" x 5' Bertram.
1—14" x 6' Monarch.
2—14" x 6' Porter.
1—15" x 8' Le Blond.
2—16" x 6' Canedy-Otto.
1—16" x 6' MacGregor-Gourlay.
1—16" x 6' F. E. Reed.
1—16" x 8' Cleveland.
1—16" x 8' Lodge & Shipley.
1—18" x 6' Cincinnati.
1—18" x 12' Porter.
1—18" x 12' Bertram.
1—18" x 8' Bertram.
1 18" x 10' Stevens Hamilton.
1—20" x 8' MacGregor-Gourlay.
1—20" x 10' Bertram.
1—20" x 10' Canada Machy. Corporation.
1—20" x 10' MacGregor-Gourlay
1—20" x 10' Boye & Emmes.
1—20" x 10' London.
1 20" x 10' Whitcomb Blaisdell.
1 22" x 8' Bertram.
1 24" x 10' Bertram.
1—24" x 12' London.
1 24" x 12' Schumaker & Boye.
1 24" x 20' Stevens-Hamilton.
1 26" x 12' Fitchburg.
1—26" x 16' Bertram.
1 26" x 18' Bullard.
1 28" x 10' Pond.
1 40" x 18' London.
1—20" x 34" x 10' London Gap
1—18" London Fox Turret.
1 14" Bertram Fox Turret.
6 1½" Wood Tilted Turret.
3 No. 4 Bardon & Oliver Turrets.
3—1¾" National Acme Turrets
1 Pratt & Whitney Turret.
8 6A Potter & Johnson.
2 16" Bawden Single Purpose.
1 100" Bertram Locomotive Wheel.
1 Bertram Axle Turning.

**MILLING MACHINES**

1 No. 00 Brown & Sharpe Bench
1—No. 3 Hendley Universal
1 No. 2 London Plain.
1—No. 13 Brainard Universal.
1—16" x 6' Le Blond.
1—No. 3 Bertram Plain.
1 Brown & Sharpe Plain.
1—24" Bertram Slab Miller Planer Type.
1—40" Bertram Slab.
1—42" Newton Vertical.
1—54" Newton Slab.

**SHAPERS**

1 14" Bertram Traverse, Double Table.
1 16" T. W. Hand Traverse.
1—16" Broadbent Traverse.
1 15" Smith & Mills Plain.
1—20" Hendey.
1 20" Bertram.
1—24" Morton Draw Cut.
1—30" Morton Draw Cut.

**MISCELLANEOUS**

1 10" Crosby Slotting Machine.
1 24" Bertram Triple Head Locomotive Frame Slotter.
2 4" Pipe Machines.
1—2" Pipe Machine.
2 Coil Winding Lathes.
1—Coil Winding and Measuring Machine.
6 Bull Riveters, 9" to 42". Allan & Hanna.
8—6" Racine H.S. Hack Saws.
2—6" Marvel H.S. Hack Saws
1—10" Racine H.S. Hack Saw.
1 Hand Bending Machine
1 12" x 72" Grindstone with bearings
2—3-ton Harrington Hoists.
1 2-ton Harrington Hoist
1 2-ton Sprague Electric Hoist
1 Single Friction Drum Cable Hoist
1—Sand Mill.
1 No. 2 Garvin Tapping Machine.

**CANADIAN ALLIS-CHALMERS, LIMITED, King & Simcoe Sts., Toronto**

# Canadian Machinery BUYERS DIRECTORY

**If what you want is not here, write us, and we will tell you where to get it. Let us suggest that you consult also the advertisers' index—last page of book, after having secured advertisers' names from this directory. The information you desire may be found in the advertising pages. This department is maintained for the benefit and convenience of our readers. The insertion of our advertisers' names under proper headings is gladly undertaken, but does not become part of an advertising contract.**

**Abrasive Discs**
Norton Co. of Can., Ltd., Hamilton, Ont.
Oakey & Sons, Ltd., John London S.E., Eng.

**Abrasive Materials**
Can. Hart Products, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont

**Acetylene, Dissolved**
L'Air Liquide Society, Toronto, Ont.

**Accumulators, Hydraulic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Air Cocks**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass

**Air Lifts**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Analyses, Chemical**
Toronto Testing Laboratory, Toronto, Ont.

**Angle Bars**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Anvils**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Columbia Hdwe. Division, Cleveland, O.
Petrie, Ltd., H. W., Toronto, Ont.

**Arbors**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Cleveland Twist Drill Co., Cleveland, O.
Ford-Smith Machine Co., Hamilton, Ont
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Jacobs Mfg. Co., Hartford, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.

**Axles, Car**
Dom. Foundries & Steel, Hamilton, Ont.

**Babbitt Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.

**Balls, Brass, Bronze and Steel**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian SKF Co., Toronto, Ont.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

**Barrels, Tumbling**
McDougall Co., Ltd., R., Galt, Ont.

**Bars, Boring**
Armstrong Bros. Tool Co., Chicago, Ill.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Madison Mfg. Co., Muskegon, Mich.

**Bars, Boring, Portable**
Underwood Corp., H. B., Philadelphia, Pa.

**Bars, Bronze Cored**
Moore & Son, Thos., Montreal, Que.

**Bars, Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Bars, Steel**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.

**Bearings, Ball**
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Railway Roller Bearing Co., Syracuse, N.Y.

**Bearings, Bronze**
Railway Roller Bearing Co., Syracuse, N.Y

**Bearings, Die-Cast**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Tallman Brass & Metal Co., Hamilton, Ont.

**Bearings, Journal**
Fisher Motor Co., Ltd., Orillia, Ont.

**Bearings, Roller**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

**Belt Cement**
McLaren Belting Co., J. C., Montreal, Que.

**Belt Dressings and Fillers**
Aikenhead Hardware Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.

**Belt Fasteners**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Belt Hooks**
Torrington Co., Ltd., Upper Bedford, Que.

**Belt Lacing**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

**Belt Lacing, Steel**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing, Hinged**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing, Flexible Steel**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing Machines**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
McLaren Belting Co., J. C., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Belt Joiners, Conveyor**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Tools**
Graton & Knight Mfg. Co., Worcester, Mass.

**Belting, Chain**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Belting, Fabric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
McLaren Belting Co., J. C., Montreal, Que.
Sumner & Co., New York City.

**Belting, Leather**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Smith Belting Co., Toronto, Ont.
Sumner & Co., New York City.
Tullis & Son, Ltd., John, Glasgow, Scot.

**Belting, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.
Quaker City Rubber Co., Philadelphia, Pa.

**Belts, Abrasive**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.

**Bench Countershaft Standards**
Ford-Smith Machine Co., Hamilton, Ont.

**Benches, Work**
Aikenhead Hardware Ltd., Toronto, Ont.

**Bending Machines, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bertrams Ltd., Edinburgh, Scotland.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Bins, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Blocks**
Ford Chain Block Co., Philadelphia, Pa.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Chain (See Hoists, Hand)**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**For list of Dealers see the last page of This Buyers' Directory**

Ford Chain Block Co., Philadelphia, Pa.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Die**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Blocks, Pillow**
Can. Link-Belt Co., Toronto, Ont.

**Blowers**
Can. Blower & Forge Co., Ltd., Kitchener.
General Combustion Co. of Can., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Bolt and Nut Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Greenfield Tap & Die Corp., Galt, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Bolt and Nut Machinery, Automatic**
National Acme Co., Cleveland, Ohio.

**Bolts and Nuts**
London Bolt & Hinge Works, London, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Petrie, Ltd., H. W., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Bolt Threading Die Heads**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa

**Boosters**
Sturtevant Co., B. F., Boston, Mass.

**Boring and Turning Mills, Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.

**Boring, Drilling and Milling Machines, Horizontal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa.

**Boring, Drilling and Milling Mach., Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Boring Heads**
Aikenhead Hardware Ltd., Toronto, Ont.

**Boring Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Gisholt Machine Co., Madison, Wis.

**Brakes, Magnetic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Brass**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Brass Valves**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Brass Pipe Fittings**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Bricks, Fire**
Elk Firebrick Co. of Can., Ltd., Hamilton, Ont.

**Bridges**
Hamilton Bridge Works Co., Ltd., Hamilton Ont.
MacKinnon Steel Co., Sherbrooke, Que.

**Broaching Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont

**Bronze**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bronze, Phosphor**
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bucket Carriers, Pivoted**
Can. Link-Belt Co., Toronto, Ont.

**Buffing or Polishing Machines (See Polishing and Buffing Machines)**
Blount Co., J. G., Everett, Mass.
Can Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
U S Electrical Tool Co., Cincinnati, O

**Bulldozers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Burners, Oil and Gas**
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

**Bushings**
Fisher Motor Co., Ltd., Orillia, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Cabinets, Oil**
S. F. Bowser & Co., Ltd., Toronto, Ont.

**Calipers**
Brown & Sharpe Mfg. Co., Providence, R.I
Starrett Co., L. S., Athol, Mass.

**Cams**
Canada Foundries & Forgings Co., Welland, Ont.

**Can-Making Machinery (See Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont
MacKinnon Steel Co., Sherbrooke, Que.

# BUYERS' DIRECTORY

Union Carbide Co. of Can., Ltd., Welland, Ont.

**Cars, Ore**
MacKinnon Steel Co., Sherbrooke, Que

**Castings, Aluminum**
Canada Electric Castings Co., Ltd., Orillia
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Brass and Bronze**
Algoma Steel Corp., Ltd., Sault Ste Marie, Ont.
Canada Electric Castings Co., Ltd., Orillia
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont
Can. Driver-Harris Co., Walkerville, Ont
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Copper**
Canada Metal Co., Ltd., Toronto, Ont
Can. Hanson & Van Winkle Co., Toronto, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Marine**
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Castings, Die Molded**
Fisher Motor Co., Ltd., Orillia, Ont
Franklin Die-Casting Corp., Syracuse, N.Y
Kaltle Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Ferro-Alloy**
Can. Steel Foundries, Montreal, Que

**Castings, Iron**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Kaltle Foundry Co., Galt, Ont
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Hyd. Press**
Can. Steel Foundries, Montreal, Que.

**Castings, Monel Metal**
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

**Castings, Naval Bronze**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Nichrome**
Can. Driver-Harris Co., Walkerville, Ont.

**Castings, Nickel**
Can. Hanson & Van Winkle Co., Toronto, Ont.

**Castings, Semi-Steel**
Davidson Mfg. Co., Thos., Montreal, Que.
Hull Iron & Steel Foundries, Hull, Que
Kaltle Foundry Co., Galt, Ont
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

**Castings, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

**Cements, Iron**
Smooth Mfg. Co., Jersey City, N.J.

**Centering Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Chains (See Sprockets and Chains)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chains, Driving**
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chasers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chemists**
Toronto Testing Laboratory, Toronto, Ont.

**Chucking Machines**
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont
Steinle Turret Machine Co., Madison, Wis
Warner & Swasey Co., Cleveland, Ohio

**Chucks, Drill**
Jacobs Mfg. Co., Hartford, Conn

**Chucks, Drill and Tap**
Aikenhead Hardware Ltd., Toronto, Ont
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn
Dom. Steel Products Co., Brantford, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Lathe**
Aikenhead Hardware Ltd., Toronto, Ont
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que

**Chucks, Magnetic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**
Columbia Hdwe. Division, Cleveland, O
Dickow, Fred C., Chicago, Ill
Starrett Co., L. S., Athol, Mass

**Cleaners, Metal, Waste, General**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Clocks, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Clutches, Friction**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**
Can. Link-Belt Co., Toronto, Ont

**Cocks and Faucets**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass

**Collars, Shaft or Set**
Canada Foundries & Forgings Co., Welland, Ont
Can. Link-Belt Co., Toronto, Ont.

**Collets**
Ackworthie, Ltd., John, Birmingham, Eng
Butterfield & Co., Inc., Rock Island, Que
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn
Kearney & Trecker Co., Milwaukee, Wis
Petrie, Ltd., H. W., Toronto, Ont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compressors, Air**
Curtis Pneumatic Machinery Co., St Louis, Mo

**Compressors, Air and Gas**
Can. Fairbanks-Morse Co., Ltd., Montreal
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**
Ford-Smith Machine Co., Hamilton, Ont
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que
Mathews Gravity Carrier Co., Port Hope, Ont.

**Conveyor Belt Joiners**
Flexible Steel Lacing Co., Chicago, Ill.

**Copper**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Cored Bronze Bars**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Cotter Pins**
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Counterbores**
Cleveland Twist Drill Co., Cleveland, O
Eclipse Counterbore Co., Ltd., Walkerville, Ont
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**
Aikenhead Hardware Ltd., Toronto, Ont
Starrett Co., L. S., Athol, Mass.

**Countershafts**
Bertram & Son Co., Ltd., The John, Dundas, Ont
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**
Butterfield & Co., Inc., Rock Island, Que
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Couplers, Car and Locomotive**
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont

**Couplings, Flexible**
Holden Co., Ltd., Montreal, Que

**Couplings, Rigid**
Bernard Industrial Co., A., Fortierville, Que

**Couplings, Shaft**
Bilton Machine Co., Bridgeport, Conn
Can. Link-Belt Co., Toronto, Ont

**Cranes, Electric**
Bertram & Son Co., Ltd., The John, Dundas, Ont
Can. Link-Belt Co., Toronto, Ont
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.

**Cranes, Hand (See Hoists, Hand)**
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Sheffield Engineering Supplies, Ltd., Montreal, Que

**Cranes, Locomotive**
Can. Link-Belt Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que

**Cranes, Traveling**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont

**Crank Pin Turning Machines**
Garlock-Walker Mchy. Co., Toronto, Ont
Herbert Ltd., Alfred, Toronto, Ont
Underwood Corp., H. B., Philadelphia, Pa.

**Cutters, Flue**
Holden Co., Ltd., Montreal, Que

**Cutters, Gear**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que
Brown & Sharpe Mfg. Co., Providence, R.I
Butterfield & Co., Inc., Rock Island, Que
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**
Armstrong Whitworth, of Canada, Ltd., Montreal, Canada
Atkins & Co., Inc., E. C., Indianapolis, I.
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Madison Mfg. Co., Muskegon, Mich
Pilot Steel & Tool Co., Montreal, Que
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Milling**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I
Butterfield & Co., Inc., Rock Island, Que
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Milling Machine Co., Cleveland
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont
Kearney & Trecker Co., Milwaukee, Wis
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que

**Cutters, Stay Bolt**
Acme Machinery Co., Cleveland, Ohio
Landis Machine Co., Inc., Waynesboro, Pa
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Thread**
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa

**Cutting-Off Machines**
Bertram & Son Co., Ltd., The John Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I
Etna Machine Co., Toledo, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Cutting-Off Machines, Pipe (See Pipe Cutting and Threading Machines)**
Landis Machine Co., Inc., Waynesboro, Pa
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Cutting-Off Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill
Pilot Steel & Tool Co., Montreal, Que.

**Cutting Oil Filters (See Oil Filtering Systems)**
Bowser, S. F., & Co., Ltd., Toronto, Can
Cataract Refining Co., Toronto, Ont.

**Cutting, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que
Perdue, W. B., San Francisco, Calif
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont

**Cutting, Oxy-Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Dealers, Machinery (See Searchlight Section)**
Ford-Smith Machine Co., Hamilton, Ont
Petrie, Ltd., H. W., Toronto, Ont.

**Deckle Straps**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Diamonds, Black and Rough**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond, Carbon and Bortz**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond Tools**
Aikenhead Hardware Ltd., Toronto, Ont
Can. Desmond-Stephan Co., Hamilton Ont.
Ford-Smith Machine Co., Hamilton, Ont
Wheel Trueing Tool Co., Detroit, Mich.

**Diamond Crossings**
Can. Steel Foundries, Montreal, Que.

**Die-Castings**
Tallman Brass & Metal, Ltd., Hamilton Ont.

**Dies, Pipe-Threading**
Jones & Lamson Machine Co., Springfield, Vt.

**Die Sinking Machines, Automatic**
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

**Die Sinkers**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Screw and Thread Cutting**
Ackworthie, Ltd., John, Birmingham, Eng
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt
Landis Machine Co., Inc., Waynesboro, Pa
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Toledo Machine & Tool Co., Toledo, Ohio.

# BUYERS' DIRECTORY

**Dies, Forging**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

**Dies, Hammer**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Self-Opening, Adjustable**
Can. Fairbanks-Morse Co., Ltd., Montreal
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Dies, Threading-Opening**
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Disc Cement**
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Dividing Heads**
Ackworthie, Ltd., John, Birmingham, Eng.
Darlow, Fred C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Dogs, Lathe and Milling Machine**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drafting Boards and Tables**
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Drafting Materials**
American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Dressers, Grinding Wheel**
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Drill Holders**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drill Rods**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Drill Speeders**
Canada Machinery Corp., Galt, Ont.

**Drilling Machine Heads**
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

**Drilling Machines, Automatic**
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

**Drilling Machines, Bench**
Beacon Engineering Co., Tipton, England.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Electric and Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Gang**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drilling Machines, Heavy Duty**
Armstrong-Whitworth, of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Multiple Spindle**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

**Drilling Machines, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Drilling Machines, Portable**
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Radial**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Drilling Machines, Sensitive**
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Turret**
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

**Drilling Machines, Vertical**
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng.
Tool Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Drills, Center**
Bullard Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drills, High Speed Twist**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Bullard Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Drills, Twist and Flat**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Pilot Steel & Tool Co., Montreal, Que.

**Dust Handling Equipment**
Can. Blower & Forge Co., Ltd., Kitchener.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Electrical Instruments**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Electrical Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O.

**Elevating Trucks (See Trucks)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Elevators and Conveyors**
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Emery Wheels (See Grinding Wheels)**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Hart Products, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Engines, Capstan**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Engineers, Mechanical**
Dominion Engineering Works, Ltd., Montreal, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.

**Expanders, Tube**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Eyeglasses, Safety (See Goggles, Safety)**
Prest-O-Lite Co. of Can., Toronto, Ont.
Willson Goggles, Inc., Reading, Pa.

**Fans, Electric**
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal
Northern Electric Co., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Exhaust**
Can. Blower & Forge Co., Ltd., Kitchener.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Ventilating**
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**File Handles**
Ingersoll File Co., Ltd., Ingersoll, Ont.

**Files and Rasps**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Filing Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Filler, Iron (See Cements, Iron)**
Smooth Mfg. Co., Jersey City, N.J.

**Fire Extinguishers**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Fittings, Pipe**
International Malleable Iron Co., Guelph, Ont.

**Flexible Shafts**
Aikenhead Hardware Ltd., Toronto, Ont.

**Flux, Galvanizing**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Fluxes, Welding**
L'Air Liquide Society, Toronto, Ont.

**Forging Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Forgings, Drop**
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd., Toronto, Ont.

**Forgings, Hammer**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Foundry Equipment**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Foundry Supplies**
Atkins & Co., Inc., E. C., Indianapolis, Ind.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Frogs, Spring or Rigid**
Can. Steel Foundries, Montreal, Que.

**Fuel Oil Burning System**
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Coal**
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Oil and Gas**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces and Ovens, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces, Tempering and Annealing**
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furniture, Machine Shop**
Garlock-Walker Mchy. Co., Toronto, Ont.

**Gages, Comparator**
Jones & Lamson Machine Co., Springfield, Vt.
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont.
Perdue, W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass.

**Gages, Measuring (See Tool Work)**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Gages, Recording**
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.
Taylor Instrument Co., Toronto, Ont.

# BUYERS' DIRECTORY

Ackworthic, Ltd., John, Birmingham, Eng
Brown & Sharpe Mfg. Co., Providence, R I
Can Fairbanks-Morse Co., Ltd., Montreal
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Standard**
Armstrong Whitworth Co. of Can., Lt Montreal, Que.
Athins & Co., Inc., E. C., Indianapolis,
Johansson Inc., C. E., Windsor, Ont.

**Gages, Thread**
Ackworthic, Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Gas, Coal Compressed**
L Air Liquide Society, Toronto, Ont.

**Gas, Compressed**
Prest-O-Lite Co. of Can., Toronto Ont.

**Gaskets**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg Co., Jersey City, N J.

**Gauges, Vacuum and Pressure**
[illegible] Instrument Co., Toronto, Ont.

**Gear Blanks**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario
Philadelphia Gear Works, Philadelphia, Pa.

**Gear-Cutting Machines**
Bertram & Son Co., Ltd, The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R I
Can Fairbanks-Morse Co., Ltd., Montreal.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn

**Gear Testing Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
[illegible] Machine Co., Hamilton, Ont.

**Gears, Cast**
Can Link-Belt Co., Toronto, Ont.
Can Steel Foundries, Montreal, Que.
Dom Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd, Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

**Gears, Cut**
Brown & Sharpe Mfg. Co., Providence, R I.
Canadian SKF Co, Toronto, Ont.
Crescent Machine Co., Ltd., Montreal Q
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dominion Bridge Co, Ltd, Lachine, Que.
Dom Steel Products Co, Brantford, Ont
Ford Smith Machine Co., Hamilton, Ont
Gardner & Son, Robt., Montreal, Que
Hamilton Gear & Machine Co, Toronto, Ontario
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co, A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd, R, Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Gears, Dressed**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Gears, Forged**
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co, Montreal, Que.

**Gears, Herringbone**
Dom Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co, Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

**Gears, Machine Moulded**
Can Steel Foundries, Montreal, Que.

**Gears, Rawhide (See Gears, Cut)**
Hamilton Gear & Machine Co, Toronto, Ontario
Philadelphia Gear Works, Philadelphia, Pa.

**Gear, Silent Chain**
Gardner & Son, Robt., Montreal, Que.
Morse Chain Co, Ithaca, N.Y.
Can Link-Belt Co, Ltd, Toronto, Can
Hans Renold of Canada, Ltd, Montreal, Quebec

**Gears, Worm**
Dom Steel Products Co, Brantford, Ont.
Hamilton Gear & Machine Co, Toronto, Ontario

**Generators, Acetylene**
[illegible] Supply Society, Toronto, Ont.

**Generators, Electric**
Holden Co, Ltd, Montreal, Que.
Northern Electric Co, Montreal, Que.
Petrie, Ltd., H W, Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Goggles, Safety**
Perdue, W. R, San Francisco, Calif
Prest-O-Lite Co. of Can, Toronto, Ont
Standard Optical Co, Geneva, N Y
Willson Goggles, Inc, Reading, Pa

**Grab Buckets**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can Link-Belt Co, Toronto, Ont
Dominion Bridge Co, Ltd, Lachine, Que
Morris Crane & Hoist Co, Ltd., Niagara Falls, Ont.

**Grease Cups, Pressed Steel and Brass**
Can. Winkley Co, Ltd, Windsor, Ont

**Greases, Lubricating**
Canadian SKF Co, Toronto, Ont
Cateract Refining Co., Toronto, Ont.

**Grinding Discs**
Ritchey Supply Co., Toronto, Ont.

**Grinding Machines**
Brown & Sharpe Mfg Co, Providence, R I
Can. Fairbanks-Morse Co., Ltd., Montreal

**Grinding Machines, Abrasive Belt**
Beacon Engineering Co, Tipton, England
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Automatic**
Pratt & Whitney Co., of Canada, Ltd, Dundas, Ont.

**Grinding Machines, Bench**
Aikenhead Hardware Ltd, Toronto, Ont
Blount Co, J. G., Everett, Mass.
Ford-Smith Machine Co, Hamilton, Ont
Foss Machinery & Supply Co., Geo F, Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Morse Twist Drill & Machine Co, New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co, Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.
Terry & Co., John C., Birmingham, Eng
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery & Supply Co., A. R Montreal, Que.

**Grinding Machines, Center**
U S Electrical Tool Co, Cincinnati, O
Wisconsin Electric Co, Racine, Wis.

**Grinding Machines Chaser**
Jones & Lamson Machine Co, Springfield, Vt

**Grinding Machines, Cutter and Reamer**
Cincinnati Milling Machine Co, Cincinnati, Ohio.
Garlock-Walker Mchy Co, Toronto Ont
Greenfield Machine Co, Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd, H W Toronto, Ont
Pratt & Whitney Co, of Canada, Ltd, Dundas, Ont.

**Grinding Machines, Cylindrical**
Garlock-Walker Mchy Co, Toronto Ont
Greenfield Machine Co, Greenfield, Mass
Pratt & Whitney Co, of Canada, Ltd, Dundas, Ont.

**Grinding Machines, Die**
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co, Detroit, Mich
National Acme Co, Cleveland, Ohio
National Machinery Co., Tiffin, Ont.

**Grinding Machines, Disc**
Beacon Engineering Co, Tipton England
Ford Smith Machine Co, Hamilton, Ont

**Grinding Machines, Drill**
Beacon Engineering Co, Tipton England
Bertram & Son Co, Ltd, The John, Dundas Ont
Holden Co, Ltd, Montreal, Que

**Grinding Machines, Face**
Ford Smith Machine Co, Hamilton, Ont

**Grinding Machines, Floor and Tool**
Beacon Engineering Co, Tipton England
Blount Co, J. G, Everett, Mass
Ford Smith Machine Co, Hamilton Ont
Gisholt Machine Co, Madison, Wis
Modern Tool Co, Erie, Pa
National Acme Co, Cleveland, Ohio
Petrie, Ltd, H W, Toronto Ont
Terry & Co, John C, Birmingham Eng

**Grinding Machines, Internal**
Garlock-Walker Mchy Co, Toronto, Ont
Holden Co, Ltd, Montreal, Que

**Grinding Machines, Portable**
Can Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Electrical Tool Co, Cincinnati, Ohio.
Cleveland Pneumatic Tool Co, Toronto, Ont.
Garlock-Walker Mchy Co, Toronto Ont
Holden Co, Ltd, Montreal, Que
Independent Pneumatic Tool, Chicago, Ill
Wisconsin Electric Co, Racine, Wis

**Grinding Machines, Power Oscillating Tool**
Herbert Ltd., Alfred, Toronto, Ont.

**Grinding Machines, Ring Wheel**
Ford Smith Machine Co, Hamilton, Ont

**Grinding Machines, Snagging**
Blount Co, J. G, Everett, Mass
Ford Smith Machine Co, Hamilton, Ont.
Norton Co of Can, Ltd, Hamilton, Ont

**Grinding Machines, Surface**
Garlock-Walker Mchy Co, Toronto Ont
La Salle Tool Co, Ltd, La Salle, Ill.
Petrie, Ltd, H W, Toronto, Ont
Pratt & Whitney Co, of Canada, Ltd, Dundas, Ont

**Grinding Machines, Thread**
Pratt & Whitney Co, of Canada, Ltd., Dundas, Ont

**Grinding Machinery, Tool Post**
Foss Machinery & Supply Co, Geo F, Montreal, Que
Gisholt Machine Co, Madison, Wis
Wisconsin Electric Co, Racine, Wis

**Grinding Machines, Universal**
Foss Machinery & Supply Co, Geo F, Montreal, Que
Garlock-Walker Mchy Co, Toronto Ont
Gisholt Machine Co, Madison, Wis.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co, Waynesboro, Pa
Modern Tool Co, Erie, Pa
Morse Twist Drill & Machine Co, New Bedford, Mass
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co, Toronto, Ont.
Waltham Grinding Wheel Co of Canada, Brantford, Ont

**Grinding Wheels**
Aikenhead Hardware Ltd, Toronto, Ont
Atkins & Co, Inc, E C, Indianapolis, I
Can. Fairbanks-Morse Co., Ltd, Montreal
Dom. Abrasive Wheel Co, Ltd., Milnico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co of Canada, Ltd., Brantford, Ont.

**Guards, Emery Wheel**
Ford Smith Machine Co, Hamilton, Ont

**Guards, Machinery and Window**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Guards, Electric Lamp**
Flexible Steel Lacing Co, Chicago, Ill.

**Gun-Barrel Machinery**
Stebbins Turret Machine Co, Madison, Wis

**Hack Saws, Power**
Ackworthic Ltd, John Birmingham, Eng
Aikenhead Hardware Ltd, Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I.
Chesson Bros., Hamilton, Canada.
Garlock-Walker Mchy Co, Toronto Ont
Lyman Tube & Supply Co, Montreal, Que
Petrie, Ltd, H W, Toronto, Ont
Simonds Canada Saw Co., Montreal, Que.
Starrett Co, L S, Athol, Mass
Williams Machinery & Supply Co, A R, Montreal, Que.

**Hammers, Chipping**
Cleveland Pneumatic Tool Co, Toronto Ont.

**Hammers Drop**
Bertram & Son Co, Ltd, The John, Dundas, Ont.
Bliss Co, E W, Brooklyn, N Y
Bowen Boggs & Co, Ltd, Hamilton, Ont
Canada Foundries & Forgings Co, Welland, Ont.
Canada Machinery Corp, Galt, Ont

**Hammers, Electric**
Aikenhead Hardware Ltd, Toronto, Ont
Bowen Boggs & Co, Ltd, Hamilton, Ont
Holden Co, Ltd, Montreal, Que

**Hammers, Pneumatic**
Can. Ingersoll Rand Co, Ltd, Sherbrooke, Que.
Cleveland Pneumatic Tool Co, Toronto Ont
Garlock-Walker Mchy Co, Toronto Ont
Holden Co, Ltd, Montreal, Que
Independent Pneumatic Tool, Chicago, Ill
Keller Pneumatic Tool Co, Grand Haven, Mich

**Hammers, Power**
Bertram & Son Co, Ltd, The John, Dundas, Ont.
Bowen Boggs & Co, Ltd, Hamilton, Ont
Jardine & Co, A B, Hespeler, Ont
Petrie, Ltd, H W, Toronto, Ont.

**Hammers, Riveting**
Cleveland Pneumatic Tool Co, Toronto Ont

**Hangers, Shafting**
Can. Link-Belt Co, Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co, Toronto, Ont.
Ford Smith Machine Co, Hamilton, Ont
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Terry & Co., John C., Birmingham, Eng.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hardening, Case-Hardening and Tempering**
Hamilton Gear & Machine Co, Toronto, Ont

**Hardness Testing Apparatus**
Shore Instrument Co., Jamaica, N.Y.

**Heating**
Sturtevant Bros Mfg Co, Inc, St. Louis, Mo

**Hobbing Machines**
Herbert Ltd, Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hobs**
Armstrong Whitworth of Canada, Ltd. Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R.I
Greenfield Tap & Die Corp, Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd. Dundas, Ont.

**Hoists, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can Link-Belt Co, Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd, Montreal
Garlock-Walker Mchy Co., Toronto, Ont
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

**Hoists, Hand**
Lyman Tube & Supply Co, Montreal, Que
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Weed Mfg. Co., Lisbon, Ohio.

**Hoists, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo
Garlock-Walker Mchy. Co, Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Holders-On, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Hose, Flexible Steel**
Can. Fairbanks-Morse Co., Ltd., Montreal
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Hose, Industrial**
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can. Ltd., Toronto, Ont.

**Hose, Rubber**
Can Consolidated Rubber Co., Ltd., Montreal, Que
Can Fosmite Firefoam Co., Hamilton Ont.

**Hydraulic Leather**
Graton & Knight Mfg. Co., Worcester, Mass

**Hydraulic Machinery**
Bertram & Son Co., Ltd, The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Stewart & Co., Duncan, Glasgow, Sco.

**Hydrogen**
Niagara Electro Products, Ltd, Toronto Ont.

**Index Centers**
Dudley, Fred C., Machinery Co, Chicago, Ill.

**Igniters, Gas Engine**
Canada Foundries & Forgings Co, Welland, Ont.

**Indicators, Speed and Test**
Aikenhead Hardware Ltd, Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I
Brown & Sharpe Mfg. Co., Providence, R I

**Insulation**
Diamond State Fibre Co of Can, Ltd. Toronto, Ont.

**Iron Valves**
Haws Sanitary Drinking Fountain Co., Haywardville, Mass

**Jacks, Hydraulic**
Norton, A. O., Boston, Mass

**Jacks, Planer**
Armstrong Bros Tool Co, Chicago, Ill
Starrett Co., L. S., Athol, Mass.

Bilton Machine Co., Bridgeport, Conn.
Burgess & Marckland, Montreal, Que
Crescent Machine Co., Ltd., Montreal, Q

# BUYERS' DIRECTORY

**Jigs and Fixtures (See Tool Work)**
Fisher Motor Co., Ltd., Orillia, Ont
Ford Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Keyseating Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Keys, Machine**
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

**Knives, Machine**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Simonds Canada Saw Co., Montreal, Que.

**Knurl Holders**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lacing Leather**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

**Lamps, Electric**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**Lathe Attachments**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.

**Lathe Pans, Portable**
Canada Machinery Corp., Galt, Ont.

**Lathe Tools**
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

**Lathes, Automatic and Semi-Automatic**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Bench**
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lathes, Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
McDougall Co., Ltd., R., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Engine**
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Sidney Machine Tool Co., Sidney, Ohio
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Extension and Gap**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Lathes, Heavy Duty Projectile Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blaskill Wire Machy. Co., Ltd., Montreal
Sidney Machine Tool Co., Sidney, Ohio.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio.
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Polishing (See Polishing and Buffing Machines)**
Ford-Smith Machine Co., Hamilton, Ont

**Lathes, Relieving**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Lathe, Universal Hand**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Lathes, Screw-Cutting**
Jones & Lamson Machine Co., Springfield, Vt.

**Lathe, Speed and Hand**
Blount Co., J. G., Everett, Mass.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Lathes, Spinning**
Terry & Co., John C., Birmingham, Eng.

**Lathes, Threading**
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

**Lathes, Vertical Turret**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

**Lathes, Wood Turning**
Blount Co., J. G., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Lead Pipe**
Canada Metal Co., Ltd., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Lighting Fixtures**
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

**Linoleum Mill Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Liquid Air Plants**
L'Air Liquide Society, Toronto, Ont.

**Lockers, Clothes**
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

**Lubricants**
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Lubricating Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Machinists' Small Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Mandrels, Expanding**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Mandrels, Solid**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Measuring Machines**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Metals, Alloy**
British Smelting & Refining Co., Ltd. Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Tallman Brass & Metal, Ltd., Hamilton, Ontario.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Metalite Cloth**
Ritchey Supply Co., Toronto, Ont.

**Micrometer Calipers**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Milling Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Milling Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**Milling Machines, Automatic**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Bench**
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Hand**
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

**Milling Machines, Horizontal and Planer Type**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Milling Machines, Plain**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Milling Machines, Universal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Milling Machines, Vertical**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

**Monel Metal**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Motors, Electric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Moulded Rubber Goods**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Nail Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Nails and Staples**
Canada Metal Co., Ltd., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont

**Nickel, Bars, Sheets, Wire, Etc.**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Nickel Plating Outfits**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Nickel Silver**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Nitrogen**
L'Air Liquide Society, Toronto, Ont.

**Nut Tappers (See Bolt and Nut Machinery)**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

**Nuts, Finished and Semi-finished**
Galt Machine Screw Co., Galt, Ont.

**Nuts, Machine Screw**
Torrington Company, Ltd., Upper Bedford, Que.

**Nuts, S.A.E., Plain and Castellated**
Galt Machine Screw Co., Galt, Ont.

**Oil Cocks and Burners**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Oil Filtering and Storage Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oil Storage Engineers**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oils**
Canadian Oil Companies, Ltd., Toronto, Ont.
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Hole Covers**
Can. Winkley Co., Ltd., Windsor, Ont

**Oils, Soluble**
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oxygen**
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

**Oxy-Acetylene Apparatus**
L'Air Liquide Society, Toronto, Ont.

**Packing, Hydraulic**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

**Packing, Steam**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

**Paper Mill Conveyors**
Bertrams Ltd., Edinburgh, Scotland.
Dominion Engineering Works, Ltd., Montreal, Que.

**Patents**
Fetherstonhaugh & Co., Ottawa, Ont.
Marion & Marion, Montreal, Que.

**Pans, Wet and Dry**
Frost Mfg. Co., Chicago, Ill.

**Pattern-Shop Machinery (See Woodworking Machinery)**
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Patterns, Wood and Metal**
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont
Wraggis Pattern Works, Galt, Ont.

**Penstocks, Steel**
MacKinnon Steel Co., Sherbrooke, Que

# BUYERS' DIRECTORY

**Phosphor Tin**
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.

**Photographic Duplicating Machines**
Commercial Camera Co., Providence, R.I.

**Pig Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Bending Machines**
American Pipe Bending Machine Co., Boston, Mass.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

**Pipe Couplings**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Cutting and Threading Machines**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**
Landis Machine Co., Inc., Waynesboro, Pa.

**Pipe Fitters' Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa.

**Piston-Ring Machines**
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Planers, Parallels**
L. & P. Mfg. Co., Niagara Falls, Ont.

**Planing Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Planing Machines, Rotary**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Plumbers' Brass Goods**
Pure Sanitary Drinking Fountain Co., Haydenville, Mass.

**Pneumatic Tools**
Can Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**
Ackworthle, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Blount Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Pots, Steel**
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Pressed Steel Parts**
Ackworthle, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich.
Can. Fairbanks-Morse Co., Ltd., Montreal.
L. & P. Manufacturing Company, Ltd., Niagara Falls, Ont.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strellinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Presses, Drop and Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Foot and Hand**
Brown, Boggs & Co., Ltd., Hamilton Ont.
Terry & Co., John C., Birmingham, Eng.

**Presses, Forcing**
Atlas Press Co., Kalamazoo, Mich.
Stewart & Co., Duncan, Glasgow, Scot.

**Presses, Hydraulic**
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

**Presses, Power**
Brass Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Protractors**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Propellers**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Pulleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal and Fibre**
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Pulp and Paper Mill Equipment**
Dominion Engineering Works, Ltd., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que

**Pumps, Barrel and Boiler-feed**
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coalant**
Trahern Pump Co., Rockford, Ill.

**Pumps, Geared and Hand**
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**
Can. Fairbanks-Morse Co., Ltd., Montreal
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Dominion Engineering Works, Ltd., Montreal, Que.
Hepburn Ltd., John T., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

**Pumps, Lubricant and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Jardine & Co., A. B., Hespeler, Ont.

**Punches, Power**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

**Punching Machines, Horizontal**
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Taylor Instrument Co., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Racks, Cut**
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**
Holden Co., Ltd., Montreal, Que.

**Reamer Holders**
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.

**Reamers, Expanding**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Reamers, Solid**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Reamers, Taper**
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Recorders, Temperature**
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Recorders, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Regulators, Temperature**
Taylor Instrument Co., Toronto, Ont.

**Rheostats**
Northern Electric Co., Montreal, Que.

**Resistance Materials**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Rivets**
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

**Rivet Heaters**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.

**Riveting Machines**
Bilton Machine Co., Bridgeport, Conn.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**
Stewart & Co., Duncan, Glasgow, Scot

**Rolls (Rubber Covered)**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rudder Frames, Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Rubber Goods, Mechanical**
Quaker City Rubber Co., Philadelphia, Pa.

**Rubber Machinery Makers**
Can. Consolidated Rubber Co., Ltd., Montreal Que

**Rules, Steel**
Chesterman & Co., Ltd., J., Sheffield, Eng

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R.I

**Rust Preventatives**
Oakley Chemical Co., New York, N.Y.

**Sand Equipment**
Can Link-Belt Co., Toronto, Ont

**Sand Mills**
Frost Mfg Co Chicago, Ill

**Sanding Machinery**
Oliver Machy. Co., Grand Rapids, Mich.

**Sand Rammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Saw Frames and Blades, Hack**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que

**Sawing Machines, Metal**
Atkins & Co., Inc., E. C., Indianapolis, I
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que

**Sawing Machines, Power Hack**
Ackworthle, Ltd., John, Birmingham, Eng
Atkins & Co., Inc., E. C., Indianapolis, I
Can. Fairbanks-Morse Co., Ltd., Montreal
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Saw Sharpening Machines**
Atkins & Co., Inc., E. C., Indianapolis, I
Oliver Machinery Co., Grand Rapids, Mich

**Saw Tables, Universal**
Atkins & Co., Inc., E. C., Indianapolis, I
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**
Atkins & Co., Inc., E. C., Indianapolis, I
Simonds Canada Saw Co., Montreal, Que
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I
Simonds Canada Saw Co., Montreal, Que

**Saws, Hot and Cold**
Atkins & Co., Inc., E. C., Indianapolis, I
Simonds Canada Saw Co., Montreal, Que
Stewart & Co., Duncan, Glasgow, Scot

**Saws, High Speed Steel**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I
Butterfield & Co., Inc., Rock Island, Que
Clemson Bros., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que

**Saws, Metal Band**
Atkins & Co., Inc., E. C., Indianapolis, I
Oliver Machinery Co., Grand Rapids, Mich

**Saws, Metal, Power**
Clemson Bros., Inc., Hamilton, Ont

**Saws, Metal Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I
Brown & Sharpe Mfg. Co., Providence, R.I
Butterfield & Co., Inc., Rock Island, Que
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que
Pratt & Whitney Co., of Canada, Ltd. Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que
Starrett Co., L. S., Athol, Mass.

**Saws, Milling**
Atkins & Co., Inc., E. C., Indianapolis, I
Butterfield & Co., Inc., Rock Island, Que
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Saws, Screw Slotting**
Atkins & Co., Inc., E. C., Indianapolis, I
Butterfield & Co., Inc., Rock Island, Que
Pratt & Whitney Co., of Canada, Ltd. Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que

**Saws, Swing Cut-off**
Oliver Machinery Co., Grand Rapids, Mich

**Scales**
Brown & Sharpe Mfg. Co., Providence, R.I
Can. Fairbanks-Morse Ltd., Montreal, Q

**Screens**
Can. Wire & Iron Goods Co., Hamilton Ont.

**Screens, Paper**
Dominion Engineering Works, Ltd Montreal, Que

**Screw Drivers, Optical, Jewelry and Novelty**
Torrington Co., Ltd., Upper Bedford, Que.

**Screw Driving Machine**
Canada Machinery Corp., Galt, Ont
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill

**Screw Extractors**
Cleveland Twist Drill Co., Cleveland, O

**Screw Machine Work**
Barnes Co., Wallace, Bristol, Conn
Cook Co., Asa S., Hartford, Conn
National Acme Co., Cleveland, Ohio
Tallman Brass & Metal Co., Hamilton, Ont.

# BUYERS' DIRECTORY

**Screw Machinery, Wood and Leg**
Cook Co., Asa S., Hartford, Conn.

**Screw Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Screw Machines, Automatic**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

**Screw Machines, Plain or Hand**
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio.

**Screw Machine Products**
Torrington Company, Ltd., Upper Bedford, Que.

**Screw Plates**
Alrenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

**Screws, Cap and Set**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Lock Cap**
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Machine**
Barnes Co., Wallace, Bristol, Conn.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Safety Set**
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Screws, Side Knob**
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Thumb**
Torrington Company, Ltd., Upper Bedford, Que

**Second-Hand Machinery**
See last page of directory.
Petrie, Ltd., H. W., Toronto, Ont.

**Separators, Moisture and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Separators, Oil and Waste**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Shafting**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Shapes, Cold-Drawn Special Steel**
Union Drawn Steel Co., Hamilton, Ont.

**Shaping Machines**
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morris Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Rodefson Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Walcott Lathe Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Shapers, Wood**
Oliver Machinery Co., Grand Rapids, Mich.

**Shears, Hand**
Can. Blower & Forge Co., Ltd., Kitchener

**Shears, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener
Stall Co., Inc., D. H., Buffalo, N.Y.
Thos. & Co., Duncan, Glasgow, Scot.
Toledo Machine & Tool Co., Toledo, Ohio
Williams Machinery Co., A. R., Toronto, Ont.

**Shearing Machines, Angle, Iron Bar and Gate**
Bertrams Ltd., Edinburgh, Scotland

**Sheet Lead**
Canada Metal Co., Ltd., Toronto, Ont.

**Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio

**Sheets, Nickel, Resist, Alloy**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Sheets, Nickel, Monel and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Side Frames, Locomotive**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Slotting Attachments**
Ford-Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

**Slotting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

**Solders**
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.

**Snap Flasks**
Oliver Machy. Co., Grand Rapids, Mich.

**Special Machinery and Tools**
Brown Engineering Corp., Ltd., Toronto.
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Specialties, Swaged and Headed Work**
Torrington Company, Ltd., Upper Bedford, Que.

**Springs**
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

**Spring-making Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Sprockets and Chains**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Squares**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Stamping, Metal**
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Metal Stamping Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Stamps, Steel**
Diamond Saw & Stamping Works, Buffalo, N.Y.

**Stairways, Wrought Iron**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Steam Specialties**
Crane Ltd., Montreal, Que.

**Steel Plate**
Dom. Foundries & Steel, Hamilton, Ont.

**Steels, Tool**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel Blooms and Billets**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steel, Cold-Rolled Strip**
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Steel Castings**
Dom. Foundries & Steel, Hamilton, Ont

**Steel Forgings**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Sheets, Open Hearth Steel**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steel, Shafting and Free Cutting Screw**
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

**Steel, Sheet**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

**Steel, Stainless**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont
Vanadium Alloys Steel, Latrobe, Pa.

**Steel Wire Rods**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steels, Alloy, Open Hearth and Electric**
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
United Alloy Steel Corp., Canton, Ohio.

**Steels, Alloy and Carbon**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steels, High-Speed**
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel, Magnet**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel, Structural**
MacKinnon Steel Co., Sherbrooke, Que.

**Steel Tubing, Close Joint and Welded**
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

**Stern Frames, Cast Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Straightening Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Studs**
Galt Machine Screw Co., Galt, Ont.

**Surface Plates**
Bilton Machine Co., Bridgeport, Conn.

**Swaging Machines**
Atkins & Co., Inc., E. C., Indianapolis, I
Etna Machine Co., Toledo, Ohio.

**Swaging Machine Parts**
Etna Machine Co., Toledo, Ohio.

**Switches, Railway**
Can. Steel Foundries, Montreal, Que.

**Switches and Switchboards**
Northern Electric Co., Montreal, Que.

**Tablets, Bronze, Memorial**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Tachometers**
Alkenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

**Tanks, Steel**
MacKinnon Steel Co., Sherbrooke, Que.

**Tanks and Pumps, Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

**Taper Cutting Dies**
Jones & Lamson Machine Co., Springfield, Vt.

**Tap Holders**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taper Pins**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Tapes, Measuring**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass.

**Tapping Machines and Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Taps and Dies**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que
Can. Fairbanks-Morse Co., Ltd., Montreal
Geometric Tool Co., New Haven, Conn
Greenfield Tap & Die Corp., Galt, Ont
Jardine & Co., A. B., Hespeler, Ont
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taps, Collapsing**
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Teeth, Dredge Bucket**
Kennedy & Sons, Wm., Owen Sound, Ont

**Testing Metals and Materials**
Toronto Testing Laboratory, Toronto, Ont

**Thermometers**
Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Toronto, Ont.

**Thread-Cutting Tools**
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Thread Cutting Machines**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa.

**Threaded Wires**
Torrington Company, Ltd., Upper Bedford, Que.

**Threading Machines**
Acme Machinery Co., Cleveland, Ohio.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Thread Lead Testing Machines**
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Thread-Rolling Machines**
Bliss Co., E. W., Brooklyn, N.Y.

**Tongs**
Hepburn Ltd., John T., Toronto, Ont.

**Tool Cases**
Rice Lewis & Son, Ltd., Toronto, Ont.

**Tool Holders**
Armstrong Bros. Tool Co., Chicago, Ill
Bilton Machine Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Markers, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Tool Posts, Lathe**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Steels for all Purposes**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Tools, Small (See Machinists' Small Tools)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill
Bertrams Ltd., Edinburgh, Scotland.
Burgess & Marchand, Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
Chesterman & Co., Ltd., J., Sheffield, Eng.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.
National Machine Tool Co., Racine, Wis
Rapid Tool & Machine Co., Lachine, Que
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford Ill.
Starrett Co., L. S., Athol, Mass.
**Strelinger Co. of Can., Ltd., Chas. A. Windsor, Ont.**
Wheel Truing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Tool Work**
Brown Engineering Corp., Ltd., Toronto
Crescent Machine Co., Ltd., Montreal, Q
Ford-Smith Machine Co., Hamilton, Ont

# BUYERS' DIRECTORY

**Torches, Blow**
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Trackwork, Railway**
Can. Steel Foundries, Montreal, Que.

**Trackwork, Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Transformers**
Northern Electric Co., Montreal, Que.

**Transmission Machinery**
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Toronto, Ont.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Transportation Systems (See Trucks)**
Mathews Gravity Carrier Co., Port Hope, Ont.

**Treated Bits**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Trolleys and Tramways**
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Trucks**
Can. Fairbanks-Morse Ltd., Montreal, Q.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Maple Leaf Mfg. Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Trucks, Industrial Motor**
Maple Leaf Mfg. Co., Montreal, Que.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Tube, Products**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Electric Welded or Oxy-Acetylene Welded**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Flexible**
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Tubing, Seamless Steel**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Seamless Steel, Brass and Copper and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Steel Products Co., Brantford, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Tubing, Welded**
International Nickel Co. of Can., Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Tubing, Welded Steel**
Tube Co. of Canada, Toronto, Ont.

**Turbines, Water**
Dominion Engineering Works, Ltd., Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.

**Turret Heads**
Ackworthie, Ltd., John, Birmingham, Eng.
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Turret Machines (See Lathes, Horizontal Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Cook Co., Asa S., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Turrets, Tool Post**
Gisholt Machine Co., Madison, Wis.

**Unions, Pipe**
Crane Ltd., Montreal, Que.

**Universal Joints**
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Valves**
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Crane Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Vises, Drilling Machine**
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
Charles Parker Co., Meriden, Conn.

**Vises, Metal Workers'**
Aikenhead Hardware, Ltd., Toronto, Ont.
Columbia Hdwe. Division, Cleveland, O.
Charles Parker Co., Meriden, Conn.

**Vises, Milling Machine**
Brown & Sharpe Mfg. Co., Providence, R.I.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kearnes & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Charles Parker Co., Meriden, Conn.
Oliver Machy. Co., Grand Rapids, Mich.
Charles Parker Co., Meriden, Conn.
Victor Tool Co., Waynesboro, Pa.
Parmenter & Bullock Co., Gananoque Ont.

**Voltmeters**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Wagon Loaders**
Can. Link-Belt Co., Toronto, Ont.

**Washers**
Barnes Co., Wallace, Bristol, Conn.
Diamond State Fibre Co., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

## DIRECTORY OF DEALERS

THE Buyers' Directory of CANADIAN MACHINERY was originally intended to contain information regarding lines actually manufactured by our advertisers. We now carry the advertising of leading machinery dealers, some of whom represent scores of manufacturers in addition to being manufacturers themselves in some cases. This necessarily widened the scope of our Directory, but it would be impracticable to list all the lines handled by all the dealers. We recommend, therefore, if our subscribers cannot find what they want in our Directory that they communicate with the dealers whose names appear herewith.

### MACHINE TOOLS AND METAL WORKING EQUIPMENT

Chas. P. Archibald & Co., Montreal, Que.
The Canadian Fairbanks-Morse Co., Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
H. W. Petrie Limited, Toronto, Ont.
The Standard Equipment & Tool Co., Montreal, Que.
Chas. A. Strelinger Co. of Canada Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Wilson-McGovern Limited, Toronto, Ont.
Yeates Machinery Co., London, Ont.

### MACHINE SHOP AND FACTORY SUPPLIES

Chas. P. Archibald & Co., Montreal, Que.
The Canadian Fairbanks-Morse Co., Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
H. W. Petrie Limited, Toronto, Ont.
The Standard Equipment & Tool Co., Montreal, Que.
Chas. A. Strelinger Co. of Canada Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Wilson-McGovern Limited, Toronto, Ont.
Yeates Machinery Co., London, Ont.

### POWER EQUIPMENT AND SUPPLIES

The Canadian Fairbanks-Morse Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
H. W. Petrie Limited, Toronto, Ont.
The Standard Equipment & Tool Co., Montreal, Que.
Wilson-McGovern Limited, Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.

### WOODWORKING MACHINERY

Chas. P. Archibald & Co., Montreal, Que.
The Canadian Fairbanks-Morse Co., Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
H. W. Petrie Limited, Toronto, Ont.
Chas. A. Strelinger Co. of Canada, Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
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Greenfield Tap & Die Corp., Galt, Ont.
Charles Parker Co., Meriden, Conn.

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Carter Welding Co., Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.

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National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

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Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Prest-O-Lite Co. of Can., Toronto, Ont.

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Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Prest-O-Lite Co. of Can., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

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### 143 UNIVERSITY AVE., TORONTO, CANADA

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*If what you need is not advertised, consult our Buyers' Directory and write a... listed under proper heading.*



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*A pair of Starrett 6" Dividers, Combination Square, Surface Gage and Universal Bevel Protractor.*

Setting up the headstock for a Rivett Back Geared Precision Lathe, preparatory to planing the bottom, calls for close work. Skilled machinists, men who make Rivett Lathes and Grinders, prefer Starrett Tools because they know they can trust their accuracy.

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*The World's Greatest Toolmakers*
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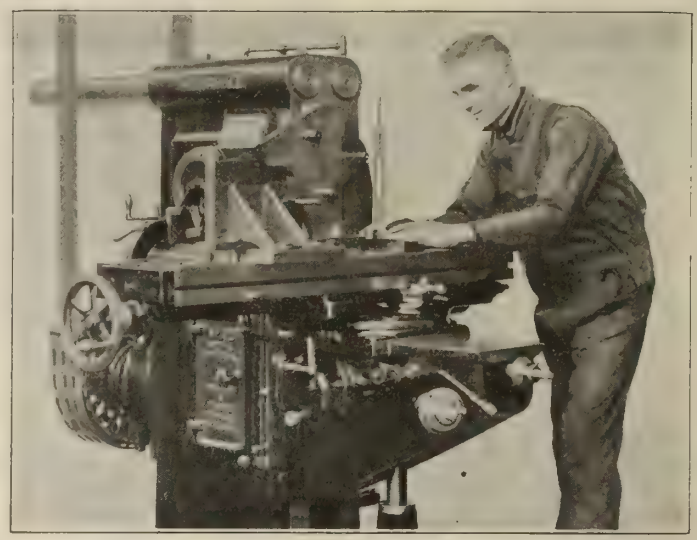
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STARRETT TOOLS — STARRETT HACK SAWS CUT QUICKER LAST LONGER

# Use Starrett Tools

# MILWAUKEE MILLING MACHINES



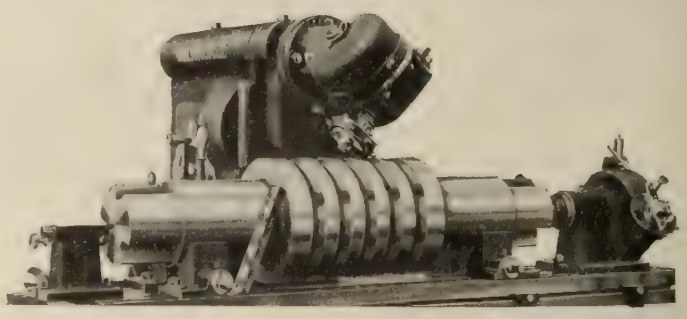
## Efficient on Light and Heavy Milling

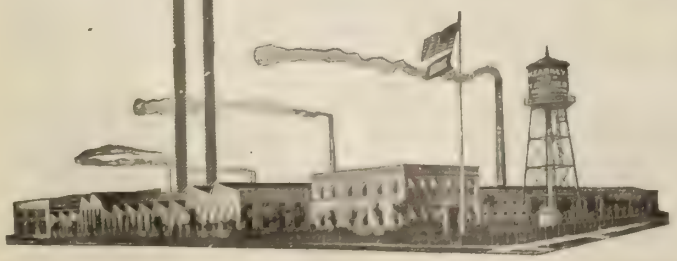
Heavy milling jobs are not unknown to Milwaukee Universal Milling Machines, while delicate and intricate ones are efficiently performed with little effort.

Both light and heavy milling operations are handled with such smoothness and accuracy that the finest results are obtained. Because Milwaukee Universal Milling Machines perform such a wide variety of work, they are particularly well adapted for the tool-room.

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# CANADIAN MACHINERY
## AND MANUFACTURING NEWS

Vol. XXV., No. 24 | Published by the MacLean Publishing Company, Limited, London, Ont. | June 16, 1921 | $4.00 a Year Subscription Price


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# "Some Tap"



# The BERTRAM Page

## MACHINE TOOLS

JB&SCo

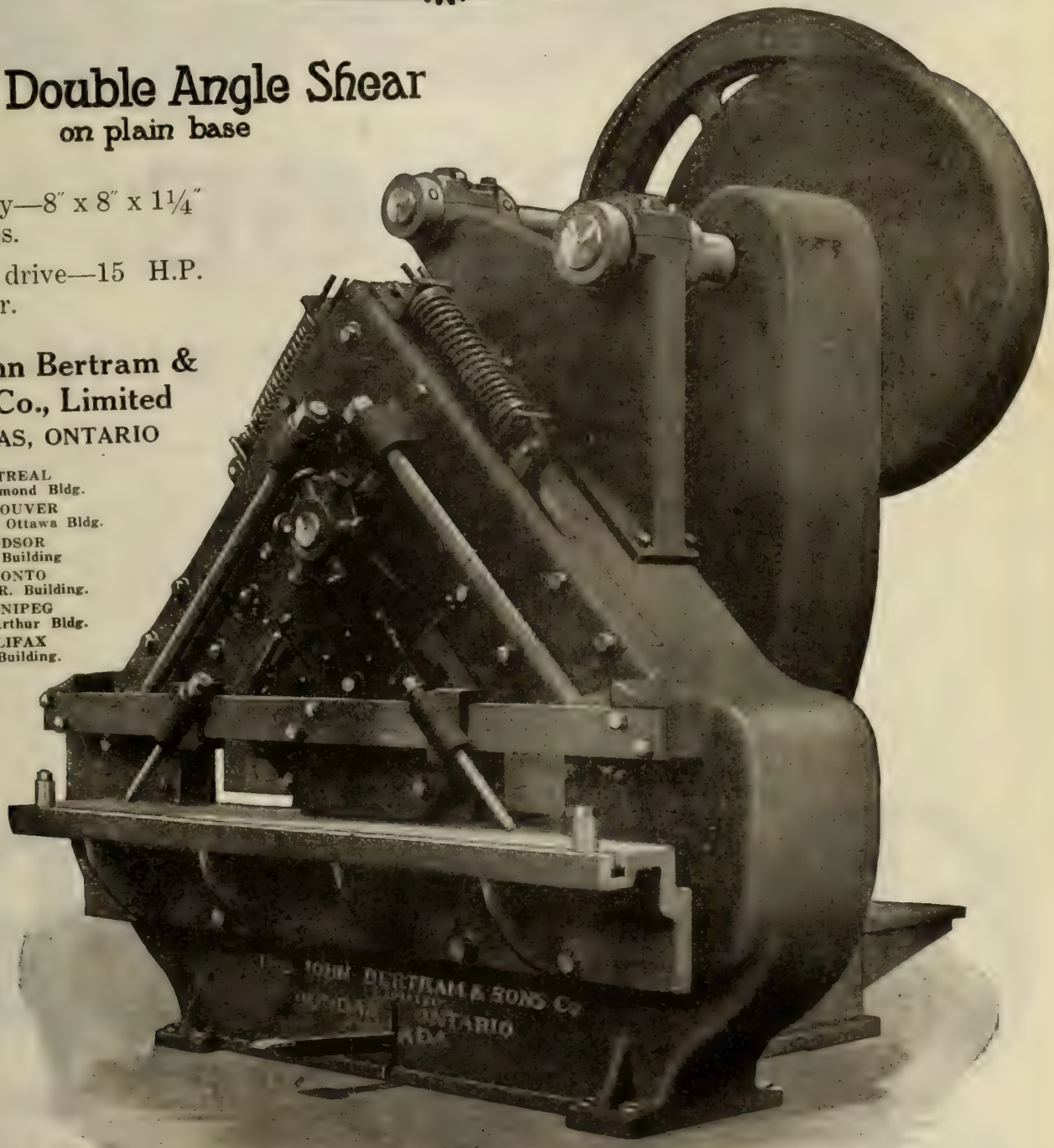
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on plain base

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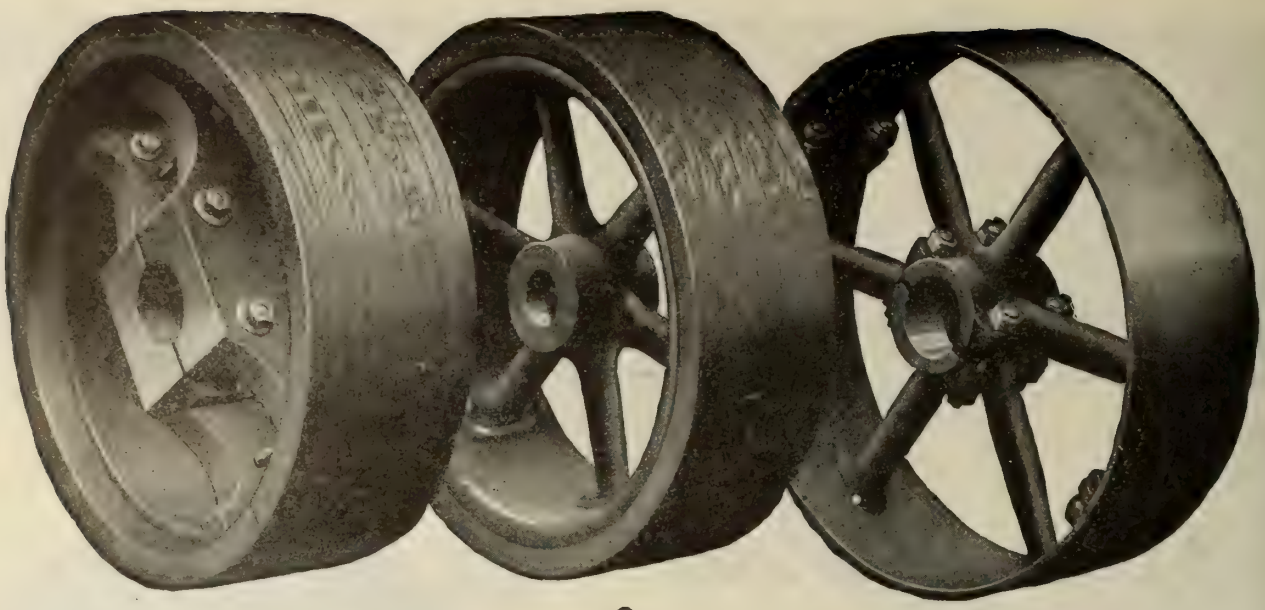
Motor drive—15 H.P. Motor.

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P13201



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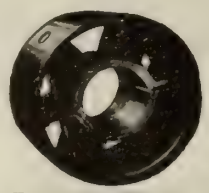
Whatever your opinion as to type, be sure it was built by Dodge.



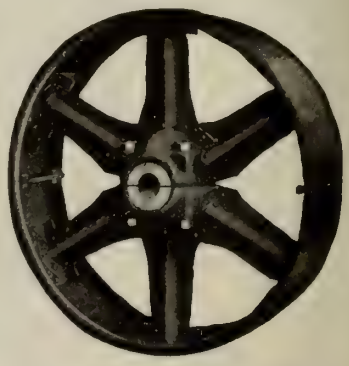
KEYSTONE

## Dodge Manufacturing Co. of Canada, Ltd.

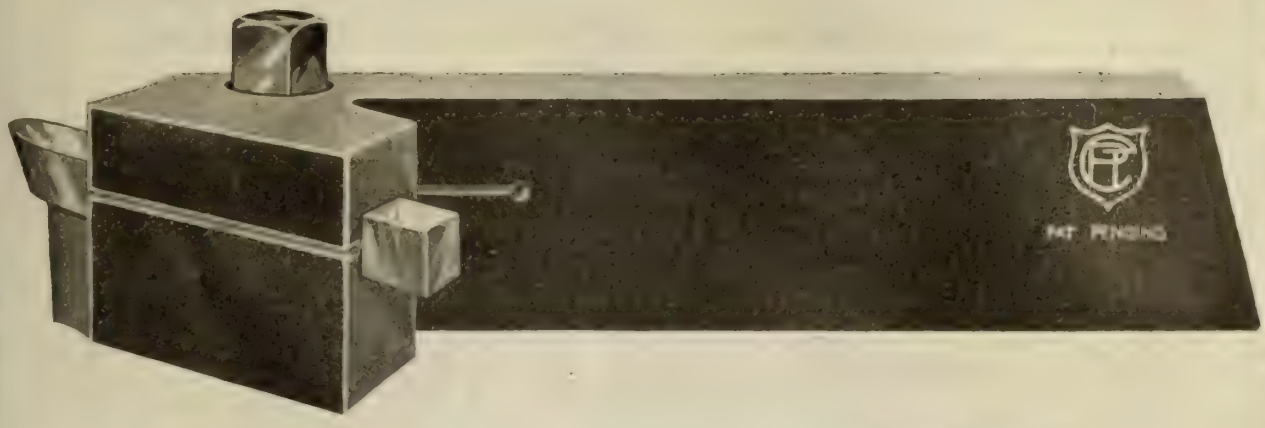
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Everything You Need for Your Machine Shop

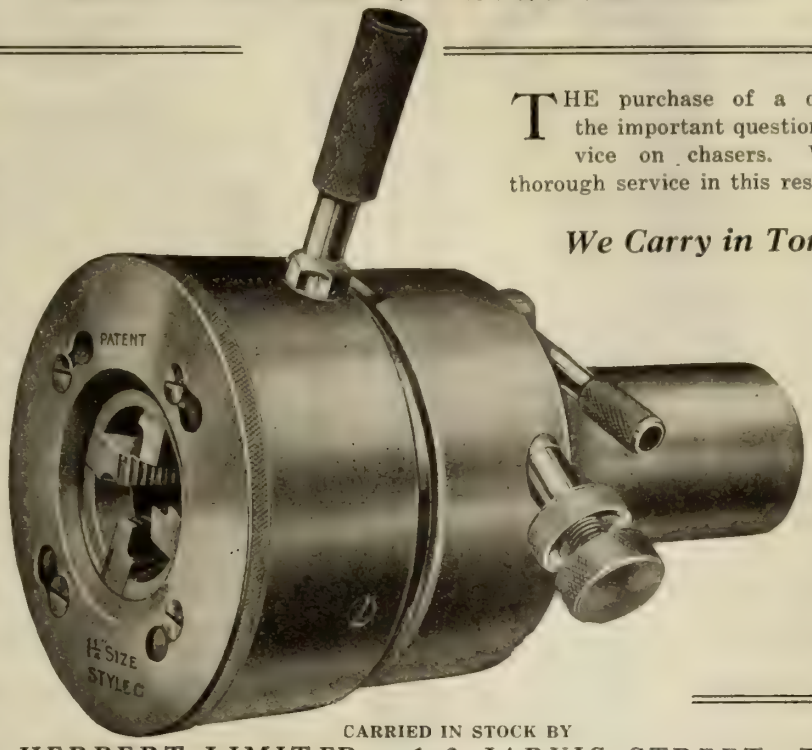
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MADE IN SEVEN SIZES—5/16", ½", ¾", 1", 1¼", 2" and 3"

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Chasers With
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A.S.M.E. Thread
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*by the*
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American Drill Grinder
For Wet or Dry Drill Grinding 1/8" to 2¼". Also 1/8" to 3½" dia.

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# One Hour *or* Ten Minutes

## *Which Do You Prefer?*



By actual time study in one foundry it was found that an 8′ x 6′ x 6″ cope requiring one hour to tamp by hand could be rammed and peined in ten minutes with a Little David Sand Rammer and the results were better.

When Little Davids are used castings never swell, pin holes are unknown, and no matter who uses them, they deliver blows of just the right weight, thirteen times faster than the best hand tamper. They are moderate in first cost, require very little power, practically no repairs, and never tire or "soldier on the job."

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# Hull Iron and Steel Foundries, Limited *Hull, Quebec*

## Steel, Chrome, Manganese and Nickel Steel Castings

***Annealed and Unannealed***

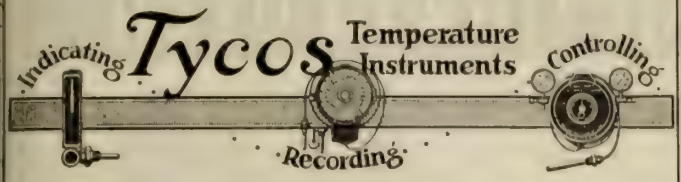
Cement Mill and Mining Machinery Castings, Stamp Mills, Crushing Plants, Excavating Outfits, Steel Car Wheels, Locomotive Driving Wheels and Frames, etc.



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"HISCO" machine-moulded gears, while requiring no pattern, insure accuracy, dependability, quality, and the price is minus the cost of patterns—which in these days of high prices of lumber is something to be considered.

**Specify "HISCO" Products**




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*Prompt*
*Efficient*
*Service*

Competent instrument makers, ample equipment for overhauling and testing, indicating, recording and controlling temperature instruments, pyrometers, barometers, etc.

*We would be pleased to receive visits and inquiries from those interested either in new equipment or repairs.*

## Taylor Instrument Companies

110-112 Church St., Toronto

*There's a Tycos and Taylor Temperature Instrument for Every Purpose.*

753

# Buried in the Work and Broke!



Next time a tap breaks below the surface of a large casting, don't let some makeshift method of removing it injure the thread and waste half an hour of valuable production time. Instead—



## Walton it Out in a Jiffy

And save the casting.

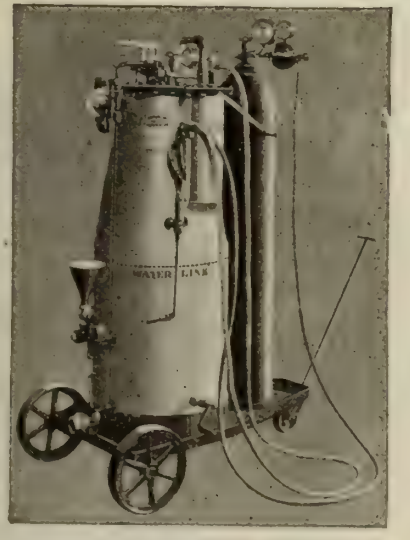
Special analysis steel fingers of the Walton Extractor drop into the flutes of the broken tap—and grip. Then a few turns of a wrench applied to the squared end of the Extractor backs out the buried tap.

**Sixty-day trial offer** proves the Walton Extractor pays for itself.

Write.

**The Walton Co.**

Hartford, Conn.



This is the Imperial Acetylene Generator which can be used with any make of welding apparatus—saves from 2c to 4c on every cubic foot of acetylene gas used in welding. It can be mounted on a truck with an oxygen tank and easily transported anywhere in the plant.

# An Imperial Welding Outfit Will Save You Hundreds of Dollars

Factory and production managers are just beginning to learn that oxy-acetylene welding is one of the most useful and economical processes which they can use. In minutes and hours, instead of days and weeks, broken pulleys, gears and machine parts can be made good as new.

Not only is there a saving on repair parts, but production is speeded up, departments are kept working and layoffs are avoided.

## Imperial Automatic ACETYLENE GENERATOR

In many factories, short cuts on production are made with oxy-acetylene welding, with considerable saving on costs. The whole subject of welding is worthy of your investigation. Write for our catalog and description of welding possibilities.

**Send us the name of your distributor through whom you prefer to deal.**

## Imperial Brass Mfg. Co.

503 S. Racine Ave. Chicago, Ill., U. S. A

Makers of Imperial Welding, Cutting, Carbon and Lead Burning Equipment and Supplies.

*Pageant of Progress Exposition*
*At Chicago's $5,000,000 Municipal Pier*
*July 30 to August 14.*

# IMPERIAL BRASS PRODUCTS

# THE JOHNSON FRICTION CLUTCH

## The Case Against the Countershaft

The old familiar countershaft drive, through cross belts and tight and loose pulleys, stands accused of the following offences against efficiency:

1. Involves needless equipment.
2. Costs too much to set up.
3. Prevents economical and systematic use of space.
4. Operates sluggishly.
5. Multiplies belt troubles and the resultant cost of upkeep.

**Modern practice has discarded the antiquated countershaft for the simplicity and efficiency of the clutch drive direct from lineshaft.**

### Adopt the Johnson Lineshaft Drive

The economical, efficient and durable method of power transmission through friction control.

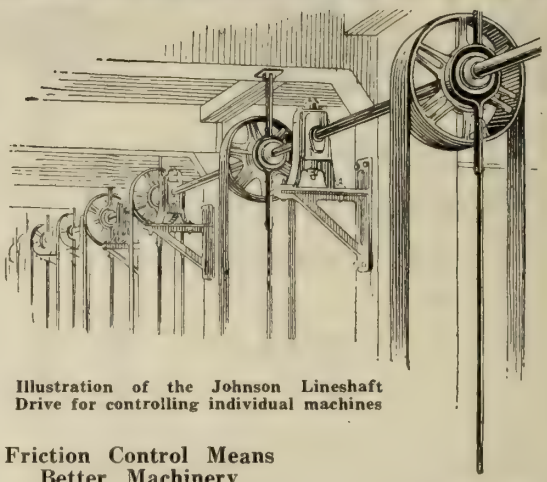
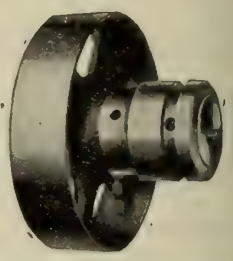


Illustration of the Johnson Lineshaft Drive for controlling individual machines

**Friction Control Means Better Machinery**

Whether it is applied overhead or in the machine itself.



**Write for our Booklet "Clutches as Applied to Machine Building" and our Yellow Catalog.**

CANADIAN AGENTS:
WILLIAMS & WILSON, LTD., 84 Inspector Street, Montreal
CANADIAN FAIRBANKS-MORSE CO., LTD., Montreal, Toronto, Winnipeg

**THE CARLYLE JOHNSON MACHINE CO.** MANCHESTER, CONN.

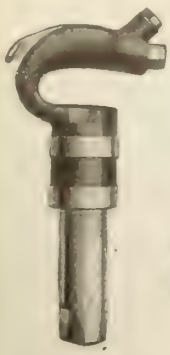
# Cleveland Sand Rammers

## FOR FLOOR, BENCH, PEIN AND FLASK RAMMING

Cleveland Sand Rammers are made in several sizes and weights, and are adapted for all kinds of Foundry Ramming.

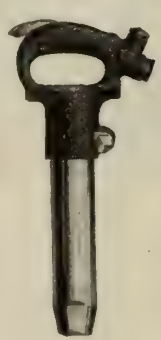
The Piston Rods are packed with a resilient packing which prevents any dirt from entering piston chamber and working parts—They are fitted with either Round or Flat Rod as required. Cleveland Rammers are light in weight, have high speed and practically no vibration, making them ideal foundry tools.





## CLEVELAND CHIPPING HAMMERS

For Foundry Work. Are furnished in any required size or weight for grey iron or steel castings; they have high speed, and are adapted for fast chipping now required by piece-workers.



## CLECO PRESSURE-SEATED AIR VALVES AND BOWES AIR HOSE COUPLINGS

**Are Standard Equipment Everywhere**

***Both Valves and Couplings are pressure tight.***

Bowes Couplings are instantly connected or disconnected.



Bowes Couplings are absolutely air tight under all pressures.

Above cut shows the Never-Slip Clamp attached to Bowes Coupling.

IN STOCK:—RIVETING HAMMERS, DRILLS, REAMING, TAPPING AND FLUE-ROLLING MACHINES, CORNER DRILLS, PORTABLE AND BENCH GRINDERS, PRESSURE-SEATED AIR VALVES, ETC.

**Write for Bulletins 44-46-48 and 49.**

*ADDRESS ALL INQUIRIES TO:*

## CLEVELAND PNEUMATIC TOOL CO. OF CANADA, LIMITED

**84 CHESTNUT STREET, TORONTO, ONT.** **337 CRAIG ST. W., MONTREAL, QUE**

# CANADIAN STEEL FOUNDRIES LIMITED

## AMONG OUR PRODUCTS

**O. H. STEEL**
- Bolsters
- Couplers
- Draft Arms
- Locomotive Side Frames
- Machinery Castings
- Marine Castings
- Rolling Mill Rolls
- Wheel Centres

**FERRO-ALLOYS**

**MANGANESE-STEEL**
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- Crusher Jaws
- Dipper Teeth
- Mixer Teeth
- Special Trackwork

**OTHER ALLOYS**
- Crank Pins
- Crank Shafts
- Locomotive Frames
- Rolls
- Roll Shells

**TRACKWORK**
- Diamond Crossings
- Crosses
- Frogs
- Mates
- Switches
- Rail Braces
- Guard Rail Clamps
- Complete Intersection

This list is merely an indication

General Offices:
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Cast Steel Circuit Breaker

# Electrical Machinery

Parts of every description in cast steel

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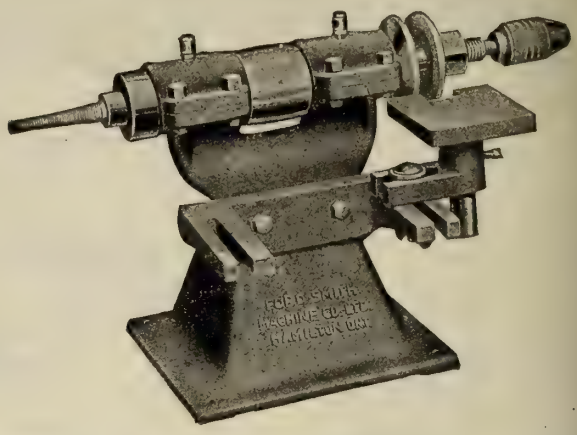
Steel Sheets and Plates

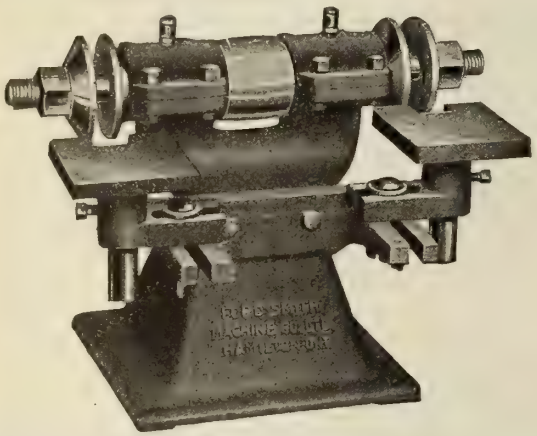
**Alloy Steel Gear Blanks**

# DOMINION FOUNDRIES & STEEL LIMITED

HAMILTON, CANADA

# FORD-SMITH BENCH GRINDERS





BENCH Grinders that conform to the standards of dependability that typify all Ford-Smith products. These durably constructed machines are ideal for all Light Grinding and Buffing requirements. We have these Bench Machines with extended spindle on one end and used largely by garages to polish off the rough surfaces on tires after vulcanizing. **Grinders for every purpose; all guaranteed.**

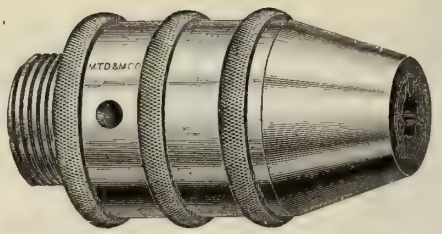
## THE FORD-SMITH MACHINE COMPANY, LIMITED

**Hamilton** **Ontario**

*FOREIGN AGENTS:*

Wm. E. Storey, London, England; McLeod & Co., Calcutta, India; Gollin & Co., Melbourne, Australia; British & Canadian Hydraulic Tube Co., Johannesburg, S.A.

# "MORSE" DRILL CHUCKS



**Morse Twist Drill & Machine Co.**

New Bedford, - - Mass., U. S. A.

Will hold your DRILLS tight and fast and drive them accurately. We use hundreds ourselves and have sold thousands to satisfied users. We await your order.

## THE MORSE CHAIN CO.

are the

Largest Manufacturers in the world

of

High Speed Silent Chains

Why?

Morse Chain possesses the exclusive

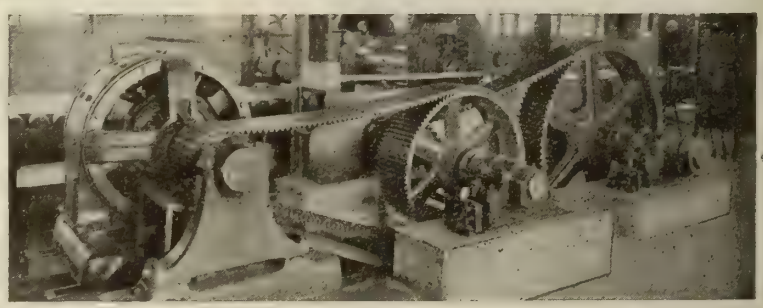
**Rocker Joint**

Frictionless—Requires no Oilbath.

**Jones & Glassco** (Reg'd.)

Canadian Agents

**Montreal - - Toronto**



80 H.P. Morse Drive to Rolls, reverses direction every 45 seconds

# BROWN-BOGGS

B B

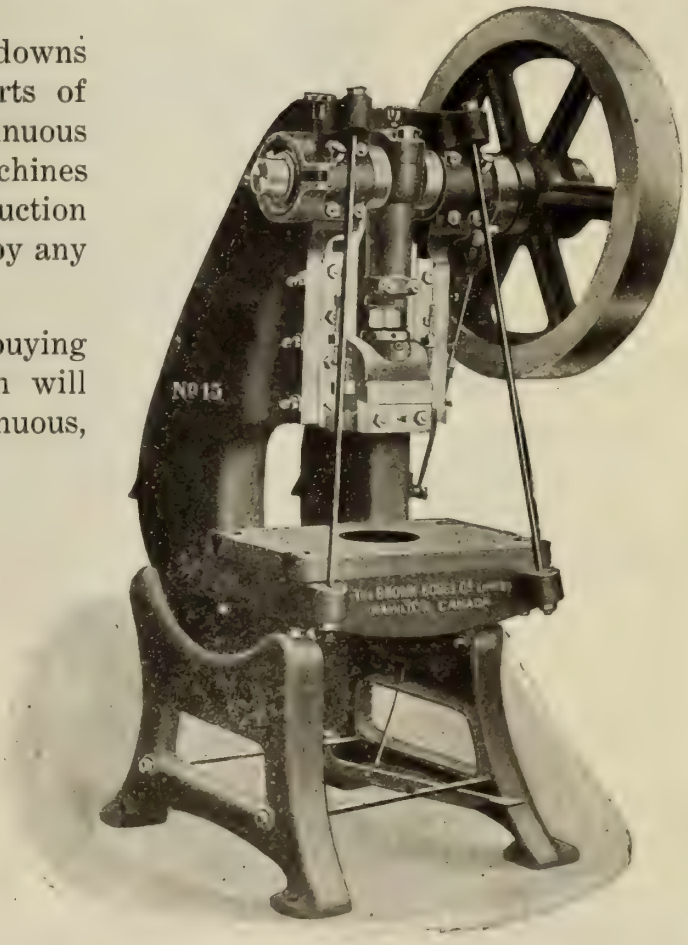
## *Built to Give Long, Hard Service*

Output lost through breakdowns can't be made up by spurts of speed. The steady, continuous operation of efficient machines develops a volume production which cannot be attained by any other means.

Therefore, when you are buying a machine, buy one which will give you long, hard, continuous, efficient service.

The "B-B" line comprises tinsmiths' tools and sheet metal working machines of all kinds; canners' and evaporators' machinery, shears of every description, power presses for punching, forming, embossing, blanking.

We shall be glad to send you catalogs containing a full description of the machines and tools in which you are interested.

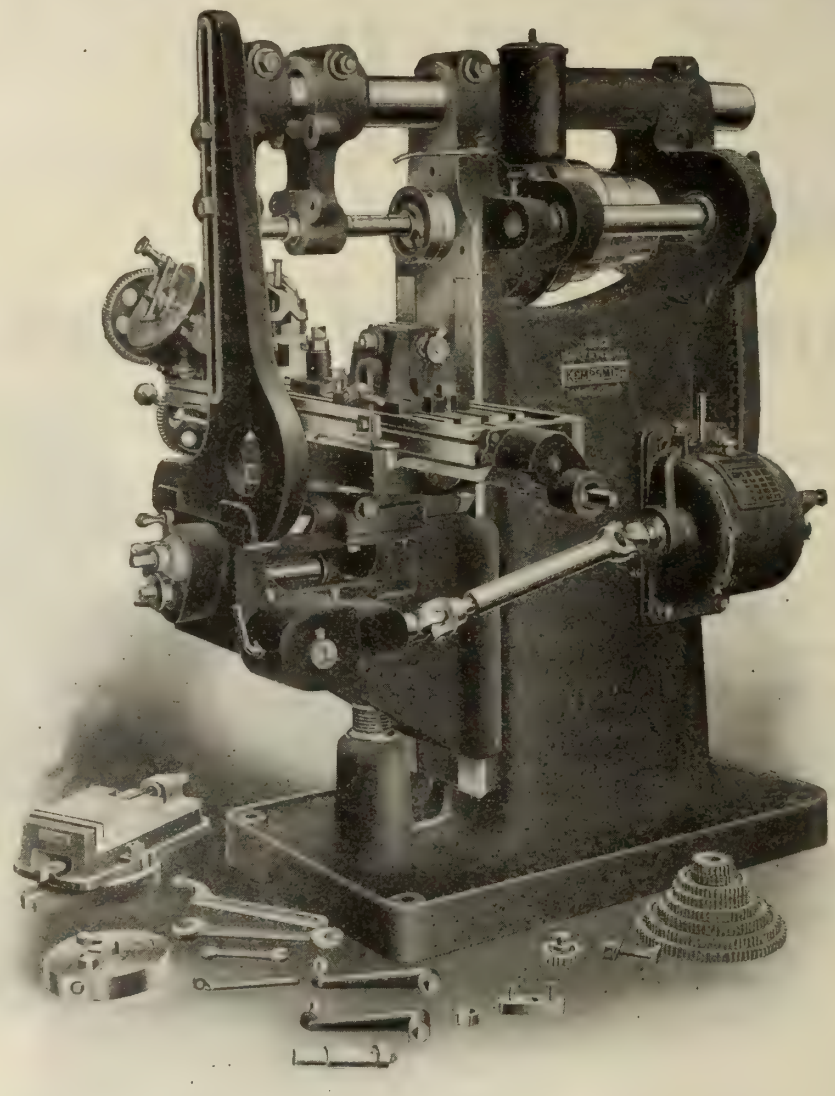



No. 15—Power Press

# THE BROWN-BOGGS CO. LIMITED

## HAMILTON, CANADA.

# KEMPSMITH



## No. 2 UNIVERSAL

Thirty-two years ago the Kempsmith Company began its career in a small one-story frame building. To-day there are four main buildings, aggregating 106,000 square feet of floor area, besides various storage sheds, etc. Every building of the plant is a model of its kind.

It has always been, and will continue to be, the purpose of the Kempsmith Company to produce machines of the highest quality only, suited to the most advanced practice.

Every machine, whatever size or type, is put to test under cuts and conditions purposely more severe than it will encounter in even the most progressive shops and when it leaves our factory it has our positive and definite guarantee back of it.

***Literature will be gladly sent upon request***

## THE KEMPSMITH MANUFACTURING CO.

### MILWAUKEE, WIS., U. S. A.

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CANADIAN DEALERS.—The Geo. F. Foss Machinery & Supply Co., Limited, 305 St. James St., Montreal, Canada; General Supply Co., 38 Toronto St., Toronto, Canada.

*Talk About Saving Time and Labor—*

# Murchey Collapsing Taps and Self-Opening Dies

will boost your production fifty per cent. and at the same time turn out better and more economical work than ordinary tools.



Murchey Tools are built for long, hard service. The fine materials and workmanship, their extremely simple design and rugged construction, enable clean, accurate threading under all conditions.

**If you would experience a new kind of tap and die satisfaction send for a trial order of Murchey Taps and Dies.**



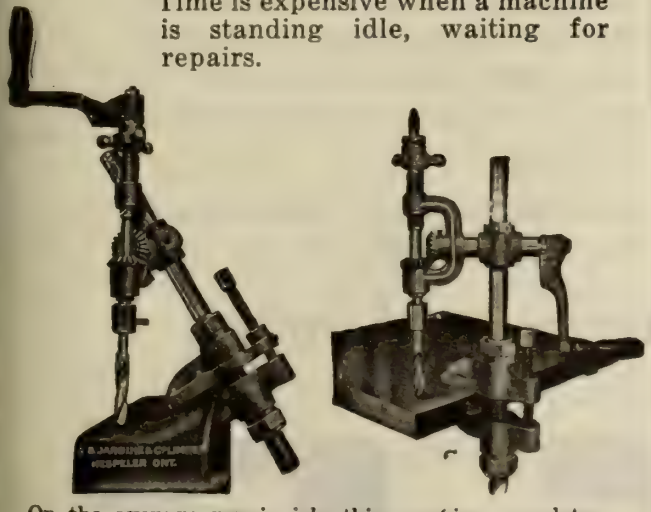
## Murchey Machine & Tool Company

**75 Porter Street, Detroit, Mich.**

Coats Machine Tool Co., London, Glasgow, Newcastle, Eng.
Fenwick Freres & Co., Paris, France

## Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



**On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.**

**Weight, 40 lbs. Price, $26.50 net.**

**Sold by all Machinery and Supply Houses.**

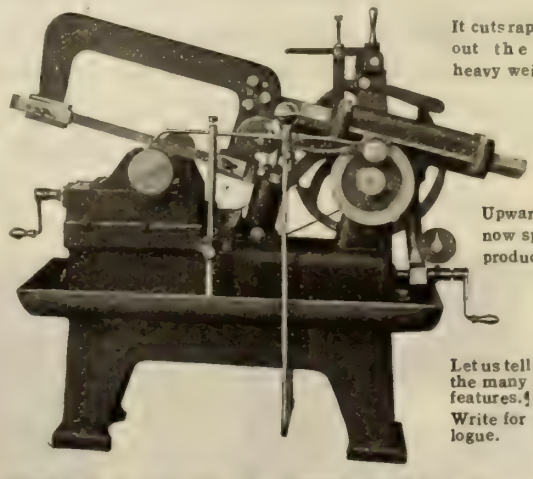
## A. B. JARDINE & CO., Limited

**HESPELER, ONTARIO**

**Fast Cutting Economy on this**

## "Rapid" Saw

THIS No. 1 "Radid" Sawing Machine is built to cut—and cut it does. It operates speedily, easily, minimizing "waste" and demanding little for upkeep operation. Note the powerful rigid construction and extreme simplicity. This is a positive insurance of longer life. Made in sizes to take bars from 6″ up to 26″.



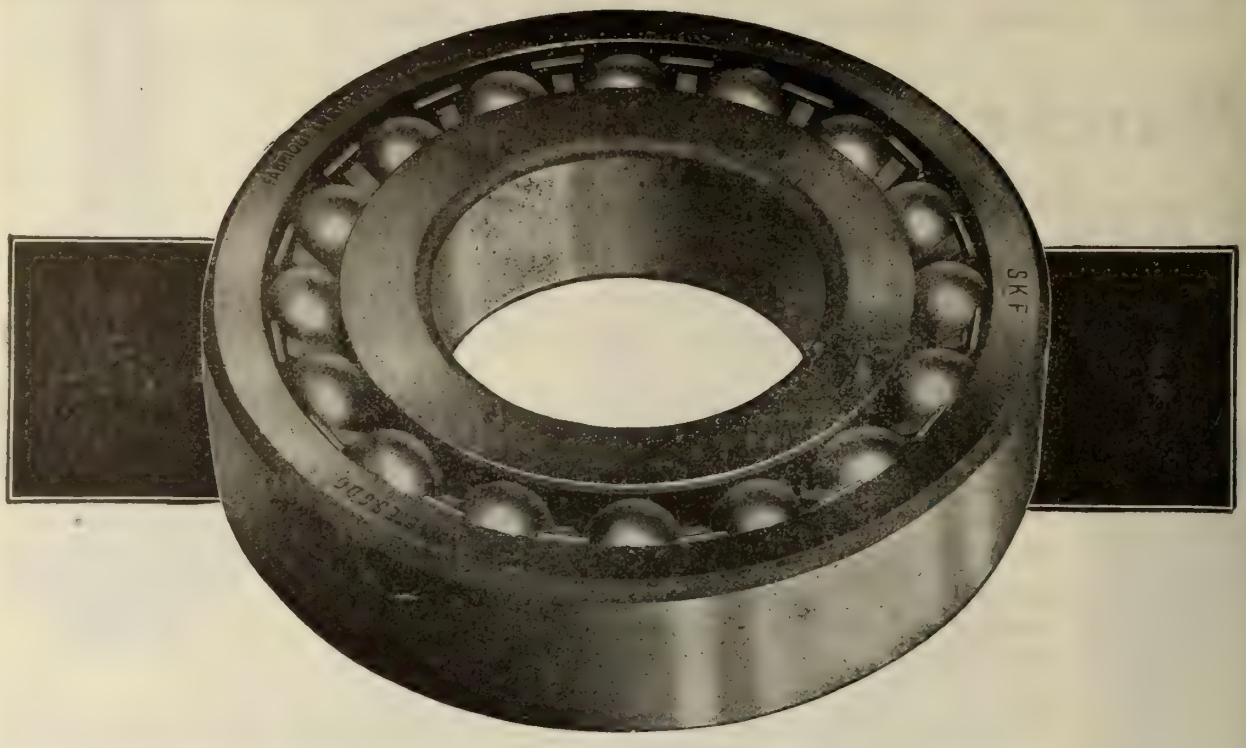
It cuts rapidly without the use of heavy weights.

Upwards of 3000 now speeding production.

Let us tell you about the many important features.
Write for our catalogue.

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# THOUSANDS ARE LOST

## In Oiling and Re-babbiting Bearings, and Overhauling Transmissions

For the same reasons — inefficient bearings—thousands more are lost

—in slow speed and low production

—in imperfect and poorly finished products

—in variations in products making finishing by hand necessary.

**SKF** engineers will show you how they have helped manufacturing throughout the world to avoid these losses. They bring to you without charge experience gained in industrial plants of every kind. They offer you in addition, the services of the **SKF** Industrial Laboratory—to solve any new problem that may arise in your plant.

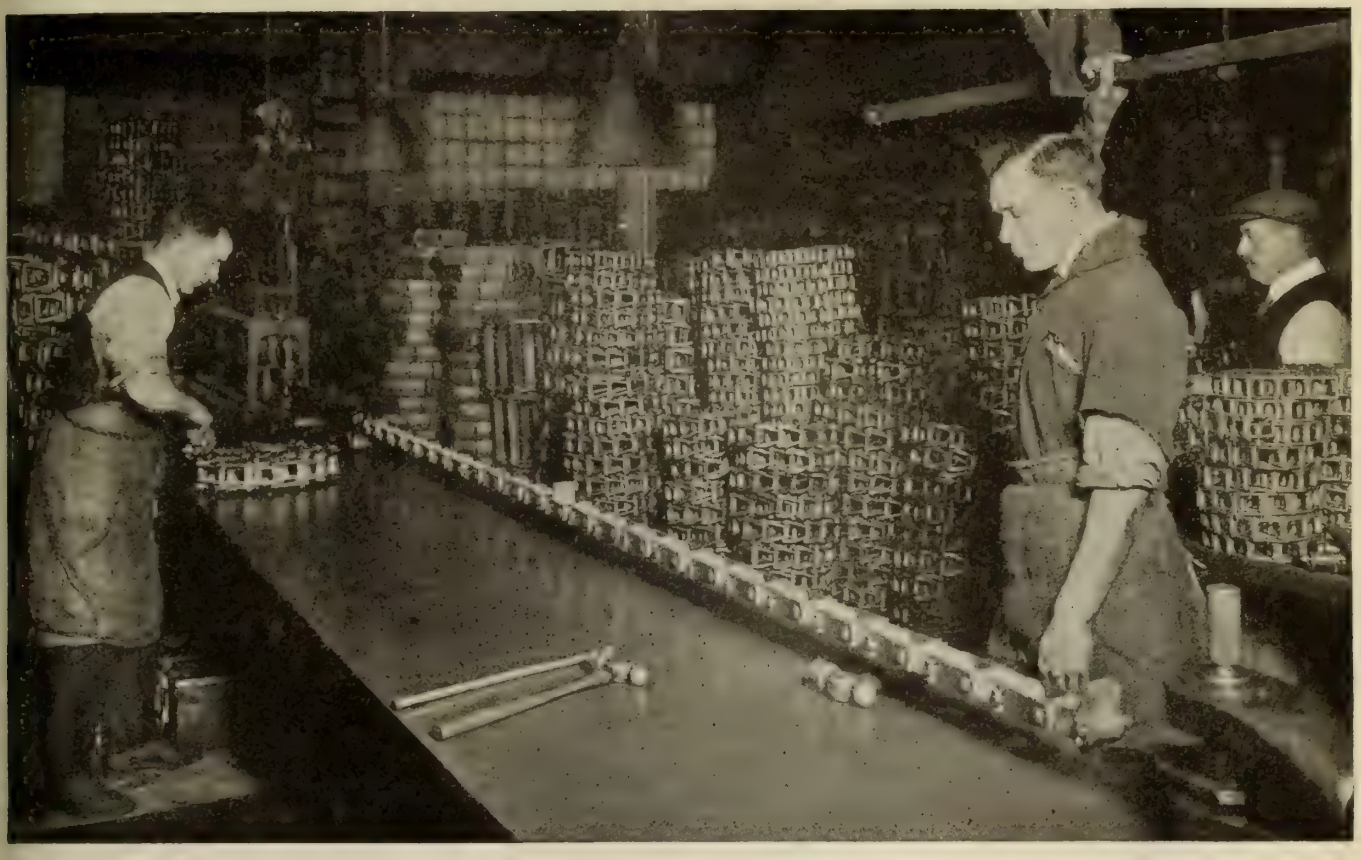
Consult **SKF** engineers without incurring either expense or obligation.

## Canadian SKF Company, Limited

**TORONTO - - - MONTREAL**

SKF

# Buy Chain by the Pound of *Strength* and *Service*



TWO chains may be identical in appearance, yet one is ten per cent heavier and thirty per cent stronger than the other. Mere inspection can tell little; the use of a scale and a few simple tests will reveal marked differences.

If you lack facilities, a simple bending test with the aid of a vise and a hand hammer will tell you something. Don't buy a chain that breaks short under the hammer, for you want a tough, not a brittle chain.

Subject our chains to the most thorough comparative tests and you will find substantiation of our claim that we give you more pounds of service and units of durability than any other maker. And what is more important, forty years of experience as chain makers have taught us how to maintain the high standards.

We have chains for every type of transmission, elevator or conveyor, and have engineers to assist you in making proper selections.

Write for catalog containing prices and full particulars.

This trademark >——< identifies genuine Link-Belt Chain

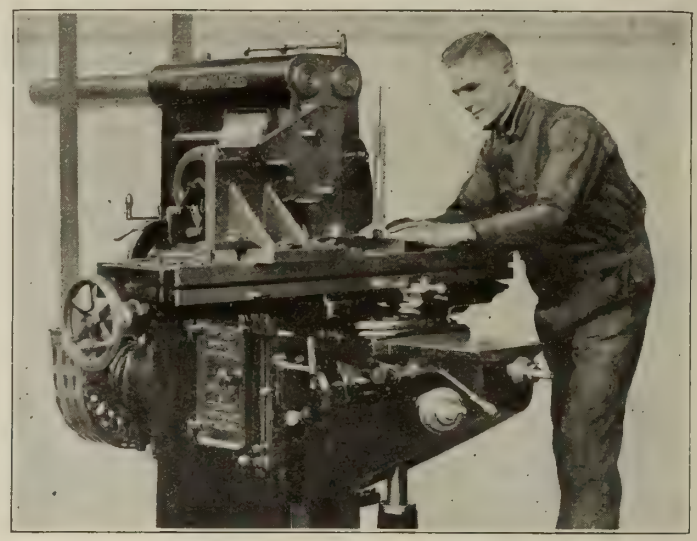
## CANADIAN LINK-BELT COMPANY, LIMITED

TORONTO: Wellington and Peter Sts. MONTREAL: 10 St Micheals Lane

# LINK-BELT

## CHAINS FOR EVERY SERVICE

# MILWAUKEE MILLING MACHINES



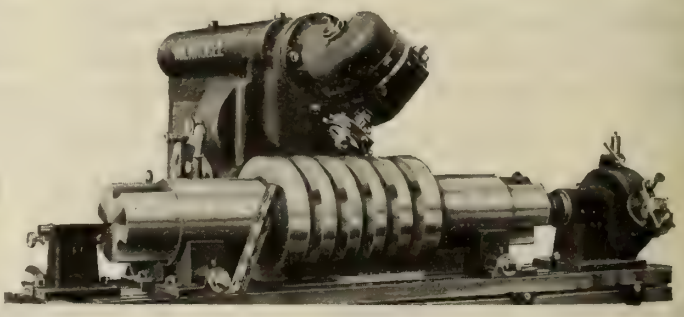
## Efficient on Light and Heavy Milling

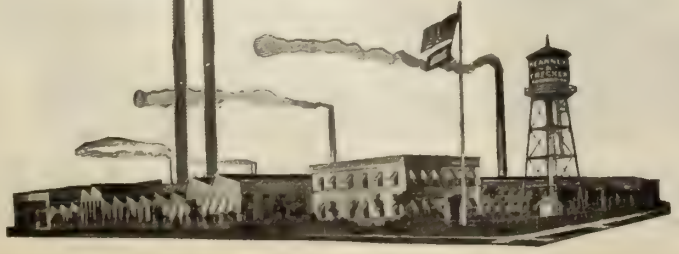
Heavy milling jobs are not unknown to Milwaukee Universal Milling Machines, while delicate and intricate ones are efficiently performed with little effort.

Both light and heavy milling operations are handled with such smoothness and accuracy that the finest results are obtained. Because Milwaukee Universal Milling Machines perform such a wide variety of work, they are particularly well adapted for the tool-room.

The jobs shown in the two illustrations are representative of "Milwaukee" adaptability. The upper illustration shows a jig being bored with a fly cutter. The lower illustrates the milling of a chilled roll with the use of a Universal Milling Attachment.

**Write for Catalogue—NOW.**





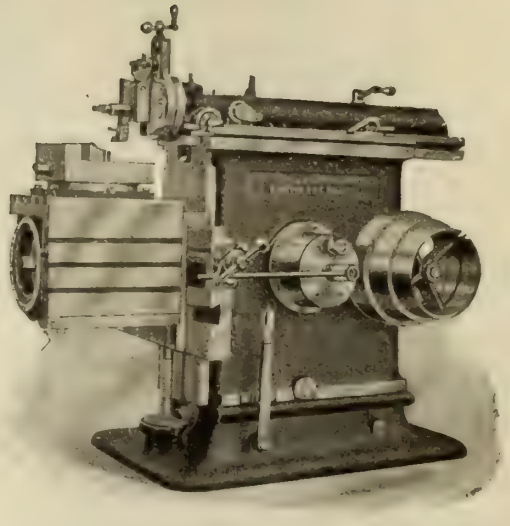
KEARNEY & TRECKER
CORPORATION
MILWAUKEE, WIS., U.S.A.

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# UNIVERSAL

## SHAPING MACHINES

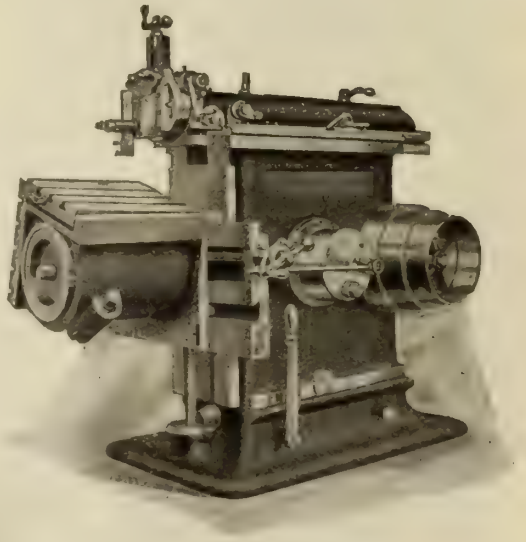


No special vises or fixtures needed; the Universal features of these machines take care of everything, making them particularly adapted to—

Die Work
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Machines regularly furnished with—

Swivelling Graduated Table
Auxiliary Tilting Side for Compound Angles
Power Down Feed on any angle, with any variation of feed
Automatic Feed Stop
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We carry large stocks of our 15-inch and 24-inch shapers in our Toronto show rooms—all ready for immediate shipment.

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*Head Office and Show Rooms:*

**11 Wellington Street East - TORONTO, CANADA**

*If interested tear out this page and place with letters to be answered*

# Have You the Tools for Making This Headstock Spindle?



Making headstock spindle for Rivett No. 106 Automatic Internal Grinder, Rivett Lathe and Grinder Company, Boston, Mass.

*Starrett Tools needed for this job are: Starrett 2" Micrometers, 6" Outside Calipers, 12" Scale, 6" Hermaphrodite Calipers, and a Bevel Protractor.*

Starrett Tools afford that dependable gage of accuracy essential to the proper machining and finishing of Rivett Internal Grinder headstock spindles.

For every metal working operation where the work must be finished within close limits, Starrett Tools afford a positive check on accurate work.

Picture yourself on this spindle job. Have you the Starrett Tools necessary for handling it right? Be ready for any job. Overhaul your Starrett Tool kit now, and make it complete. Write for the Starrett Catalog No. 22-3 Free on request.

**THE L. S. STARRETT COMPANY**
*The World's Greatest Toolmakers*
*Manufacturers of Hack Saws Unexcelled*
ATHOL, MASS.

42-183

# Use Starrett Tools




# Canadian Hart Wheels

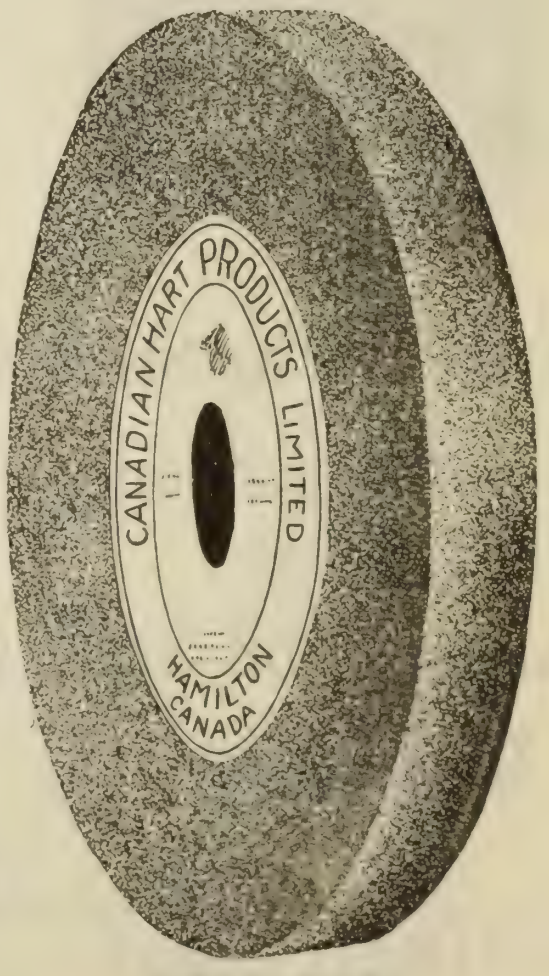
## *Vitrified — Silicate — Shellac*

TELL us what you want to grind and we will tell you the wheel to use for the best results.

**Canadian Hart Vitrified Wheels** recommended for the majority of grinding jobs. May be used wet or dry; give better all-round satisfaction and have a longer life.

**Canadian Hart Silicate Wheels**—can be made in twenty-four hours and are often substituted when it is inconvenient to wait the required length of time for Vitrified Wheels.

**Canadian Hart Shellac or Elastic Wheels**—indispensable for slotting work where a thin wheel is required, or for work requiring a special finish. Can be operated wet or dry.

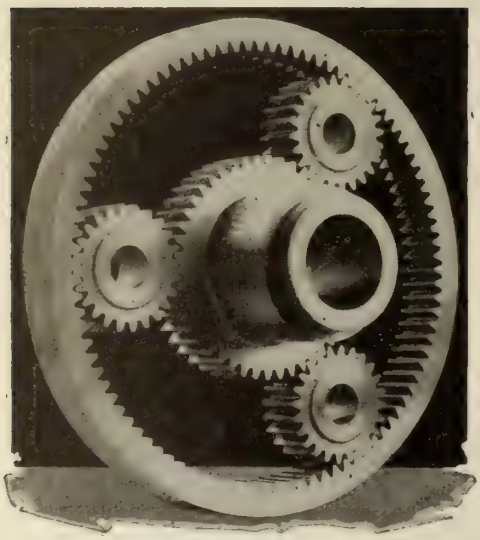



**Canadian Hart Products**
**LIMITED**
**Hamilton - Ontario**

**Made In Canada**

Cut
Gears
of
All Kinds

CUT GEARS



Planetary or Special
Combinations

Designed for Special
Requirements

Hamilton Gear
& Machine Co.

Van Horne St. TORONTO

STEEL CASTINGS

*QUICK DELIVERIES*

High Carbon Steel
Manganese Steel
Chrome Steel
Mild Steel

*QUALITY GUARANTEED*

Sizes—½ lb. to 5,000 lbs. each

THE WILLIAM KENNEDY & SONS,
*LIMITED*
OWEN SOUND, ONTARIO
ESTABLISHED 1860

CANADIAN
ATLAS CRUCIBLE STEEL Co.
LIMITED

Made in Canada

L-XX HIGH-SPEED
ATLAS TOOL STEELS
ATLAS ALLOY STEELS

for Machine Tools, Automotive Parts, etc.
Noted for their uniformity

Hot Rolled, Forged Blocks and Discs
Cold Drawn Steel and Drill Rod

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# GENUINE EMERY

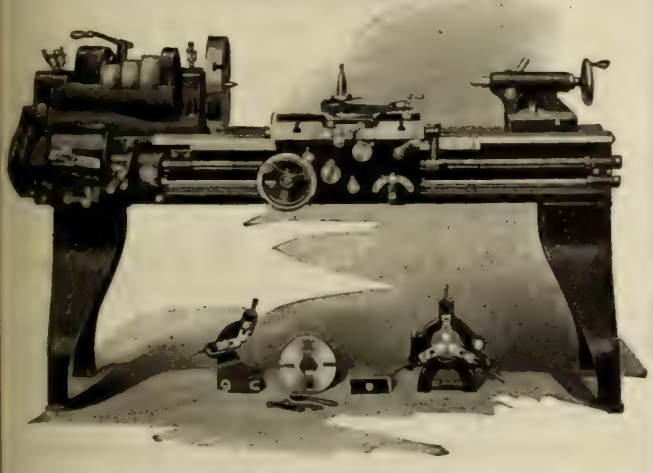
Sizes 180, 160, 140, 120, 110, 100, 90, 80, 70, 60, 54, 46, 40, 36, 30, 24, 20, 18, 16, 14, 12, 10, 9, 8, hole.

EMERY FLOUR AND WASHED FLOUR

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|---|---|---|
| Emery<br>Glass<br>Flint<br>Garnet<br>Corundum<br>Carborundum | Paper and Cloth | In Sheets, Rolls, Discs, Bands, Strips and Tapes, &c. |

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## Sufficient Weight and Power to Handle Modern Production

Though small in size, the "Economy" Double Back Geared, Quick Change Engine Lathe is strong and powerful. Its extreme accuracy makes it particularly adapted to the tool room of the modern manufacturing plant. Made in 14 in., 18 in. and 22 in. swing.

**Write for complete information of this small, heavy duty lathe, without delay.**

## Rockford Lathe and Drill Co.
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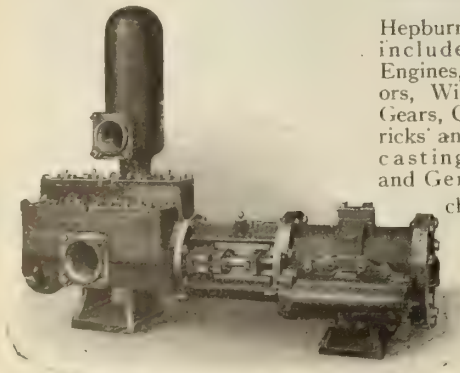
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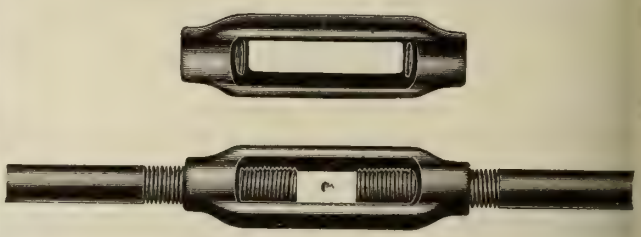
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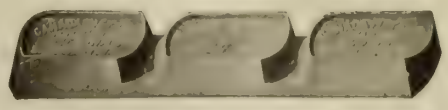
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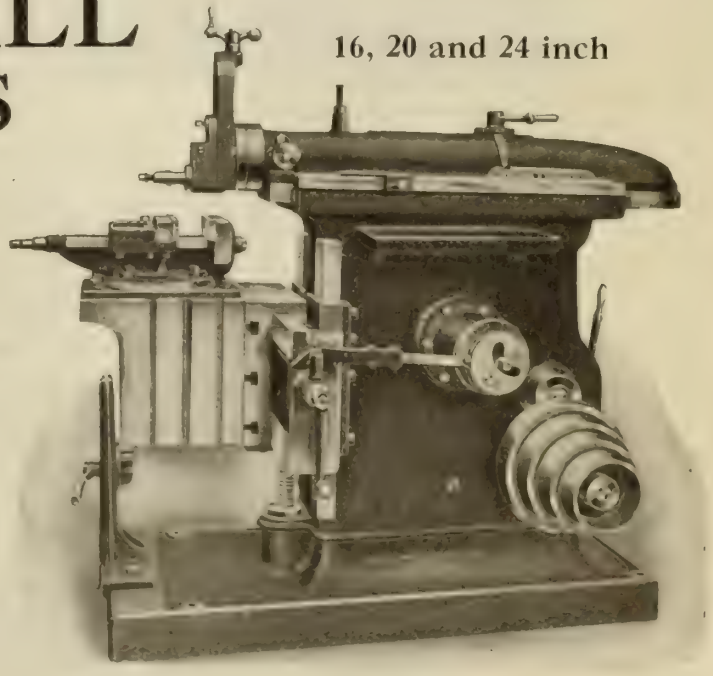
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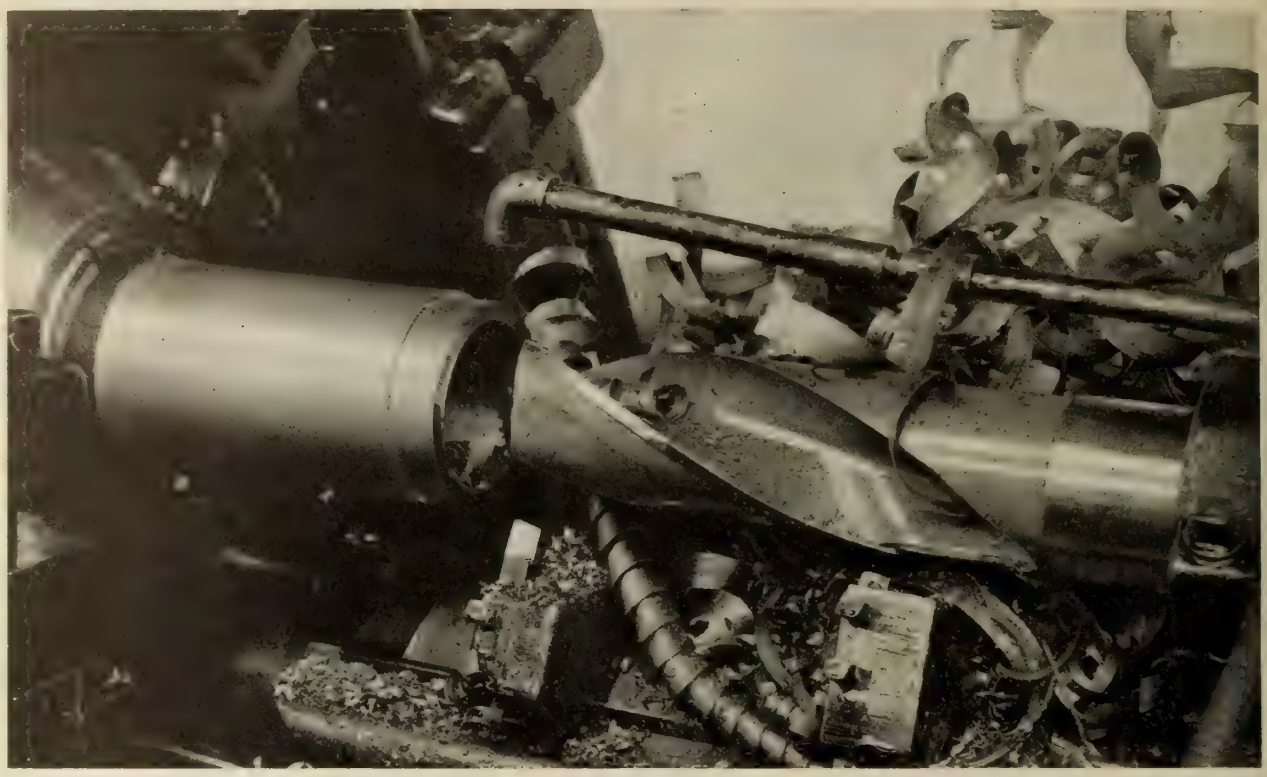
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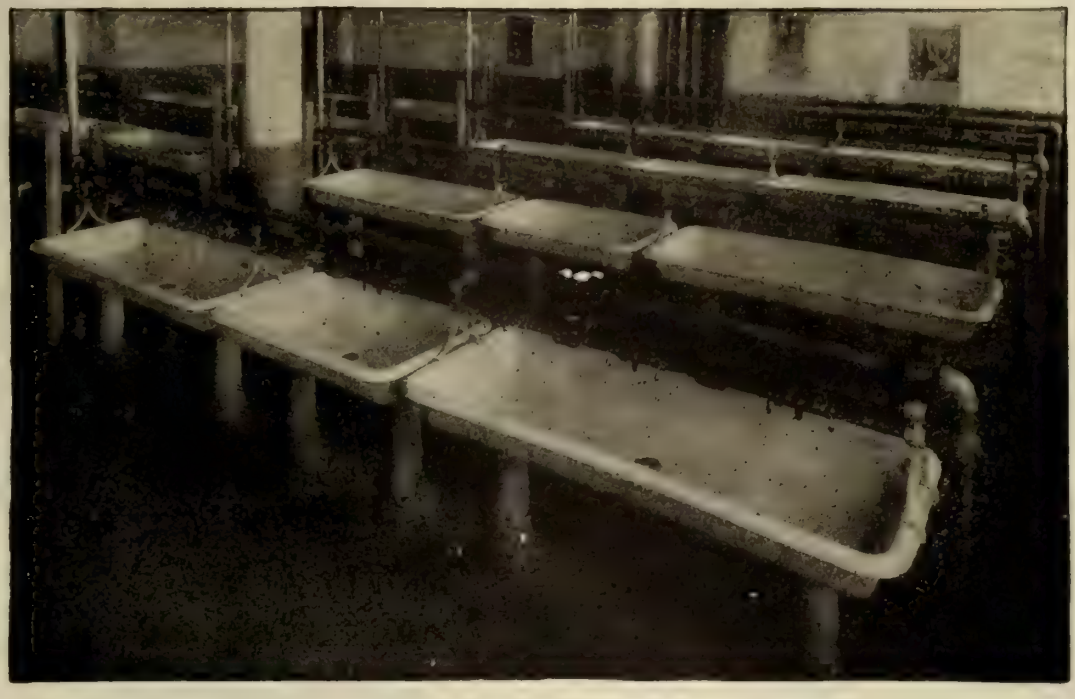
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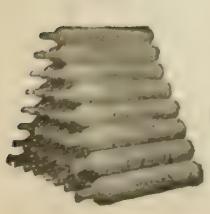
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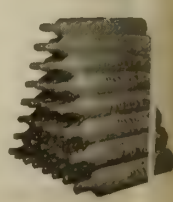
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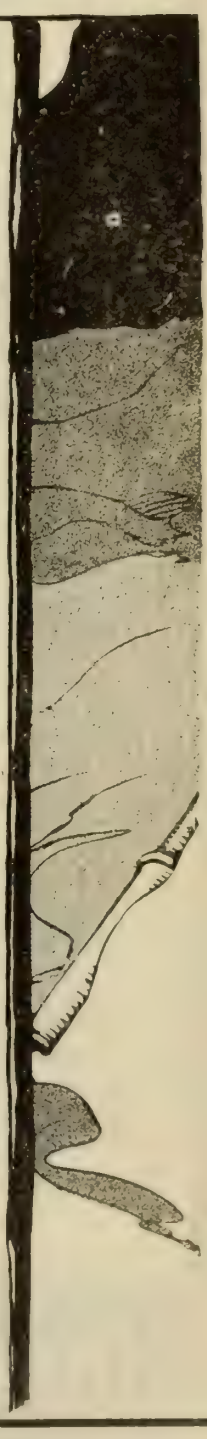
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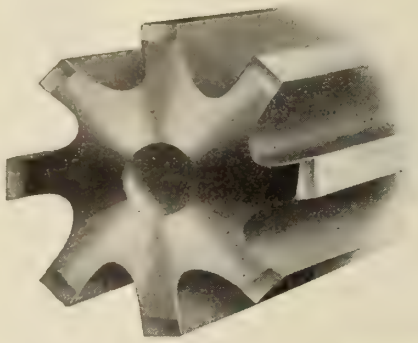
*Canadian Machinery* is a member of The Audit Bureau of Circulations.



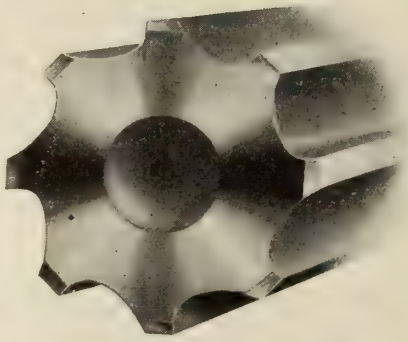
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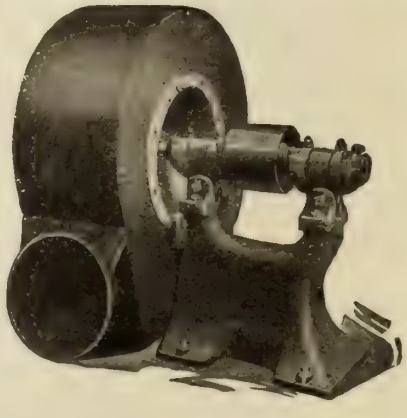
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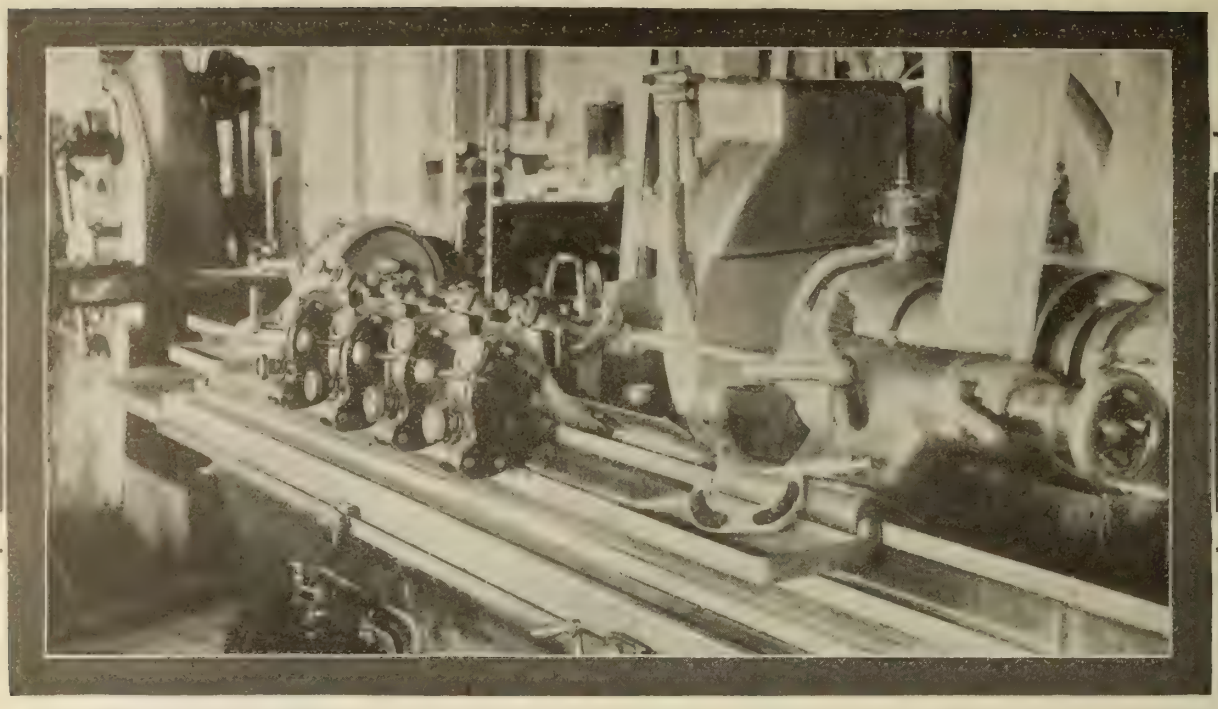
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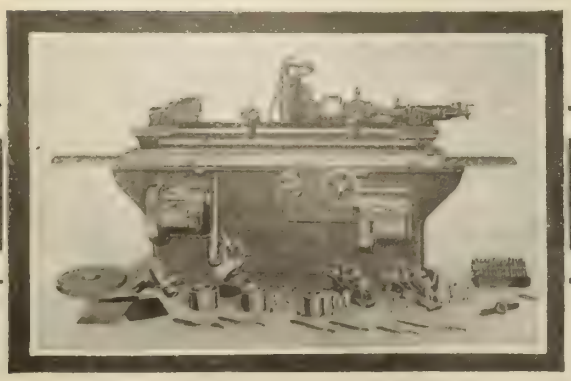
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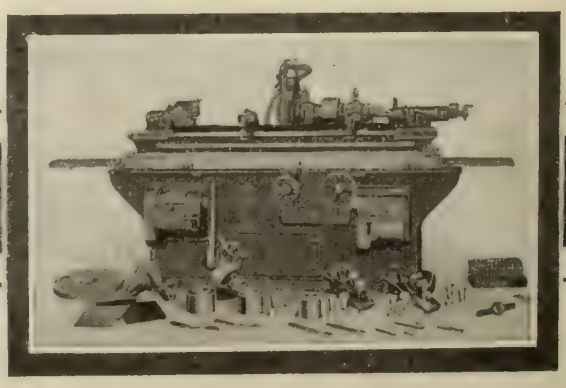
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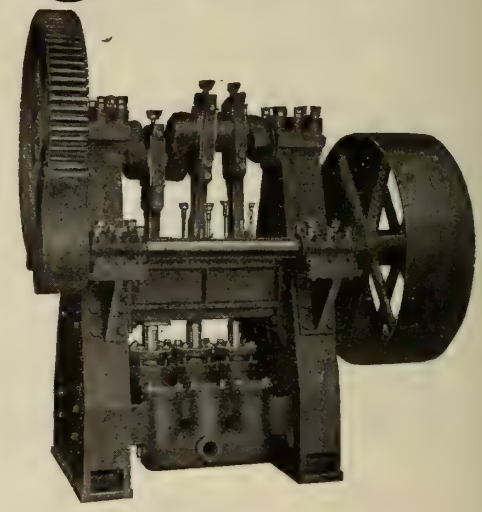
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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

VOL. XXV. No. 24. June 16, 1921

# Machining A Motor Shaft in Two Operations

## Two Machines Used, One Operator Running Both—Machining a Three-Step Cone Pulley—Two Operations Necessary—Producing Pistons in Three Operations. Tool Set Ups Shown in Each Case

By H. A. LOUDEN

WHEN machining quantities of duplicate parts it is an understood fact that if a high production rate is desired, one must use a machine suited to the work. In the following artiele examples of work which have been produced on the type of lathe known as the Fay automatic will be shown. On these machines are a sufficient number of tools, so that the turning or facing cuts on the various surfaces can be taken simultaneously. This is made possible by the construction of the lathe, which provides multiple tools for both facing and turning, operated by independent cam movements. In this way the machining of all the surfaces may be accomplished in the time taken to make the longest single cut.

These machines are automatic in all their movements. When the tools reach the end of the cut the drum is thrown into fast motion and the tools are returned to the starting point and the machine stops.

The work which we will first consider is the machining of motor shafts. Two machines are used in this case, one being set up on one end, referred to under first operation, the other being set up on the other end, referred to under second operation. One operator runs both machines and the machines are stiff enough so that the work is finished ready to grind with one cut.

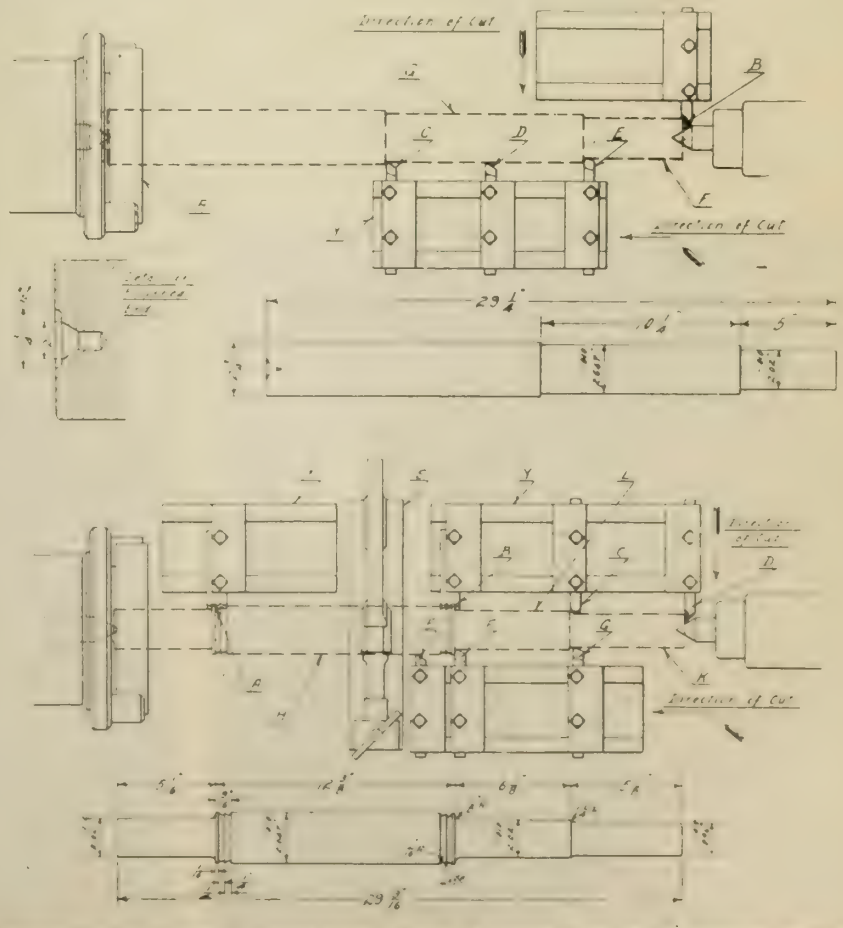
### First Operation

The layout of the tooling equipment is shown in Fig. 1. The outline of the work is shown by dot and dash lines. The shaft is held between centers, and driven by a double end dog "A." The dog is rotated by driving pins on the face-plate of the machine. An equalizing drive is obtained on account of the face plate being allowed to float.

In operation, the arm on which the rear tool holder "X" is mounted swings forward, thus causing the tool holder and the tools to rock towards the work in the direction indicated by the arrow adjacent to this tool holder. When this occurs, tool "B" faces end of shaft and forms radius. At the same time that this tool is being operated, the carriage "Y" is fed in on an angle until the three tools "C", "D" and "E", mounted on the carriage are taking the proper depth of cut, and then longitudinally as shown by the arrow, turning the two diameters "F" and "G." The two tools "D" and "C" divide the turning of the diameter "G" between them, thus cutting the turning time of this diameter in half. It is evident that the shaft is machined in the time necessary to turn one-half of diameter "G" or the part turned by tool "C," or tool "D." Production on this shaft is sixteen to twenty pieces per hour.

### Second Operation

The tooling for the second operation is shown in Figure 2. The shaft is re-



UPPER VIEW, FIG. 1—SHOWING FIRST SETTING ON THE MOTOR SHAFT
LOWER VIEW, FIG. 2—SECOND SETTING ON THE SAME SHAFT

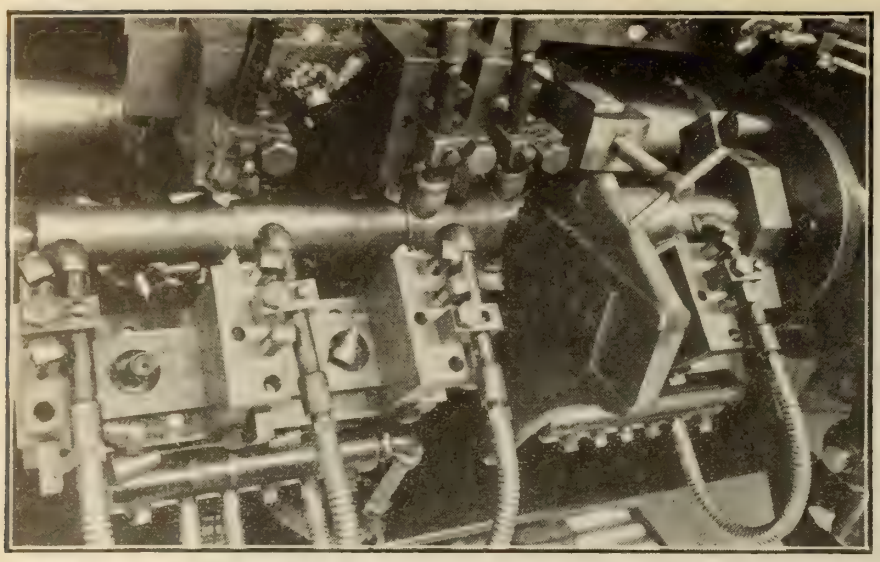


FIG. 3—CLOSE UP OF MACHINE WORKING ON MOTOR SHAFT AT SECOND SETTING.

versed, and held and driven as in the first operation. The shaft is supported by the use of a steady rest "S." In this operation the machine is equipped with two rear tool holders "X" and "Y." These holders are moved forward in the direction shown by the arrows. Tools "A" and "B" face and form oil deflectors. Tool "C" faces shoulder, and tool "D" faces the end and forms radius. At the same time that these tools are cutting the carriage, carrying tools "E", "F" and "G", feed in on an angle to the proper depth of cut, and then longitudinally toward the headstock as shown by arrow turning the three diameters "H," "L" and "K."

Figure 3 shows the machine set up on this operation. The shaft is machined complete in the time necessary to turn diameter "L." It will be noticed that on account of all the shoulders being faced on this one machine, the shoulder lengths on the shaft all come absolutely uniform. The production is 16 to 20 per hour.

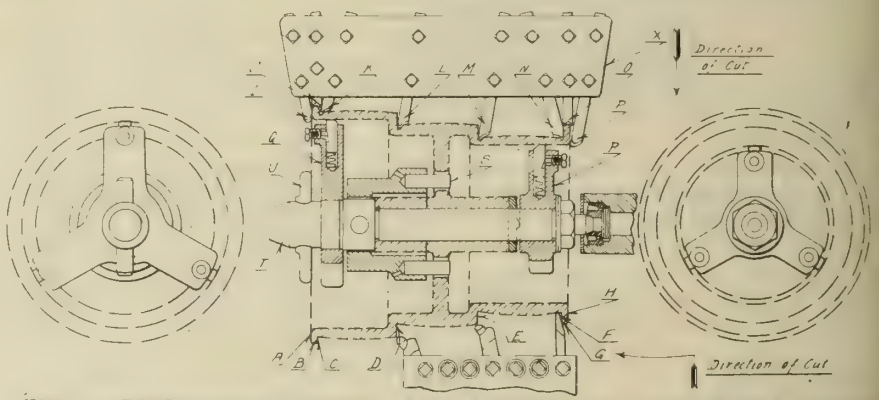



FIG. 4—TOOLS FOR TURNING AND ARBOR FOR SUPPORTING CROWN PULLEY.

**Machining a Three-Step Cone Pulley.**

Two machines are used in the operations on pulleys. One operator runs both machines. The first machine roughs while the second machine finishes. The work is mounted on arbors, and held between centers. Three arbors are provided so that the work is being changed on one while the other two are in the machines. This eliminates having the machine idle while a finished pulley on an arbor is being replaced by a rough one.

**First Operation**

The tooling provided for rough turning and rough facing a three-step cone pulley is illustrated in Figure 4 in which the outline of the work is shown by dot and dash lines. The work is mounted on arbor "T" by means of a reamed hole through the pulley hub, and is located longitudinally on the arbor by the hub faces. The hole and hub faces of the pulley are finished in a preceding operation. The rims of the two outer steps are adequately supported on the inside by the three-armed spiders "Q" and "R." The arms of these spiders are provided with pins that are forced against the work by coil springs placed in the same holes as the pins. When the pins are in con

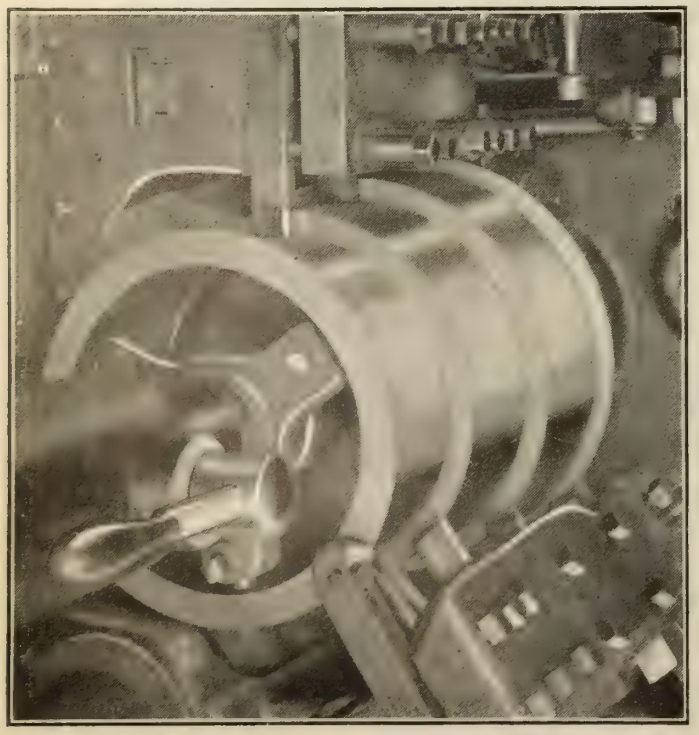


FIG. 5—SECOND OPERATION ON THE PULLEY.

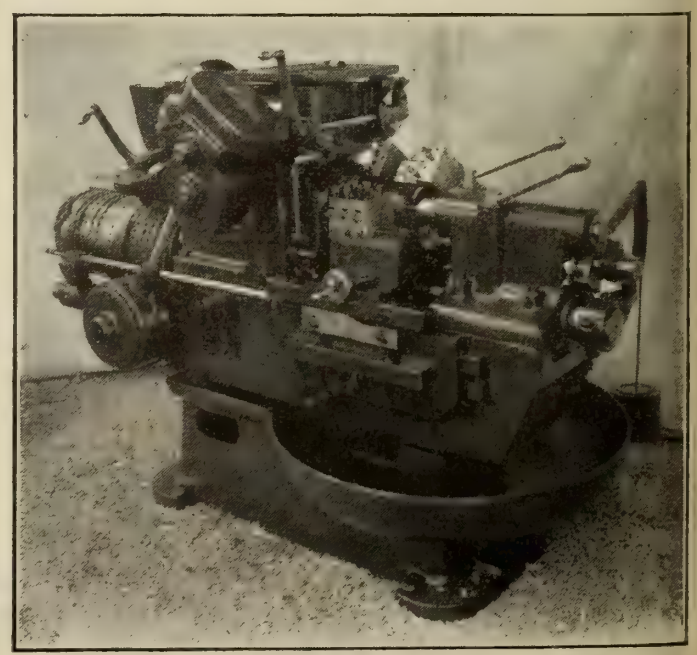


FIG. 6—SHOWING THE TYPE OF MACHINE USED.

tact with the pulley rim they are clamped in position by means of screws. A floating drive is obtained on the arbor through the pin "U," which is flatted off on an angle on both ends and allowed to turn to equalize the driving pressure, the pulley in turn being driven by pins "S" which extend through the holes in a rib on the pulley beneath the middle step. These pins are mounted in an equalizing sleeve as shown.

In operation the arm on which the rear tool holder "X" is mounted, swings forward carrying the tool holder and the tools toward the work in the direction indicated by the arrow shown adjacent to this tool holder. When this occurs, surface "A" is faced by tool "I"; surface "B" is formed by tool "J"; surfaces "C", "D", "E" and "F" are faced by tools "K", "L", "M" and "N"; surface "G" is formed by tool "O" and surface "H" is faced by tool "P." At the same time that these tools are being operated, the carriage "Y" first moves transversely until its tools are taking the proper depth of cut, and then longitudinally, during which movement each of the three steps on the pulley are turned by one of the three tools mounted on the carriage. The direction of the carriage movement is indicated by the arrow in the lower part of the illustration. The pulley is roughed complete in the time necessary for one of the tools on the carriage to turn a single step.

### Second Operation

Figure 5 shows the machine in operation for finish turning and finish facing the various surfaces, during which operation a curved crown is produced on each of the three steps. A former with concave face beneath the front carriage gives the tools the required movement for accomplishing the crowning. The actual production on this work is six pulleys per hour, roughed and finished complete. One man running two machines. This style of lathe may be used to equal advantage in the machining of four and five step pulleys, also plain pulleys.

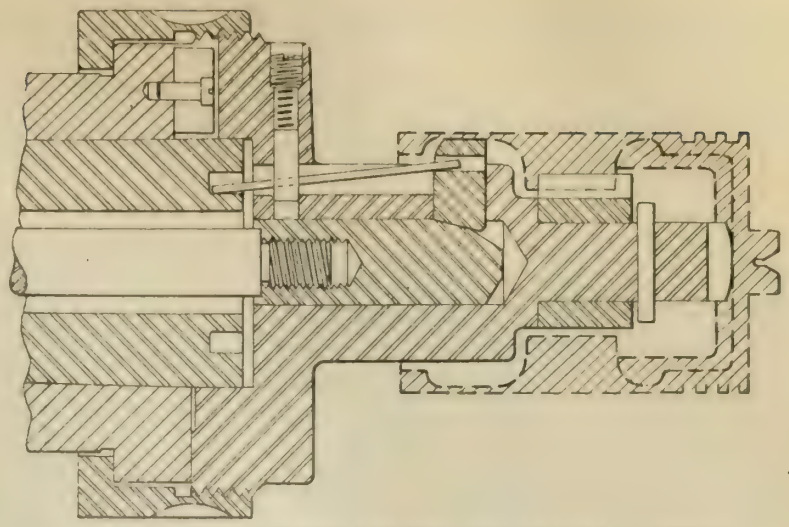


FIG. 7 FIRST SETTING ON THE 3¾" PISTON

### The Machining of Pistons

The method outlined is that proven by experience to be the best one for getting pistons of the highest grade at the lowest cost. The machine used is the short bed Fay automatic, shown at Fig. 6. Before the casting comes to the machine it is placed on a centering mandrel on a sensitive drill press and centered true with the rough core.

The first setting is clearly shown in Fig. 7. The piston is mounted on an air operated fixture provided with three expanding pins "P", which bear against the rough core close to the skirt thereby centering the open end very accurately. The closed end is supported on a revolving ball bearing center, bearing on the center hole above mentioned. This hole having been drilled accurately with respect to the core, the piston is rough turned in this setting true with the inside core so that a piston with a very uniform thickness of wall is produced. The carriage tools rough turn the outside diameter while the back arm tools are facing both ends and rough grooving the piston ring grooves. Enough tools are used in the carriage so that all the rough turning is done during the time required to rough face the closed end.

Production of a piston which is 3 3-4 dia. x 3 3-4 long on this operation, one man, two machines, is 90 to 100 pieces per hour. These figures represent a production that has been maintained over quite a period of time with annealed castings. No. 2 stellite was used for all tools except the grooving tools which were made from high speed steel. The tailstock ram is lever operated, and the machine goes through all of its motions automatically, thus requiring the minimum of attention from the operator.

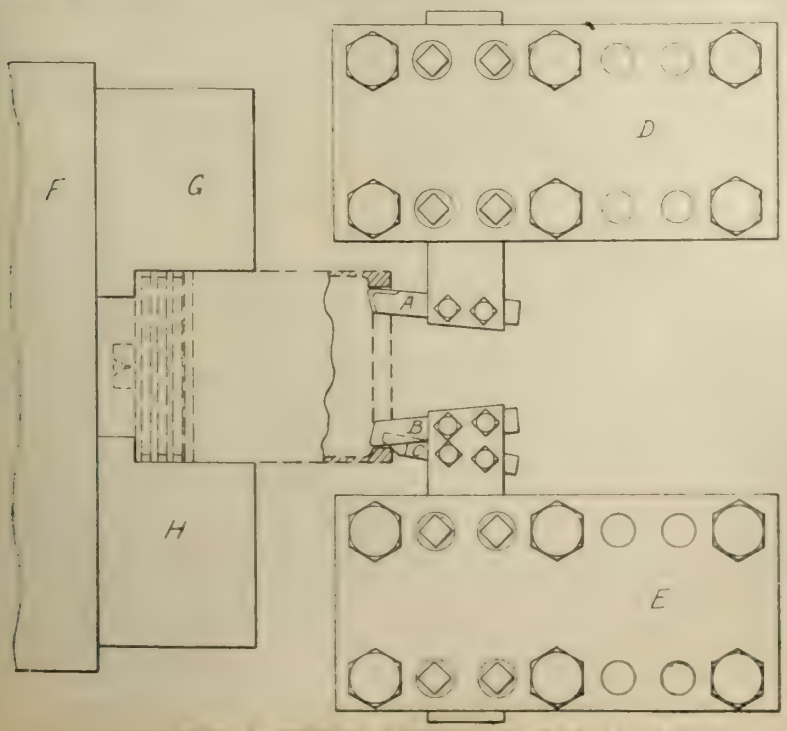



FIG. 8—SECOND SETTING ON THE 3¾" PISTON

### Second Operation

The second setting is shown in Fig. 8. The piston is held in the air operated chuck, and gripped by the outside diameter, which has already been rough turned true with the core. In this operation the skirt is rough bored with a tool mounted in the back arm and finished bored with a tool mounted in the carriage. The resulting diameter being held within .002 so as to be a good fit on a fixture employed for finish turning and finish grinding. The machine holds the pistons within this limit of accuracy without any trouble, and a production has been obtained of 150 to 180 per hour per machine.

In the third setting the tools are mounted as shown in Figs. 9, 10 and 11. Fig. 9 shows the carriage and back arm tools as well as details of the spindle fixture and ball bearing revolving center. Fig. 10 shows details of the auxiliary grooving attachment mounted directly below the back arm tools shown in Fig. 9. The relative position of all these tools is shown by the

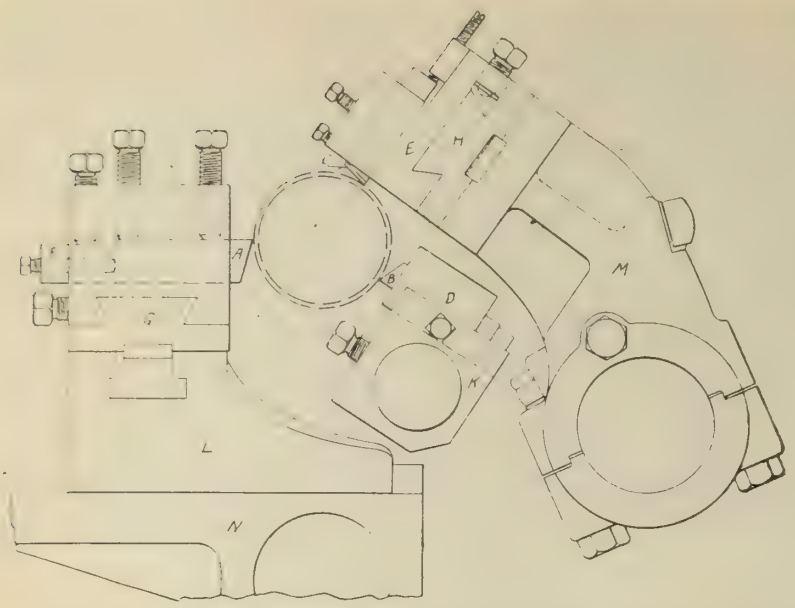


FIG. 11—THIRD SETTING ON 3¾" PISTON, SHOWING END VIEW.

end view Fig. 11. In this operation the outside diameter is finish turned ready to grind during the time that the back arm tool faces down the closed end to a point where the finish grooving tools which are mounted in the back arm begin to cut. During the time that the finish turning tools in the carriage are cutting, the grooving tools mounted in the auxiliary grooving attachment (shown by Fig. 10, and shown below the back arm Fig. 11) take a second roughing cut on the grooves.

The first cut on the grooves has been done in setting No. 1. This cut just described sizes the grooves and lines them up perfectly with the finish grooving tools mounted in this same machine. This cut also brings the grooves very nearly to size, so that the final finish grooving tools mounted in the back arm have very little work to do, and will maintain an accurate width of groove for a long time.

The back arm is fed through its final travel, which is employed for the final finishing of the grooves after all the other tools are through cutting. This method results in finish turning the piston all over in the time required to finish face the closed end of the piston. All the motions of the machine being fully automatic the resulting production is higher than that obtained by any other method. An extremely fine job is also produced. It will be noticed that both ends of the piston are finish faced at the same time that the grooves are finished, and also at the same time that the outside diameter is finish turned so that all the work is perfectly concentric. The only thing necessary to watch in this operation is the locating ring "T" shown in Fig. 9. This ring is renewable, and can be replaced and finished in place on the fixture whenever it gets worn. This ring should be a close fit on the open end of the piston. If the piston fits a trifle tight it is readily pressed into place by the lever operated tailstock spindle. The piston is ejected from the fixture as readily by means of the ejecting pin "U," shown in Fig. 9, which is connected with an air cylinder on the rear of the spindle.

The production on this third setting as described above runs at the rate of 45 to 50 pistons per machine, or 90-100 pistons per operator per hour. Stellite tools are used throughout, except that the grooving tools are high speed steel.

## A TALK ON LAMPS

In view of the variety of purposes for which lamps are used on board ship, states Mr. W. J. Jones in a paper read before the Illuminating Engineering Society, it is not surprising to find a multiplicity of different types in use. At the inception of electric lighting carbon lamps were exclusively used and even now find favor on some cargo vessels. The introduction of metal filament lamps, however, has effected a considerable saving of electrical energy. Although in modern vessels the engines are carefully balanced and the structure designed so as to transmit vibration as little as possible, yet the lamps still experience a considerable amount of vibration of high frequency. In recent years lamps have been specially designed to withstand great mechanical shock, and such lamps are in daily use on the London trams and on railway systems.

## INCREASE IN PRODUCTION

The production of magnesite in the United States in 1920 increased 94 per cent. in quantity over that of 1919. The entire output was made by two States, California and Washington. California mined 63 per cent. more magnesite in 1920 than in 1919 and more than eight times as much as it mined seven years ago. Washington increased its production 109 per cent. over that of the preceding year, making by far the largest output it has yet made. According to the United States Geological Survey, Department of Interior, the total production of magnesite in the United States in 1920 was 303,767 short tons, which was valued at approximately $2,748,150.

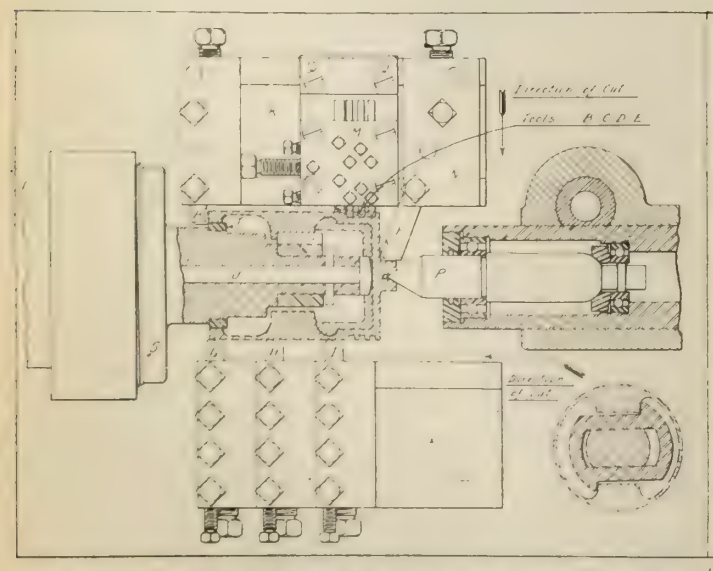


FIG. 9—THIRD SETTING ON PISTON SHOWING PLAN OF CARRIAGE TOOLS AND BACK ARM TOOLS.

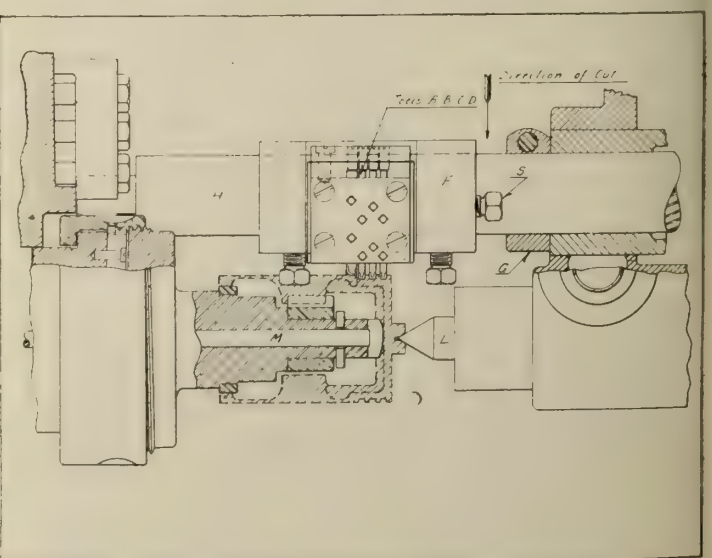


FIG. 10—THIRD SETTING ON PISTON SHOWING PLAN OF AUXILIARY GROOVING ATTACHMENT.

# Making Machinists Out of Returned Soldiers

## The Course Takes Thirty Three and One Third Weeks. In That Time The Student Receives Tuition in Shop Mathematics—Shop Practice and Mechanical Drawing. Experience Comes as Matter of Course

By J. A. McGILVRAY

THE RETRAINING of returned soldiers in the art of machine shop practice, is something which has received close attention at the Nova Scotia Technical College, in their mechanical department. Early in 1917 this work was started, and up to May, 1921, 150 men were trained in machine tool operation, and other branches of the machinist trade. Many of these men are at present successfully carrying on as machinists, and in view of the fact that normally it takes four years to train an apprentice in the machinist's art, it reflects a great deal of credit on those in charge of the school, for the men taking this course only put in a period of eight months.

The shop instruction was first started under the leadership of Prof. Donkin, with Mr. S. Leedman as his assistant, but later on Mr. Leedman relieved Prof. Donkin, who took over the chair of mechanical engineering. Practical machinists were secured as assistant instructors, these men being specialists in their work, and from then on it was up to those learning the trade to gather in as much information as possible in the time at their disposal. No standard time at any work was stipulated, and every man was advanced as he showed merit. Machine tool equipment was added from time to time, until at present they are equipped with the very best in the machine tool line.

The duration of the course, as already stated, is 8 months, or 33 1-3 weeks. Machine shop practice occupies 33 hours per week, or 1100 hours during the course, while practical shop mathematics has 100 hours allotted to it during the course. Drafting occupies 266 2-3 hours of the student's time, the total being 1466 2-3 hours for all three sections. The different studies are taught at various hours throughout the day, this avoiding any tendency to tire of any one particular section.



MAIN BUILDING OF NOVA SCOTIA TECHNICAL COLLEGE, HALIFAX, N.S.

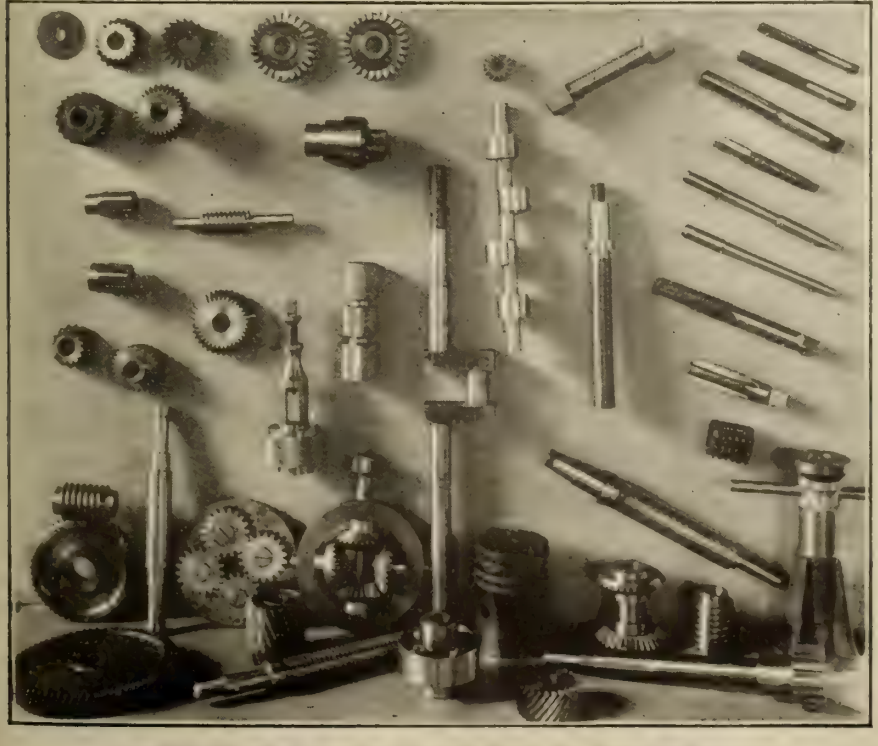
The course of instruction has been carried on without changes since the class first commenced. The above schedule has worked out well, as statistics show that a man with average intelligence and no experience along this line of work can become (if he applies himself) a fairly proficient machine tool operator in 8 months. Of course he lacks experience, but that comes later.

When a man first enters the shop he is carefully sized up by the instructors; his name is entered on the roll, and the time limit noted. He is passed over to the assistant instructor who places him at work on the bench, where he learns how to use his hands, and how to apply them to the use of hand tools such as hammers, chisels, files, scrapers, etc., on a particular job which must be finished by hand tools. On the completion of this job he is allowed to change to other machines, and he is carefully instructed to give him a good start, so that he will apply only methods which are correct.

The time period for the bench may range from two weeks to one month, depending on the ability of the student, and every student starts at the bench on standard, well thought out work. When the term at the bench is finished he is shown the different methods of drilling holes in various metals, both at high and low speed, also the use and abuse of hand taps and reamers, remaining at this work until a satisfactory standard has been reached.

From this he is moved to the shaper where the different methods of shaping metal to form is carefully taught him by the instructor. The various methods of setting up work; the way in which to grind the tools used to do the different operations; a detailed description of the various parts of the machine itself; correct and incorrect ways of operating are all pointed out to him, and, after a few weeks when he presents to the instructor a complete job, and when the application of micrometer or calipers to his work has shown it well done, he is moved to the lathe, which seems to be the desire of all students.

The course of lathe instruction is mapped out carefully, both to help the student, and to save the machine. One of the first jobs usually given to the beginner is to turn a plain spindle 1½ in. diam. by 18 in. long. He is then instructed to select a piece of round steel from the stock rack allowing enough oversize on the rough stock to finish to a given diameter. He is next shown how to cut off the required length in the power hack saw, and the required allowance to leave on for squaring ends. Next comes the use of the Hermaphrodite caliper, and center head square, to enable him to find an approximate center



SOME OF THE WORK COMPLETED BY THE STUDENTS.

before drilling centers in the ends of parts that have to be mounted between lathe centers. The method of fastening the dog to the work is shown, and before placing work between centers he is shown how to start and stop his lathe, also how to engage and disengage lateral and cross feeds.

He is now shown how to grind the tools for this particular operation. He then takes a roughing cut across work to within 3 or 4 inches of head center, changing end for end and finishing the remainder of cut. He is taught to use the calipers as the next cut is to be finished size, and is shown how to grind tools to give a clean, smooth cut. In beginning, the student is usually started below speed until such time as he improves in skill and confidence, then the matter of speed and feeds are taken up and he is shown how to move along at a business-like pace. He is also instructed how to turn tapers both by setting over the tail stock, and by the use of the taper attachments. He is shown how to cut threads on the lathe, both vee and square, right and left hand, single and multiple. There is also a variety of work on the lathe that is required to be done in the chuck or face plate. This work is gone into carefully, and he is taught to use judgment and caution as each job has its own peculiarities, no fixed rule being existent for this class of work. At the end of the time allotted for the lathe the student is transferred to the milling machine which runs hand in hand with precision grinding and other work. The finest work is taught him, this including the milling of slabs, keyways, slots; the milling of gears, worms, spirals; the making of reamers, taps, hobs, and other fluting operations; bevel gears, skew gears, also the making of milling cutters. A brief insight into the tempering and grinding of these tools is given, until at last the student goes out to earn his daily bread by means of the machine tool knowledge given him.

### Mathematics

When a student enters the mathematical class he is first questioned as to his previous schooling in order to ascertain just where he should begin. If he has a good knowledge of fractions and decimals he is put in the advanced class, otherwise he is placed in the junior class. The preliminary mathematics consists of fractions, compound fractions, decimals, percentages, use of percentages, efficiencies and discounts. After the student has shown that he has a fair knowledge of the preliminary work (I say fair owing to the short time that he is in the class) he is transferred to the advanced class, this dealing with practical shop mathematics.

The subjects taught are the use of formulae, circumferential speeds, grindstone and emery wheels, cutting and belt speeds, ratio and proportion, direct and inverse proportion, speeds and diameters of pulleys, gear ratios, compound gear and pulley trains, area of circles, square root, triangles and rectangles, levers and wheels, axles and incline planes. The student studies also each machine in the shop separately. For example, on the milling machine he receives instruction on the index head; compound and differential indexing; the spiral head; cutting spur gears, bevel gears and worm gears; also how to figure the proportions of such gears.

On the lathe he is taught how to figure his gears to cut any thread. Tapers and speeds are also considered. Each



FREDERICK H. SEXTON, D.Sc., L.L.D., PRINCIPAL NOVA SCOTIA TECHNICAL COLLEGE.

machine is taken in this manner and the student is encouraged to apply his theory to his work in the shop. Examinations are held at intervals to find out how students are progressing, and special instructions are given to the slower students. If a student wishes to enter this course, but his education is not sufficient, he is sent to the re-educational class. This has proved of great benefit, as students show a decided improvement on returning.

### Machine Shop Drafting

This part of the course is complete within itself, giving to the student a clear and concise training in the art of making a working drawing both from sketches and from actual objects or parts, thus enabling him to use blue prints, from which he can make a machine any part in the course. He receives good practice in the reading of prints as all his instructions are given him, when he is sufficiently far advanced, by sketches or by blue prints. The photograph at Fig. 1, showing work completed, tells a story in itself, and great credit is due Frederick H. Sexton, D.Sc., L.L.D. the principal of this technical college, for the success of the course. One must see the men at work to fully appreciate the careful instruction afforded them.

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## THE ORIGIN OF NATURAL OIL.

In a paper which he recently read before the Melbourne Section of the Junior Institution of Engineers, Rear-Admiral Sir William Clarkson advanced the theory that natural oil is of vegetable origin. Life must, Sir William thought, have originated on the earth in a vegetable form, for it is impossible to conceive animal life without food of some kind, and all our experience tends to show that this food must, in the first instance, have been of a vegetable nature. The original vegetable life must also have grown in water and not on land, for in those early periods—the crust of the earth being thin and excessive rainfall and tremendous erosion being the prevailing conditions—the surface of the land would not have, at first, been in a sufficiently stable or fit condition to support terrestrial growths. It is natural to suppose that the heat, and the saturation of the water with carbon-dioxide, would supply all the conditions necessary for very luxuriant aquatic growths. Terrestrial growth must necessarily possess qualities which need not be present in plants growing in water. For instance, in order to support themselves in air, they must possess strength and fibre of an altogether different nature to that required by aquatic plants, which are supported by the water in which they grow. It is not straining things very seriously if we suppose that for this reason terrestrial plants, in process of time and under favorable conditions, have been mostly converted into coal and other carbonaceous deposits; aquatic plants being, from their composition, incapable of forming coal, have by a different process of deposition and decomposition, been turned into oil. We do not find any evidence of the presence of coal in the older geological periods, when aquatic growth would be possible. On the other hand, as before mentioned, we do find oil in rocks belonging to those periods. This affords fair presumptive evidence that natural oil—provided always that it is of organic origin—has been produced from the decomposition of organic material of aquatic origin.

Some years ago the Naval Board investigated the occurrence of an alleged oil deposit found in quantity over a large area in the south-east of South Australia. This substance, which has been named "coorongit," is a tough substance resembling india-rubber. It occurs in layers of from ⅛ in. to 1 in. in thickness under the sand. Mr. Marcus Bell, the Commonwealth Superintendent of Laboratories, reported that it "burned with an oily smell, and that, by means of a solvent, 25 per cent. of oily matter was extracted which was of vegetable origin." There appears to be no definite evidence that it has been originally forced up from any considerable depth to the surface as a liquid, and it has most probably been formed where it is found, resulting from the decomposition of masses of seaweed thrown up on old ocean beaches. This is in a measure confirmed by the presence of small wiry twigs in the body of the coorongite identical, to all appearances, with similar twigs found on the sea beaches intermingled with the seaweed.

Sir William suggested that instead of spending money and time in an endeavor to produce power alcohol from molasses and foodstuffs, by means of fermentation and distillation, with very doubtful chances of commercial success, it might be advisable to try what can be done with seaweed. Find a suitable ferment, he said, put it to work under suitable conditions, and observe the result. Foodstuffs are required for food; no one wants seaweed, and it is available in unlimited quantities. He dd not suggest that hydrocarbon oil could be produced commercially in quantity by any such method—the element of time necessary to complete the conversion would most probably negative any commercial success—but such an investigation, if successful, would, at any rate, go far to settle the very vexed question of the origin of natural oil, and would give an immense impetus to prospecting.

The latter part of the paper was devoted to a consideration of the possibilities of finding oil in Australia, and to descriptions of the wells which have been sunk already.

# Keeping Tab on the Operations and Tools Used

## How do You Determine an Operators Value?—A System That Keeps Track of Every Special Tool, Jig, Reamer, Drill, etc. Operator Must Give Definite Reason for Spoiled Material

By ROBERT MAWSON

HOW do you determine whether a workman is worth more money or not, in the event of his requesting an increase? Do you call in your foreman and depend solely on his advice or have you some definite data on each worker that determines his worth to you?

A system that has found favor by one concern is shown in the illustration, and it has solved very satisfactorily for them the problem of increases.

Every special tool such as a jig, fixture, reamer, drill, etc., is marked, in this plant, with a number, and it is kept in the tool room. The detail drawings of the different elements are marked on the various surfaces operated upon, with letters such as A for surfaces, B for bosses, etc.

Referring to the illustration, it will be seen how this works out. The spaces on card are to be filled out by the foreman or his assistant, giving the machine operator's name, department, order number of the job and drawing number, this last information being also the number of the detail to be worked upon.

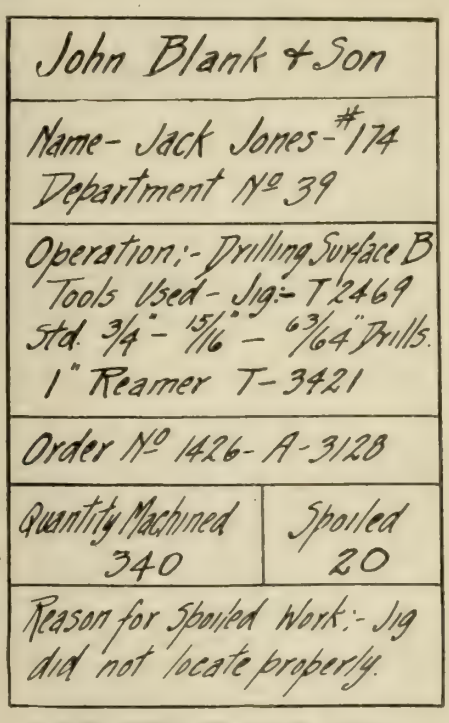
Another line gives the number of each tool required when machining the particular operation in question. In the example given the operation calls for drilling surface B and requires jig T-2469, standard ¾ inch, 15-16 inch and 63-64 inch drills and 1 inch special reamer T-3421. The order number of the job is 1426 and the part drawing A-3128. The quantity to be machined is 340 of part A-3128.

After the drilling machine operator has received the filled out card as described, he takes it to the tool room storage and receives the various tools noted in a box, the same being checked out against his workman's number, which is shown to be 174. In the meantime a tote box has been placed at the drill press by one of the helpers containing 340 unfinished castings of this part A-3128, also the working drawing of the same.

After the first piece has been machined with the operation noted it is inspected and if found correct, the workman is told to complete the work. If any mistakes are found the cause is investigated and remedied. After the 340 parts have been finished by the machine operator they are inspected and should any be found spoiled, the card is marked accordingly. Supposing it be found that 20 are defective, the card is returned to the machinist and he has then the opportunity of noting on the card why he spoiled these pieces during the machining operation.

Let us see what reasons are sometimes given. One would be, "Jig did not work right." Under these conditions, it will be the foreman's duty to find out if the jig does not function properly and at once take steps to correct it. The excuse would then be considered valid and the card marked "Reason sufficient."

Again the reason might be, "Castings bad," and this would cause the work being spoiled and the card marked in a similar manner to that already noted. However, it might be found that though the reason given was "Jig not right," after investigation it could be proved to the man that he was at fault in not using




THE TYPE OF CARD USED.

the jig properly after being properly instructed and then the card would be marked "Reason insufficient." The cards are then turned over to an assistant in the superintendent's office, who makes a rating card for each man monthly, computed on the percentage of spoiled work actually counted against him. It might be noted here that where the cards are being of course deducted.

With this simple method of keeping track of a man's work, the superintendent was provided with certain knowledge of all the various men's ability. When any man was showing a high percentage of efficiency, in other words when his spoiled work was low it was considered good policy to increase such man's wages, as by so doing the man realizes that his work is being appreciated. On the other hand supposing a man came to ask for an increase saying that he thought he was worth one, by referring to his efficiency cards for the past, say, three months which had been compiled from his actual work we could at once see whether he was improving in his work or not and act on the wage question accordingly.

### HOW ABOUT DUST?

Is your plant free from dust? Of course it's not. It may be very clean, but there is always a certain amount of dust existent. The chief question is, "How dusty is the air?" Knowledge as to the degree and composition of such dust is important, for certain amounts and sorts of air dust seriously affect the lungs and predispose those who breathe them to tuberculosis and other diseases.

Dr. O. M. Spencer, of the U. S. Public Health Service, speaks of this matter in a recent report of the Service. He shows that neither the fact that the exhaust pipes, etc., required by law appear to be properly functioning nor the use of wet instead of dry processes in grinding, polishing, and the like make it at all certain that the dustiness in a given plant is what it should theoretically be. He finds that many exhaust pipes do not in fact exhaust as they are supposed to do; and that under certain conditions some wet processes create much more dust than dry ones. Only actual "dust counts" show the real dustiness of the air that the workmen must breathe; and such counts should be made periodically to check the theoretical conditions.

To determine how unhealthful the dustiness of any particular plant process may be the composition of its dust should be ascertained and its effects interpreted by standard tables, which Dr. Spencer urges should be worked out for the various industries. Different industrial processes produce dusts which differ greatly in injurious properties.

### WIRELESS DEVELOPMENTS IN CHINA

"Finance and Commerce" states that the Mitsui Bussan Kaisha are constructing a high-power wireless station about nine miles east of Peking. The sending station in the east, and the receiving station in the west are about a mile apart. The power-house and four of the six steel towers, each 700 ft. high, are finished; the remaining two towers will be ready within two months. The construction of this plant, which was commenced last April, was delayed by prolonged negotiations with over 300 small landowners, who had to be bought out. The contract with the Chinese Government was signed on February 21st, 1918, but no time was set for the completion of its provisions. The Government is reported to be considering the establishment of wireless stations at Chefoo and Weihsein, in Shantung, thus covering the district east of the Kiaochow-Tsinan railway.

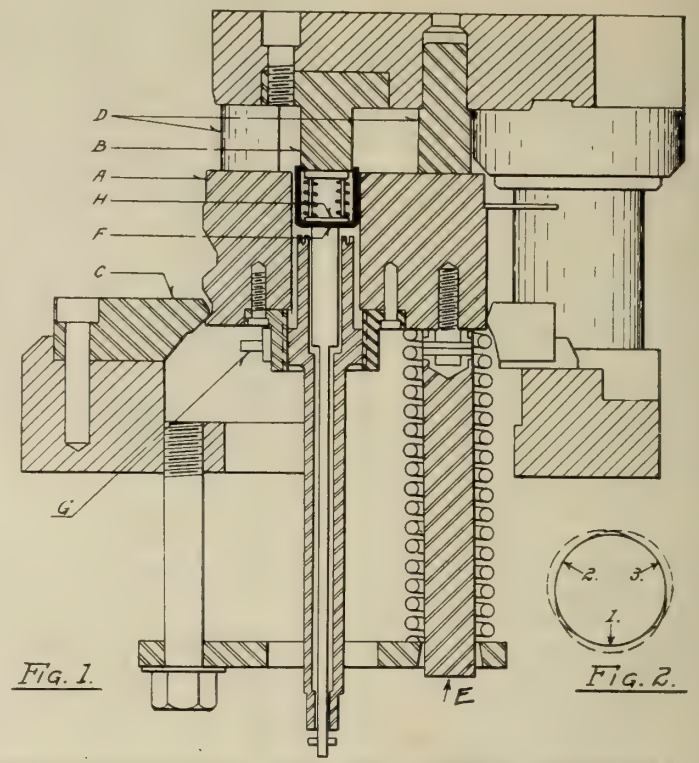
# Construction And Action of New Trimming Die

## A Patented Tool That Trims the Surplus Metal—Special Action Causes the Cutting—In Place of Downward Movement of Punch a Lateral Oscillating Movement Accomplishes the Operation

A new patented tool that is being introduced by Jos. P. Cleal, of Toronto, will be of interest to manufacturers who use parts drawn into various shell shapes by the punch press. This tool, known as the Brehm trimming die, trims the surplus metal from the shell, leaving the part with a perfectly straight edge. These dies can be built to trim round, square or irregular shaped shells.

One of the principal points of difference between these trimming dies and the ordinary blanking dies is the action that causes the cutting. In a blanking die the cutting is caused by a downward movement of the punch; in the Brehm trimming die it is caused by a lateral oscillating movement of the die block.

In the construction of the die, the die block "A" in Fig. 1 is triangular in shape, having cams cut on its sides similar to the one shown except that they are so placed as to operate in rotation. The shell to be trimmed is placed in the die as "F," and as the press slide descends the punch "B" enters the blank. Three studs mounted on the punch holder—two shown as "D"—which are slightly longer than the punch "B," come in contact with the die block and force it down on springs. As seen in the cut, this downward movement of the die block will cause the cams on this piece, and the cam on the permanent female cam "C," to operate, forcing the die in a lateral direction, which in connection with the punch causes the cutting operation. After the first cam has operated, the cam on the second face operates in a similar manner, and then, in rotation, the third set of cams. Take two coins of the same diameter and place them together but off centre. By watching the edges as they meet when the coins are moved, an exact duplicate of the shear movement of the die will be given. In Fig. 2 the direction of the different movements and the amount of scrap stock removed by each cam is shown.




SECTIONAL VIEW OF THE DIE, SHOWING PRINCIPLES INVOLVED.

One feature of this trimming die is its simple construction. The die block "A" with the three attached studs, one shown at "E," are the only movable parts. These studs are merely for holding the springs in their proper places and to prevent them from buckling during the operation of the die. To sharpen the die one of the female or permanent cams "C" is removed, allowing the die block to be lifted out. After removing the studs "E" and the threaded bushing which carries lock screw "G," the die can be ground on an ordinary surface grinder. Throughout the life of the die the grinding does not affect the timing of the cams. As the top surface of the die block is ground away, the screw support which determines the length of the trimmed shell can be lowered. Lock screw "G" holds this part permanent during the operating of the die. The punch is ground in the same manner as

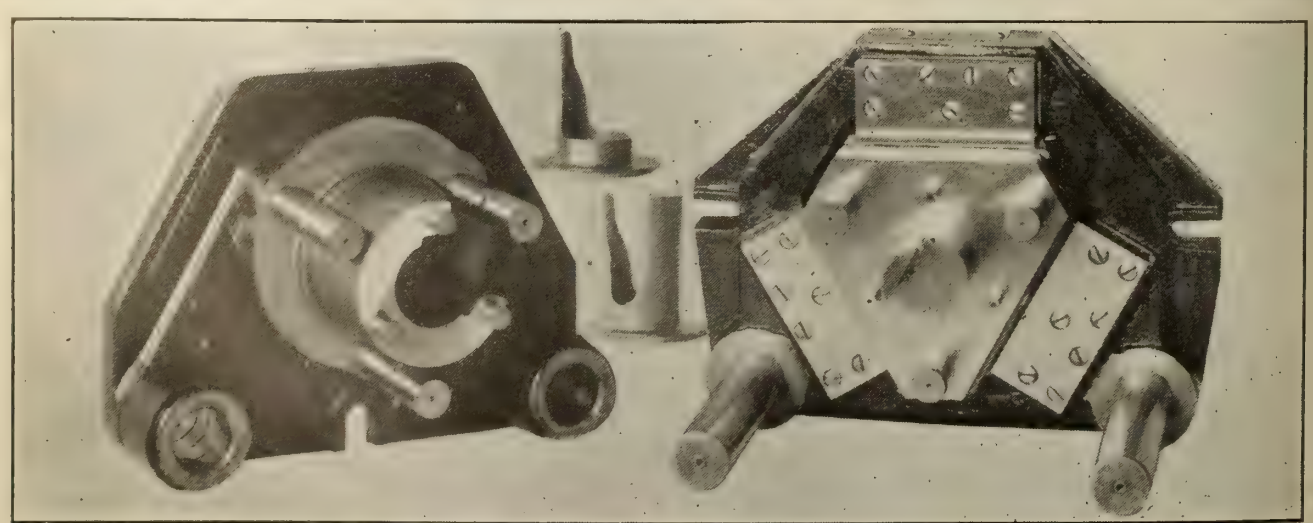
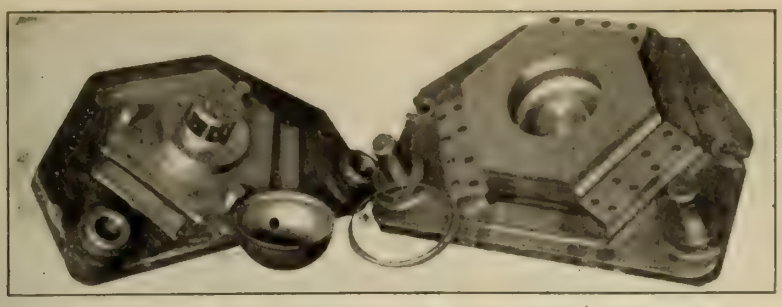


FIG. 3—A TRIMMING DIE FOR MAKING THE PIECE SHOWN.



ANOTHER DIE DESIGNED ON THE SAME PRINCIPLE

a blanking punch and a slight amount shorter than the pressure studs mentioned as "D" — this variation making the clearance between the punch and die when in operation. The grinding of either punch or die does not change their shapes so as to affect the shells to be trimmed. The spring pad "H," fastened to the punch, is for holding the blank stationary during the trimming operation.

Owing to the shear movement of the die they are said to have an unusually long productive life. The minimum amount of grinding space allowed is one-half inch. Dies built for shells of one inch or under have oil-hardened die blocks with carbonized female cams. All larger sizes have die blocks of carbonized steel with tool steel inserted bushings which do the cutting. All cam faces on both the female cams and the die blocks are ground to their proper dimensions. Carburetor bowls, trimmed in this type of die are said to have shown a greater degree of perfection than those trimmed in a lathe, as the bowl is not distorted by clamps in any way during the cutting operation. Shell drawn from extremely thin metal, such as copper, aluminum or fibre, are as easily trimmed as those of more substantial build. Parts made from .010-inch to ⅝-inch stock from ¼ inch to 21 inches in diameter and from ⅛ inch to 10 inches deep have been successfully trimmed.

When operating the die, the pieces to be trimmed are merely dropped in the opening in the die block. There are no stop pins, clamps or nests or other attachments to retard the speed of the operation. If the press is inclinable and equipped with compressed air, which can be used to eject the shells, a very high speed of production can be obtained. In a number of cases one die has been built to trim several shells of different diameters and lengths. This practice is limited in small dies to minor variations. In the trimming of automobile brake drums, fifteen different sizes are being trimmed in one die, which takes care of the following variations: from ⅜-inch to ¼-inch stock, from 21 inches to 15 inches in diameter and from 9½ inches to 6 inches in depth.

In Fig. 3 a die for trimming a piece not entirely straight is shown. The projection on the edge of the shell is formed on an ordinary horn die while the straight part is trimmed by the trimming die. A similar combination of dies can be used to advantage in trimming metal boxes when the hinges are formed on the edge as part of the box or lid.

## MACHINING LOCOMOTIVE BOILER STAYS

J. H. Moore

LOCOMOTIVES, like human beings, do not always remain in the pink of condition. Constant service of a locomotive causes wear, which in turn necessitates repair. One of the parts that frequently requires repair is the firebox. New stay bolts are often necessary and generally the old holes for the bolts are retapped, and larger stays inserted. This process is continued until the maximum allowable size of stay bolt is reached.

When large quantities of such bolts of similar size are required, an automatic machine is generally used, but for regular repair work where the bolts vary in size and do not come through in quantity, an automatic is not essential, and in fact is a considerable expense. The Alfred Herbert, Ltd., Coventry, England, have had considerable experience on this class of work and their Toronto office, 1-3 Jarvis St., has furnished us with some interesting data showing how, with the aid of a simple attachment, they use their regular No. 4 capstan lathe for such a purpose.

Referring to Fig. 1 we see the attachment as used for machining copper and steel stays. The copper bar, which is drawn about .010 inch over nominal size, is gripped in the draw-in chuck of the lathe. On the first capstan face is an adjustable stop against which feeds the bar, thus regulating the length of the feed.

On the second turret position there is a holder fitted with a cast iron sleeve bored an easy fit on the bar, this supporting the end of the stay. A tool at the back of the cross slide is meanwhile fed into the depth of the clearance portion. On engaging the automatic feed to the turret slide, a boss on the sleeve-holder pushes the slide along, the traverse of course cutting the clearance portion.

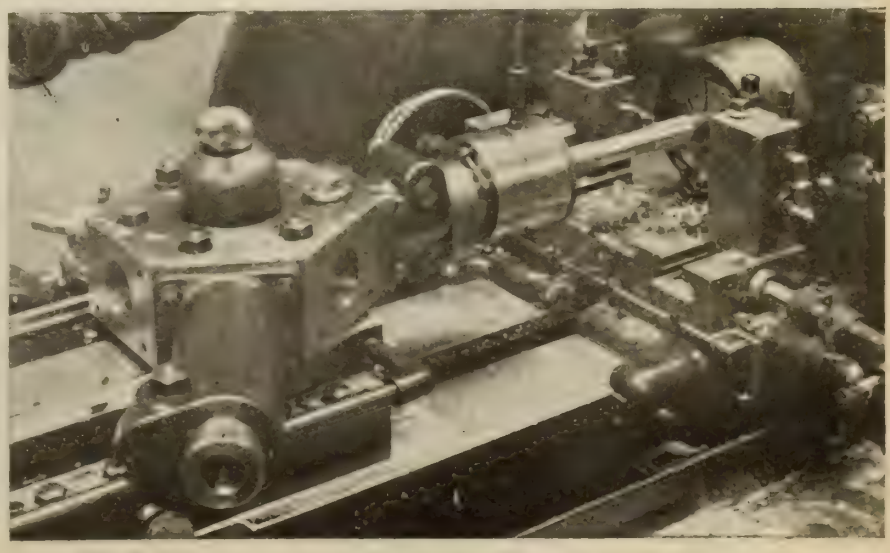
Threading is the next operation, and this is accomplished with a Coventry self-opening die head. Owing to the gap of unthreaded portion between the two ends, it is necessary to provide some means of maintaining the two threaded ends in continuous pitch. This is accomplished by coupling the die-head up to the chasing saddle. A notched, hardened steel collar is placed at the rear of the die-head and a block carrying a plunger designed to engage with this notch is carried on the front of the cross slide. The die-head is brought up into position at the end of the stay, and the cross slide moves along until the plunger is a little to the right of the notch.

On engaging the chasing mechanism, the cross slide moves inward, thus compressing the plunger. The chasing saddle now commences to move and when the plunger is opposite the notch it snaps in and carries the die-head and turret slide along at the correct pitch.

As soon as the die-head reaches the end of the first thread, the friction clutch in the headstock is thrown over by hand to the fast speed in order that the unthreaded gap may be speedily traversed. As soon as the die-head reaches its proper position for the second thread, the speed is reduced and the second portion of bolt is threaded.

The chasing saddle is automatically brought to rest at the end of the second threading, this preventing any danger of overrunning. The die-head now pulls off and opens. On disengaging the chasing mechanism, the saddle moves outward

(Continued on Page 44)



VIEW SHOWS THE DIE HEAD IN POSITION FOR THREADING.



# WELDING AND CUTTING



## Are Studs Used In Arc Welding Merely As Pegs?

### Steel Studs Should be Properly Distributed—It Does Not Harm Steel to Strain It, Even beyond Its Elastic Limit—Various Examples of Work Welded Are Shown

By C. J. HOLSTAG

THE writer encounters the prevailing notion about the country that in the electric arc welding of cast iron, studding is resorted to to entangle the parent metal in the metal of the weld, similar to the wooden skewer stuck in a piece of meat prepared for roasting. Such is absolutely not the case. This method of studding was thought out, designed and developed; and my engineering spirit resents the inference that the studs are placed there to function similarly to the pegs in a shoe.

Assuming that steel can be welded to cast iron where the parts are free to align themselves, which assumption is a fact, the use of studding comes in where the weld is in such a position that the parts are not free to align themselves to the contracting strains which result during cooling. In the latter case, a steel weld made to cast iron without studs looks fine until just about the time it is being most admired during cooling, when it invariably cracks along the edge of the weld. This is easily explained when we consider that steel has approximately four times the strength of cast iron. The definite location of the break comes about because the cast iron next to the weld has become chilled cast iron, no matter whether it was originally so or not, and a sharp demarcation of structure together with a possible layer of weaker cast iron causes the break invariably to take place in this layer of cementite.

If, however, steel studs are properly distributed along the face of the cast iron to be welded or adjacent to the joint, so that the weld cannot pull away from the cast iron, the cooling strains result in stretching the steel weld, and the union between the weld and the cast iron and steel studs is maintained as it was made.

That it does not harm steel to strain it even beyond the elastic limit, is a fact not generally known; and I would refer any doubter of this to tests where the ultimate strength of steel has been increased by stretching it beyond the elastic limit. To make this clear, it is only necessary to refer to the well known fact that working steel increases its strength and other desirable physical properties. The point I am trying to make is that it does not injure the weld to subject it to strains even beyond the elastic limit. Of course it may happen that these strains are such that, in work done too rapidly, the weld stretches beyond the ultimate strength and a crack appears. This occurrence is no cause for apprehension, because this crack can be veed out and rewelded, in which case you ar welding steel to steel, and the crack be ing much smaller than the original one the break is not likey to occur again.

How to insure the proportioning o the studs so that the weld does not pul away from the cast iron is a very simpl engineering problem, now that the wa has been shown; but one that require real initiative on the part of the pioneer As nearly as I can find out, the man t whom the world is indebted for thi method of successfully welding cast iro is Mr. Joseph McAllister of the Ne York Central Railroad. It was he, wh upon discovering the ordinary troubl in welding cast iron, developed this stud ding system, not by guess work, but b design, having had similar problems t contend with in boiler construction. was he, who, together with Mr. H. A Currie of the New York Central Rai road and Mr. D. H. Wilson of the Eri convinced the Navy Department tha the interned German ships' damage cast iron parts could be successfull welded. Mr. McAllister laid out th first successful job on these ships an his welders, trained in this work, mad possible the speedy restoration of thes engine parts.

Remembering that steel has fou times the strength of cast iron, the prol



A FLYWHEEL WELD, A LARGE CASTING WELDED SUCCESSFULLY, AND A PORTION OF AN ENGINE FRAME PATCHED. NOTE—THE LATTER HAS BEEN TURNED UPSIDE DOWN THROUGH AN ERROR.

ken is to so proportion the studs that the ratio of the cross section of the steel to the cross section of the remaining cast iron is something less than four to one at any one section that will be subjected to cooling strains at one time. This, in general, is a very simple and easily applied method and means in general, large studs for large sections and smaller studs for smaller sections. Common sense together with welding experience is required in placing the studs. The writer has seen this studding method abused horribly by people who evidently did not understand why they were using this method; and there is no doubt that some of the unsuccessful work done by amateurs is partly due to the prevailing opinion that the studs are simply there to function as tent stakes. That this is not true, can also be seen from the fact that the steam tight joints on cast iron can be made by this method, showing that the weld to the cast iron has been maintained in full efficiency by the use of the studs.

Another very useful application of studding is the use of large studs as an anchor or nucleus for breaks in casting such as gear teeth. One to three of these large anchor studs, together with some smaller regular studs appropriately distributed will provide the necessary weld strength to the cast iron as well as strength to withstand some shear and thrust strains. The weld, built up to size and machined off, furnishes a perfect wearing or bearing surface. This latter method of studding is also applicable to cast steel, where the original section has not been adequate to withstand the strain.

Details of how to accomplish this studding which are not explained by the photographs are:

First: Vee out the crack on both sides of the break from one surface; if only one is accessible, or half way from both surfaces if both are accessible for welding; saving enough parts of the original break to keep the piece securely clamped in alignment. Before any of the welding is done, the stud holes are to be drilled and tapped with a bottoming top, and the studs screwed in tight, completely filling the hole for a distance of at least four times the diameter of the stud. A convenient way of doing this is to have rods threaded for their entire length, screw these in tight, and saw off ¼-inch to ⅜-inch above the surface of the work depending on the accessibility. That is to say, a narrow vee should have the studs closer to the work than a more open one.

Second: In welding, the following procedure should be carefully adhered to. Weld around the studs so that they are part of the cast iron; then weld between the studs crosswise or diagonally until the entire surface of the cast iron that has been veed out and the adjacent surface forming the underside of the pad is completely covered before proceeding with the main filling in. That is to say, add metal, one bead at a time, so that no great section of the weld congeals from the molten state at any one time.

First welding the stud to the cast iron makes the stud an integral part of the casting. Welding from stud to stud diagonally or crosswise draws the fractured surfaces together to their original contact, if a small amount of the original break has been left intact at the bottom of the vee. This can be done in most instances; but, naturally, not if pieces are broken out and lost, and must be replaced by a casting or forging. In this steel studding process for cast iron, especially on cylinders and the like, machining is often necessary subsequent to welding, and the hard stratum of metal directly under the weld prevents ordinary cutting operations and grinding must be resorted to. There are other means of taking care of this hardened layer for machining on the surface, one of the newest of which is to finish the machined part with a nickel-copper electrode, which electrode has the property of so merging the cast iron that there is no hard layer of cementite formed. This electrode was developed by the automobile trade for repairing scored cylinders and the like. Older methods are to calk the bottom of the vee, say with copper, which is machined off later. Probably the best method of all is to supply a bushing for the finished part. Many cylinders, especially those of steam engines, are built with this bushing originally; and, in welding, the bushing is to be removed and perhaps slightly refitted after the welding job is finished.

There is no mystery about the electric weld making the cast iron hard at the joint. It is simply that the cast iron is heated up to the welding temperature necessary, and is chilled by the adjacent mass of cold iron. Chilled cast iron has always been hard and probably always will be.

Cast iron differs from steel in containing 3½ per cent. carbon, more or less, whereas steel, even the hardest, contains less than 2 per cent. carbon, and 98 per cent. of all steel in the world has less than 3/10 of one per cent. carbon. The cast iron with the same amount of carbon in it may have the carbon in two forms, i. e., combined and uncombined (graphitic). In the combined form, the cast iron is very hard. In the uncombined form, it is comparatively soft, easily machined and can be calked. Various degrees of hardness range between these two limits according to whether all of the carbon has flaked out of the combination into graphite, or whether some remains in combination. The conditions as to whether the graphite will be separated, or remain in combination, depend on the rapidity of the cooling from a temperature just above a red heat. If it is cooled rapidly, there will be no time for the graphite to come out of combination. If it is cooled very slowly, the graphite will all come out of combination and various degrees of hardness are obtained by different rates of cooling. A form of cast iron called malleable cast iron is less used, in which after weeks of slow cooling, the graphite settles to the outside and is taken off the cast iron, and it begins to take on the properties of wrought iron. As already said, this is a long process, and real malleable iron is rapidly going out of use due to the time taken to make it. So-called malleable iron is generally cast iron with very little of the graphite removed.

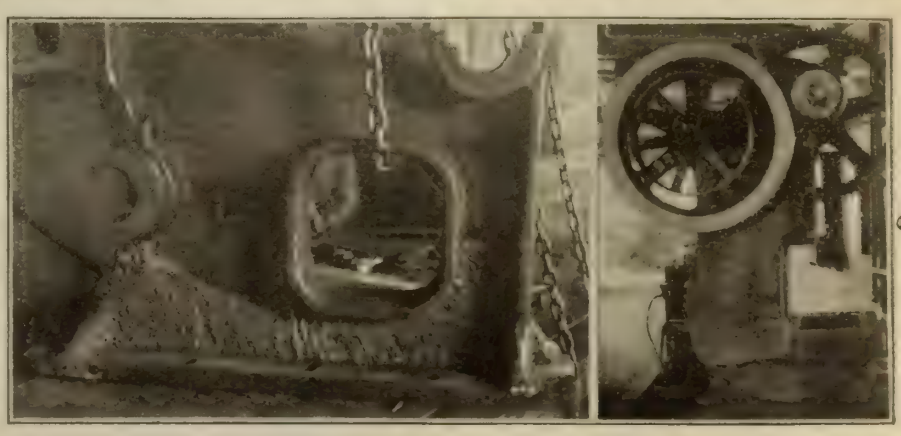
In making a weld on cast iron cold, naturally, the cast iron is cooled very quickly, or chilled just below the joint of the weld and sometimes the weld itself will be very hard because of the very quick cooling. This occurs whether welding with a steel electrode or with a cast iron electrode. This chilling, hardening effect can be removed by reheating and annealing in lime or warm sand, or any way to allow it to cool slowly from above a red heat.

To avoid this hardened layer when welding with steel, or to avoid the hardness of the entire section when welding with cast iron, the following procedure must be followed: When the piece is of such shape that it can be welded cold, reheating and annealing will render it capable of being machined. This can be done at any time after welding, by bringing the weld and adjacent cast iron up to a little higher than a red heat and allow it to remain there from two to ten minutes, depending on the size of the piece, then cooling slowly by burying it in warm sand, fire clay or lime. When the piece is of such shape that the cooling strains when welding quickly, as in electric welding, would warp or break the piece, preheating is necessary; however, only to a small degree; that is, less than red heat, in order to save the piece from breaking while welding. Directly after welding, the weld and adjacent cast iron should be heated a little higher than a red heat and annealed as before. This method results in welds made either with steel or cast iron electrodes being easily machined throughout. Welds made with a cast iron electrode are not distinguishable from the original cast iron by either physical or chemical analysis.

In general, cast iron containing small amounts of steel, so-called semi-cast iron (semi-steel), is much easier to weld than pure cast iron.

Generally, the only welding executed on cast iron, except in the case of accidents, is where the original cast iron is defective because of sand holes, porous spots or other flaws occurring during casting. Such sand or slag must be entirely removed before satisfactory welding can be expected.

Usually, the cast iron electrode, while it becomes more fluid than steel under the arc, cools more quickly than steel and from the outside inwards; while steel cools from the inside outwards by the conduction of the heat in the weld



TWO OTHER GOOD EXAMPLES OF WELDING.

into the adjacent metal. Hence with cast iron there is more chance of voids and gas bubbles being left in the weld, and some sort of flux to prevent this is necessary in depositing cast iron; desirable ingredients in such a flux being:

1. A quieting reagent.
2. A quick floater of dross to the surface.
3. A protector against oxygen and nitrogen, so that bubbles, films or needles of oxide and nitride are not left in the weld.
4. Protection against rapid cooling of surface.

The studding of cast iron is not necessary in all cases, for instance:

First case: Simply as a means of filling in, or building out, where grinding is the only machining necessary. Clean out the spot to be welded by chipping or grinding so that all dirty, oily, sandy, or porous metal is cleaned away and a reasonably bright metal foundation is provided for the weld. Weld with either a steel or cast iron electrode according to whether a reasonably hard or a very hard surface is wanted after grinding. The steel gives a hard surface and the cast iron a very hard surface. Care must be taken in using the cast iron electrode that the quick cooling does not entrap gas bubbles in the weld, leaving holes after finishing. The steel causes no such trouble, but if slight imperfections should show, peening will close them up.

Second case: Welding cast iron where tensile strength is required, but not resistance to bursting pressure; such as welding broken machine parts, small bed-plates, etc. In general, where no undue strain will be encountered and the part was originally broken by some accident which will hardly happen again in the same place, proceed as follows: Vee out the break wide enough so that the electrode can be held at approximately right angles to either face of the vee. Cover the two faces of the vee separately with steel, using great care to have the steel united to the surface of the cast iron as the arc progresses, and not to let any of it run down ahead of the puddle. Weld from the bottom up; and, if any of the deposited metal does get away, stop and chip it off. After the two faces are successfully covered, it is extremely easy to make a good weld from the steel faces, using steel or cast iron in the vee.

Cast iron will not endure any considerable deformation. In other words, it cannot be bent, stretched or changed from its original shape in any manner without breaking or cracking. To relieve the stresses, set up in welding cast iron cold, the weld must contract. If the shape of the cast iron pieces is such that one or both ends cannot move with the weld, something must give way. If the weld is one-quarter or less of the section of the cast iron and a good joint is made to the cast iron, the weld will hold; because the weld, even if of steel (the steel being four times as strong as the cast iron) will stretch if it is one-quarter or less in area. However, it does not hurt the weld to stretch. It is similar to working steel after casting into forgings and rolled shapes. If the weld can be put on a little at a time, so that its cross section is also less than one-quarter of the cast iron which it is welded to, results can be obtained which will not bend out of the original position, even on a section that is ultimately the same size The foregoing applies to welding with steel electrodes. In welding with cast iron electrodes, the relative strengths would be the same, but due to the cast iron weld not being able to stand any deformation, it would crack through the weld. The remedy for this is to preheat the parts to be welded so that they will all contract at the same rate. In this manner, welding with a cast iron electrode is much more rapid and more satisfactory than any other process. The arc has a tendency to burn out the carbon in any weld, and this is especially true where the carbon approaches 3½ per cent. There has been developed a coating for the electrodes which replenishes the carbon, so that true cast iron of the same nature as the original results in the weld.

There is another method which has a basic theory similar to studding, and is especially useful for sections that are too thin to stud; that is, automobile cylinders, jackets, crank cases, heating boilers, and other cast iron parts complicated in shape, and which can tolerate no deformation. This is to run beads at right angles to the crack about eight to ten times the thickness of the weld at the crack, with right angle beads laced back and forth at intervals of four to six times the thickness of the piece to hold the weld and adjoining cast iron from separating; so that the contraction takes place in the weld where it does no harm. In this manner automobile water jackets, crank cases, furnaces, etc., have been welded. Automobile water jackets have also been welded in emergencies without taking the water out of the engine. Sometimes the weld will be stressed beyond its elastic limit and crack, but no precautions need be taken in regard to rewelding, as this crack will then have steel to hold it. Naturally, the less heat used, the less will be the stresses to be taken care of. To that end, use the light work taps on the welding machine to secure as little heat as possible. Proceed by welding a little at a time, allowing one bead to cool completely before beginning the next one; except in the case of filling in the beads at right angles to the weld, which bead should be put down as nearly as possible at the same time in order to fill in the spaces between the intermediate crosswise of the crack beads. In pieces that have cracked and sprung apart and should be brought into alignment, this method of crosswise beading, proceeding from the smallest end of the crack, will bring the original pieces into such intimate contact that it is very often water-tight before starting the intermediate beading. In order to keep the heat as low as possible, a special electrode, whose melting rate is higher than ordinary steel, should be used. You will find this will aid materially in keeping the stresses down. All of this welding with steel is done without preheating or annealing of any kind, the necessary finishing being done by grinding. I know an operator who has not seen anything but cast iron welding for so long that he probably has forgotten how to weld steel, and the majority of cast iron work in a jobbing shop can be done without studding. In cases of scored cylinders, if the machine can be set so that it will draw an arc, but not sustain it, the metal can be deposited in one flash at a time; without cracking the adjacent cast iron, by using a special nickel electrode. In the case that the machine cannot be set at half-voltage, a foot switch in the secondary circuit or the primary circuit should be opened, as each drop is deposited so as not to use the high heat in depositing the metal. If a nickel electrode is used, the weld must be calked in place, but a special electrode of nickel and copper can be run continuously, providing the cast iron wall is thick enough to stand it.

To sum up: cast iron welding with the electric arc is to my mind just as useful as with gas and a great deal quicker and cheaper when the parts are preheated. Also, as pointed out in this paper, there are a great many places where electric arc welding is possible without the trouble of preheating and often where preheating would not be possible.

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## IMPORTANT DATA BOOK.

The Hamilton Gear and Machine Co., Toronto, Canada, have issued a valuable data book on gearing that will interest plant owners and designers generally. It contains formulae, tables, and gear data that are in constant use in their own plant, therefore in constant use throughout the country. The matter has been placed in very convenient and condensed form, and gear users can find in these pages brief, yet accurate gear information.

The object of the book is first stated, then follows the information necessary to quote on, to cut, or to supply gears. The form of gear teeth is next taken up, tables being given for pitch diameters of various diametral and circular pitch gears. Tooth parts follow, then standard size of keyseats for gears. Correct method of inspecting gears is also shown, and rules and definitions of gear teeth generally are stated.

### Bevel Gears.

Next comes the rules and definitions for bevel gears, this data being carefully explained. The method of cutting bevel gears is shown. Tables of diameter increments follow, also information on double helical gears; worms and worm gears; standard worm gear reductions and miscellaneous types of gearing.

Rawhide pinions the next discussed also method employed in the heat treatment of gears in their plant. The materials from which gears for various purposes are made; limits of tolerances on holes; shafting sizes; strength of gear teeth; table of sizes,cosines, etc. also pattern proportions follow in sequence. Various other valuable tables complete this data book of 48 pages.

A limited number of these books are being sent to their customers, but for general distribution the price is 50c which is hardly half the actual cost of production.

## ERRATA

On page 97, May 26th issue of Canadian Machinery, under the head of "Punch and Riveter," it was stated that this was a new product made by the Band Pneumatic Tool Co. This was an error on the part of the printers, a Baird Pneumatic Tool Co., Kansas City, Miss., was what was intended.

## LOCOMOTIVE STAYS.

(Continued from Page 41).

releasing the plunger from the notch and permitting the turret to be withdrawn. This leaves the cutting off tool in proper position for parting off the stay.

Copper stays 1 inch diameter and 6½ inches long are machined in this manner in 40 seconds. The attachment we have described is equally suitable for producing mild steel stays, the tool layout being exactly the same. The operation time on a mild steel stay 1 inch diameter 7 inches long is 2½ minutes. The attachment carries a 1 inch die-head, and threads stays up to 1 3-16 inches diameter, if required.



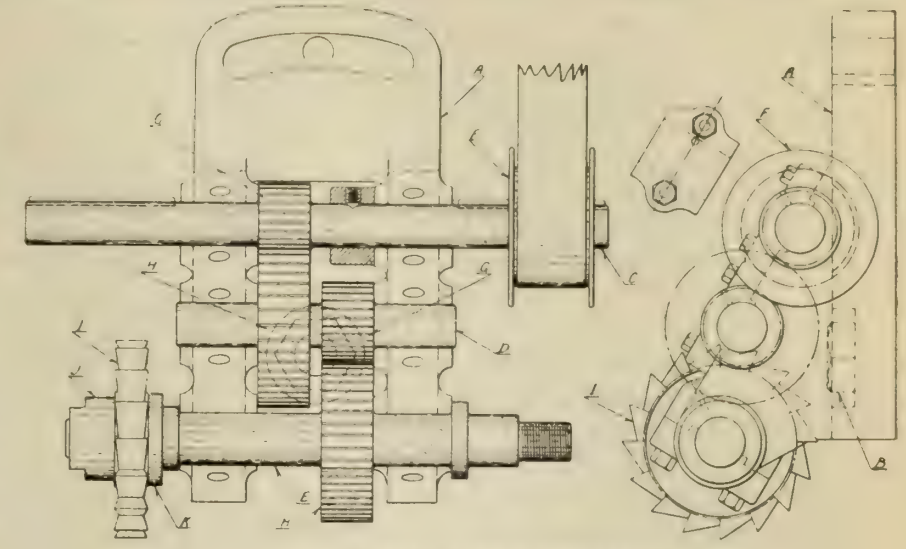
# WHAT OUR READERS THINK AND DO



## ILLING KEYWAYS ON A PLANER

By J. H. R.

The device shown is one that is in e for the milling of keyways and sim- ır work when a regular milling ma- ıine is not available. As can be seen om the illustration the attachment is ·ld in the tool head of a planer and the ork clamped to the table of the ma- ıine. For feeding the work to the cut- r a feed screw is arranged on the oper- ing side of the machine, the feed ındle being shown beneath the right ınd end of the table. Supporting ·ackets are secured to the planer bed, hile one with the feed nut is fastened the side of the table by means of the ·dinary T-slot. The line drawing shows ıe design of the milling head. The ›dy of the head A, is bolted to the regu- r tool head by means of the pivot stud and the upper clamping nut. The rimary drive shaft C is extended on ›th sides of the head so that the drive ulley F, can be located on either end suit working conditions. The two- rive pinions G G, are integral with their ·spective shafts, while the gears H H, re keyed on. The cutter shaft E, is rovided with solid collars to take end ırust. Cutter I, can be placed on either nd to meet work requirements. The ountershaft is provided with a drum to ccommodate varying locations of the illing head.



DETAIL VIEW OF THE MECHANISM.

## ROLLING MILL ENGINE.

(By Earl R. Tindall).

In the May 19th issue of Canadian Machinery, Page 52, I noticed with interest the description of a rolling mill engine, at present being completed in a British steel works.

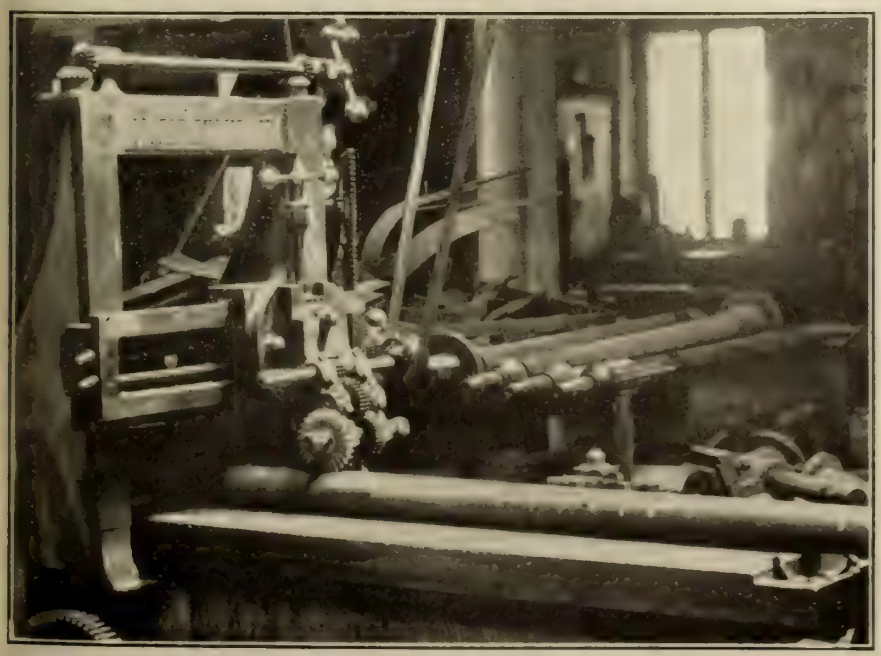
I am very much interested in steel mill news as I was four years on a forty-inch blooming mill at Cleveland, Ohio, and rolled on this particular mill during the last two years of the war. The engine that ran the mill was built by the Mesta Machine Co., and was purchased as a 35,000 H.P. engine, although when tested it actually developed 37,000 H.P. It was a twin tandem compound, with two high pressure cylinders 46 in. diameter, and two low pressure cylinders, each 76 in. diameter, the stroke being 5 feet. It took a good sized train of flat cars to bring the engine from Pittsburgh to Cleveland to be assembled on its foundation.

It was a one lever engine, and by this I mean that the throttle and reverse levers were one and the same. The throttle valve was opened and closed by a steam jack, and the steam could be shut off by electricity at any time the engine got beyond control of the engineer.

To give readers an idea of the speed with which the engine could be reversed, I might mention that I have seen eleven three-ton ingots rolled in ten minutes, giving each ingot seventeen passes through the rolls, reversing at each pass.

The record for fast rolling on that mill when I left two years ago was 158 tons of slabs in one hour. These were rolled from 5 ton ingots; three inch draft to an ingot, that is taking off three inches in one pass, through the rolls was a regular everyday pull for this engine. I think readers will agree with me that the engine I speak of was "some engine," although there is one of the same type and size at Youngston, Ohio, while there is a still larger one in Gary, Ind.

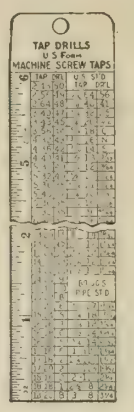
This is the type of chatty information we always like to receive. The letter from the above writer was unsolicited, and shows clearly he enjoys perusing his Canadian Machinery.



GENERAL VIEW OF THE ATTACHMENT.

# Improve Your Powers of Perception—Try This Contest

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.




The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

## What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

J. A. Scarsbrook, 307 Popular Ave., Winnipeg, had the only correct list for the May 26th contest. Several readers complain that they send in correct lists, which we don't acknowledge. This we can readily explain. When we do not announce a list correct, it is because the list never reached us. As it is, some of the answers sent in reach us by good luck. For example, one came to the office to-day addressed McLean Publishing Co., Toronto. Considering the fact we have numerous papers being published, it is wise to always mark your envelope as follows: "Canadian Machinery Contest," Editorial Dept., 143 University Ave., Toronto. If this is done there will be no further difficulty.

**CONTEST FOR JUNE 16TH ISSUE**

**Contestants are required to write us, stating to which advertisements we refer in this number.**

1—Something that not everyone will agree on
2—A product accurate in two important points
3—How to cut expense in six.
4—How to get away from lumber expense
5—What to do if a tap breaks.
6—Something said to be air tight under all pressures
7—A line of products that are all guaranteed
8—How to get continuous, efficient service
9—A case where inspection isn't everything
10—How to boost production 50%
11—What to use on heavy engines.
12—How to get a check on accurate work

**These are Correct Answers for List from May 26th Issue.**

1—Pratt & Whitney Co. of Canada.
2—John Bertram & Sons Co., Ltd.
3—Oakley Chemical Co., per C. P. Murphy.
4—Cleveland Pneumatic Tool Co. of Canada.
5—Hoefer Mfg. Co.
6—Canadian Ingersoll Rand Co., Ltd.
7—Canadian Fairbanks-Morse Co., Ltd.
8—International Malleable Iron Co., Ltd.
9—Chamber of Commerce, St. Catharines.
10—National Acme Co.
11—Modern Tool Co.
12—Cincinnati Electric Tool Co.

## Closing Date for This Contest is July 7th



# DEVELOPMENTS IN SHOP EQUIPMENT



### NORTON AUTOPART REGRINDING MACHINE.

The Norton Company, Worcester, Mass., has just placed on the market a special type of grinding machine designed for automobile regrinding shops. This machine is so arranged that the various set-ups required on this class of work can be very easily and quickly made. It is adapted for the regrinding of crankshafts as well as the grinding of pistons, piston pins, valves, etc. With a swing of 18" and a distance between the centers of 55" it will accommodate practically all makes of crankshafts. With the 12 work speeds provided, efficient grinding can be performed on work of small as well as large diameter.

The base is heavy and rigid, and is supported at 3 points. This method of support makes it unnecessary to provide special foundations for the machine, and insures permanent alignment. The wheel slide is of massive design, weighing about 900 pounds, and is equipped with 26" diameter grinding wheel so that ample clearance will be provided when grinding crankshafts for long stroke motors. The headstock and footstock are of standard Norton type except that they are somewhat heavier and have longer bearing surfaces on the table. Large capacity pump is supplied which is driven directly from the overhead works. The standard wheel feed mechanism is used, consisting of 3½" diameter feed screw engaging with half nut underneath the wheel slide. The wheel slide rests on one flat and one vee way. These ways are of such proportion that the slide practically floats on a film of oil.

The precision of this machine may be judged by the fact that the movement of the feed index pin one space advances the 900 pound slide exactly one eighth of a thousandth of an inch. The table is operated by a two-speed hand feed apron. In order to provide for the many types of crankshafts which the regrinding shop handles, a very simple adjustable end block is furnished with the machine. With these types of blocks no bushings or other devices are required for fastening different diameters of shafts in the fixture.

There is also furnished with the machine as part of the regular equipment a combined center and valve face grinding attachment. By the use of this attachment, the machine centers may be re ground and kept in perfect condition. The attachment is adjustable, permitting the regrinding of the faces of all types of valves. On account of the various features incorporated, this machine will handle all the cylindrical grinding necessary to put an engine in first-class condition. It is claimed that this machine together with a cylinder grinder constitute all the grinding equipment necessary for a shop doing this class of work.

Following are the specifications:—Length between centers 55", swing 18", weight of handstock 240 lbs., range of work speed 20 to 207 r.p.m., weight of footstock 100 lbs., weight of wheel slide 900 lbs., length of bearing ways 24½", length of spindle 28¼", large bearing 3½" diameter, 8" long, small bearing 2" diameter, 6" long, diameter grinding wheel 26", net weight of machine 7,600 lbs.

---

### SHEAR BLADE AND FACE GRINDER.

The Springfield Mfg. Co., Bridgeport, Conn., has placed on the market a heavy duty reversing motor shear blade and face grinder.

This machine is entirely self contained, operated by three motors; one of 15 H.P. for driving the wheel; one variable speed 5 H.P. reversing motor for driving the table traversing mechanism, and one ½ H.P. motor for driving the pump. The variable speed motor permits of obtaining a table speed of from 7 to 27 feet per minute, and the reversing feature of the motor dispenses with belting. The operation of the machine is controlled from either front or rear by mechanical means, and is also provided with a push button for controlling the motors. The machine has a wheel 24" in diameter and has capacity to grind 12 ft. long, but is made in lengths varying from 6 ft. to 17 ft.

This machine can also be furnished with a swivel knife bar, making it suitable for grinding large paper and veneer knives, and by removing an angle bar it becomes a standard face grinder and can be used for all kinds of grinding within its capacity. Special bearing construction is used, this being known as the sleeve flange type, which fit into bored holes and bolted in place by a flange. These are again bronze bushed and can easily be replaced in case of wear, the original alignment not being disturbed.

The machine is of very heavy construction, carrying two wheels 20" diameter, 6½" wide, on a spindle of 3½" diameter; the spindle operating in bearings 3½" diameter by 18" long.

One of the principal features is its direct motor application to an oscillating motion of the spindle, and this is accomplished by using a drum on the spindle and holding the belt stationary, the drum pulley being connected direct to the spindle, and with the oscillating slides. The whole mechanism is oscillated back and forth by means of a crank motion on the right hand end of the cross rail slides.

## *LEADING ARTICLES IN THIS ISSUE*


Machining A Motor Shaft in Two Operations ... 33

**Two machines used; one operator running both—Machining a three step cone pulley—Two operations necessary—Producing pistons in three operations.**

Making Machinists Out of Returned Soldiers.....37

**Course takes thirty-three and one-third weeks. In that time the student receives tuition in shop mathematics—Shop practice, and mechanical drawing.**

Keeping Tab On The Operations.....39

**A method of determining a man's real value. This system keeps track of every special tool, jig, reamer, drill, etc. Operator must give reason for spoiled material.**

Construction And Action of Trimming Die.....40

**A patented tool that trims the surplus metal—Special action causes the cutting—In place of downward movement of punch a lateral movement is used.**

Are Studs Used Merely As Pegs.....42

**Studs in arc welding should be properly distributed—It does not harm steel to strain it—Even beyond its elastic limit—Examples of work.**

Cutting Keyways On The Planer.....45

**A simple fixture that allows milling of keyways on the planer—A detailed description of a large rolling mill engine.**

Canadian Machinery Weekly Contest.....46

**Interest in this contest still continues to grow—Perhaps you have not been successful so far. Do not be discouraged. This may be the very week you'll land the prize.**

# CANADIAN MACHINERY
## AND MANUFACTURING NEWS

Published in the Interests of the Machinery, Manufacturing, Iron, Steel, and Metal Working Industries.

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J. H. MOORE, Technical Editor
T. H. FENNER, Associate Editor
J. H. RODGERS, Montreal Editor





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## An Unusual Action

IT is reported from Springfield, Mass., that the members of the Machinists' Union, of their own free will and accord, have accepted a reduction of 12% in wages. According to the report absolutely no pressure was brought to bear on them by the employers. The decision was arrived at in a secret meeting of the men, and became effective immediately. There is a considerable reduction in the working time of most of the factories in the district, and those that are working full time are doing so with considerably reduced staffs. It will be interesting to note the effect of the action taken by the Machinists' Union. Not being a productive branch in one sense, it may not have a very great effect on manufacturing firms as far as increased activities are concerned, but it may indirectly do a great amount of good in the direction of carrying out much needed repairs, and in some cases new installations. Lower wages to machinists means a lower cost of many articles of equipment, and should have a stimulating effect. If manufacturers are enabled to buy equipment that they have been delaying the purchase of due to high prices, they will be in turn enabled to reduce their production costs, which will stimulate sales, and thus give increased employment. Such action as that taken by the Springfield machinists if emulated by others would speedily make a difference in the present time of watchful waiting.

## Raising the Rates

IN another portion of this issue we refer to the movement which has been started by the railroads to elevate the listing of machinery from sixth to fifth place. Not only is a higher freight rate suggested, but the proposal contains an increase in the minimum of carload capacity from 20,000 to 24,000 lbs.

This tentative suggestion is primarily advanced for the purpose of increasing the carrying tonnage of freight traffic. Canadian Machinery, discussing the subject with various dealers, finds that according to those interested, no more machinery can be shipped than what the market periodically calls for.

As a general rule current orders are of small weight, with as occasional purchase of six to seven thousand pounds. At present dealers try to combine these shipments in a given direction, accordingly to locality, in order to secure the carload rate, and of course at the same time obtain prompt delivery. As a rule, the total tonnage is well below the 20,000 lbs., so that should this suggestion of raising the minimum go through, any such increase in rates would most likely be reflected in the cost of the machines to the consumer.

It seems to be the opinion of the trade generally, that the adopting of such a measure would inflict an additional hardship on the machinery business. This is a time of declining prices, not a day for increased costs, and those responsible for the deciding of this matter should weigh carefully the result it would have on business before giving their decision. Railway revenue is important, but on the other hand business interests must not be strangled to produce such revenue.

Marnet Summary, 3-column head

## Aerial Photography

THE strides made in the art of Aerial Photography within the past few years have been nothing short of marvellous. Before the war this art was in its infancy, in fact was practically unheard of. During the war its development was rapid. With a camera, the observers could come back, not with a mere descriptive story of what they had seen, but an actual reproduction of the ground they had passed over. The value of such records can never be fully realized.

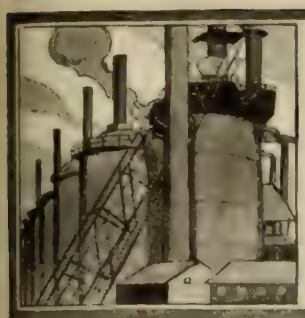
This style of photography has also opened up many new fields, including the photographing and mapping out of industrial plants and grounds. There is an old saying that photographs cannot lie, and the prints made from photographs taken from above show plainly all scrap piles littered grounds, and poor arrangement of piled material Such photographs are also useful when planning extensions The use of this type of photograph in many cases saves expensive surveys, and the art is sure to still further advance as new uses are discovered.

## Rules for Industry

THE commission which has been studying the economic situation in Belgium, has brought out some fine points many of which could be studied by Canadian manufacturers to advantage. Among the recommendations made by this commission are the following so-called industry rules:

To market cheaply industry must be improved by the most modern technique, and the most up-to-date improved machinery. In organizing the industries, specialization and standardization needs must be taken into account, and the mechanism must be designed and adapted to meet these requirements. Industries and manufacturers are advised to combine for the economic handling of credits, and so on through banks and export agencies, acting for the collective interests of all. Appeals should be made to agents of industry and well-informed workmen for increased production, and, in addition, methods of remuneration that will incite workers to produce more should be applied. To avoid conflicts with workers, committees of employees should be set up to control the internal or domestic mechanism of the industry.

By following these recommendations Belgian industry has already made notable strides toward recovery. The lesson may well be followed by industry in other countries



# MARKET DEVELOPMENTS



## Improvement Shown in Number of Enquiries

### While there is Not Much Change in Business, a Better Volume of Enquiries Are Present. Railways Attempt to Raise Classification of Machinery. Scrap Market Weak.

THERE is in evidence this week a much larger volume of enquiry, from which some dealers deduce a change for the better, but others seem to consider but a flash in the pan. There has been no change in prices, in the machine tool trade, and the chance for improvement in the immediate future is not any too good. The next month or two is at the best of times a dull season, and there is no reason to think it will be otherwise this year.

One feature is the large number of small orders that are in evidence, and although the volume of business transacted through these orders is small, it keeps the staffs just as busy as large orders would. Local steel warehouses report a good volume of inquiry this week, in fact better than for some time past, and this is considered to be in some measure encouraging. However the amount of business that will transpire through the inquiry is doubtful.

The steel mills of the U. S. had a somewhat larger production in May than in April, and this is credited almost entirely to the operaton of the independent mills. The Steel Corporation ran at less capacity in May than in April. Production has been dropping steadily since the latter part of May and the average over the independents and the Corporation is not more than 25% at the present time; and it is expected to get as low as 20% before the end of this month. The falling off in production is due to an absolute lack of buying by any of the ordinary consumers of steel, and reduction of prices does not help in any way to stir the interest of the consumer. They simply do not want to buy under the present conditions.

Pig iron under these circumstances, is naturally at a very low ebb, and further small declines have been noted, but it is not expected that they will go any lower unless there is also a drop in freight rates and production costs in general.

The scrap metal market is very quiet, and local dealers report no change in the situation. There are pretty heavy stocks on hand, and a tentative reduction in prices did not bring forth any eager buyers. Reports from the different U. S. centres tell about the same story.

## THE STEEL MARKET IS IN PROCESS OF HAVING STILL ANOTHER DECLINE

Special to CANADIAN MACHINERY

PITTSBURGH, June 16.—From the monthly report of the American Iron and Steel Institute, giving the steel ingot production of 30 steel companies, the indication is that the steel industry as a whole produced steel ingots at the rate of about 18,000,000 gross tons a year in May, or at about 34 per cent. of capacity. The April production was at the rate of about 32 per cent. of capacity. The increase was due entirely to heavier operations by independent producers, who operated at about 25 per cent. of capacity in April and at about 32 per cent. in May. Estimates are that the Steel Corporation ran at about 41 per cent. in April and at about 38 per cent. in May.

The increase in operations by the independents was due to the extra business they gathered up in April at the time they were advancing their prices, as they gave customers an opportunity to cover at the former prices. The announcements of advances began about April 8, while it was on April 12 that the Steel Corporation announced its reductions, to the levels to which the independents had just advanced, the condition of the independents having much lower prices than the corporation then ending by an equalized market being established, though this was largely on paper since for a couple of weeks afterwards there were reports of independents getting business at "old prices" as it seemed to be difficult to recall all the quotations outstanding.

This burst of activity was followed by a lull, since the independents soon finished most of the business they had booked, and fresh sales were very difficult to make. Since the middle or latter part of May operations have been decreasing, and this week operations may be estimated roughly at 15 to 20 per cent. for the independents and at 30 to 35 per cent. for the Steel Corporation, making an average for the whole industry of not over 25 per cent., this comparing with averages of 34 per cent. in May and 55 per cent. last January.

Judged by the present rate of buying, which is smaller than was previously thought possible, steel production is likely by the end of the month to be down to a rate of 20 per cent. or less. A 19 per cent. rate would mean 10,000,000 gross tons of steel ingots a year, equal to about 160,000 net tons of finished steel a week. Some observers express the opinion that scarcely any steel at all will be made in July, except for very special purposes.

### Stocks of Manufactured Goods.

The almost complete stoppage of buying of steel from the mills is attributable to a variety of influences, as the buyers of steel fall into different classes. The railroads, whose natural requirements, however, have been generally overestimated in recent years, have no money and little credit, while with a good supply of funds they would hardly spend freely when on account of costs the money would not go far. As to buyers of steel for construction work, the erection of bridges, hotel and office buildings, factories, etc., the investors consider costs of construction too high, they would have to pay too high interest rates on borrowed money, and they are doubtful of the earning power of investments in the near future.

The third important class of steel buyers is the so-called "manufacturing consumers," making hardware, hand tools, machinery, agricultural implements, etc. These buyers are not all in precisely the same position, but the common position is that they have large stocks of their manufactured goods, which are not selling, hence they do not wish to manufacture more. They have some stocks of steel, which they would like to reduce. In general the desire to reduce stocks of unmanufactured steel is not due to the stocks being large in relation to normal consumption but to operations being so light that the factories do not want to

carry normal stocks of their raw material. Steel salesmen relate that often when they call on a customer, the customer, instead of considering the purchase of steel, asks the salesman if he cannot sell some steel for him.

For several months there has been much talk of there being a "buyers' strike" and this view is largely correct even at the present time, though the mental attitude has changed somewhat. It is no longer a mere strike against high prices, for buyers have reduced their views as to how much they would buy if the prices were satisfactory. It must be understood also that in the case of the steel mills it is not a strike of their direct customers for lower prices for steel. If that were the case the mills would be glad to come to terms. There are no terms offered. The agricultural implement maker, for instance, does not tell the steel mill he would buy steel bars if the price were so-and-so instead of 2.10c. He shows the steel salesman his large stock of implements, filling his warehouses, and says the farmer is not buying.

### Steel Prices.

The steel market is in process of having another decline. The decline will cover some period of time, not being in the form of one clear cut set of reductions. How long the process will take, and how far it will carry prices, no one can predict. All that can be said is that the decline has begun. A fortnight ago, when most of the independent wire mills had been selling nails at $3, against the April price of $3.25, the Steel Corporation began to meet the cut price, and since then plain wire has dropped $5 a ton to $2.75 and galvanized barb wire by the same amount, to $3.85. In plates there have been sales, even in small lots, at $2 against the April price of $2.20. Bars and shapes have shown little shading as yet, while there is considerable shading in sheets. The Steel Corporation will meet independent cutting on most products if not all, but only when the cutting becomes widespread, and thus far does not seem to have reduced on anything but wire products. The Corporation will not hold aloof from independent cutting as it did in February and March.

This report of a week ago ventured the guess that the present decline will run to something like $10 a net ton before a clear cut market is established again. No closer guess can now be made. There is no likelihood that there will be a full return to the pre-war average of prices, much less to the low point before the war. Nothing like full operation of the steel industry is expected by anyone this year, and with light operation costs are high, because the overhead is poorly distributed and because it takes much more labor per ton of output when a mill is running light than when a mill is running full. Some mills will prefer to take their loss by being idle entirely than by running part time, hence prices cannot go down indefinitely.

### Pig Iron.

Pig iron prices continue to sag, but the declines are now by small amounts, showing that the market is beginning to scrape bottom, on the basis of present freight rates and present wage rates at the coke works, limestone quarries, ore mines and blast furnaces. If freight rates and wages come down the bottom will be lower. Basic iron is quotable at $21.50, valley, or 25 cents decline, and foundry iron at $22.50, or 50 cents decline. Bessemer remains at $23, valley, a market price developed on sales of single carloads.

## POINTS IN WEEK'S MARKETING NOTES

**Enquiries are somewhat better, although there is some indication that the steel market is in process of another decline. How long it will last, or whether it will affect prices much is not known.**

**Since the latter part of May, operations in the mills has been decreasing, and this week's operations may be estimated roughly at 15 to 20 per cent. for the independents, and at 30 to 35 for the steel corporation. This makes an average for the whole industry of about 25 per cent. against 34 per cent. in May and 55 per cent. last January.**

**Pig iron prices continue to sag, but by very small amounts, showing that the market is beginning to scrape bottom. Basic iron is quoted at $21.50 valley, or 25 cents decline, while foundry iron is marked $22.50 or 50 cents decline. Bessemer remains at $23.00 valley.**

**Prices in old material have weakened considerably since last week. This is due to a falling away in demand. Indications are that things will not be better for some little time.**

**The recent price slashing by automobile builders, and a general business stagnation have had their effect on the iron and steel scrap market at Detroit. The general tone there is far from promising, and business as a whole is much below normal. Wrought iron axles are down to $24.00, heavy melting steel being quoted at $7.50, which is a slight increase, due to a sudden demand. This however, is not expected to last.**

**The railways have started a movement for increased rates. It is suggested that the minimum carload weight be raised. Dealers claim that if such an arrangement goes through, it will affect the price of machines generally.**

**Prices in the machine tool business remain much the same, and general conditions are reported to be practically stationary.**

## NEW MOVE ON PART OF RAILROADS

**Railroads Want to Raise the Listing of Machinery From Sixth to Fifth Rate. Enquiries are Larger.**

TORONTO.—A movement is reported on foot for the railways to elevate the listing of machinery from sixth to fifth rate. Not only is a higher freight rate suggested through these sources, but the proposal contains an increase in the minimum of carload capacity from 20,000 to 24,000 lbs.

While this tentative suggestion is primarily advanced for the purpose of increasing the carrying tonnage of freight traffic, yet dealers point out that no more machinery can be shipped than what the market periodically calls for. Current orders are principally of small weight, with an occasional purchase of from six to seven thousand pounds. The present method of delivery is to combine shipments in a given directon, or accordng to locality, in order to secure the carload rate and automatically obtain prompt delivery. Most frequently however, the total current tonnage is well below the 20,000 lb. minimum heretofore in effect, and any movement to raise this minimum would result, it is said, in adversely affecting the cost of delivery.

Such an increase would have to be reflected in the cost of machinery to the consumer, which, it is further pointed out, is in direct variance to public opinion and the general trend of prices at the present time. The opinion in the trade seems to be that no increase in carload-carrying capacity can be achieved in this manner, and that such revised regulations would fail, if that is the chief objective. On the other hand, to increase the railway revenue through this adoption would inflict an unexpected hardship on the machinery business. Dealers state that they can and always have arranged to absorb the extra proportionate cost between the 12,000 or 14,000 lbs. that is loaded into cars under current methods, and the charge for the minimum of 20,000; but any additional charge in this direction would serve to decrease the ratio of carload shipments. The final outcome of the proposal both as regards the higher listing, and also the increased carload minimum, is awaited with keen interest.

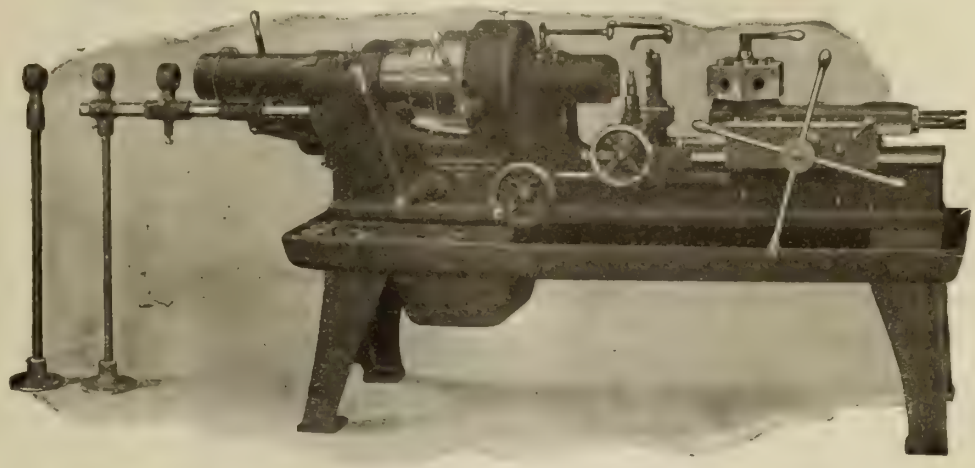
Market conditions remain about the same, with a larger number of inquiries now evident. The opinion is expressed that these are probably feelers to test out the market tone. Other dealers state that business shows signs of improvement. While a brisker movement has been noted, it is yet too early for the market tone to register permanent strength. The current business is looked upon as a momentary spurt, with another slackening off apparently due later on.

In the machine tool business, prices are remaining unchanged, and general conditions are reported to be practically stationary. Very little improvement, if any, is expected during the next few weeks, but a more optimistic tone is developing in trade relations. Another dealer reports current markets quiet. A dull outlook is claimed for the ensuing summer months. Plants are mostly working short time, very few running to full capacity. A decrease has been noted, according to this report, in prevailing business, but the heavy proportion of small orders keeps dealers' staffs almost as busy as in a strenuous season. Slightly better con-

# Warner & Swasey Screw Machines

For large output and close limits—If you are figuring on screw machine work you can depend on W. & S. machines being right for the job.

**We can supply you from stock immediately.**



## The A. R. Williams Machinery Company, Limited

ST. JOHN, N.B.
WINNIPEG, VANCOUVER

*If It's Machinery—Write "Williams"*

64 Front Street West
TORONTO

# HŒFER

**Drillers and Auxiliary Drilling Heads**
**Produce exact work in record time.**

Send for Catalog—and remember that Hoefer Service is yours for the asking.

**THE HŒFER MFG. CO., FREEPORT, ILL.**

Canadian Representatives:
**Canadian Fairbanks-Morse Co., Montreal**
Branches Throughout Canada 25

# MORTON MANUFACTURING COMPANY

**Muskegon Heights, Mich., U.S.A.**

Heavy Duty Draw Cut Shapers, Special Heavy Duty Draw Cut R.R. Shapers, Special Locomotive Cylinder Planers, Traveling Head Planers, Special Roll Wobble Planers, Portable Planers, Stationary and Portable Keyway Cutters, Finished Machine Keys. See our full page advertisement in the first issue each month of "Canadian Machinery."

# THE

TRADE K—T MARK

# FOUNDRY
# GALT, ONT.

## Do Your Castings Cost Too Much?

A rearrangement of your patterns might cut their cost 25 per cent.; a different method of molding them might double your production at no increase in molding cost. We can advise you and we have expert metal and wood patternmakers who are able to make any changes that may commend themselves to you.

### If you need some new Patterns

send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.

We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us. **Ask us.**

***We have for our and your requirements, a large stock of assorted White Iron Stars, suitable for light agricultural to medium weight machinery castings, while they last, at 8 cents per lb. F. O. B. Galt.***

ditions are looked for to prevail during the fall, due to the improved tone of commercial activity, and the harvest period stimulating economic conditions.

Seasonable inquiries are the feature of the steel market this week. The best week in inquiries is reported for some time past, but what proportion of business will result is difficult to estimate. Based on this general surface improvement, prospects are considered a little brighter, for it is encouraging to receive inquiries in this volume. Mill conditions are still varied, however. On the other hand, this week's business is described as another brief spurt, with a reaction expected as soon as current demands have been filled. No price reductions have been announced, but it is practically conceded that better prices could be secured on large orders, if there was a generous volume of business apparent. Every order can be said to be treated on its individual merits, with basic quotations for small purchases, which predominate. No marked development in steel business is anticipated for several weeks.

## Pig Iron Markets

In the 31 days of May, pig iron production was 1,221,221 tons. For a smaller output in a 31-day month, almost thirteen years must be retraced, July, 1908, showing 1,218,129 tons. Thirteen furnaces were blown out in May and seven were blown in—a net loss of six.

The only important business recently done in the Pittsburgh district has been the purchase by an Allegheny Valley sheet maker of approximately 2,000 tons of basic iron at delivered prices of $22.25 to $22.50. One lot of 500 tons of basic iron recently was sold at $21, Valley furnace, and this now measures the market on this grade, especially in view of the fact the merchant producers have expressed a willingness to take business at that figure. The market on No. 2 foundry iron is quotable from $22.50 to $23, but the latter is more of an asking than a selling price.

On the Chicago market a local furnace has sold $1,000 tons of basic iron to a melter in the St. Louis district at $20 base, Chicago. Current business in Chicago and vicinity has been light and largely confined to carload lots. A Michigan melter bought 500 tons of foundry for delivery within the next 45 days at $20 base, Chicago. Locally buying will probably be stimulated somewhat as a result of the settlement of the strike of union molders.

The pig iron market at New York has descended to new depths of dullness. The New Jersey melter which was mentioned as being in the market last week for 1,200 tons has withdrawn the inquiry and will buy from month to month to meet its requirements. The New Jersey inquiry brought out some low quotations, for example, a Buffalo furnace quoted $22 furnace for iron analyzing 1.75 to 2.25 silicon.

The largest sale reported on the Cincinnati market was of 200 tons of Northern iron to an Indiana melter. A Kentucky melter is in the market for 500 tons of Southern iron and 250 tons of either Northern or Virginia iron for June shipment. The National Cash Register Co., Dayton, Ohio, has sent out an inquiry for 320 tons half Northern and half Southern and a central Ohio melter inquired for 500 tons of malleable but almost immediately withdrew the inquiry. With these exceptions the market is very quiet.

The market at Cleveland is dull and weak, foundry iron prices having declined at least 50 cents per ton, to $22.50 for No. 2, at which some small lot sales have been made. A few furnaces, however, are still asking $23.

About 2,000 tons of pig iron was sold by Buffalo furnaces through their several offices at the $24 and $25 base prices, but on the whole business is quieter. Sales are mostly for carload lots and the improvement hoped for by several furnace interests has failed to materialize.

Following a sale of 300 tons of No. 2 plain iron to a radiator plant at Trenton, N.J., at $23 furnace, and Eastern producer of pig iron decided to advance its price to $24 base, with $25 for No. 2X and $26 for No. 1X. Other Eastern producers intimate that they also will adhere to these prices, which constitute an advance of $1 on No. 2 plain from the low point, 50c to $1 on No. 2X and about the same amount on No. 1X.

The St. Louis market might be said to be entirely without feature. The expected activity as a result of the settlement of the stove molders' scale, has not developed and in one or two instances stove molders have asked that shipments under contracts be deferred on account of the condition of their yards.

## Scrap Metal Markets

Prices on old material have weakened considerably since a week ago at Pittsburgh, due to a further falling away in the demand in keeping with steel works operations. Plants in operation appear to be congested and permits for shipments to them are being withheld. Shipping instructions are lacking to those plants which are down or nearly so. Owing to this condition prices have been cut from 50 cents to $1 per ton in almost all grades. One steel maker was recently offered 1,000 tons of heavy melting steel at $13 delivered, but being filled up for the present refused the offer.

The indications in the scrap market at Chicago are that prices will be lower and quotations on several grades have declined about 50 cents during the past few days. Prospects for moving scrap are less bright and this is reflected in the attitude of dealers.

Trading in scrap has been listless during the week at Boston. The stiffening tendency in the market that existed during the latter part of May has in several instances appreciably stiffened. Machine shop turnings have dropped from $3 to $2.50 and car wheels, No. 1 machinery and skeleton scrap are weaker than they were several days ago.

New York reports heavy melting steel and machine shop turnings as being easier, now holding at $7 to $7.50 and $4 to $4.50 f.o.b. New York. Other grades are nominally unchanged although weakness is in evidence throughout the market.

Outside of a few scattered inquiries for heavy melting steel, the scrap market continues weak for every grade. A little miscellaneous buying is being done with the market still holding at $13.

Price slashing by automobile builders and a general business stagnation have had their effect on the iron and steel scrap market at Detroit. The general tone is far from promising, and business as a whole is much below normal. Wrought iron axles are down to a ne low, $24, and heavy melting steel, d to a slight increase in demand duri the last days, is quoted at $7.50.

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### CROSS INDEXING MECHANICAL I FORMATION.

(by F. M.)

A very convenient method of indexir miscellaneous information, such as usually accumulated from catalogue notes and magazines, is shown by th accompanying chart. This chart may b used where the information indexed placed in regular letter files, cabine or most anywhere that a letter of nun bered system is used.

Referring to the chart it will be n ticed from the title that this index r fers to "File number 1," from Janua 1918, to a date which is to be filled i when a new index sheet and addition file is developed. Below the title in th diagonal spaces are major titles suc as Lathe, Milling, Planing, etc. In th column at the extreme left are a nun ber of sub-titles. Intersecting lines ru ning from both of these titles for spaces in which letters or numbers a placed and reading down from one co umn along the top and across from column on the side; by noting the lett in the space which they form whe they intersect, it is apparent that th subject matter so designated is file under that letter or numeral.

For example, we will presume th it is desired to look up information th has been accumulated under "Adve tising Forms." Looking along the to we find the word "Forms," and glancin down the left hand column we find "A vertise," while in the square where th two intersect, is the letter "V." O would therefore look into the file "V for the information desired; likewise it was desired to find information in r gard to drilling machines, one wou look along the top to the word drillin along the left to the word machines, a at the intersection of the two is th letter K indicating the file to be looke up.

A chart of this nature can be easi compiled to suit individual requiremen and may be more or less extensive. can be pasted on a card and makes very handy visible index.

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### PRESS CATALOGUE.

The Max-Ams Machine Co., Ne York, have forwarded us a very inte esting catalogue on their line of pow presses and sheet metal working m chinery. Section No. 1 is devoted inclinable single action presses of va ous sizes, while the second section d scribes the same inclinable type b with double action.

Section No. 3 deals with ben presses; section No. 4 with horning a wiring presses, and section 5 with va ous styles of punching presses. T other sections cover the following line —Open back presses; arch presse straight sided presses; reducing presse double crank presses; and knuckle joi presses. All these lines are gone in in detail, full specifications being show

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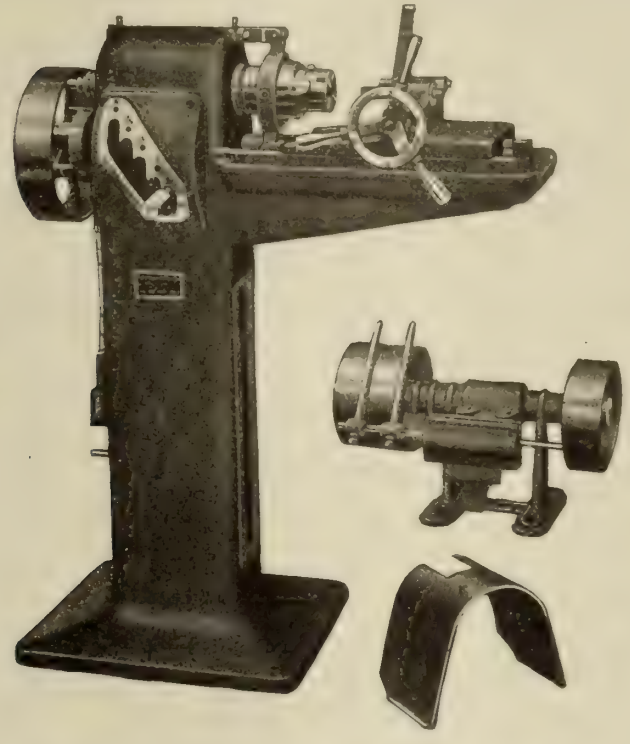
### VISE CATALOGUE.

The Chas. Parker Co., Meriden, Con have forwarded us an 8 page circul that deals with their line of vises, th data explaining the patented featur on this particular line. The circular well illustrated and shows constructio al details on the vises.

Right on the Lead

# GEOMETRIC

The Threading Machine that makes Quick work of Big Orders for Small Threaded Parts.



There are three sizes—½-inch, ¾-inch and 1-½-inch

Not the ordinary bolt cutter, these machines duplicate threads rapidly, accurately, profitably, doing work that cannot be handled on the ordinary Screw Machine or produced economically in any other manner.

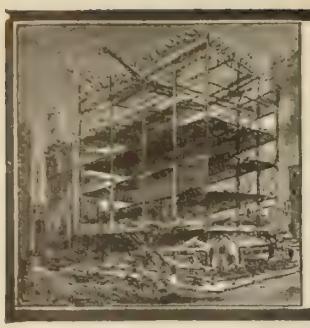
**FOR DOUBLE QUICK THREADING**
**THE GEOMETRIC DOUBLE SPINDLE THREADING MACHINE**

Is a very rapid producer, handling practically as much work as two single machines.

**THE GEOMETRIC TOOL COMPANY**
**NEW-HAVEN CONNECTICUT**

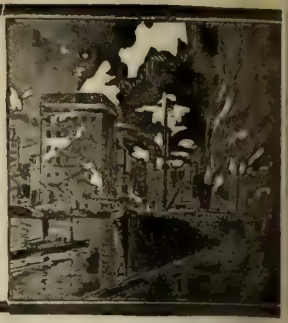
*Canadian Agents*

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, St. John, N.B., Halifax, N.S.



# INDUSTRIAL NEWS

## NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES



A new plant has been opened up at the corner of Queen and Wellington Streets, Kingston, Ont., by Mr. R. M. Campbell. A $4,000 Heald Cylinder Grinder has been installed and the plant is ready to handle all worn and scored cylinders for all machines.

The new bridge which has been built across the Red River at Morris, Man., was opened for traffic on June 2nd. This bridge was built at a cost of about $140,000 and is by far the largest highway bridge in the province. It is 606 feet long and the main span measures 368 feet. The bridge is unique in respect of its being the first fixed span over the Red River.

The Hamilton Bridge Works, Hamilton, Canada, one of the biggest manufacturing concerns in that city, has closed down for an indefinite period, owing to slump in trade. The employees were advised to look for work elsewhere.

Plans will be prepared at once for the erection of a factory for London Motors, Ltd., East London, Ont. W. Stansell, manager.

The Anglin-Norcross, Ltd., 65 Victoria St., Montreal, have received the general contract for an addition to the power house to cost $80,000 for the Montreal Light, Heat and Power Co., 83 Craig St., Montreal, at Cedar, Que.

The iron foundry owned by Fleming Brothers, Cabot St., Halifax, N.S., which was destroyed by fire with loss of $15,000 will be rebuilt.

It has been announced by C. L. Thompson, of the Martin Engineering Co., Niagara Falls, Ont., that plans have been prepared for a brick, tile and glazed tile plant at Winnipeg, the capacity of which it is stated will be 20,000,000 brick annually.

A rotary brick press is being placed on the market by the Rotary Brick Machine Company, of Canada, Limited, 117 University Ave., Toronto, for which they claim a capacity of 56,000 per day.

Ferguson Manufacturing Co., Ltd., has been incorporated with a capital of $40,000 and head office at London, Ontario, to carry on the business of brass and iron founders, etc.

The Auto Rim Co., Ltd., has been incorporated with a capital of $250,000 and head office at Toronto, to manufacture and deal in engines, machinery and tools of all kinds.

Walker Twist Drill and Tool Co., Ltd., has been granted incorporation with a capital of $750,000 and head office at Walkerville, to manufacture drills, cutters, reamers, screws, bolts, nuts, etc.

The St. Maurice Power Co., Ltd., Montreal, has been incorporated with a capital of $8,000,000, to carry on the business of an electric light, heat and power company, to build power station, etc.

During the discussion following the report of the postal and parliamentary committee at the June 10th session of the Canadian Weekly Newspaper Association, A. W. Dunlop, Neepawa, Man., urged that the government be asked to abolish free postal delivery for newspapers. The report was adopted.

W. J. Keyes, instructor of printing classes in Kelvy Technical school, Winnipeg, addressed the Saskatchewan Press Association in the University at Saskatoon on June 3rd, on the subject of "Advertising in a Country Weekly." Description and uses of the various kinds of type was one of Mr. Keyes' main points. He also showed the correct and incorrect ways of constructing display advertisements, recommended the use of single rulings to outline ads. An address was also given by David Miller, secretary treasurer of the Western Press, Moose Jaw, on "System in the Front Office." Mr. Miller dealt mainly with the use of the synoptic in the bookkeeping system. The third speaker of the morning session was Walter P. Confarr.

The Edmonton Journal has announced the appointment of John M. Imrie, as managing director of that newspaper in succession to the late M. R. Jennings, also the election to its board of directors of Charles R. Morrison and Arthur Yockney, who have been on the staff for many years as managing editor and business manager, respectively. Mr. Imrie has had a wide experience in newspaper work. He was manager of the Canadian Press Association, and later of the Canadian Daily Newspaper Association. Recently he has been a member of the head office staff of William Southam and Sons, Ltd., where he was doing special work of an executive character for various papers in which that company is interested. His appointment takes effect on July 1st.

Reeve E. A. Harris, editor of the Burlington Gazette, left last week with Mrs. Harris, on the Press excursion to Vancouver, B.C.

## $6 PER DAY TO BE MINIMUM WAGE

**No Sunday Work Will be Done on This New Ford Acquisition.**

Beginning July 1st, each employee of the Detroit Ironton Railroad will receive six dollars a day minimum wage. This is the same rate being paid to workers at the various Ford automobile plants. Evidently Henry intends to play no favorites. In addition, bonuses for efficiency will be allowed.

Eight hours will constitute a day's work, and there will be no turn anywhere on the system from 6 p.m. Saturday until 6 a.m. Monday.

There are 1,327 employees on the road, which runs from Detroit to Ironton, Ohio. A total of 467 miles of trackage is operated. The road taps the rich Ohio coal fields and connects with the Baltimore and Ohio and th Lake Shore and Michigan Souther Railroads.

## BRANTFORD PLANTS ARE IN GOOD SHAPI

**Several Plants Increasing Staff, Whil Many Others are Normal or Even Slightly Above the Normal Point.**

According to the industrial census Brantford, Ont., things are going fih Of the 48 largest industrial plants, onl two have less than 50 per cent. of the employees at work, save those whi are totally closed. Four of the factori are employing more than normal, th Cockshutt Plow Company is employin approximately 110 per cent. of its nun ber of normal employees. The Bran ford Roofing company a few days ag commenced the use of a night staff an by so doing increased the number employees on its payroll to 40 per cen above normal. The Brant Creamer one of the smaller industries of the cit is employing about 80 per cent. mo than under normal conditions, and th A. J. Reach Company has slightly ov five per cent, more employees tha usual.

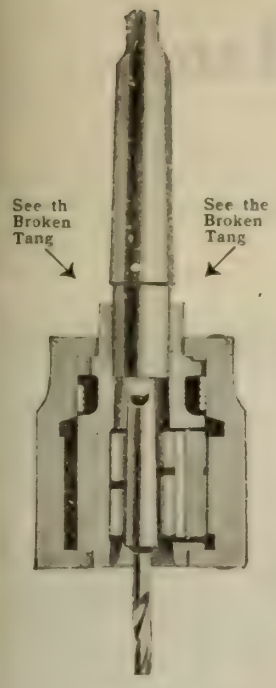
Fifteen factories are employing the full regular staff. Such large concer as the Verity Plow Company, Watso Manufacturing, Brantford Corda Company, American Radiator Compan are included in this list and the fa that they have such a high percenta of their employees at work at the pre ent time has meant considerable t wards the solving of the unemployme situation in that city.

In addition to those large concer the following somewhat smaller indu tries report that 100 per cent. of the regular employees are at work at t present time: Brantford Coffee a Spice Co., Brantford Felt Novelty C Brantford Oven and Rack Co., Bra ford Willow Works, J. and J. Cash C Cummings Button Co., Dominion Dre Co., Dominion Flour Mills, S. C. Joh son and Sons, Scarfe and Co. The factories constitute some of the large of the smaller factories and their 1 per cent. record represents the emplo ment of a large number of men.
2-column head

### MACHINE TOOLS.

Wm. Sellers & Co., Inc., Philadelph Pa., have issued their catalogue G-2 This book contains a description their line of machine tools for railw and machine shop equipment, this i cluding bending machines, boring m chines, boring and turning mills, rad drills, grinding machines, steam ha mers, lathes, planing machines, slotti machines, etc., etc.

# Aikenhead's




*Grips the Entire Shank— Never Slips*

## Wahlstrom Chucks

The clutch of the Wahlstrom positively cannot slip. Its instant-acting jaws close on the entire shank with a grip that becomes firmer and firmer as the resistance to the tool increases.

There's no time lost in waste motion with the Wahlstrom Chuck. It is automatic and instantaneous in action. Two seconds is all you need to change from drilling to reaming, counterboring or tapping—and you don't stop the spindle.

In addition to regular drill press work they will increase production of lathes for burring, turning, filing, etc.

Made in two different styles. One style holds No. 1, 2, or 3 Morse Taper Shank Drills —with or without a tang. The other style is made in three sizes, which hold all sizes of straight shank tools from 1-4 to 1-inch.



*The World's Standard of Accurate Gauging*

## Johansson

The "Limit System" introduced by a set of Johansson Gauges to your shop will assure equal results on all work, even in the hands of unskilled operators.

Johansson Gauges are the fulfillment of an ideal in measuring tools heretofore unattainable. They combine the advantages of both line and end measures. Like line measures they give all sizes within their range—like end measures they are convenient, solid, non-adjustable blocks of steel. They insure the same result any number of times and in the hands of any number of mechanics. This fact has made them indispensable where the work of one shop is to be assembled with the work of others.

No individual to-day is independent of the machine-shop. No machine-shop to-day can afford to be independent of Johansson gauges. They save time, decrease costs and increase both the quantity and quality of the work, factors of vital importance in these days of keen competition.

*Buy them at*

## AIKENHEAD HARDWARE LIMITED

**17 Temperance Street, TORONTO, ONT.**

# From a $500 Bush League Pitcher to a $5000 Business Man

## How One Man Took Advantage of an Opportunity to Build Up a Successful Business on a "Shoe String"



Where successful efforts were awarded with cheers and applause from the crowd—and a $500 yearly salary.

As our old friend Aesop would say, "Once upon a time"—But Andy Van Dusen, as we will call him, was no fabulous character. He was the star pitcher on the Blank Base Ball Team the year they topped the list in their League.

After the "last call" Andy wrapped up his uniform in moth balls and hit for a winter's berth. He landed in a plant at the North end of the city where they manufactured Grinding Machines that are used in automobile factories for grinding cylinder bores, piston rings, gears and similar parts.

The former star ball player soon became quite an expert in setting up and running these machines. So when one day a customer who had bought two or three, sent in a request for some one to show his operators how to keep things going on high, Andy was sent to stage the show.

It was while he was on this job that he saw how easy a dandy business could be built up on only a trifling capital, provided the man had sand, some mechanical knowledge and was willing to work like a "bee in a tar barrel."

That night he "built a few castles." He saw himself, with a shop mate, running a business of their own. They had equipped a plant for regrinding the bores of auto and truck cylinders. He visioned mountains of cylinder blocks piled around his doorway and saw the results of his three-shift efforts being trucked away by satisfied customers, who were saved days and weeks of time by not having to send them back to the manufacturers.

Andy's "air castles" were built on a firm foundation because he knew, as do most auto owners and repair men, that a reground cylinder fitted with new oversize pistons and snug rings makes a far better running motor than one fresh from factory where they do not finish their cylinders by grinding.

He had learned that castings in a new engine were "green" and unseasoned; that when they are put to work the heat from the explosions more or less distorts the cylinder bore and permits leakage and power loss.

Andy was also aware that over 8,000,000 automobiles, trucks, tractors and motorcycles were now operating in this country. Sooner or later each individual one of these would require overhauling and grinding. *He determined to get his share of this business.*

The next morning Andy told his boss that he was going to quit and go into business for himself, if he would sell him one of the cylinder grinding machines he had learned so well to run and give him a little time to pay for it. He got the machine.

Andy and his partner rented a room in a down town section. They set up their Cylinder Grinder—a Heald, of course—and backed it up with a lathe, a vise and a few bench tools.



Here, a like amount of effort applied to business amounts in a $5000 annual income.

He notified the garage men and truck fleet owners that he was "all set" and from then on there has never been a time that cylinders have not littered the floor, waiting their turn to be reground and refitted.

Andy's advertising bills were small, every customer was a booster. The first Grinder was soon paid for and before the next season's work loomed up, Heald No. 2 was added to the family and put to work earning bright dollars for the boys who had the courage to dig in and go to it, even if they didn't have a fat roll in their pocket to start on.

If you are desirous of learning Andy's faith in the future of his business, just try to sign him up in any of the big leagues now.

Andy's case is not exceptional We could name scores.

Just a few days ago the writer was in a shop in one of the largest cities in this country where the business has been literally built up on Heald Cylinder Grinders, the first machine having been put in March, 1918, and the man who took me there said that when the owner started he didn't have over $300.00 to his name but now his investment is easily worth $300,000. So you see what can be done starting on a "shoe string" as they say, IF YOU HAVE THE RIGHT STRING TO START WITH.

There is just one machine for this work which is made right, has the needed capacity, is durable and can do rapid and efficient work that will satisfy both the owner and the customer it serves, and that is the one made by Andy's old boss—The Heald Machine Company of Worcester, Mass.

These people have been building grinding machines for fifteen years for the big auto factories where quantity and quality production must be the greatest possible, and in every one of the shops building the better grade of cars, these machines will be found in daily operation.

They build rotary machines for grinding the edges of piston rings, to make them the right thickness to fit in the piston; and internal grinding machines to finish the gears, the ball bearings, and all the holes in the many hardened sleeves and bushings used in the wonderful machines that carry us and our friends from place to place—to work or to play—in Summer or in Winter—in sunshine or in rain—by day or by night—whatever our need may be.

The Heald Machine Company has the facilities, the experience, the right machines and the desire to help you to make a success of handling this line of work, and we shall be pleased to have you call upon us at our factory or any of our branches or agencies, either in person or by telephone or by wire or wireless, and the same will receive our best attention.

THE HEALD MACHINE CO.

51 New Bond St. Worcester, Mass.

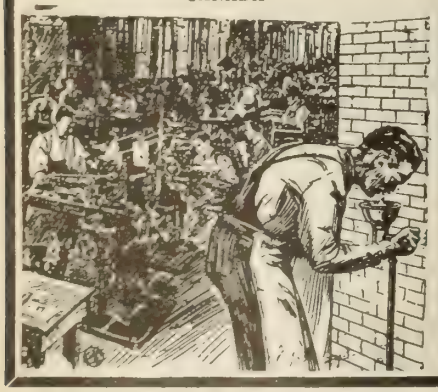
THE "FLU"
Stayed out of this PLANT




PURO SANITARY DRINKING FOUNTAIN
(MADE IN CANADA)

The only fountain with a bowl that prevents lips touching the bubbler paid its moderate cost over and over in all those well-ordered plants whose precautionary measures successfully barred the Spanish influenza. PURO saves lives, time and water. Write

Puro Sanitary Drinking Fountain Co.
888 F. St. Andrew St., Montreal, P.Q
CANADA



DROP FORGE DIES
Send us your blueprints and specifications. Entrust your requirements to experienced workmen and up-to-date equipment. Have your dies made in Canada. First-class workmanship guaranteed.
THE KIMBER & HILLIER MFG. CO.,
Thorold Road, - St. Catharines, Ont.

OVENS
Japanning and Varnishing Ovens heated by Gas, Electricity, Steam or Coal. Kernchen Siphonage Ventilators, Bakers' Ovens, trucks, casters, etc. Write for Booklet.
Brantford Oven & Rack Co. Ltd
*Brantford, Canada*

# THINKS EFFECT ON CANADIAN MANUFACTURERS WILL BE EXCELLENT

An important change, with considerable effect on American imports into Canada, in computing the value for duty of currencies of invoices from countries where the rate of exchange is adverse to Canada, has been put into force by the Department of Inland Revenue and Customs, and came into effect on June 6th.

On an invoice of goods imported from the States, it is suggested in an example given in the memorandum issued by the Department to local customs collectors, where actual home consumption value is $100, and the premium of exchange is 12 per cent., the value for duty purposes will be $112. Where there is heavily depreciated currency, on the other hand, not more than 50 per cent. depreciation of the proclaimed value of the currency is to be allowed by customs for computing values of invoices for duty. Thus the German mark, whose proclaimed value is 23.82 cents, will be taken as worth 11.91 cents, though actually worth much below that figure.

"These changes will help Canadian and British manufacturers and merchants considerably," stated Captain E. J. Edwards, Senior British Trade Commissioner, yesterday, "as well as other Empire merchants who export to Canada, by giving them an additional preference, but on a perfectly fair basis. I understand that importers are upset at the change, but it is after all on the same basis as that in use by American customs on Canadian imports into that country. They levy duty on Canadian invoices in American currency, which gives added protection to their manufacturers, a reasonable proceeding for any country where, as in Canada, protection is needed to maintain home industries.

**An Excellent Effect.**

"I think the effect on British importers and Canadian manufacturers will be excellent," continued Capt. Edwards, "as added protection amounting to 3 or 4 per cent. will be given, and I hope that this plan, outlined by Sir Henry Drayton, Minister of Finance, in his recent budget speech, will soon evidence the effect for which he designed it, the expansion of Canadian industry and the purchase of supplies within the Empire as far as possible. It will be recalled that the Minister intimated that bankruptcy lay ahead of Canada if she continued to buy at her present alarming rate from the United States Anything that will assist, as this must, in the development of British trade, naturally has my hearty approval, and I look forward to a consequent early improvement in British trade here. There are admittedly some lines in which Great Britain has not yet recovered her pre-war ability to manufacture at low prices, and this will give her manufacturers useful assistance.

"As to the provision that customs shall not allow any reduction more than 50 per cent. of standard currencies in computing values, the recent inrush of German manufacturers into Canada, with a consequent bad effect on British imports, and as Canadian manufacturers tell us, on their factories, in my judgment proves that in this respect too we shall also both benefit, though, as German imports are still comparatively insignificant, not to such an extent as provided by the new regulations on goods from the States and other countries, whose exchange rate is adverse to Canada."

## PERSONAL.

R. B. Morley, who has been general manager and secretary-treasurer of the Ontario Safety League for seven years, has been appointed secretary-treasurer of the Industrial Accident Prevention Association, an organization founded under the authority of the Workmen's Compensation Act. Although he has resigned his position with the league, he still holds the position of honorary secretary. J. F. H. Wyse, who has been organizer and engineer of the league since its inception, takes over Mr. Morley's former position.

Mr. Oskar Kylin has recently been appointed general sales manager of the Foster Machine Co., Elkhart, Ind. For the past five years Mr. Kylin has been chief engineer, and a member of the executive board. Although taking on this new position, he still retains his former duties as well.

The Mechanical Leathers, Ltd., who are the Canadian representatives of the Chicago Rawhide Mfg. Co., have supplied us with some interesting information regarding the three directors of their company.

The president, Richard W. Coleman, has charge of the engineering and sales depts., and previous to his present position was belt and sales engineer for the Chicago Rawhide Co., coming to Canada as their representative in 1913. Since May 1st he has been occupying his new position.

The secretary-treasurer, Herbert R. Allay, was born in Toronto, and is a B.A. of the University of Toronto. He has had varied experiences in the past war, rising from Lieutenant in the Q.O.R., up to Major. His industrial activities have included various concerns, including the Goodyear Tire & Rubber Co., which concern he left to form the present company.

E. W. Wright, partner in the Toronto firm of Rowell, Reid, Wood, Wright & McMillan, Solicitors, is the third Director. Mr. Wright also served in the past war, and is well known in legal and business circles throughout Canada.

This concern handles the following lines:—High speed, heavy duty, moisture proof, heat proof, friction proof and oil proof belting, rawhide gears blanks, frictions, lacings, hammers mallets and mauls, also "Krome" cups gaskets, washers, discs, and hydraulic packing. Their line also includes motor car and commercial leathers, shoe findings, etc.

## IMPORTANT NOTE.

The article on welding in this issue was procured through the courtesy of the Electric Arc Cutting and Welding Co., Newark, N.J., Mr. Holslag being chief engineer of that company.

## AUTOMATIC COUNTERS.

"Census Takers of Industry" is the title of the catalogue No. 31 issued by the Root Co., Bristol, Conn. Various photographs are shown of their counters also typical installations.

### WIRELESS TELEPHONY

The first illustration of wireless telephony for commercial purposes in the United Kingdom was put to work recently at Liverpool between the head offices of the Mersey Docks and Harbor Board and the Mersey bar lightship, 12 miles away. The other two lightships guarding the Mersey entrance are connected with the shore by telegraph cables, but that is impracticable in the case of the bar lightship owing to the heavy currents. A portable Marconi set of 100-watt power with a 35 miles' range is employed and the wave length adopted is 400 m., to minimize the possibility of interference with other wireless stations.

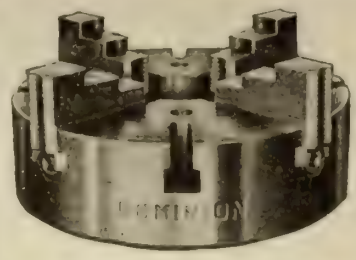
### IRONSTONE DEPOSIT

A fresh deposit of ironstone has been discovered in Great Britain after boring operations to a depth of nearly 500 feet. The seam is close on thirty feet thick and is expected to prove of great commercial value. A larger bore will now be sunk, and the result of the further investigation is awaited with keen interest.


HAMILTON ENGINEERING SERVICE
LIMITED

*Consulting and Designing* — Tools, Jigs, Fixtures and Special Machinery. Let us shoulder your problems.

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DOMINION CHUCKS

STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY



All Screws Are Reversible

SCREWS are made of the best grade steel. Both ends are broached and are heat treated after machining. They are reversible, so that either end may be used, are large enough in diameter to stand the torsional strains applied by operator when setting up his work. They are made to give the best service—and may be depended upon to stand up under the hardest usage.

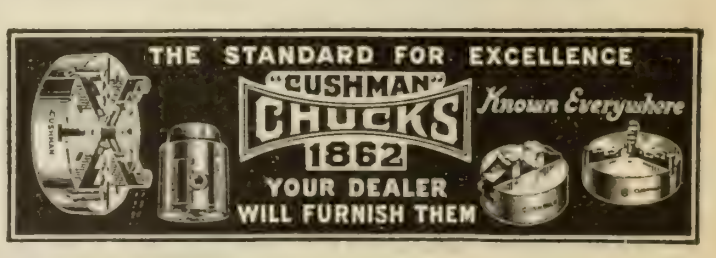
DOMINION STEEL PRODUCTS CO. LIMITED
*Engineers • Manufacturers*
BRANTFORD, CANADA

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PATENTS
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The old established firm. Patents everywhere. Head office, Royal Bank Bldg., Toronto. Ottawa office, 5 Elgin St. Offices throughout Canada.
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SKINNER DRILL CHUCKS
GIVE BETTER SERVICE

TRADE MARK

Skinner Drill Chucks eliminate most of the trouble of accurate drilling operations, simply because they are built right to hold the drill or tap accurately and truly in center. The hardened jaws are ground true.

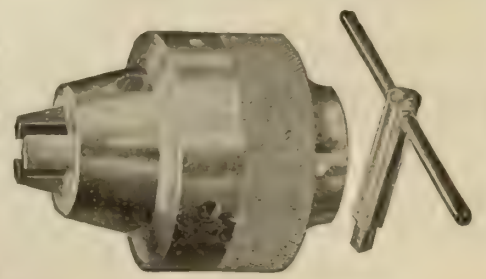
They are easy to handle, too, as there are no exposed gears to pinch the fingers.

The long life of Skinner Drill Chucks is due to the great care we exercise they are built. Made of the best materials available for the purpose. All working parts hardened to resist wear, and of sufficient strength to rigidly hold the tool to the work.

These Drill Chucks are all described in our catalogue, which will be sent to you with prices upon request.

THE SKINNER CHUCK COMPANY
NEW BRITAIN, CONN U.S.A.

Established 1887
New York Office: 94 Reade Street. San Francisco Office: Rialto Building. Chicago Office: 552 West Washington Blvd.
London Office: 139 Queen Victoria St., E.C. 4.



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WANTED—ONE 10 H.P., 3 PHASE, 25 CYCLE, 220 volts; one 25 h.p., 3 phase, 25-cycle, 220 volts. Complete with low voltage release starter, base and pulleys. Box 781J, Canadian Machinery.

## SALESMAN WANTED

WANTED — BY WELL-KNOWN AMERICAN manufacturers of pneumatic tools enterprising salesman for Canadian field. Reply giving full experience, present connection, etc. All replies will be treated in confidence. Box 782N, Canadian Machinery.

## MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

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UP-TO-DATE MACHINE SHOP FOREMAN desires change, as foreman, general foreman or superintendent. Age 37. Apply Box 783, Canadian Machinery.

## MACHINE WORK WANTED

We are equipped to handle all kinds of general or special machine work. All operations in our plant are done under the most careful supervision and we can satisfy you as to price. Always available for consultation.

**PERFECT MACHINE COMPANY, GALT**

Builders of Reliable Machinery.

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GENERAL MACHINE WORK

Turret Lathe and Automatic Screw Machine a Specialty. Let us quote on your work.

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**SUNCLO BRAND**

**WIPING CLOTHS**

**COTTON WASTE**

**WOOL WASTE**

*Prepared By*

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**98 John Street**

**TORONTO, ONT.**

*Prices on application*

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TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (ctfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

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1—36" Yeates Band saw.
1—No. 103 Rivet Internal Grinder.
1—No. 190 Wells Universal Cutter Grinder.
1—Cincinnati Slab Miller.
1—No. 3 Greenard Arbor Press and Stand.
1—18"x8' Cincinnati Lathe.
1—24"x24"x6' Putnam Planer.

**CHAS. P. ARCHIBALD & CO.**
**285 Beaver Hall Hill, Montreal**

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**WELDING**

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**CUTTING APPARATUS**

Oxygen, Acetylene, and a complete line of Welding and Cutting Supplies.

**Carter Welding Co.**
**of Toronto, Limited**
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**Phones: Adelaide 2841 and 1524**
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## Modern Marine Machinery

Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

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We carry right in stock a large quantity of used Belting, Pulleys, Hangers, Shafting, etc., in good condition, which we sell at half the price of new. Inquiries solicited. In writing mention sizes wanted. L. S. Tarshis & Sons, 92 Wellington St., Montreal.

Machine Shop and Foundry for sale, St. Catharines, Ont. In the centre of the Welland Ship Canal and Hydro activities. Going concern capable of handling all classes of work. Turnover $60,000 a year. Good reasons for selling. Box 777, Canadian Machinery. (c5m)

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WANTED—BY AN ESTABLISHED CONCERN. Twelve to fifteen thousand dollars for a period of from one to three years, to take care of business expansion. This concern will stand the fullest investigation. 8% is offered with ample security to principals only, with an opportunity of becoming permanent associates with the partners, if mutually satisfied. Box 767, Canadian Machinery. (etfm)

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ELECTRIC STORAGE BATTERY LOCOMOtives for sale. Two. 36-inch gauge. Complete and in good condition. R. T. Gilman & Company, Dept. "E," 211 McGill Street, Montreal. (ctfm)

MOTORS FOR SALE — 5 H.P. CAN. GEN. Electric, 2-phase, 60-cycle, 1800 r.p.m., switch starter; 20 h.p., Fairbanks-Morse, 2-phase, 60-cycle, 1200 r.p.m., Auto starter (without low voltage release); 25 h.p., Can. Gen. Electric, 2-phase, 60-cycle, 1000 r.p.m., no starter; 30 h.p., Westinghouse, 2-phase, 60-cycle, 945 r.p.m., Auto starter (without low voltage release); 3 h.p., Westinghouse, 2-phase, 60 cycle, 1700 r.p.m., switch starter; 1 Smart-Turner Triplex Belt-driven Pump, 2 x 3. Box 780J, Canadian Machinery.

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Light and Medium-Bench and Floor Repetition Castings; Capacity 15 tons per day.
Expert Metal and Wood Pattern Work. Our advice and estimates will save you money.
Semi-finishing operations on Lathe or Grill on Castings supplied if required.
ASK US.

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Will handle medium Specialty Line — Manufacturing and Selling

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**Apply Quickly**

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# Bargain in Used Boiler Plant Equipment

3—350 H.P. Stirling Boilers—125 lbs. pressure.
1—Spare water column for boilers.
1—Moffat Water Heater, Steel Tank, 10 in. outlet.
34—Spare Boiler Tubes—NEW.
1—Sturtevant Blower with 30 in. dia. discharge opening with 60 ft. 36 in. dia. Sheet Metal Blast Pipe and 80 ft. 24 in. dia. Sheet Metal Blast Pipe.
3—Steel Plate Smoke Stacks, 4 ft. dia., 80 ft. high.
3—Fire Tender's Tools (poker, etc.)
36 ft. Steel Ladder, 18 in. wide.
15—Sections of Fire Grates (extra).
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**International Harvester Co. of Canada, Limited**

**Hamilton - - Ontario**

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Deep Drawing Crown Fender Stock—Deoxidized—Oiled.
10,200 lbs., 23 Ga., 30" x 96" Primes
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Cold-Rolled Strip Steel and Bars.
Sheets—Black, Galvanized, Brass, Copper Aluminum.
Tubing—Welded and Seamless Steel, Brass, Copper, Flexible Steel Steam Hose.

**Your enquiries are solicited.**

**Ontario Metal Products Co. Limited**
**237 Dufferin St. - Toronto, Canada**

# GARLOCK-WALKER LIST

**Over 20,000 square feet in our warehouse is filled with every variety of Equipment for Machine Shops and Woodworking Factories.**

**You will find Garlock-Walker service thoroughly dependable. Let us know what Machinery you require.**

**If you want Machinery Equipment, send us your enquiries.**

**A few Machines from our Toronto stock at exceptionally attractive prices are:—**

**LATHES**
1—14½" x 12' Berg Pit Lathe (used).
1—36" x 18' Putnam (used).
1—30" x 12' Blaisdell (used).
1—30" x 14' Niles-Bement-Pond (used).
1—26" x 14' Niles-Bement-Pond (used).
1—24" x 10' Milwaukee (new).
1—20" x 6' Le Blond Heavy Production (used).
1—18" x 8' Bertram (rebuilt).
1—18" x 8' Rae (new).
1—16" x 6' Reed (used).
1—12" x 8' LeBlond (used).
1—8" Rivett, Bench, Cabinet and Attachments (used).
1—7" Cataract Precision, Standard Equipment.

**GAP LATHES**
1—22" x 40" x 16' McDougall (used).
1—20" x 38" x 12' C. M. C. (used).
1—18" x 24" x 10' Rahn Meyer (used).

**TURRET LATHES & SCREW MACHINES**
Several No. 4 Millhollands, Davis, Oliver, Garvin, Warner & Swasey, and National Acme.

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1—16" Rae B. G. Crank Shaper (new).
1—24" McGregor-Gourlay Crank Shaper (used).

**PLANERS**
1—42" x 42" x 20' Putnam, 1 Head (used).
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1—36" x 36" x 24' Sellers, Open Side (3 Heads).
1—30" x 30" x 10' Pond, 1 Head.

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1—Briggs High Duty Type "A", 22" Traverse (new).
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Several Plain and Small Hand Millers.

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1—10" Burke Sensitive Bench (new).
1—15" Rockford (used).
1—16" No. 2B Edlund H. S. Sensitive (new).
20" "Sibley," "Champions," "Rockwell" and "Silver" (new and used).

**BORING MILLS**
1—Universal No. 2½ Horizontal, Table 42" x 22" (used).
1—Bullard "New Era" Type Vertical Turret, 36", Complete Equipment (new).

**POWER HACK SAWS**
1—No. 10 Racine 8" x 8" Cap. (new).
1—No. 7 Watkins, 9" Cap. (used).
1—No. 1 Racine, 6" x 6" Cap. (used).

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1—Landis Plain, self-contained, 36" x 12" (used).
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Tool and Cutter Grinders. New and used. "Globe," Stevens, LeBlond and Cincinnati.

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1—12" x 18" Ingersoll-Sargent, belt drive (used).
1—12" x 12" Can. Ingersoll-Rand, N.-E.-1 (used).

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1—No. 0 Consolidated Inclinable Power Press (used).

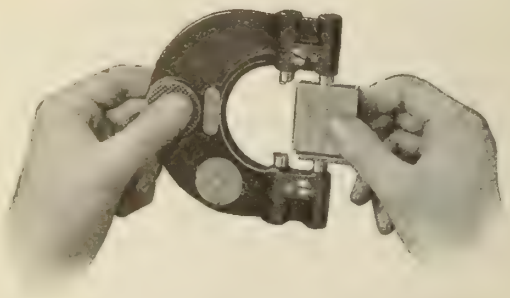
**MISCELLANEOUS**
2—No. 4 Jno. Hall Pipe Machines (1 used), (1 new).
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1—Lennox Rotary Bevel Shear, 1" cap. (new).
1—6" Curtis Pipe Machine (used).
1—Beaudry Champion Power Hammer, No. 9 (used).
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1—Grant Rivet Spinning Machine, No. 80B (used).
1—Greenerd Arbor Press No. 4 (used).
Transmission Equipment, Pulleys, Belting, Shafting and Hangers.

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*It is easy to set Johansson Snap Gages to the desired limits with great accuracy. You can also depend on their maintaining their accuracy.*

WHY take it all out of the pay envelope? In reducing your costs during this period of reconstruction, let the LIMIT SYSTEM do its share. Cut down the scrap pile and thus cut your production costs by using the LIMIT SYSTEM with Johansson Adjustable Limit Snap Gages set to the acknowledged standard of Johansson accuracy.

THE LIMIT SYSTEM, or in other words, the making of interchangeable parts *within limits*, demands dependable gages if it is to be used with the greatest efficiency. Johansson Adjustable Limit Snap Gages are ideal for the operation of the LIMIT SYSTEM. Note these features of their construction.

FRAME of Swedish Gray Iron—cannot be distorted. Tool Steel Gaging Plugs with extra large *flat* contact faces which do not turn in the frame, having end movement only. Clamping screws force the gaging plugs to seat firmly against the adjusting screws. Adjusting screws can be readily sealed to prevent tampering. Temperature changes prevented by means of the Johansson Insulated Grip.

Johansson ACCURACY

EACH of the following Machine Tool Headquarters carries a large assortment of the regular sizes of Johansson Limit Snap Gages. In conjunction with Johansson factory representatives, they are at all times ready to give you complete gage service.

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# C. E. JOHANSSON, Inc.
## POUGHKEEPSIE, N. Y.



# 1300 10-Inch Brass Gongs

is the steady day by day production rate obtained by Bevin Bros., Mfg. Co., of East Hampton, Conn., on this "BLISS" 3½-B Toggle Drawing Press. The press was installed in 1907 and has averaged four days per week operation since that time. No parts have had to be replaced since installation, and it is in first-class condition to-day. Besides the 10-inch gong, this same press is used, also, for drawing 6, 7, 8 and 12-inch gongs, all from ⅛-inch brass. Bevin Bros. have over twenty "BLISS" presses in operation at present. These were installed at various times over a period of nearly twenty years.

BLISS 1857

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*American Factories* BROOKLYN, N. Y. *and* HASTINGS, MICH.

BLISS 1920

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No. 79




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The limit of a file's usefulness is reached when its teeth begin to get dull.

It cannot be sharpened, and it wastes your workmen's time and does poor work.

Throw it away, and get a new file. To get maximum service from every file, specify one of these standard brands:

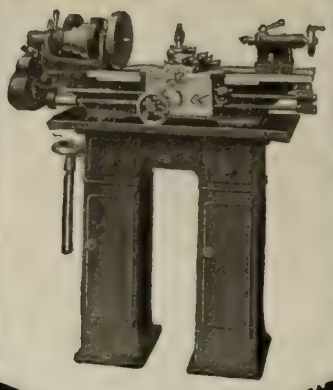
**KEARNEY and FOOT**
**GREAT WESTERN**
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*Files and Rasps*

Made in Canada by

**Nicholson File Company**

**Port Hope - Ontario**



***"The Small Lathe for the Big Job"***

**Type B-6**

*Send for Catalog No. BC-10*

For the tool room or experimental department the **"Dalton Six"** has no equal.

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| Actual Swing - - | 8¼ inches |
| Between Centers - | 18½ inches |
| Collet Capacity - - | ¾ inch |

**Dalton Manufacturing Corp'n**

**Sound Beach, Connecticut, U. S. A.**
Cable Address - - "Aledal Stamford"

*Also Manufacturers of Type B-4 Lathe*

**"DALTON SIX"**

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**LABOR SAVING EQUIPMENT**

TURRET LATHES
Hand Operated
For Chucking and Bar Work

AUTOMATIC TURRET LATHES
For Chucking Work

VERTICAL BORING and TURNING MILLS

UNIVERSAL TOOL GRINDERS

HORIZONTAL BORING AND DRILLING MACHINES

TOOL-POST TOOL HOLDERS

REAMERS, "SOLID ADJUSTABLE"
Shell and Chucking

BORING BARS
With Adjustable Cutters

PERIODOGRAPH
For Time Recording in Factories

Separate Catalogs on each Product

Send for the ones you want

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**Madison, Wisconsin, U. S. A.**



# *Oakite Saves Over $4,000 a Year On One Cleaning Operation*

This Advertisement is one of a series based on actual occurrences in the

In a certain plant, small brass parts were washed with soda ash to remove rubber compound. Soda ash left a sediment, so 5 girls had to be employed to scrub the parts with soap to remove the sediment.

This operation was slow, tedious and costly.

An Oakite representative was given an opportunity to investigate cleaning conditions in this plant. The use of 30 lbs. of Oakite every week to replace 444 lbs. of soda ash was recommended and Oakite was adopted.

The parts now come from the tank absolutely clean. No sediment. No scrubbing.

Oakite has saved this plant $83.52 weekly on one cleaning operation—or more than $4,000 a year.

We have a representative in your territory. May we ask him to call at your plant and have him go over your cleaning requirements with you? This will take but a few minutes of your time, and you can find out just what it would involve to run a competitive test on your work. He can perhaps indicate just what results you can expect and offer suggestions as to methods and materials best suited to your work.

Now is the time to cut expenses. A request from you for an Oakite service man to call to look over your cleaning problem places you under no expense or obligation whatever. Write to-day.

*Resident Canadian Representatives: Mr. C. P. Murphy, Toronto, and Mr. C. Burgin, Montreal*

**OAKITE** MANUFACTURED BY OAKLEY CHEMICAL CO. 44 THAMES STREET NEW YORK

*If interested tear out this page and place with letters to be answered.*

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## STEEL CASTINGS

ELECTRIC Steel Castings of all kinds from 5 pounds to 5,000 pounds.

PROMPT DELIVERY

**Manitoba Steel Foundries, Ltd.**

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## For Hardness Testing

in shop and laboratory use the

**Standard Scleroscope**

Universally adopted; direct reading; inexpensive, and the only instrument that agrees with others of its kind in all parts of the world, thus solving problems of ordering materials to specification.

BOOKLET FREE.



THE PYROSCOPE

**Heat Indication**

by optical means is fast becoming the correct thing. The PYROSCOPE has solved the problem.



THE SCLEROSCOPE (Set)

Perfect constancy inexpensive, no electricity used. Built to stand rough usage, and upon common-sense lines. Used by the Government and best firms.

**The Shore Instrument & Mfg. Co.** Van Wyck Ave. & Carll St. JAMAICA, N.Y.

A. R. Williams Machinery Co., Ltd., Toronto, Canada

## The Hughes Owens Co. Ltd.

MONTREAL TORONTO OTTAWA WINNIPEG

*Manufacturers*

Blue and Black Print Papers

Drawing Office Supplies for Students, Architects and Engineers.

## Torrington MACHINE SCREWS

**Side Knob and Lock Cap Screws**



Let us quote you our prices on your next order. Our quality and service is sure to please you.



**THE TORRINGTON COMPANY, LIMITED**

UPPER BEDFORD, QUEBEC

FOR SERVICE ON

## Jigs, Fixtures, Gauges

SPECIAL MACHINE TOOLS

SPECIAL MACHINERY

General Machine Work and Repairs

*Write*

**The Crescent Machine Co.**

LIMITED

20 Longueuil Lane Montreal, Que.

## ATKINS Sterling Quality SAWS

When in need of Circular Metal Cutting Saws, Hack Saw Blades, Hack Saw Frames, Kwik-Kut Power and Metal Cutting Band Saw Machines we will be pleased to have your specifications.

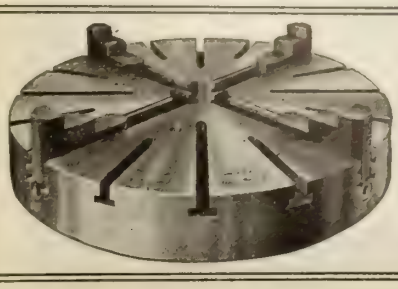
"A BETTER SAW FOR EVERY USE"

*Address the nearest point below*

**E. C. ATKINS & CO.**

Canadian Factory, Hamilton, Ontario

Branch House, Vancouver.



## *IRON BODY* INDEPENDENT CHUCKS

They represent strength and economy with high-speed cutting tools. Accurate and dependable always.

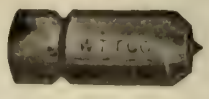
Our All-Steel Independent Chucks have established records for accurate, long-wearing qualities. We also make Geared Scroll Chucks and the Geared Scroll Combination. Ask for particulars.

**UNION MANUFACTURING COMPANY**

New Britain, Conn. New York Office: 26 Cortlandt Street

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**INDUSTRIAL DIAMONDS**
Goods Submitted on Memorandum if Desired
JOHN W. GORDON, Manager
James Street, ST. CATHARINES, ONTARIO

**WHEEL TRUEING TOOL CO.**
DETROIT



MANUFACTURERS OF
**DIAMOND POINTED TOOLS**
All Mountings Fully Guaranteed
Office and Factory:
88 West Pitt Street, WINDSOR, ONTARIO



**Gear Cutting Machines**
Hand Feed
Semi-Automatic, Fully Automatic
*Also Lathe Chucks and Centering Machines*
THE D. E. WHITON MACHINE CO.
NEW LONDON, CONN., U. S. A.

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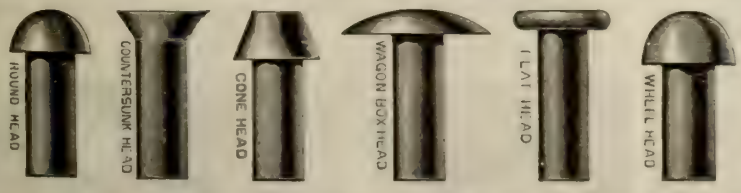
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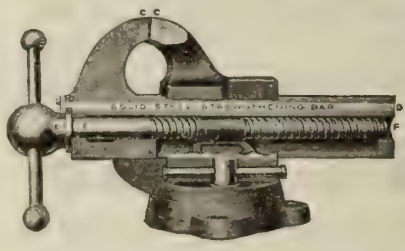
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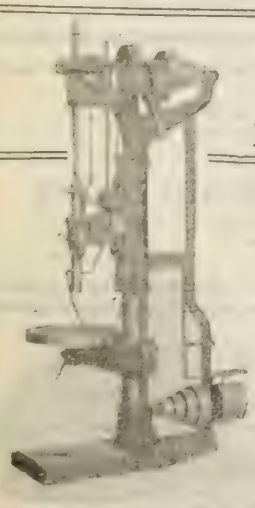
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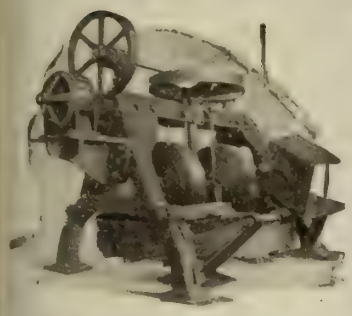
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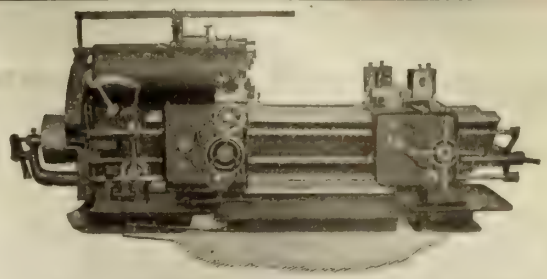
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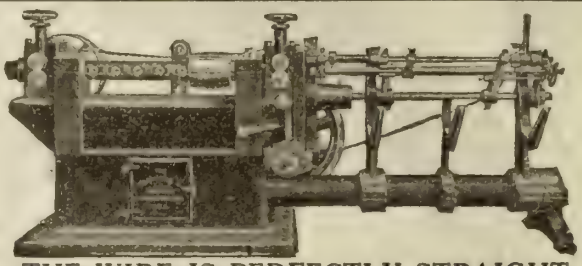
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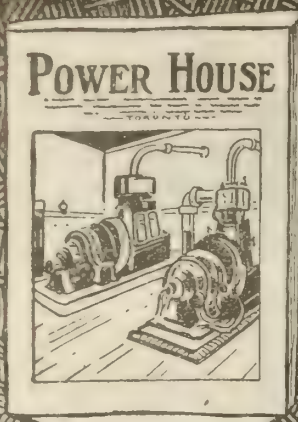
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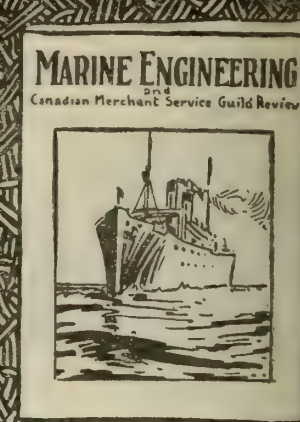
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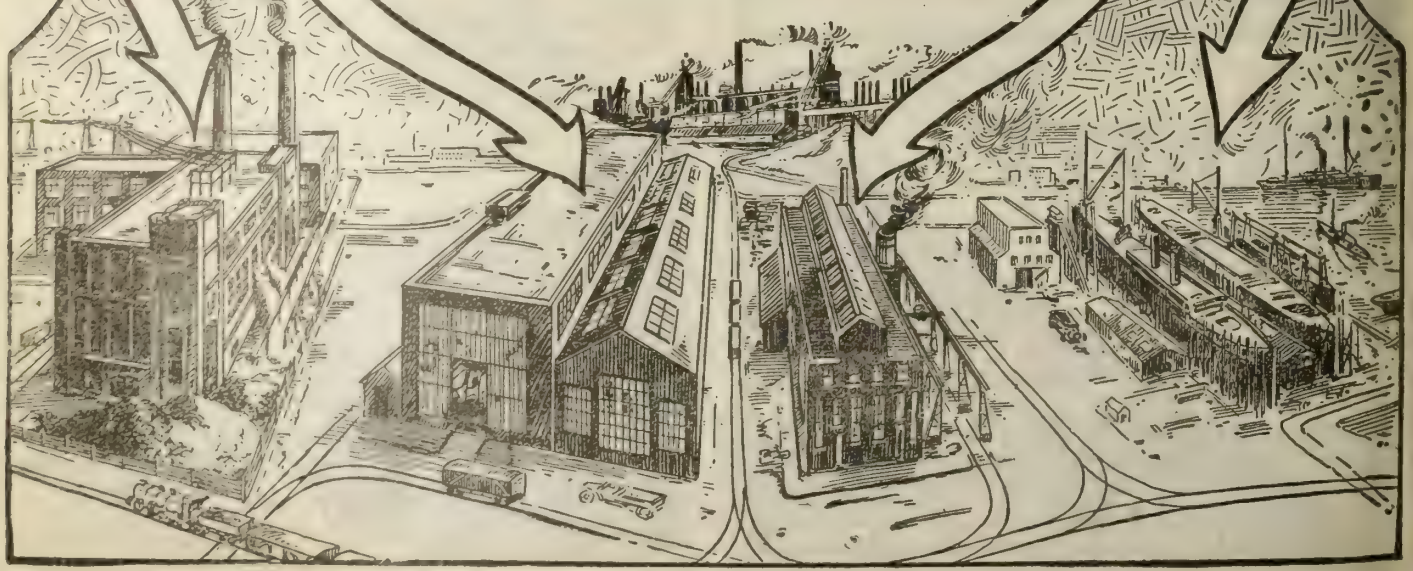
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Union Carbide Co of Can., Ltd., Welland, Ont.

**Cars, Ore**
MacKinnon Steel Co., Sherbrooke, Que

**Castings, Aluminum**
Canada Electric Castings Co., Ltd., Orillia
Can. Hanson & Van Winkle Co., Toronto, Ont
Canada Metal Co., Ltd., Toronto, Ont
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Brass and Bronze**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Canada Electric Castings Co., Ltd., Orillia
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont
Tallman Brass & Metal Co., Hamilton, Ont.

**Castings, Copper**
Canada Metal Co., Ltd., Toronto, Ont.
Can. Hansen & Van Winkle Co., Toronto, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Marine**
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Castings, Die Molded**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Ferro-Alloy**
Can. Steel Foundries, Montreal, Que.

**Castings, Iron**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Hyd. Press**
Can. Steel Foundries, Montreal, Que.

**Castings, Monel Metal**
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

**Castings, Naval Bronze**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Nichrome**
Can. Driver-Harris Co., Walkerville, Ont.

**Castings, Nickel**
Can. Hanson & Van Winkle Co., Toronto, Ont.

**Castings, Semi-Steel**
Davidson Mfg. Co., Thos., Montreal, Que.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

**Castings, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

**Cements, Iron**
Smooth Mfg. Co., Jersey City, N.J.

**Centering Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Chains (See Sprockets and Chains)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chains, Driving**
Can. Link-Belt Co., Toronto, Ont
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chasers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chemists**
Toronto Testing Laboratory, Toronto, Ont.

**Chucking Machines**
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Chucks, Drill**
Jacobs Mfg. Co., Hartford, Conn.

**Chucks, Drill and Tap**
Aikenhead Hardware Ltd., Toronto, Ont
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Lathe**
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Magnetic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**
Columbia Hdwe. Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

**Cleaners, Metal, Waste, General**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Clocks, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Clutches, Friction**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**
Can. Link-Belt Co., Toronto, Ont.

**Cocks and Faucets**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Collars, Shaft or Set**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

**Collets**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compressors, Air**
Curtis Pneumatic Machinery Co., St. Louis, Mo

**Compressors, Air and Gas**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**
Ford-Smith Machine Co., Hamilton, Ont
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Conveyor Belt Joiners**
Flexible Steel Lacing Co., Chicago, Ill.

**Copper**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Cored Bronze Bars**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Cotter Pins**
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Counterbores**
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Countershafts**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Couplers, Car and Locomotive**
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Couplings, Flexible**
Holden Co., Ltd., Montreal, Que.

**Couplings, Rigid**
Bernard Industrial Co., A., Fortierville, Que.

**Couplings, Shaft**
Bilton Machine Co., Bridgeport, Conn
Can. Link-Belt Co., Toronto, Ont.

**Cranes, Electric**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.

**Cranes, Hand (See Hoists, Hand)**
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

**Cranes, Locomotive**
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Cranes, Traveling**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Crank Pin Turning Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia, Pa.

**Cutters, Flue**
Holden Co., Ltd., Montreal, Que.

**Cutters, Gear**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Milling**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Milling Machine Co., Cleveland
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.

**Cutters, Stay Bolt**
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Thread**
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa

**Cutting-Off Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Etna Machine Co., Toledo, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Cutting-Off Machines, Pipe (See Pipe Cutting and Threading Machines)**
Landis Machine Co., Inc., Waynesboro, Pa.
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Cutting-Off Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill
Pilot Steel & Tool Co., Montreal, Que.

**Cutting Oil Filters (See Oil Filtering Systems)**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Cataract Refining Co., Toronto, Ont.

**Cutting, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont

**Cutting, Oxy-Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Dealers, Machinery (See Searchlight Section)**
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Deckle Straps**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Diamonds, Black and Rough**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond, Carbon and Bortz**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond Tools**
Aikenhead Hardware Ltd., Toronto, Ont
Can. Desmond-Stephan Co., Hamilton Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Wheel Trueing Tool Co., Detroit, Mich.

**Diamond Crossings**
Can. Steel Foundries, Montreal, Que.

**Die-Castings**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Dies, Pipe-Threading**
Jones & Lamson Machine Co., Springfield, Vt.

**Die Sinking Machines, Automatic**
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

**Die Sinkers**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Screw and Thread Cutting**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

# BUYERS' DIRECTORY

**s, Forging**
rmstrong-Whitworth of Canada, Ltd., Montreal, Canada.
rown, Boggs & Co., Ltd., Hamilton, Ont.
anada Foundries & Forgings Co., Welland, Ont.
anadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
imber & Hillier Mfg. Co., St. Catharines, Ont.

**s, Hammer**
imber & Hillier, St. Catharines, Ont.

**s, Self-Opening, Adjustable**
an. Fairbanks-Morse Co., Ltd., Montreal.
eometric Tool Co., New Haven, Conn.
erbert Ltd., Alfred, Toronto, Ont.
ones & Lamson Machine Co., Springfield, Vt.
andis Machine Co., Inc., Waynesboro, Pa.
orse Twist Drill & Machine Co., New Bedford, Mass.
urchey Machine & Tool Co., Detroit, Mich.
ational Acme Co., Cleveland, Ohio.
rest-O-Lite Co. of Can., Toronto, Ont.
ratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
ictor Tool Co., Waynesboro, Pa.

**s, Threading-Opening**
ardine & Co., A. B., Hespeler, Ont.
ones & Lamson Machine Co., Springfield, Vt.
andis Machine Co., Inc., Waynesboro, Pa.
orse Twist Drill & Machine Co., New Bedford, Mass.
urchey Machine & Tool Co., Detroit, Mich.
ational Acme Co., Cleveland, Ohio.
ratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
apid Tool & Machine Co., Lachine, Que.

**e Cement**
itchey Supply Co., Toronto, Ont.
auxau Abrasives Co., Chicago, Ill.

**riding Heads**
ackworthe, Ltd., John, Birmingham, Eng.
ickow, Fred. C., Machinery Co., Chicago, Ill.
ord-Smith Machine Co., Hamilton, Ont.
endey Machine Co., Torrington, Conn.
earney & Trecker Co., Milwaukee, Wis.
etrie, Ltd., H. W., Toronto, Ont.

**gs, Lathe and Milling Machine**
rmstrong Bros. Tool Co., Chicago, Ill.

**afting Boards and Tables**
arling Bros., Ltd., Montreal, Que.
conomy Drawing Table & Mfg. Co., Adrian, Mich.
ughes Owens Co., Ltd., Montreal, Que.

**afting Materials**
merican Lead Pencil Co., New York City, N.Y.
arling Bros., Ltd., Montreal, Que.
conomy Drawing Table & Mfg. Co., Adrian, Mich.
ughes Owens Co., Ltd., Montreal, Que.

**essers, Grinding Wheel**
om Abrasive Wheel Co., Ltd., Mimico, Ont.
ord-Smith Machine Co., Hamilton, Ont.
ueco-Koebel Co., Inc., New York, N.Y.
orton Co. of Can., Ltd., Hamilton, Ont.
ixer Machy. Co., Grand Rapids, Mich.

**ill Holders**
rmstrong Bros. Tool Co., Chicago, Ill.

**ill Rods**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**ill Speeders**
Canada Machinery Corp., Galt, Ont.

**rilling Machine Heads**
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

**rilling Machines, Automatic**
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

**rilling Machines, Bench**
Beacon Engineering Co., Tipton, England.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**rilling Machines, Electric and Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**rilling Machines, Gang**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**rilling Machines, Heavy Duty**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy Co., Toronto, Ont
Hoosier Drilling Mach Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Multiple Spindle**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn
Henry & Wright Mfg. Co., Hartford, Conn
Hoefer Mfg. Co., Freeport, Ill
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

**Drilling Machines, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Drilling Machines, Portable**
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Radial**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Drilling Machines, Sensitive**
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn
Herbert Ltd., Alfred, Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Turret**
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

**Drilling Machines, Vertical**
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng.
Streblinger Co of Can., Ltd., Chas A., Windsor, Ont.

**Drills, Center**
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drills, High Speed Twist**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Drills, Twist and Flat**
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O
Can. Detroit Twist Drill Co., Walkerville, Ont.
Pilot Steel & Tool Co., Montreal, Que.

**Dust Handling Equipment**
Can. Blower & Forge Co., Ltd., Kitchener
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass

**Electrical Instruments**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Electrical Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que
U.S. Electrical Tool Co., Cincinnati, O

**Elevating Trucks (See Trucks)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Elevators and Conveyors**
Can. Link-Belt Co., Toronto, Ont
Can. Fairbanks-Morse Co., Ltd., Montreal
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que
Main Belting Co of Can., Montreal, Que
Mathews Gravity Carrier Co., Port Hope, Ont.

**Emery Wheels (See Grinding Wheels)**
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Hart Products, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Norton Co of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Engines, Capstan**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Engineers, Mechanical**
Dominion Engineering Works, Ltd., Montreal, Que
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis
Hamilton Engineering Service, Ltd Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.

**Expanders, Tube**
Garlock-Walker Mchy Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que
Jardine & Co., A. B., Hespeler, Ont
Petrie, Ltd., H. W., Toronto, Ont.

**Eyeglasses, Safety (See Goggles, Safety)**
Prest-O-Lite Co. of Can., Toronto, Ont
Willson Goggles, Inc., Reading, Pa.

**Fans, Electric**
Can. Blower & Forge Co., Ltd., Kitchener
Can. Fairbanks-Morse Co., Ltd., Montreal
Northern Electric Co., Montreal, Que
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass

**Fans, Exhaust**
Can. Blower & Forge Co., Ltd., Kitchener
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Ventilating**
Can. Blower & Forge Co., Ltd., Kitchener
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**File Handles**
Ingersoll File Co., Ltd., Ingersoll, Ont

**Files and Rasps**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Filing Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Filler, Iron (See Cements, Iron)**
Smooth Mfg. Co., Jersey City, N.J.

**Fire Extinguishers**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Fittings, Pipe**
International Malleable Iron Co., Guelph, Ont.

**Flexible Shafts**
Aikenhead Hardware Ltd., Toronto, Ont

**Flux, Galvanizing**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Fluxes, Welding**
L'Air Liquide Society, Toronto, Ont.

**Forging Machinery**
Acme Machinery Co., Cleveland, Ohio
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy. Co., Toronto, Ont
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot
Steel Co of Canada, Ltd, Hamilton, Ont

**Forgings, Drop**
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd Toronto, Ont.

**Forgings, Hammer**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Dom. Foundries & Steel, Hamilton, Ont
Hepburn Ltd., John T., Toronto, Ont
N. S. Steel Co., Ltd., New Glasgow, N S
Steel Co of Canada, Ltd., Hamilton, Ont

**Foundry Equipment**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand, Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Foundry Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Frogs, Spring or Rigid**
Can. Steel Foundries, Montreal, Que.

**Fuel Oil Burning System**
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Coal**
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Oil and Gas**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces and Ovens, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd Hiram, Walkerville, Ont.

**Furnaces, Tempering and Annealing**
Brown & Sharpe Mfg. Co., Providence, R.I
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furniture, Machine Shop**
Garlock-Walker Mchy. Co., Toronto, Ont.

**Gages, Comparator**
Jones & Lamson Machine Co., Springfield, Vt.
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont
Perdue, W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass.

**Gages, Measuring (See Tool Work)**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Q
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont
Starrett Co., L. S., Athol, Mass.

**Gages, Recording**
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.
Taylor Instrument Co., Toronto, Ont.

# BUYERS' DIRECTORY

Ackworthie, Ltd., John, Birmingham, Eng
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Standard**
Armstrong Whitworth Co. of Can., Lt Montreal, Que
Atkins & Co., Inc., E. C., Indianapolis,
Johansson Inc., C. E., Windsor, Ont.

**Gages, Thread**
Ackworthie, Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Gas, Coal Compressed**
L'Air Liquide Society, Toronto, Ont.

**Gas, Compressed**
Prest-O-Lite Co. of Can., Toronto Ont.

**Gaskets**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

**Gauges, Vacuum and Pressure**
Taylor Instrument Co., Toronto, Ont.

**Gear Blanks**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario
Philadelphia Gear Works, Philadelphia, Pa.

**Gear-Cutting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

**Gear Testing Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.

**Gears, Cast**
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

**Gears, Cut**
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hamilton Gear & Machine Co., Toronto, Ontario.
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Gears, Dressed**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Gears, Forged**
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Gears, Herringbone**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

**Gears, Machine Moulded**
Can. Steel Foundries, Montreal, Que.

**Gears, Rawhide (See Gears, Cut)**
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa

**Gear, Silent Chain**
Gardner & Son, Robt., Montreal, Que
Morse Chain Co., Ithaca, N.Y.
Can. Link-Belt Co., Ltd., Toronto, Can.
Hans Renold of Canada, Ltd., Montreal, Quebec.

**Gears, Worm**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.

**Generators, Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Generators, Electric**
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Goggles, Safety**
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

**Grab Buckets**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Grease Cups, Pressed Steel and Brass**
Can. Winkley Co., Ltd., Windsor, Ont.

**Greases, Lubricating**
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

**Grinding Discs**
Ritchey Supply Co., Toronto, Ont.

**Grinding Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**Grinding Machines, Abrasive Belt**
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Automatic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Bench**
Aikenhead Hardware Ltd., Toronto, Ont.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Grinding Machines, Center**
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines Chaser**
Jones & Lamson Machine Co., Springfield, Vt.

**Grinding Machines, Cutter and Reamer**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Cylindrical**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Die**
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

**Grinding Machines, Disc**
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Drill**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Face**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Floor and Tool**
Beacon Engineering Co., Tipton, England.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Grinding Machines, Internal**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Portable**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Power Oscillating Tool**
Herbert Ltd., Alfred, Toronto, Ont.

**Grinding Machines, Ring Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Snagging**
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Surface**
Garlock-Walker Mchy. Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machinery, Tool Post**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Universal**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.

**Grinding Wheels**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Guards, Emery Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Guards, Machinery and Window**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Guards, Electric Lamp**
Flexible Steel Lacing Co., Chicago, Ill.

**Gun-Barrel Machinery**
Steinle Turret Machine Co., Madison, Wis.

**Hack Saws, Power**
Ackworthie, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Hamilton, Canada.
Garlock-Walker Mchy. Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hammers, Chipping**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hammers, Drop**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

**Hammers, Electric**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Hammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Hammers, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hammers, Rivetting**
Cleveland Pneumatic Tool Co., Toronto Ont.

**Hangers, Shafting**
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F. Montreal, Que.
Terry & Co., John C., Birmingham, Eng
Williams Machinery & Supply Co., A. R. Montreal, Que.

**Hardening, Case-Hardening and Tempering**
Hamilton Gear & Machine Co., Toronto Ont.

**Hardness Testing Apparatus**
Shore Instrument Co., Jamaica, N.Y.

**Heating**
Skinner Bros. Mfg. Co., Inc., St. Louis Mo.

**Hobbing Machines**
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hobs**
Armstrong-Whitworth of Canada, Ltd Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R I
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd Dundas, Ont.

**Hoists, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montrea
Garlock-Walker Mchy. Co., Toronto, Ont
Morris Crane & Hoist Co., Ltd., Niagar Falls, Ont.
Northern Crane Works, Walkerville, Ont
Shepard Electric Crane & Hoist Co Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

**Hoists, Hand**
Lyman Tube & Supply Co., Montreal, Que
Morris Crane & Hoist Co., Ltd., Niagar Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Hoists, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Il
Morris Crane & Hoist Co., Ltd., Niagar Falls, Ont.
Northern Crane Works, Walkerville, On

**Holders-On, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Cleveland Pneumatic Tool Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Il

**Hose, Flexible Steel**
Can. Fairbanks-Morse Co., Ltd., Montrea
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Hose, Industrial**
Dunlop Tire & Rubber Goods Co., Ltd Toronto, Ont.
Goodyear Tire & Rubber Co. of Can Ltd., Toronto, Ont.

**Hose, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Foamite Firefoam Co., Hamilton Ont.

**Hydraulic Leather**
Graton & Knight Mfg. Co., Worcester Mass.

**Hydraulic Machinery**
Bertram & Son Co., Ltd., The John Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Garlock-Walker Mchy. Co., Toronto, On
Stewart & Co., Duncan, Glasgow, Sco

**Hydrogen**
National Electro Products, Ltd., Toronto Ont.

**Index Centers**
Dickow, Fred. C., Machinery Co., Chicago, Ill.

**Igniters, Gas Engine**
Canada Foundries & Forgings Co., Welland, Ont.

**Indicators, Speed and Test**
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis,
Brown & Sharpe Mfg. Co., Providence, R

**Insulation**
Diamond State Fibre Co. of Can., Ltd Toronto, Ont.

**Iron Valves**
Puro Sanitary Drinking Fountain Co Haydenville, Mass.

**Jacks, Hydraulic**
Norton, A. O., Boston, Mass.

**Jacks, Planer**
Armstrong Bros. Tool Co., Chicago, I
Starrett Co., L. S., Athol, Mass.
Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que
Crescent Machine Co., Ltd., Montreal,

# BUYERS' DIRECTORY

**gs and Fixtures (See Tool Work)**
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**eyseating Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**eys, Machine**
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

**nives, Machine**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Simonds Canada Saw Co., Montreal, Que.

**nurl Holders**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**acing Leather**
Tupper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

**amps, Electric**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**athe Attachments**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.

**Lathe Pans, Portable**
Canada Machinery Corp., Galt, Ont.

**Lathe Tools**
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

**Lathes, Automatic and Semi-Automatic**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Bench**
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lathes, Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
McDougall Co., Ltd., R., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Engine**
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Sidney Machine Tool Co., Sidney, Ohio.
Strasinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Warnott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Extension and Gap**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Lathes, Heavy Duty Projectile Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blaishill Wire Machy. Co., Ltd., Montreal.
Sidney Machine Tool Co., Sidney, Ohio
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio

**Lathes, Polishing (See Polishing and Bufing Machines)**
Ford-Smith Machine Co., Hamilton, Ont.

**Lathes, Relieving**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Lathe, Universal Hand**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Lathes, Screw-Cutting**
Jones & Lamson Machine Co., Springfield, Vt.

**Lathe, Speed and Hand**
Blount Co., J. G., Everett, Mass.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Lathes, Spinning**
Terry & Co., John C., Birmingham, Eng.

**Lathes, Threading**
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

**Lathes, Vertical Turret**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

**Lathes, Wood Turning**
Blount Co., J. G., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Lead Pipe**
Canada Metal Co., Ltd., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Lighting Fixtures**
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

**Linoleum Mill Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Liquid Air Plants**
L'Air Liquide Society, Toronto, Ont.

**Lockers, Clothes**
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

**Lubricants**
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Lubricating Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Machinists' Small Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strasinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Truing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Mandrels, Expanding**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Mandrels, Solid**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Measuring Machines**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Metals, Alloy**
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Tallman Brass & Metal, Ltd., Hamilton, Ontario.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Metalite Cloth**
Ritchey Supply Co., Toronto, Ont.

**Micrometer Calipers**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Milling Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Milling Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**Milling Machines, Automatic**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Bench**
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Hand**
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

**Milling Machines, Horizontal and Planer Type**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Milling Machines, Plain**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Milling Machines, Universal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Cincinnati Milling Machine Co., Cincinnati, Ohio
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Milling Machines, Vertical**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

**Monel Metal**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Motors, Electric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis

**Moulded Rubber Goods**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Nail Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Nails and Staples**
Canada Metal Co., Ltd., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Nickel, Bars, Sheets, Wire, Etc.**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Nickel Plating Outfits**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Nickel Silver**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Nitrogen**
L'Air Liquide Society, Toronto, Ont.

**Nut Tappers (See Bolt and Nut Machinery)**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

**Nuts, Finished and Semi-finished**
Galt Machine Screw Co., Galt, Ont.

**Nuts, Machine Screw**
Torrington Company, Ltd., Upper Bedford, Que.

**Nuts, S.A.E., Plain and Castellated**
Galt Machine Screw Co., Galt, Ont.

**Oil Cocks and Burners**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Oil Filtering and Storage Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oil Storage Engineers**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oils**
Canadian Oil Companies, Ltd., Toronto, Ont.
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Hole Covers**
Can. Winkley Co., Ltd., Windsor, Ont.

**Oils, Soluble**
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oxygen**
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

**Oxy-Acetylene Apparatus**
L'Air Liquide Society, Toronto, Ont.

**Packing, Hydraulic**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

**Packing, Steam**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

**Paper Mill Conveyors**
Bertrams Ltd., Edinburgh, Scotland
Dominion Dismantling Works, Ltd., Montreal, Que.

**Patents**
Fetherstonhaugh & Co., Ottawa, Ont
Marion & Marion, Montreal, Que

**Pans, Wet and Dry**
Frost Mfg. Co., Chicago, Ill

**Pattern-Shop Machinery (See Woodworking Machinery)**
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Patterns, Wood and Metal**
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Wraggis Pattern Works, Galt, Ont.

**Penstocks, Steel**
MacKinnon Steel Co., Sherbrooke, Que.

# BUYERS' DIRECTORY

**Phosphor Tin**
British Smelting & Refining Co., Ltd., Montreal, Que
Canada Metal Co., Ltd., Toronto, Ont

**Photographic Duplicating Machines**
Commercial Camera Co., Providence, R.I.

**Pig Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Bending Machines**
American Pipe Bending Machine Co., Boston, Mass
Can. Fairbanks-Morse Co., Ltd., Montreal.
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

**Pipe Couplings**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Cutting and Threading Machines**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**
Landis Machine Co., Inc., Waynesboro, Pa

**Pipe Fitters' Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa.

**Piston-Ring Machines**
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Planers, Parallels**
L. & P. Mfg. Co., Niagara Falls, Ont.

**Planing Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Planing Machines, Rotary**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Plumbers' Brass Goods**
Pure Sanitary Drinking Fountain Co., Haydenville, Mass.

**Pneumatic Tools**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Blount Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Pots, Steel**
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Pressed Steel Parts**
Ackworthie, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich
Can. Fairbanks-Morse Co., Ltd., Montreal.
L. & P. Manufacturing Company, Ltd., Niagara Falls, Ont.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Streiliger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Presses, Drop and Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Foot and Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

**Presses, Forcing**
Atlas Press Co., Kalamazoo, Mich.
Stewart & Co., Duncan, Glasgow, Scot.

**Presses, Hydraulic**
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

**Presses, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Protractors**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Propellers**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Pulleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal and Fibre**
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Pulp and Paper Mill Equipment**
Dominion Engineering Works, Ltd., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que

**Pumps, Barrel and Boiler-feed**
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coalant**
Trahern Pump Co., Rockford, Ill.

**Pumps, Geared and Hand**
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**
Can. Fairbanks-Morse Co., Ltd., Montreal
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Dominion Engineering Works, Ltd., Montreal, Que.
Hepburn Ltd., John T., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

**Pumps, Lubricant and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Jardine & Co., A. B., Hespeler, Ont.

**Punches, Power**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

**Punching Machines, Horizontal**
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Taylor Instrument Co., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Racks, Cut**
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**
Holden Co., Ltd., Montreal, Que.

**Reamer Holders**
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.

**Reamers, Expanding**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Reamers, Solid**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Reamers, Taper**
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Recorders, Temperature**
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Recorders, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Regulators, Temperature**
Taylor Instrument Co., Toronto, Ont.

**Rheostats**
Northern Electric Co., Montreal, Que.

**Resistance Materials**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Rivets**
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

**Rivet Heaters**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.

**Riveting Machines**
Bilton Machine Co., Bridgeport, Conn.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**
Stewart & Co., Duncan, Glasgow, Scot.

**Rolls (Rubber Covered)**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rudder Frames, Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Rubber Goods, Mechanical**
Quaker City Rubber Co., Philadelphia, Pa.

**Rubber Machinery Makers**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rules, Steel**
Chesterman & Co., Ltd., J., Sheffield, Eng.

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Rust Preventatives**
Oakley Chemical Co., New York, N.Y.

**Sand Equipment**
Can. Link-Belt Co., Toronto, Ont.

**Sand Mills**
Frost Mfg. Co. Chicago, Ill.

**Sanding Machinery**
Oliver Machy. Co., Grand Rapids, Mich

**Sand Rammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Saw Frames and Blades, Hack**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que

**Sawing Machines, Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que

**Sawing Machines, Power Hack**
Ackworthie, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Saw Sharpening Machines**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saw Tables, Universal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que

**Saws, Hot and Cold**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que
Stewart & Co., Duncan, Glasgow, Scot

**Saws, High Speed Steel**
Armstrong-Whitworth of Canada, Ltd Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que
Clemson Bros., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd. Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que

**Saws, Metal Band**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich

**Saws, Metal, Power**
Clemson Bros., Inc., Hamilton, Ont.

**Saws, Metal Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que
Pratt & Whitney Co., of Canada, Ltd. Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que
Starrett Co., L. S., Athol, Mass.

**Saws, Milling**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd. Dundas, Ont.

**Saws, Screw Slotting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que
Pratt & Whitney Co., of Canada, Ltd. Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que

**Saws, Swing Cut-off**
Oliver Machinery Co., Grand Rapids, Mich

**Scales**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal, Q

**Screens**
Can. Wire & Iron Goods Co., Hamilton Ont.

**Screens, Paper**
Dominion Engineering Works, Ltd Montreal, Que.

**Screw Drivers, Optical, Jewelry and Novelty**
Torrington Co., Ltd., Upper Bedford, Que

**Screw Driving Machine**
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill

**Screw Extractors**
Cleveland Twist Drill Co., Cleveland, O

**Screw Machine Work**
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
Tallman Brass & Metal Co., Hamilton Ont.

# BUYERS' DIRECTORY

**rew Machinery, Wood and Lag**
ook Co., Asa S., Hartford, Conn.

**rew Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.

**rew Machines, Automatic**
arlock-Walker Mchy. Co., Toronto, Ont.
erbert Ltd., Alfred, Toronto, Ont.
ational Acme Co., Cleveland, Ohio.

**rew Machines, Plain or Hand**
cme Machine Tool Co., Cincinnati, Ohio.
reenfield Tap & Die Corp., Galt, Ont.
erbert Ltd., Alfred, Toronto, Ont.
ratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
arner & Swasey Co., Cleveland, Ohio.

**rew Machine Products**
orrington Company, Ltd., Upper Bedford, Que.

**rew Plates**
ikenhead Hardware Ltd., Toronto, Ont.
utterfield & Co., Inc., Rock Island, Que.
reenfield Tap & Die Corp., Galt, Ont.
ardine & Co., A. B., Hespeler, Ont.

**rews, Cap and Set**
alt Machine Screw Co., Galt, Ont.
orrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
ational Acme Co., Cleveland, Ohio
orrington Company, Ltd., Upper Bedford, Que.

**rews, Lock Cap**
orrington Company, Ltd., Upper Bedford, Que.

**rews, Machine**
arnes Co., Wallace, Bristol, Conn.
eel Co. of Canada, Ltd., Hamilton, Ont.
orrington Company, Ltd., Upper Bedford, Que.

**rews, Safety Set**
arnes Co., Wallace, Bristol, Conn.
alt Machine Screw Co., Galt, Ont.
orrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**rews, Side Knob**
orrington Company, Ltd., Upper Bedford, Que.

**rews, Thumb**
orrington Company, Ltd., Upper Bedford, Que.

**ond-Hand Machinery**
e last page of directory.
ertrie, Ltd., H. W., Toronto, Ont.

**parators, Moisture and Oil**
owser, S. F., & Co., Ltd., Toronto, Can.
an. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**parators, Oil and Waste**
owser, S. F., & Co., Ltd., Toronto, Can.

**afting**
anada Foundries & Forgings Co., Welland, Ont.
an. Drawn Steel Co., Hamilton, Ont.
S. Steel Co., Ltd., New Glasgow, N.S.
illiams Machinery Co., A. R., Toronto, Ont.
illiams Machinery & Supply Co., A. R., Montreal, Que.

**apes, Cold-Drawn Special Steel**
ilton Drawn Steel Co., Hamilton, Ont.

**aping Machines**
anada Machinery Corp., Galt, Ont.
ss Machinery & Supply Co., Geo. F., Montreal, Que.
udley Machine Co., Torrington, Conn.
erbert Ltd., Alfred, Toronto, Ont.
olly, R. S., Toronto, Ont.
rton Mfg. Co., Muskegon, Mich.
cDougall Co., Ltd., R., Galt, Ont.
elelson Machine & Tool Co., Toronto, Ont.
ith & Mills Co., Cincinnati, Ohio
alcott Lathe Co., Jackson, Mich.
illiams Machinery Co., A. R., Toronto, Ont.

**apers, Wood**
ver Machinery Co., Grand Rapids, Mich.

**ars, Hand**
Blower & Forge Co., Ltd., Kitchener.

**ars, Power**
s Co., E. W., Brooklyn, N.Y.
own, Boggs & Co., Ltd., Hamilton, Ont.
anada Machinery Corp., Galt, Ont.
Blower & Forge Co., Ltd., Kitchener.
all Co., Inc., D. H., Buffalo, N.Y.
& Co., Duncan, Glasgow, Scot.
edo Machine & Tool Co., Toledo, Ohio
illiams Machinery Co., A. R., Toronto, Ont.

**earing Machines, Angle, Iron Bar**
**d Gate**
ngrams Ltd., Edinburgh, Scotland.

**eet Lead**
ada Metal Co., Ltd., Toronto, Ont.

**ect Metal Working Machinery**
ss Co., E. W., Brooklyn, N.Y.
own, Boggs & Co., Ltd., Hamilton, Ont.
arlock-Walker Mchy. Co., Toronto, Ont.
erbert Ltd., Alfred, Toronto, Ont.
all Co., Inc., D. H., Buffalo, N.Y.
ry & Co., John C., Birmingham, Eng.
edo Machine & Tool Co., Toledo, Ohio

**ets, Nickel, Resist, Alloy**
ernational Nickel Co. of Can., Ltd., Toronto, Ont.

**ets, Nickel, Monel and Fibre**
amond State Fibre Co. of Can., Ltd., Toronto, Ont.

**s Frames, Locomotive**
an. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Slotting Attachments**
Ford Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

**Slotting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

**Solders**
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.

**Snap Flasks**
Oliver Machy. Co., Grand Rapids, Mich.

**Special Machinery and Tools**
Brown Engineering Corp., Ltd., Toronto
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Specialties, Swaged and Headed Work**
Torrington Company, Ltd., Upper Bedford, Que.

**Springs**
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

**Spring-making Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Sprockets and Chains**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Squares**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Stamping, Metal**
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Metal Stamping Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Stamps, Steel**
Diamond Saw & Stamping Works, Buffalo, N.Y.

**Stairways, Wrought Iron**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Steam Specialties**
Crane Ltd., Montreal, Que.

**Steel Plate**
Dom. Foundries & Steel, Hamilton, Ont.

**Steels, Tool**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel Blooms and Billets**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steel, Cold-Rolled Strip**
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Steel Castings**
Dom. Foundries & Steel, Hamilton, Ont.

**Steel Forgings**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Sheets, Open Hearth Steel**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steel, Shafting and Free Cutting Screw**
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

**Steel, Sheet**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

**Steel, Stainless**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel Wire Rods**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steels, Alloy, Open Hearth and Electric**
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
United Alloy Steel Corp., Canton, Ohio.

**Steels, Alloy and Carbon**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steels, High-Speed**
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel, Magnet**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel, Structural**
MacKinnon Steel Co., Sherbrooke, Que.

**Steel Tubing, Close Joint and Welded**
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

**Stern Frames, Cast Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Straightening Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Studs**
Galt Machine Screw Co., Galt, Ont.

**Surface Plates**
Bilton Machine Co., Bridgeport, Conn.

**Swaging Machines**
Atkins & Co., Inc., E. C., Indianapolis, I
Etna Machine Co., Toledo, Ohio.

**Swaging Machine Parts**
Etna Machine Co., Toledo, Ohio

**Switches, Railway**
Can. Steel Foundries, Montreal, Que.

**Switches and Switchboards**
Northern Electric Co., Montreal, Que.

**Tablets, Bronze, Memorial**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Tachometers**
Aikenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

**Tanks, Steel**
MacKinnon Steel Co., Sherbrooke, Que.

**Tanks and Pumps, Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

**Taper Cutting Dies**
Jones & Lamson Machine Co., Springfield, Vt.

**Tap Holders**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taper Pins**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Tapes, Measuring**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass.

**Tapping Machines and Attachments**
Ackworthle, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Taps and Dies**
Ackworthle, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taps, Collapsing**
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Teeth, Dredge Bucket**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Testing Metals and Materials**
Toronto Testing Laboratory, Toronto, Ont.

**Thermometers**
Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Toronto, Ont.

**Thread-Cutting Tools**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Thread Cutting Machines**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa.

**Threaded Wires**
Torrington Company, Ltd., Upper Bedford, Que.

**Threading Machines**
Acme Machinery Co., Cleveland, Ohio.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Thread Lead Testing Machines**
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Thread-Rolling Machines**
Bliss Co., E. W., Brooklyn, N.Y.

**Tongs**
Hepburn Ltd., John T., Toronto, Ont.

**Tool Cases**
Rice Lewis & Son, Ltd., Toronto, Ont.

**Tool Holders**
Armstrong Bros. Tool Co., Chicago, Ill.
Bilton Machine Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Markers, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Tool Posts, Lathe**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Steels for all Purposes**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Tools, Small (See Machinists' Small Tools)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Bertrams Ltd., Edinburgh, Scotland.
Burgess & Marchand, Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
Chesterman & Co., Ltd., J., Sheffield, Eng.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.
National Machine Tool Co., Racine, Wis
Rapid Tool & Machine Co., Lachine, Que
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass
**Strelinger Co. of Can., Ltd., Chas. A. Windsor, Ont.**
Wheel Trueing Tool Co., Detroit, Mich
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que

**Tool Work**
Brown Engineering Corp., Ltd., Toronto
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.

# BUYERS' DIRECTORY

**Torches, Blow**
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Trackwork, Railway**
Can. Steel Foundries, Montreal, Que.

**Trackwork, Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Transformers**
Northern Electric Co., Montreal, Que.

**Transmission Machinery**
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Jones & Glassco, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Toronto, Ont.
Renold (Hans) of Canada, Ltd., Montreal Que.

**Transportation Systems (See Trucks)**
Mathews Gravity Carrier Co., Port Hope, Ont.

**Treated Bits**
Can. Atlas Crucible Steel Co., Toronto Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Trolleys and Tramways**
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Trucks**
Can. Fairbanks-Morse Ltd., Montreal Q.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Maple Leaf Mfg. Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Trucks, Industrial Motor**
Maple Leaf Mfg. Co., Montreal, Que.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Tube, Products**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Electric Welded or Oxy-Acetylene Welded**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Flexible**
Dunlop Tire & Rubber Goods Co., Ltd. Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Tubing, Seamless Steel**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Seamless Steel, Brass and Copper and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Steel Products Co., Brantford, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Tubing, Welded**
International Nickel Co. of Can., Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Tubing, Welded Steel**
Tube Co. of Canada, Toronto, Ont.

**Turbines, Water**
Dominion Engineering Works, Ltd., Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.

**Turret Heads**
Ackworthle, Ltd., John, Birmingham, Eng.
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Turret Machines (See Lathes, Horizontal Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Cook Co., Asa S., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Turrets, Tool Post**
Gisholt Machine Co., Madison, Wis

**Unions, Pipe**
Crane Ltd., Montreal, Que

**Universal Joints**
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Valves**
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Crane Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Vises, Drilling Machine**
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
Charles Parker Co., Meriden, Conn.

**Vises, Metal Workers'**
Aikenhead Hardware, Ltd., Toronto, Ont.
Columbia Hdwe. Division, Cleveland, O.
Charles Parker Co., Meriden, Conn.

**Vises, Milling Machine**
Brown & Sharpe Mfg. Co., Providence, R.I.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Charles Parker Co., Meriden, Conn
Oliver Machy. Co., Grand Rapids, Mich.
Charles Parker Co., Meriden, Conn.
Victor Tool Co., Waynesboro, Pa.
Parmenter & Bulloch Co., Gananoque Ont.

**Voltmeters**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Wagon Loaders**
Can. Link-Belt Co., Toronto, Ont.

**Washers**
Barnes Co., Wallace, Bristol, Conn.
Diamond State Fibre Co., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

## DIRECTORY OF DEALERS

THE Buyers' Directory of CANADIAN MACHINERY was originally intended to contain information regarding lines actually manufactured by our advertisers. We now carry the advertising of leading machinery dealers, some of whom represent scores of manufacturers in addition to being manufacturers themselves in some cases. This necessarily widened the scope of our Directory, but it would be impracticable to list all the lines handled by all the dealers. We recommend, therefore, if our subscribers cannot find what they want in our Directory that they communicate with the dealers whose names appear herewith.

### MACHINE TOOLS AND METAL WORKING EQUIPMENT

Chas. P. Archibald & Co., Montreal, Que.
The Canadian Fairbanks-Morse Co., Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
H. W. Petrie Limited, Toronto, Ont
The Standard Equipment & Tool Co., Montreal, Que.
Chas. A. Strelinger Co. of Canada, Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Wilson-McGovern Limited, Toronto Ont.
Yeates Machinery Co., London, Ont.

### MACHINE SHOP AND FACTORY SUPPLIES

Chas. P. Archibald & Co., Montreal, Que.
The Canadian Fairbanks-Morse Co., Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
H. W. Petrie Limited, Toronto, Ont
The Standard Equipment & Tool Co., Montreal, Que.
Chas. A. Strelinger Co. of Canada, Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Wilson-McGovern Limited, Toronto, Ont.
Yeates Machinery Co., London, Ont.

### POWER EQUIPMENT AND SUPPLIES

The Canadian Fairbanks-Morse Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
H. W. Petrie Limited, Toronto, Ont.
The Standard Equipment & Tool Co. Montreal, Que.
Wilson-McGovern Limited, Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.

### WOODWORKING MACHINERY

Chas. P. Archibald & Co., Montreal, Que.
The Canadian Fairbanks-Morse Co., Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
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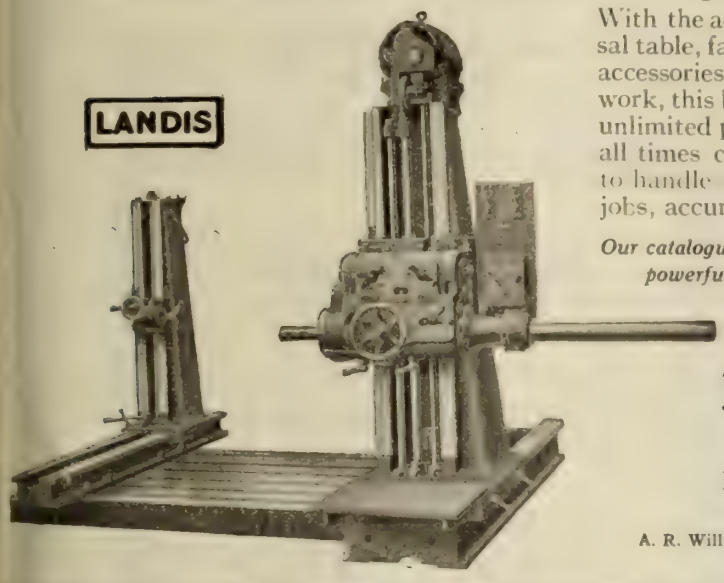
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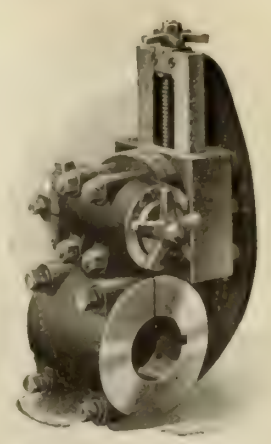
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# CANADIAN MACHINERY
## AND MANUFACTURING NEWS

Vol. XXV., No. 25 Published by the MacLean Publishing Company, Limited, London, Ont. June 23, 1921 $4.00 a Year Subscription Price


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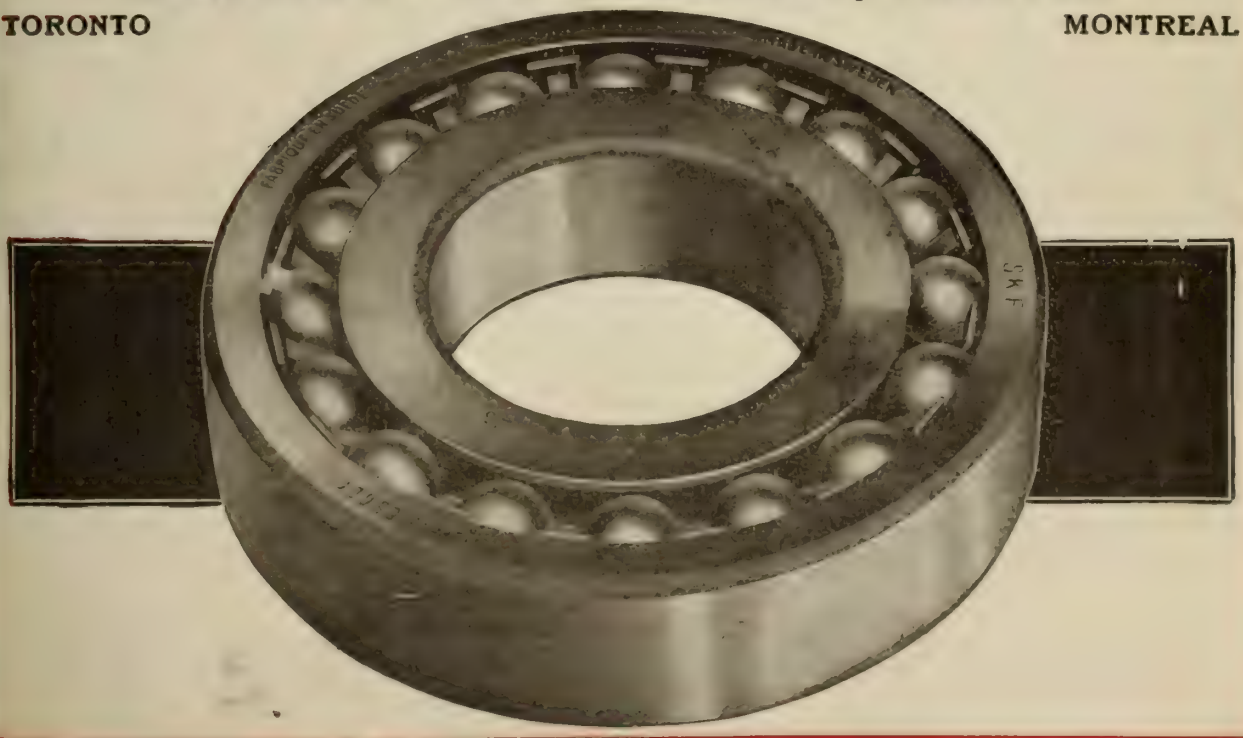
—in variations in products making finishing by hand necessary.

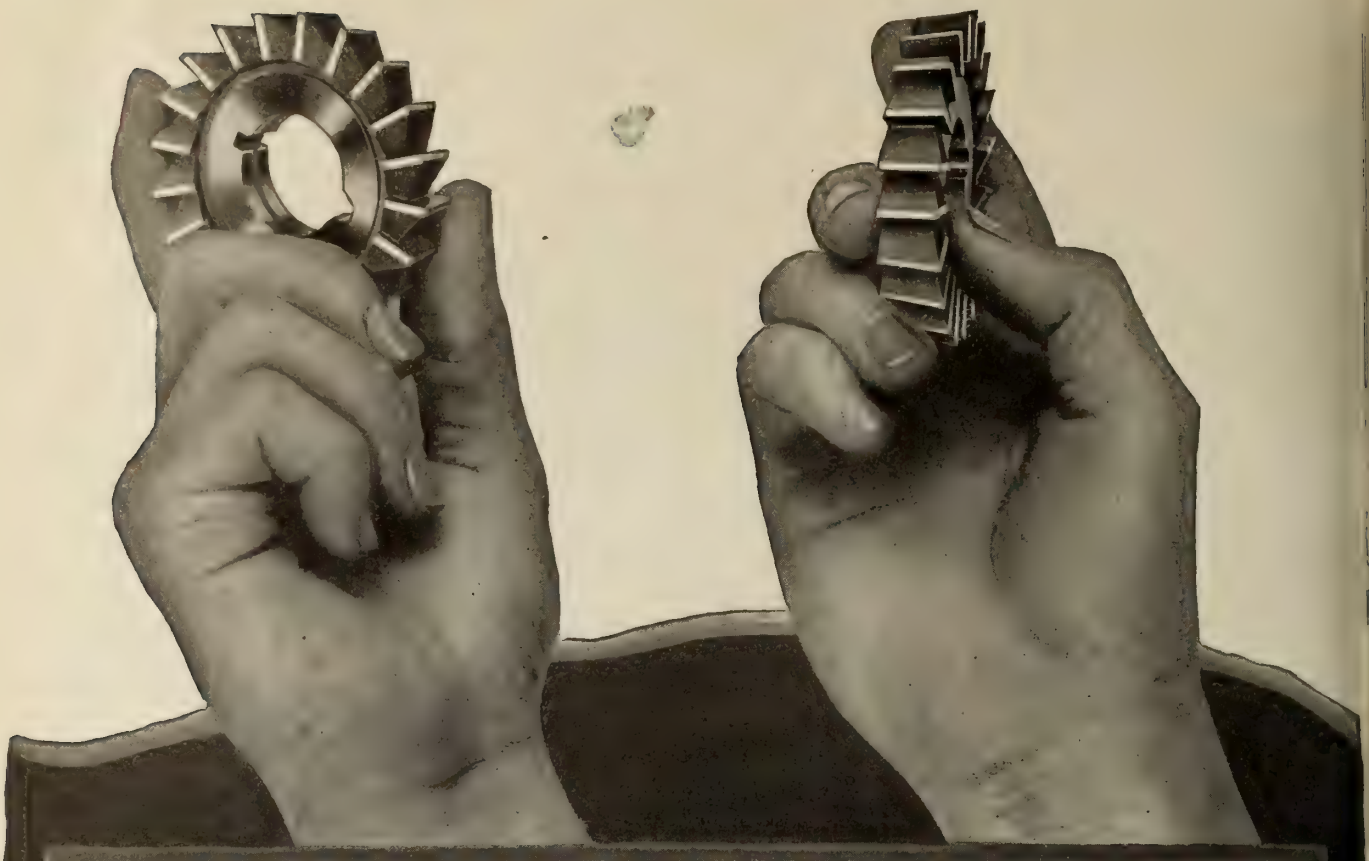
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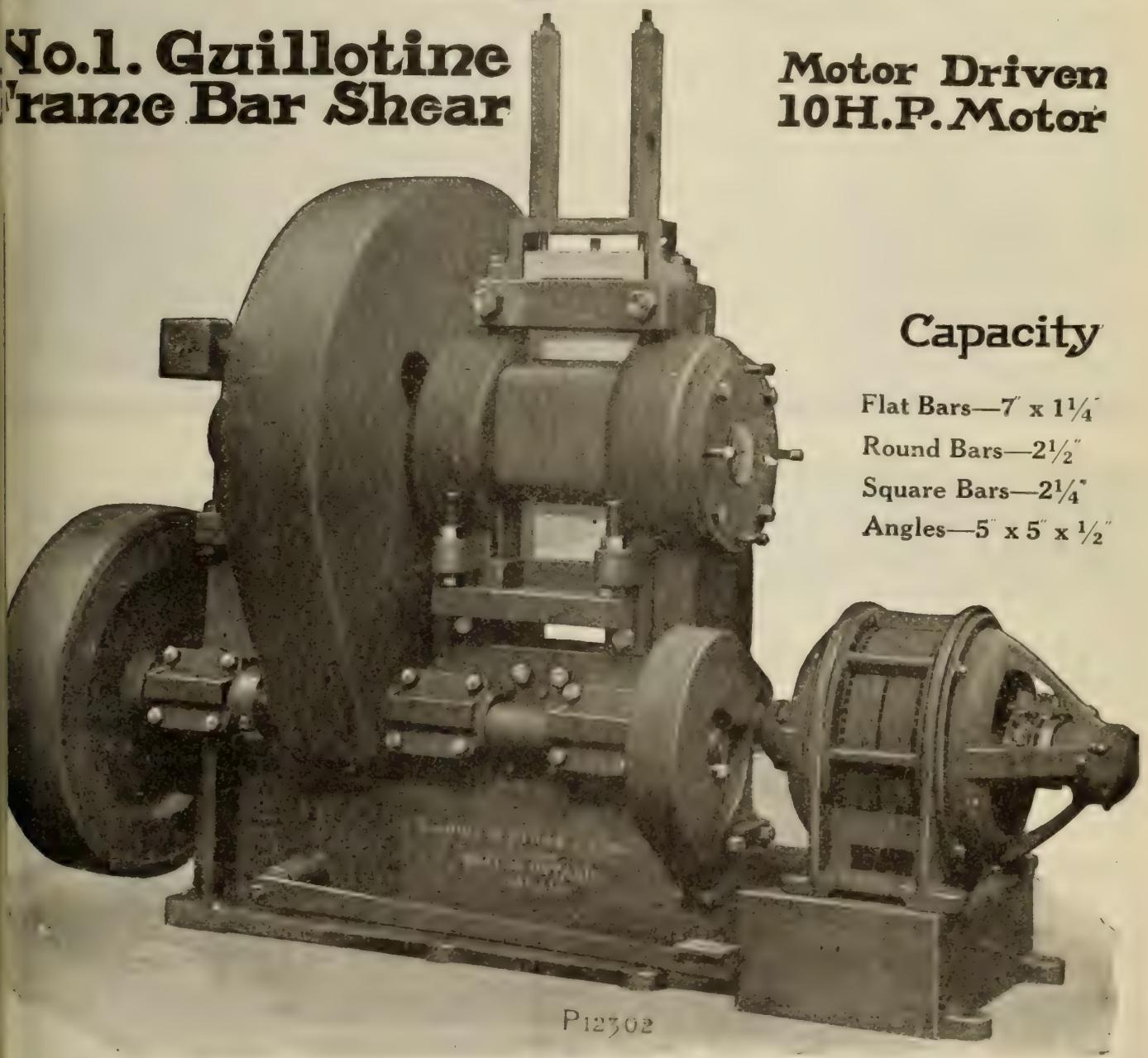
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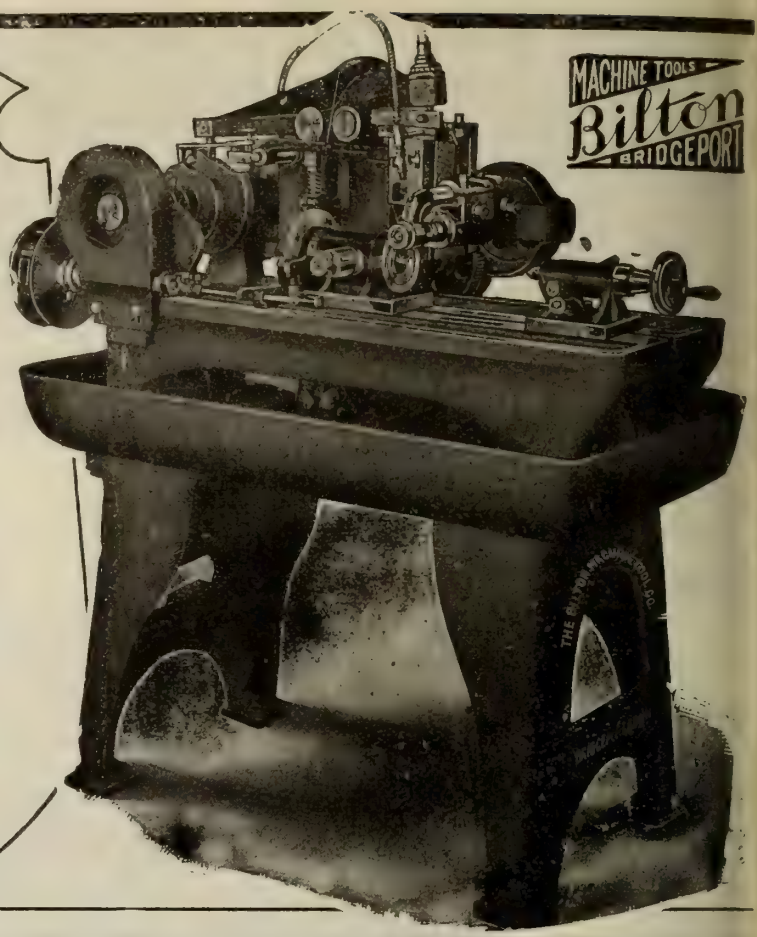
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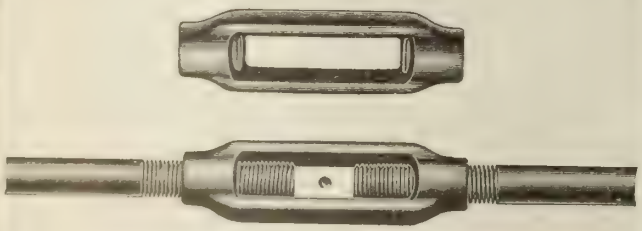
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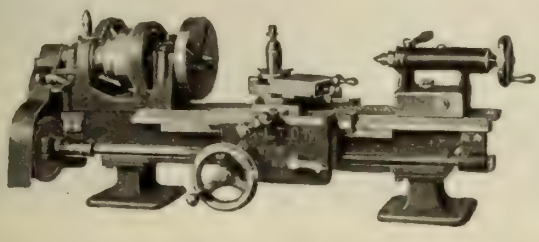
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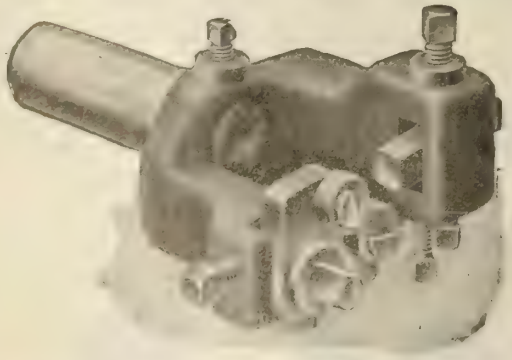
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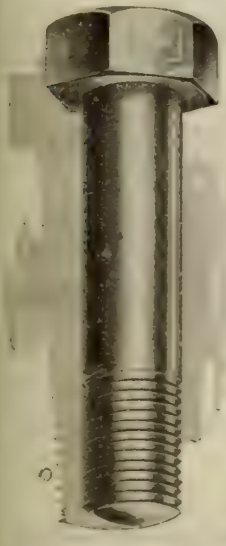
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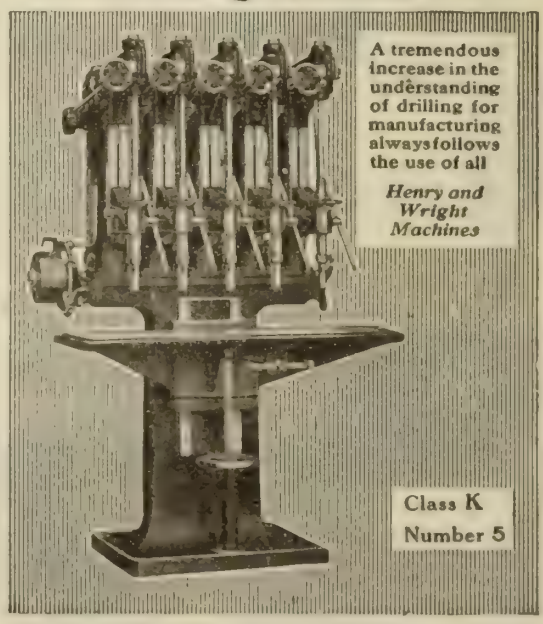
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The old familiar countershaft drive, through cross belts and tight and loose pulleys, stands accused of the following offences against efficiency:

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The economical, efficient and durable method of power transmission through friction control.

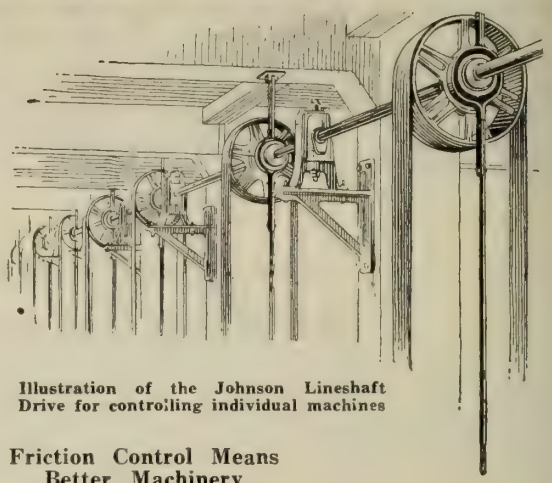
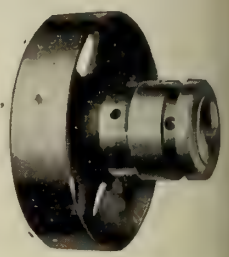


Illustration of the Johnson Lineshaft Drive for controlling individual machines

**Friction Control Means Better Machinery**

Whether it is applied overhead or in the machine itself.



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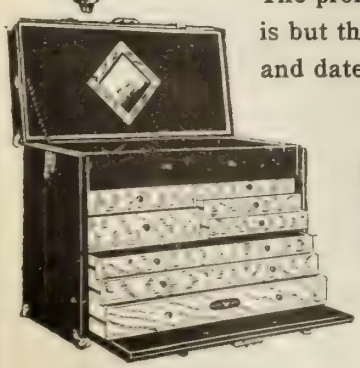
**THE CARLYLE JOHNSON MACHINE CO.** MANCHESTER, CONN.

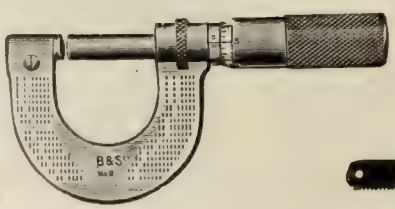


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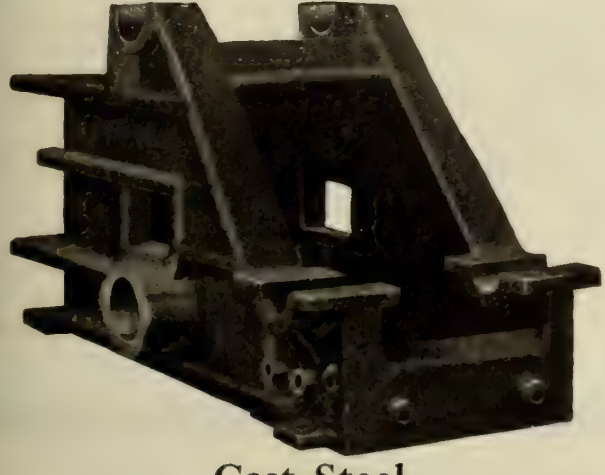
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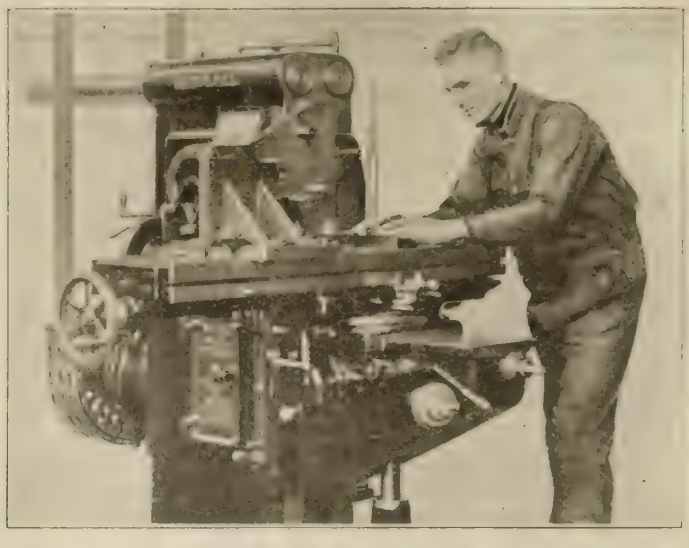
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# MILWAUKEE MILLING MACHINES



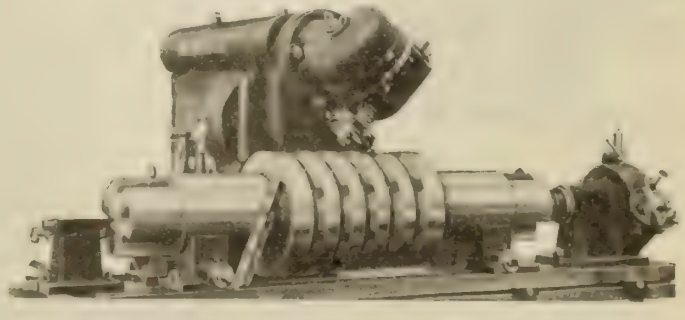
## Efficient on Light and Heavy Milling

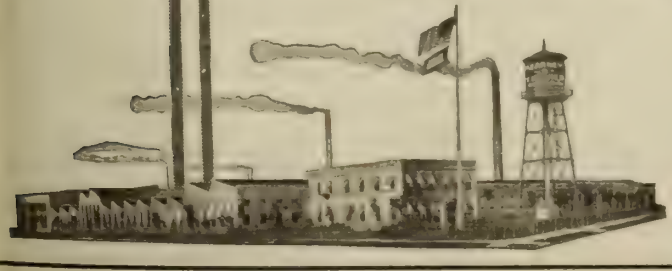
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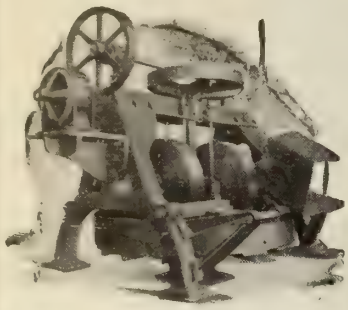
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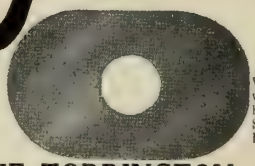
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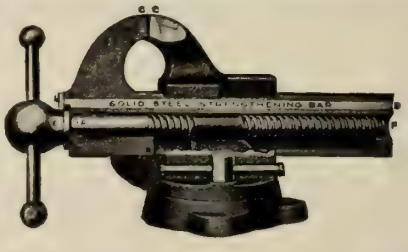
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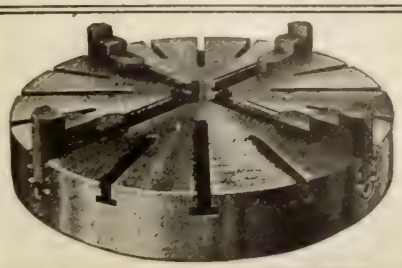
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PARKER SUPERIOR SAYS:
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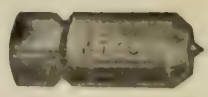
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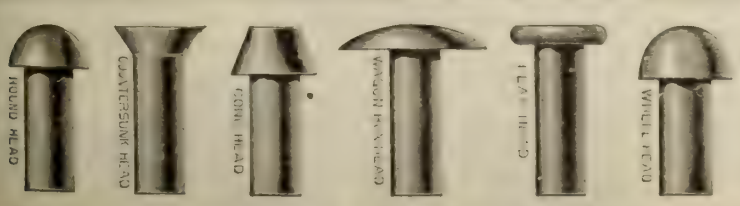
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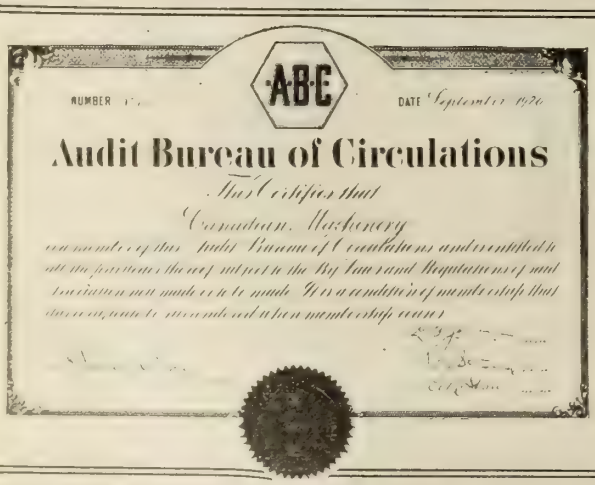
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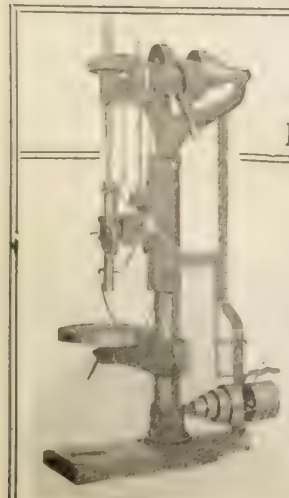


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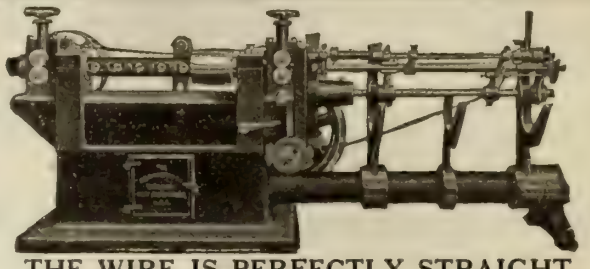
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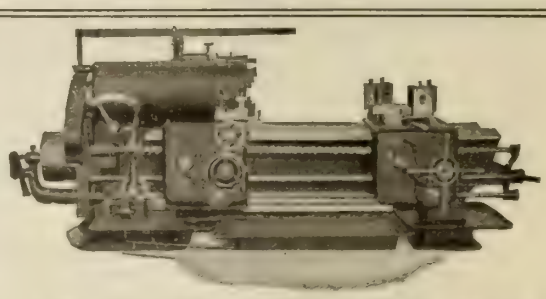
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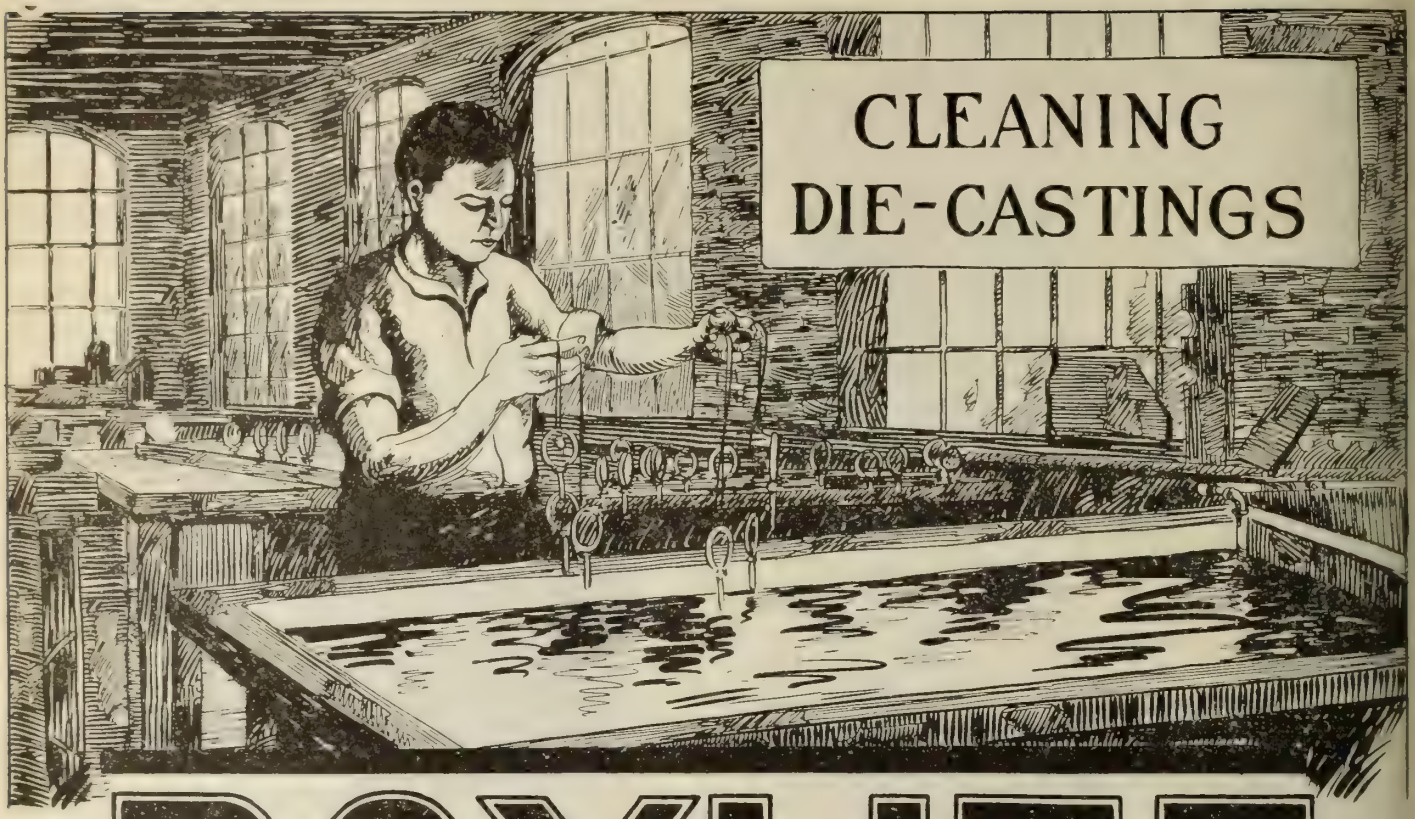
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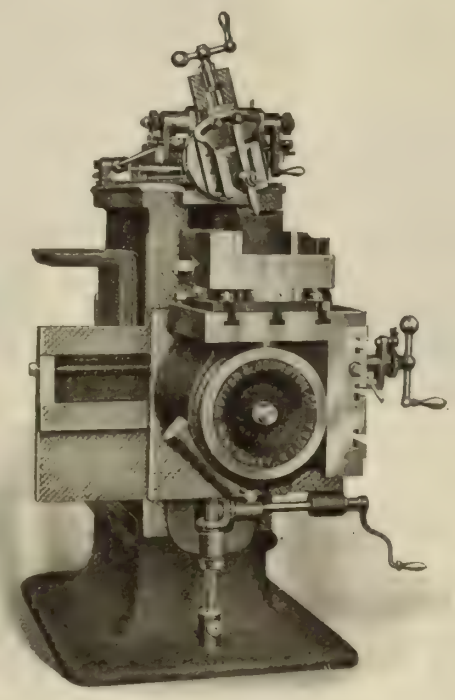
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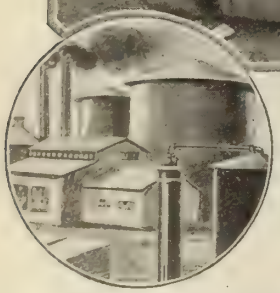
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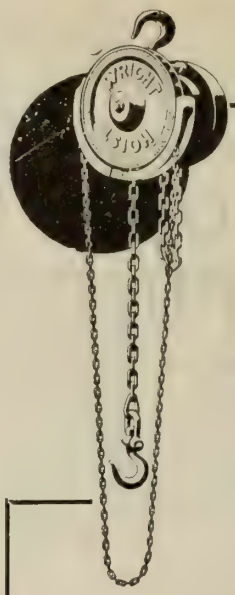
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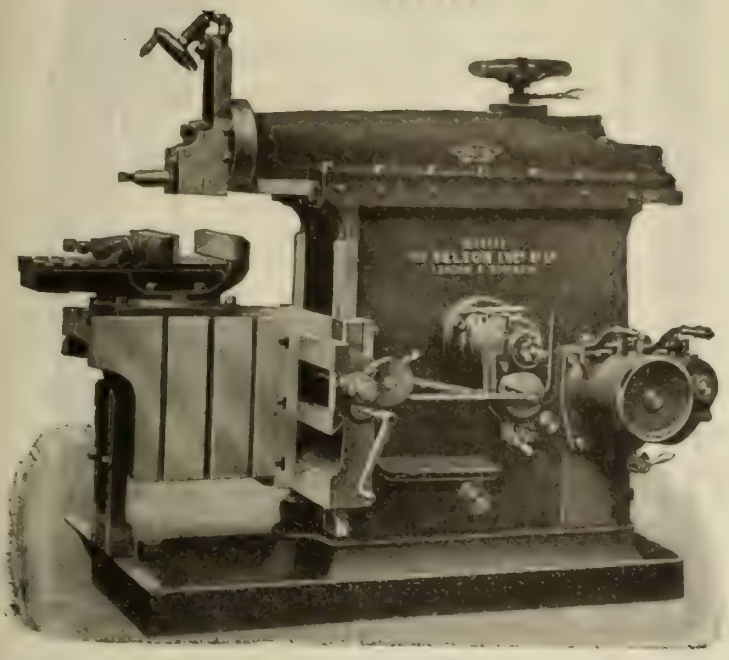
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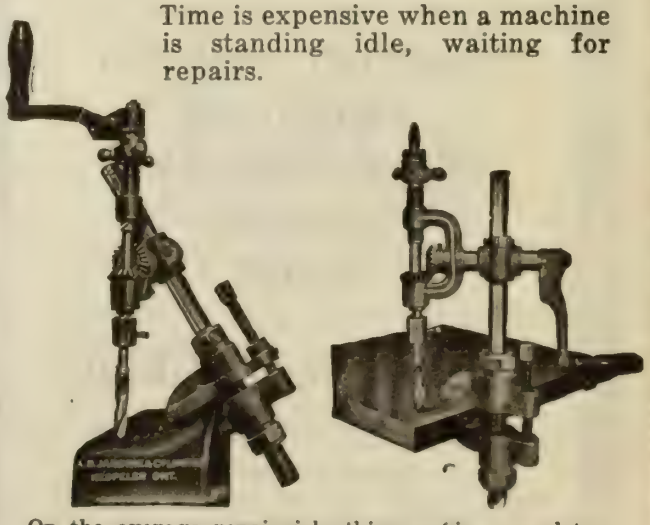
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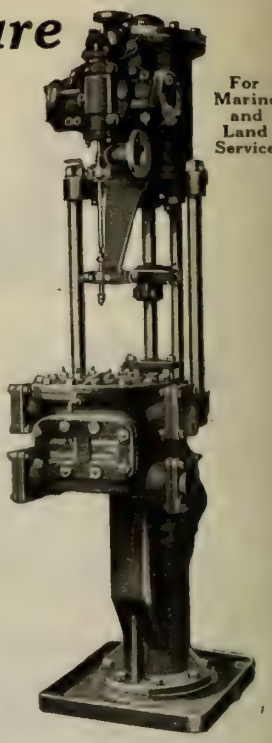
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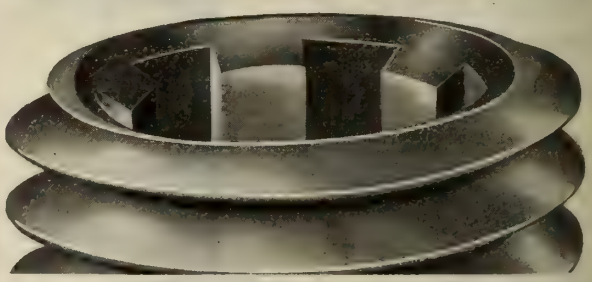
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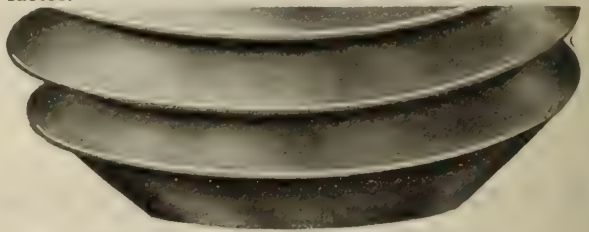
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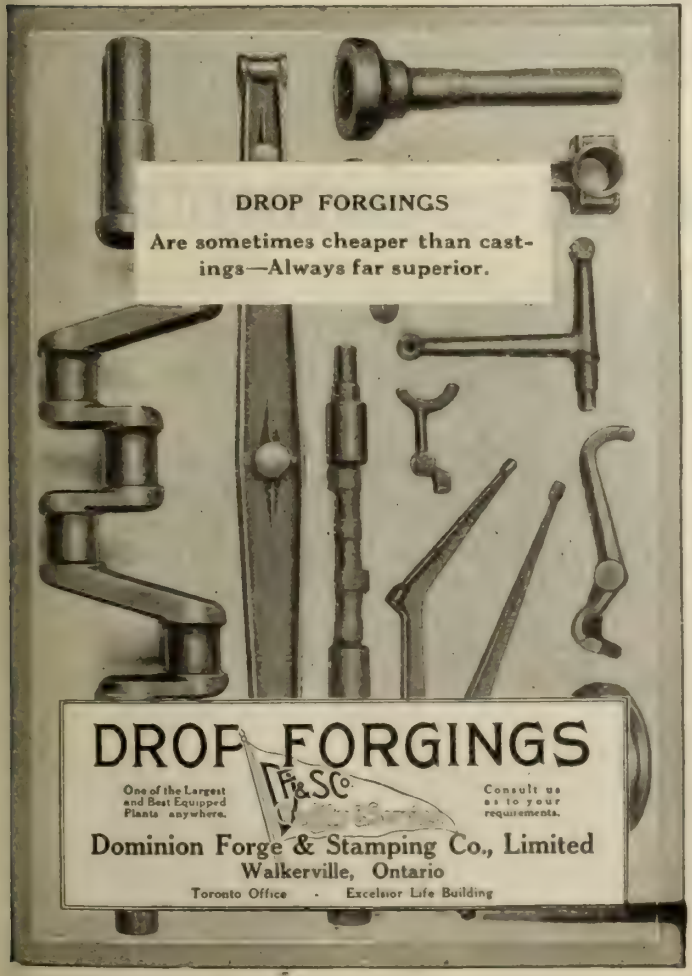
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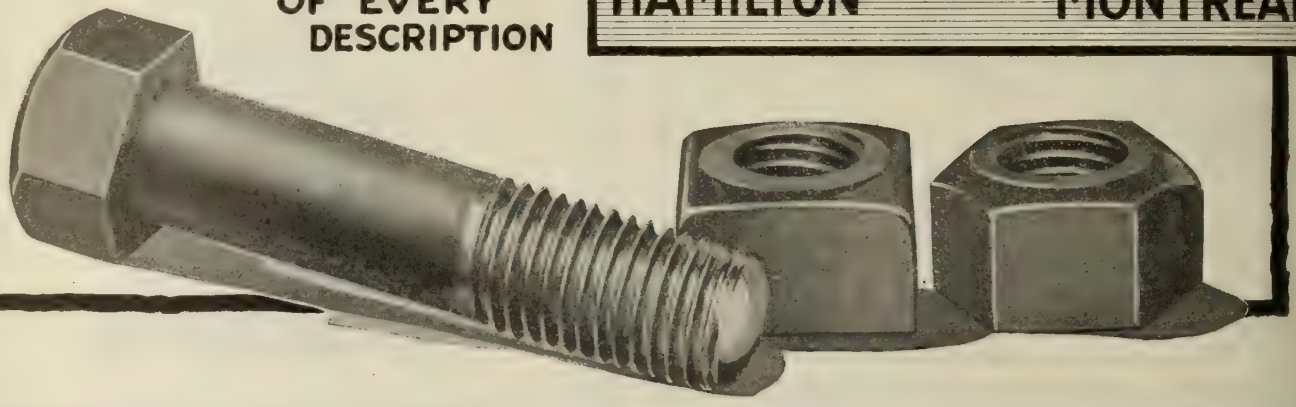
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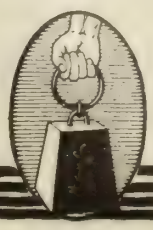
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CANADIAN MACHINERY
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MANUFACTURING NEWS

VOL. XXV. No. 25. June 23, 1921

# Drilling Two Different Parts on One Machine

## Multiple Drilling. Its Uses and Advantages—Drilling Steam Cylinders—Transmission Cases—Drive Axle Arms—Crank Cases—Cylinder Blocks—Washing Machine Parts and Steel Drive Gears.

By J. H. MOORE

TO ENTER the subject of "Multiple Spindle Drilling" properly, one must first look back quite a few years, picturing in their mind the type of single spindle drill that was then existent. Not only was the design very crude and the feeds and speeds of very uncertain character, but the chief drawback was that only one hole could be drilled at a time. True, there are various jobs where a single spindle drill is quite sufficient, but in many cases multiple spindles are absolutely essential if economical production is to be secured.

The automotive industry for example would never have made such rapid strides in production had it not been for multiple spindle drills, or in some cases, multiple spindle heads mounted on single spindle machines. One of the necessities of today in any industrial plant is the conservation of time. Labor is expensive, therefore if production costs are to be kept low, each worker's time must be made the most of. As it is impossible to get more than a certain amount of energy out of any man, his efforts must be supplemented by mechanical means, therefore in the case of drilling, designers decided to make machines that would drill more than one hole at a time. As years rolled on, the designs improved, until at present a book could be written on the various types existent. In many cases the machine is now built to suit the part, especially where the quantity to be produced warrants such procedure.

Like any other time-saving machine tool, the multiple spindle drill cannot do its best work unless equipped with accurate and rapid working fixtures. True, even without the fixtures, the production will be greater than with the single spindle, but to get the most out of the machine, the question of jig and fixture design should receive close attention. The examples to follow are installations that are in actual operation in various plants throughout the country and bear out the previous statement regarding the advisability of using modern fixtures.

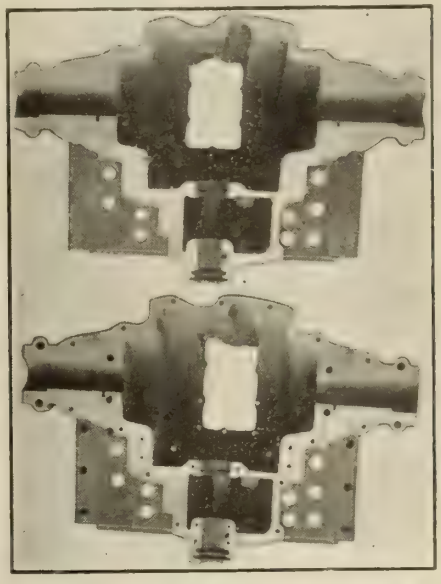


FIG. 3—TRANSMISSION CASE SHOWING PART BEFORE AND AFTER DRILLING.

Illustrations through the courtesy of National Automatic Tool Co., Richmond, Ind

### Examples of Work

Fig. 1 illustrates a steam cylinder and yoke or a duplex steam pump. Note

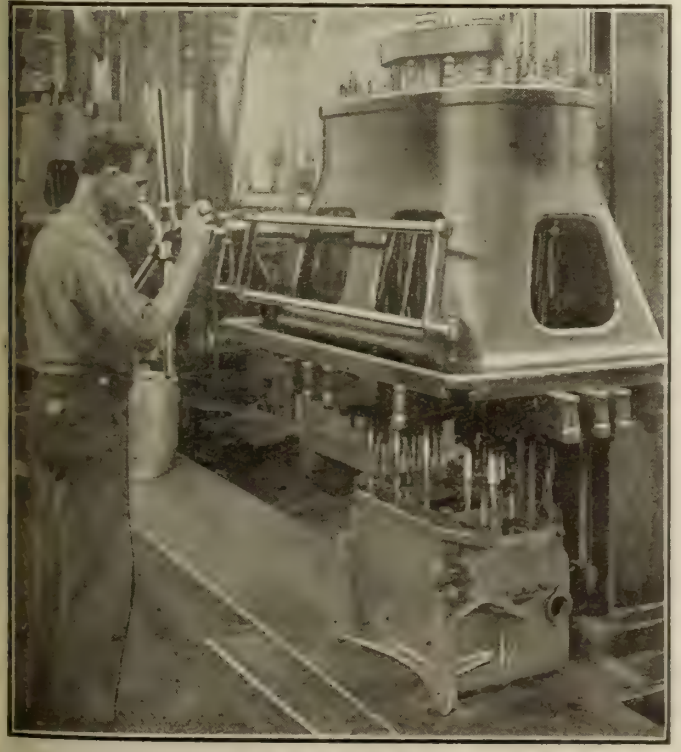


FIG. 1—DRILLING A STEAM CYLINDER FOR DUPLEX STEAM PUMP.

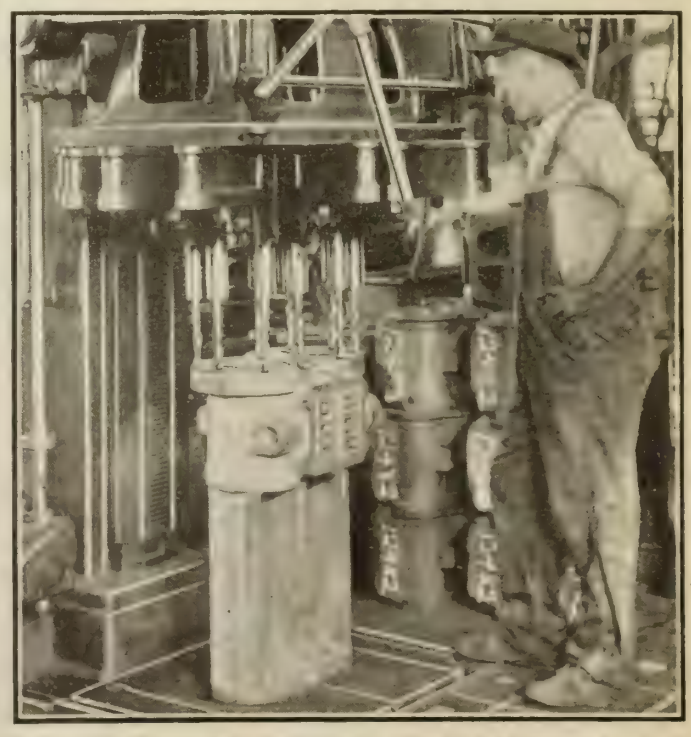


FIG. 7—MACHINES DRILLING THE CYLINDERS AND CRANK CASES.

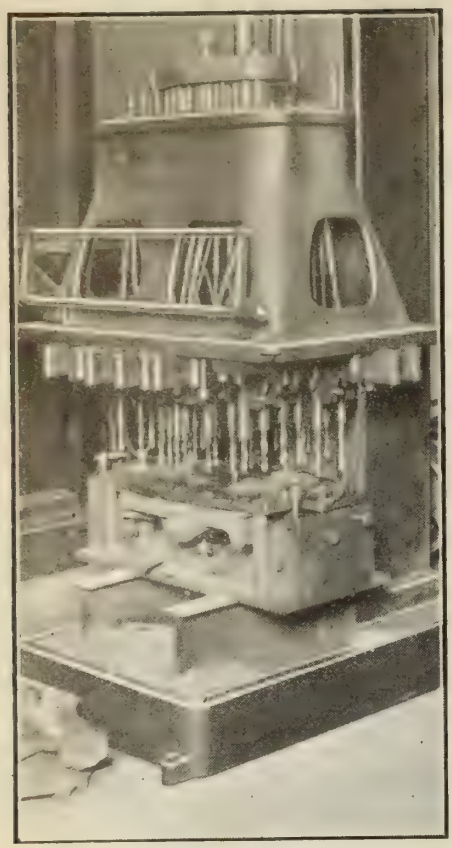


FIG. 4—TRANSMISSION CASE BEING DRILLED.

that twelve drills are in use on this machine. This operation, which is accomplished in the plant of Vogt Bros. Mfg. Co., Louisville, Ky., consists of drilling 30 ¾-in. holes to a depth of 1½ inches. Twelve holes are drilled at one setting and the present production is 20 per hour, while the former method produced only ⅓ of this amount.

It would be a good plan to mention at this point that the type of machine depicted has a patented method of drill speed changing, the speed of every spindle being independent of the speed of any other spindle. This allows the operator to change at will to the correct speed required for the size or type of tool being used. Any spindle not being used is thrown into neutral, thus saving both wear and power.

The benefit of this speed changing feature is self-apparent, for, when drilling, reaming, spot facing, etc., simultaneously, each tool can run at its correct working speed. Notched plungers on the top of head indicate the speed at which the tool is working.

Before leaving the question of feeds and speeds, it might be mentioned that this type of machine, equipped with the independent change, has six drill speeds, which may be used either as six single speeds or as three double speeds, the ratio of the low to the high being approximately 1 to 2. There are six rates of power feed, this permitting a range from .73 in. to 4.74 in. per minute. As it is not the design we are after so much as examples of work performed we will proceed to Fig. 3 which shows a transmission case having 41 holes, and which is drilled in seven minutes.

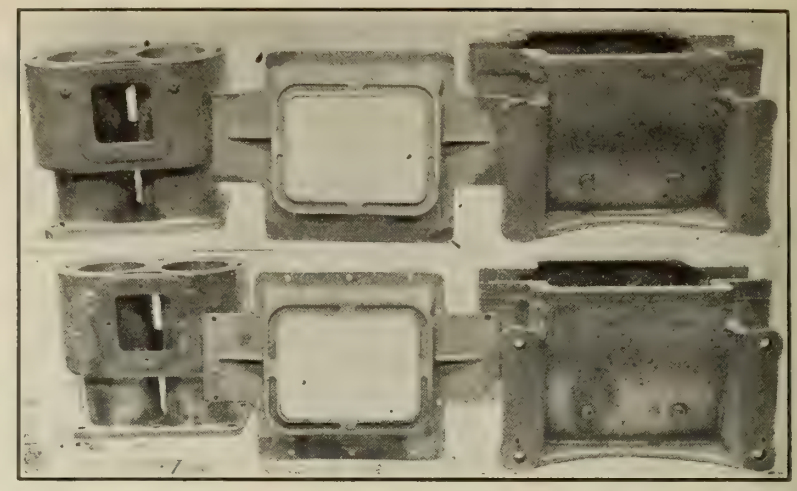


FIG. 6—CYLINDERS AND CRANK CASES BEFORE AND AFTER DRILLING.

Fig. 4 depicts the drilling machine in operation, and the photograph was taken in the plant of the Cleveland Tractor Co., Cleveland, Ohio. The part is used on the Cletrac tractor and is the lower half of the transmission case. The depth of holes ranges from 7-16 in. to 1⅝ in., and the diameter of the drills also vary. The floor to floor time, as previously stated, is only seven minutes. Note the jig used, as this is one of the production assets.

Fig. 5 shows clearly the benefits of proper fixtures. In this case two different parts are drilled on the one machine, and both are completed at one time. This is made possible by the independent speed feature already mentioned, also by the use of two tumbling jigs. One piece is a drive axle arm in which nineteen holes are drilled, while the other part is an upper pivot bracket in which eight holes are drilled. The jigs run on special carriages, mounted on a rail as shown, this making it easy for the operator to get the work from a loading position to an unloading position and vice versa.

The above operation is performed in the Moline Plow Co., and on the two jobs they obtain a production of fifteen an hour on the drive axle arms, and eight an hour on the upper pivot brackets.

At the Hart-Parr Co., Charles City, Iowa, they drill practically all their cylinders and crank cases on similar machines, to that shown in Fig 7. In this case the parts are shown at Fig. 6, and 59 holes of different sizes are drilled in three settings, from 16 to 26 holes being drilled at one setting. The production is 50 per day, as compared to 7 per day before they used the present method of drilling.

It will be noted in this photograph that the drills form a complete chain, insomuch that they are connected by means of a long steel plate on which the parts are slid. This is splendid practice, and should be followed out, except where impossible, or where gravity conveyors are in handy position.

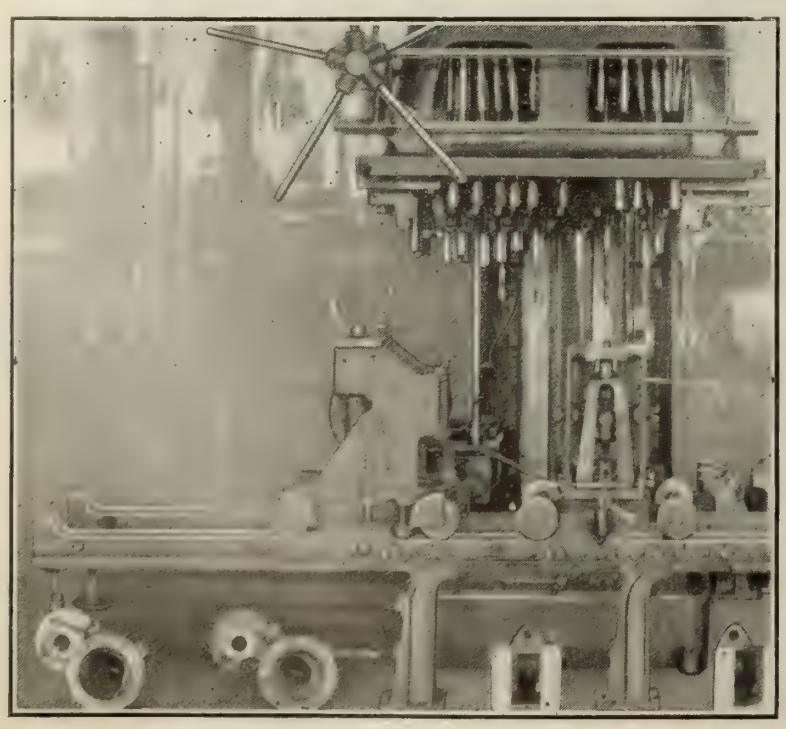


FIG. 5—TWO DIFFERENT PARTS DRILLED ON THE SAME MACHINE.

### Drilling Cylinder Blocks

At the plant of H. I. Walker Co., they drill their grey iron cylinder blocks as shown at Fig. 8, using a turnover jig for holding and locating the pieces. 36 stud holes are drilled to a depth of ⅝ in., and 7 blocks are completed per hour. In this case the jig is again mounted on

ils, and moved along the production ne.

To describe and illustrate all the perations possible on these machines ould take a volume in itself, but for a w other examples we will consider ord pictures only. At the plant of the Willys-Overland, Ltd., Toronto, Canada, ney use two such machines as shown in ig. 8, in parallel. The machines are onnected up by rail, and a turnover jig f rather heavier design to that in Fig. is used. The part produced is the ylinder block for the Overland car, and ne machine is equipped for drilling, hile the other is fitted up for tapping. he block never leaves the jig until completed, for after the part is drilled, it is erely moved along the rails until it is nder the machine doing the tapping. 8 holes are completed at the one operaion, there being 14 holes on one side, nd 24 on the other. The jig itself is evolved 180 degrees by means of a andwheel, a worm, and worm wheel, a pecial indexing attachment being used.

The Moline Plow Co. drill their brill ears at the rate of 20 per hour, the holes eing as follows: Eighteen 17-64 in.— ⅛ in. deep, and eight 33-64 in.—1⅛ in. leep.

Another plant drills 10 holes in nickle teel drive gears ½ in. thick at the rate of 125 gears per hour. Special jigs are used, as is also the case in the previous example cited.

Another concern drill washing machine parts by the multiple spindle process, and the aluminum base for their engine has three holes in it which are drilled on what is known as a No. 12 machine. Formerly this base was drilled one hole at a time, and a production of 40 per hour was the best they could get. This is now increased to 80 bases per hour.

In another plant 5,544—⅝ in holes are being drilled every day on one machine in 1½ cedar. The parts drilled are for rotary drying machines and the pieces are made of 1½ in thick cedar. The boards are 6 ft. long by 1 ft. 9 in. wide, and 396 holes are drilled in each piece. 14 boards are completed every day.

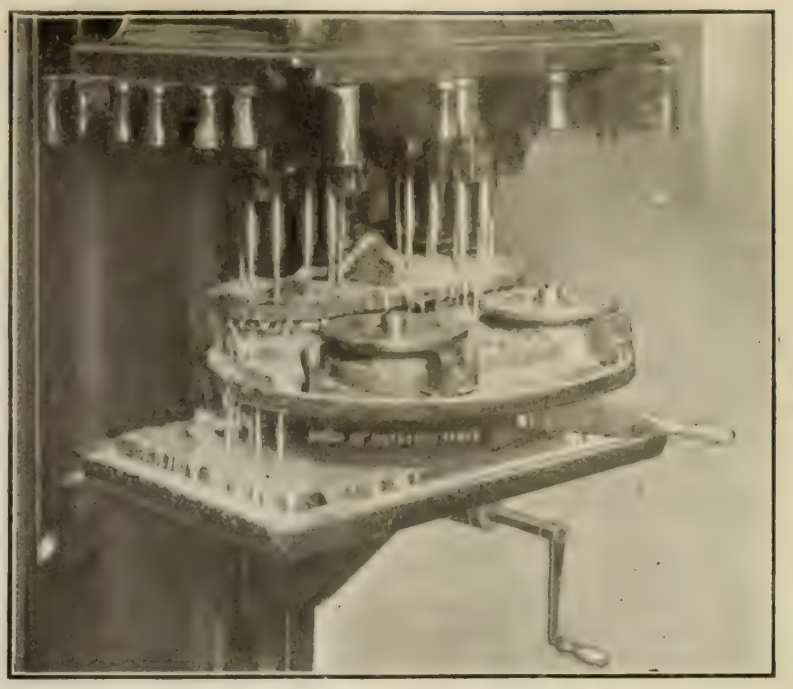


FIG. 9—DRILLING STEEL DRIVE GEARS.

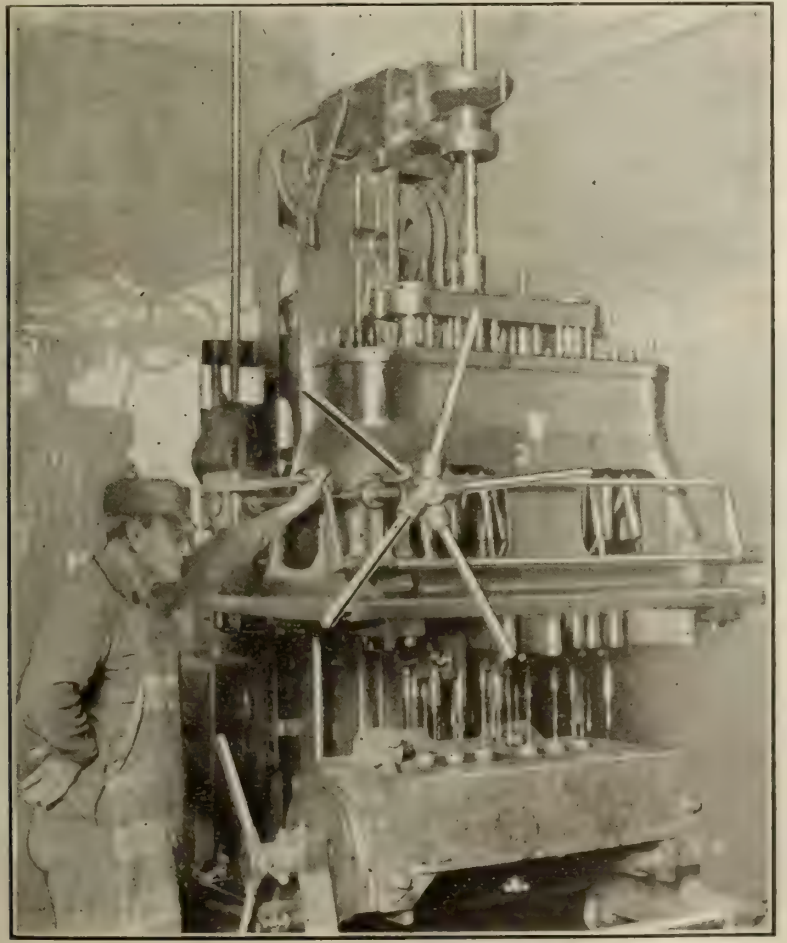


FIG. 8—DRILLING CYLINDER BLOCKS USING A TURNOVER JIG.

Twenty-two holes of ⅜ in. diameter are drilled at one time through switchboard slate panels of various thickness at the Metropolitan Electric Mfg. Co. plant, but no production figure is obtainable in this case. Slate, however, is an awkward material to drill at any time.

Before proceeding to the last example of the present article, we shall digress for a moment in order to touch on a point that so far has not been mentioned, viz.: drill breakage. Owing to the definite feeds existing on such machines there is very little tendency to break the drills, in fact the tendency might well be said not to exist. Carelessness is usually the true cause of drill breakage, but in practically all the examples that have been shown, our information is that drill breakage was practically nil.

No attempt has been made in the preceding examples to show all the lines of drills made by the concern whose machines we show, but we have picked those jobs which we believe will interest our readers. The company manufacture sixteen different types and sizes, ranging from the smallest to the larger styles we have shown, so it will be readily understood why we have confined our illustrations to the number we have.

The concluding example, Fig. 9, shows how the Weeks-Hoffman Co., Syracuse, N. Y., produce their steel drive gears. These gears are 7-16 in. thick, and there are 10 holes in each. The parts are held to .001 in., yet 140 gears are completed every hour. A special revolving table is used, on which are mounted four jigs. In this way the production is practically continuous. This example proves very forcibly our previous statement that to get the most out of a time-saving tool you have to help it all you can by the addition of suitable fixtures.

## LARGE ENGINES.

A British firm has recently equipped itself to supply the mammoth gas engine used to provide the blast for blast-furnaces in iron works. These engines are driven by the gas given off by the blast-furnaces themselves. During the last few years one British firm has supplied large gas engines with a total of about 20,000 horse power.

# Machining a Commutator End Plate for Dynamo

## Part is made from Drop Forging—Punching is First Operation—Automatic is Next Used—Drilling Follows in Due Sequence. Burring and Polishing Completes the Plate.

By ROBERT MAWSON.

AS CAN be readily understood, the machining of a commutator end plate for a lighting dynamo used on automobiles requires extreme care. The important tools used are shown in the present article, and as the part must pass rigid inspection, the jigs, punches, dies, etc., must be of the best.

The piece is made from a drop forging and the first operation is punching three brush plate fastening screw holes. A simple punch and die is used for this work. The end plate is then placed on the punch press, Fig. 1, being located in the die by means of two of the holes, A, into which fit pins that are integral with the tool. The punch, B, attached to the ram of the machine, is then caused to descend and a boss is raised and a hole punched in the piece.

The next illustration, Fig. 2, shows the die with the end plate to be worked upon removed, and gives a better idea of the construction of the tool. The pins, A, are the locating medium as previously noted. The insert, B, is made of hardened tool steel, the upper portion being made with a boss of a similar contour to what is desired to be formed in the piece. At the extreme end the insert is made to form a punch, the purpose of which is to pierce a hole in the end plate. In operation the punch, C, is caused to descend by the machine onto the sliding member, D. As this is forced down it raises the block, E, also the insert, B, as these elements are fastened together with a screw as shown.

As the block and punch insert are raised on the inside of the end plate, a boss is formed and the hole punched. As the punch, C, recedes, the springs shown over the block, E, forces it back to its normal position so that the operator can remove the end plate from the die. The oil hole is then tapped as the next operation, no special tools being required.

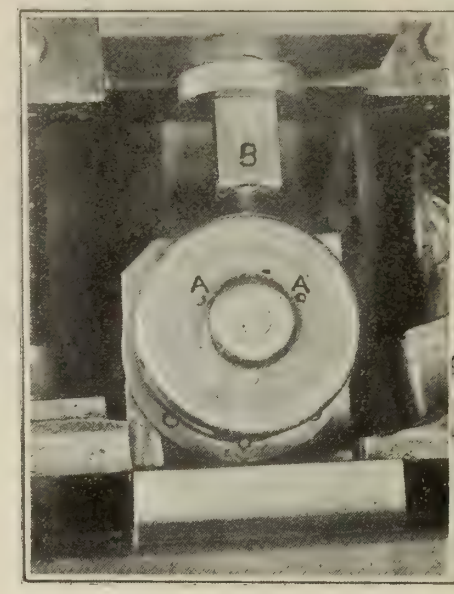



FIG. 1—FORMING BOSS AND PUNCHING HOLE.




FIG. 2—SHOWING THE DIE WITH PIECE REMOVED.

### Boring the Seat

The piece is next placed in the chuck of the automatic, Fig. 3, for the next operation. When in this position the bearing seat is bored and afterwards reamed to size; the end faced; the field frame and brush holder seats bored; the center hole bored and reamed to .609 of an inch; and the outside end cut to length. The various tools used for these operations may be seen in the turret of the machine, the cutting off tool being carried in the cross-slide at the rear. One of the finished parts is shown resting on the turret at A. The piece is then washed in a metal washing machine to remove the grease and dirt.

It is next placed in the jig, Fig. 4, being located by means of a pin, A, which fits into one of the holes punched in the first operation. The open washer, B, is then placed under the head of the binding stud, as shown, and this is drawn back with a nut at the rear of the tool thus holding the part securely.

A hole is then drilled in the piece, the drill being guided through the bushing C, the correct position for the tool being obtained with the projecting pin and stop D. The revolving arbor that carries the piece is then turned on a stud by means of the handle E to the other position, determined by the projecting pin coming against another stop at the rear of the piece and the second hole drilled. These two holes are used for

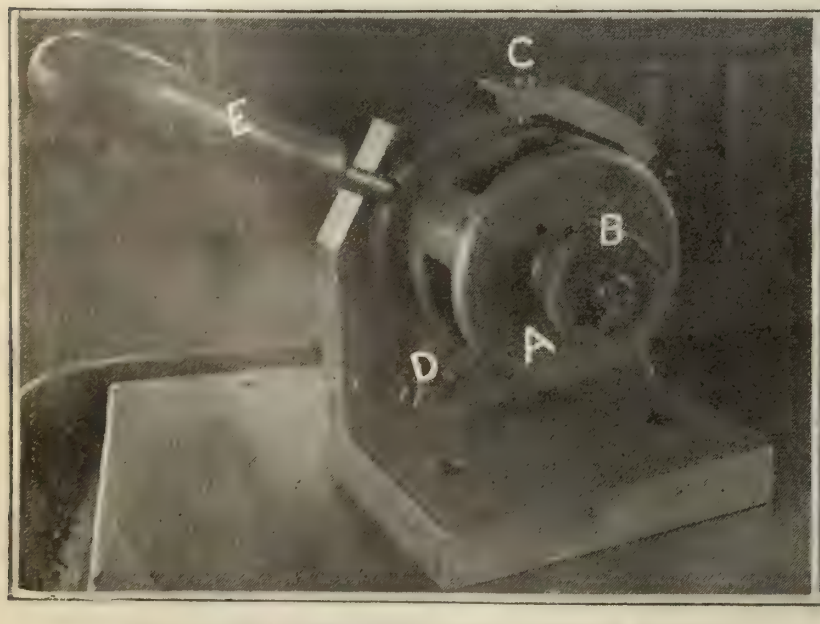



FIG. 4—DRILLING FUSE COVER SCREEN HOLES.

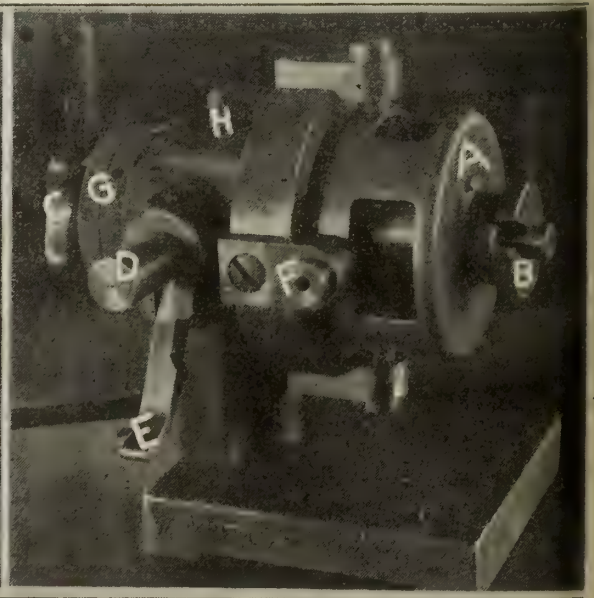



FIG. 5—DRILLING FASTENING SCREW HOLES.

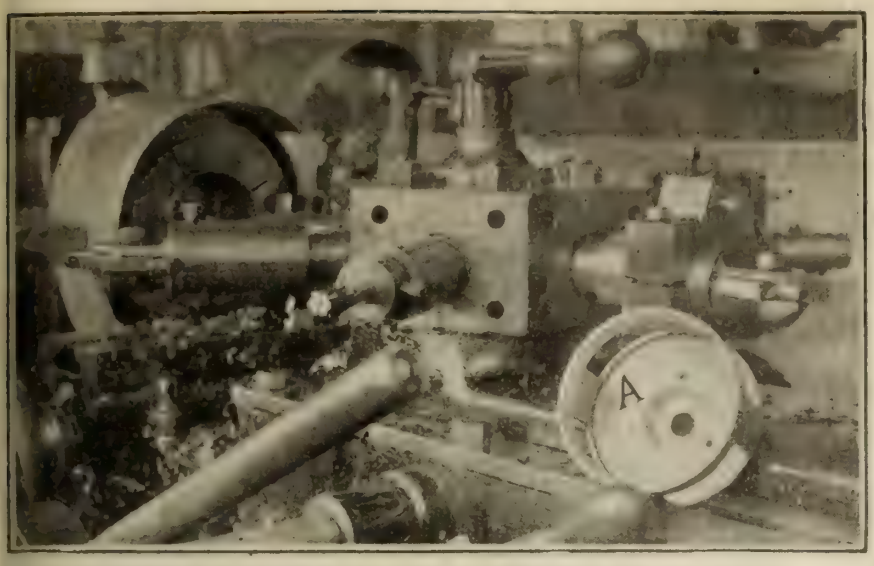



FIG. 3—BORING, REAMING, AND FACING THE WORK.

vetting on the fuse cover to the end late.

### Drilling Operation

The next operation is performed in the g, Fig. 5, being drilling four fasten- ng screw holes used to attach the end late to the frame. The piece is placed n the arbor of the tool and located by eans of the pin A which fits into one f the holes punched in the first opera- on. The open washer, B, is placed nder the shouldered head of the stud s shown, which is then drawn back with ie threaded knob, thus holding it se- urely. The four drilling positions for he tool are obtained by means of the ndex pin D, which fits into holes mach- ned on the periphery of the revolving ember of the jig. To release the pin he operator depresses the lever and this ction pushes out the pin from the locat- ng hole into which it is fitting.

The operator then revolves the jig arbor and the piece to be drilled goes around to the next station when the lever is released, the locating medium dropping into position. The drill is guided through bushings, F.

It will be observed that unusual care has been taken in the design of this tool. The threaded nuts, G, are used to take up any wear which may occur in the revolving member, and an oil cup, H, is also provided to lubricate the same. The two fuse holes drilled in the jig, Fig. 4, are then countersunk on the inside and all other holes burred to remove any projecting edges left by the drills. The piece is then burred on the inside, and the outside polished, afterwards being hot washed to remove grease and dirt. The parts are given a rigid inspection, and, if found correct are transferred to the assembling department, to be attached to the frames after the commutators have been placed into position.

## GOLD MEDAL TO BE AWARDED.

Lt. Col. A. E. White, National Presi- ent of the American Society for Steel reating, has made the announcement hat Prof. H. L. Campbell, 1103 E. Huron t., Ann Arbor, Mich., has been appoint- d Chairman of the Meetings and Papers ommittee of the Society to secure apers for presentation at the Indian- polis Convention and Exhibition to be eld Sept. 19th to 24th, inclusive.

Associated with Prof. Campbell on his committee are: Mr. George O. De- autels, President Imperial Drop Forge o., Indianapolis, Ind.; and Mr. Victor illman, Metallurgist, Crompton & nowles Loom Works, Worcester, Mass.

The Board of Directors has authorized he awarding of a gold medal for the est paper presented at the Indianapolis onvention, and a silver medal for the econd best paper. While the awarding f these medals for this year has been nade to apply to those papers present- d for this year's Convention, the policy n future years will be to award the nedals to the first and second best pap- rs presented before the Society during he year.

Chairman Campbell has just issued a ist of some of the subjects it is proposed o discuss at the Convention, and the 3200 members of the Society have been equested to prepare and submit papers either upon one of the subjects listed be- ow or upon any subject of their own hoosing.

A list of subjects upon which papers will be presented follows:

### General Topics

1.—The Organization and Management of a Heat Treating Department.
2.—Practice of Handling and Check- ing Materials to and from Heat Treating Departments.
3.—Quantity Production Methods for Forging and Heat Treating Tools.
4.—Methods of Heat Treatment of Very Small Machine Parts.
5.—Heat Treatment of Sheet Steel Parts; as Saws, Hack Saw Blades, etc.
6.—The Artificial Seasoning of Hard- ened Steel.
7.—Furnace Design with Reference to Fuel Economy.
8.—Metallography and Its Application.
9.—Comparative Study of Methods for Heating Furnaces by (a) Coal, (b) Fuel Oil, (c) Gas, (d) Electricity.

### Alloy Steels

1.—Topical Discussion of Alloy Steels and Their Heat Treatments for Specific Purposes; as (a) Springs, (b) Gears, (c) Finishing Tools (d) High Speed Cut- ting Tools, (e) Dies.
2.—Practice of Ordering Tool Steel on Specifications.
3.—Cutting Efficiency of High Speed Steel Which Has Received Different Methods of Hardening.
4.—Die Blocks and Their Heat Treat- ment.

### Carburizing

1.—Carburizing Practice Adapted to Alloy Steel Parts.
2.—Determination of Unit Cost of Car- burizing Steel Parts.
3.—Efficiencies of Different Mixtures for Cyanide Hardening.
4.—Practice of Cyanide Hardening.
5.—The Service of Annealing Boxes Made of Different Materials.

## STAINLESS STEEL.

In a paper presented at the Phila- delphia convention of the American So- ciety for Steel Treating, W. H. Marble gave the following standard analysis for stainless steel:—

| | |
|---|---|
| Carbon | 0.20 to 0.40%. |
| Chromium | 11.40 to 14%. |
| Manganese | Not to exceed 0.50%. |
| Silicon | Not to exceed 0.30%. |
| Sulphur and phosphorus | As low as possible. |

It is manufactured in either the cruci- ble or the electric furnace, the process being similar to that employed for high- speed steel, which it resembles in a number of properties, particularly in being air-hardening.

For the higher heats, temper- colours appear at about twice the temperature for ordinary tool-steel, making temper- ing by temperature rather than by color particularly important. Up to a tem- perature of about 1520° F. the gloss- surface caused by polishing and hot- tinting is permanent, and the specimen neither gains nor loses appreciably in weight. The alloy's power to resist cor- rosion is not caused by any finish ap- plied by the manufacturer, but by the properties of the steel itself. No mat- ter how rough the surface of a hardened and tempered article may be, if it is a clean metallic surface and has not been distorted, it will be rustless. However, to exercise this feature to the best ad- vantage, a really good ground polished surface should be provided.

Stainless steel does not corrode when in contact with other steel. It is, how- ever, attacked in an otherwise non-cor- roding liquid when in direct metallic contact with copper or other alloys, such as gunmetal. Cold-working des- troys its stainless property, therefore cold-pressed parts should be heat- treated.

Although the principal applications of this alloy have so far been for cutlery and valves, there are many other possi- ble uses. Its easy machinability makes possible its use for many purposes for which high-nickel steels are now em- ployed, these steels being difficult to machine. As stainless steel is hard to deform, and is not easily eroded at tem- peratures up to 1520° F., it is a good material for hot-dies, extrusion-dies, punches, and for moulds for die-cast- ings. Other possible uses include tur- bine-blades, pump-rods and valves, acid- pumps, rams, evaporating-pans, races and rollers for ball bearings, and re- frigerator machinery. Turbine and pump parts made with this alloy have remained bright, with an inappreciable amount of corrosion, after having been in use for several years. On account of its toughness, ability to resist abra- sion, and mirror-like finish, moving parts made of this alloy wear longer than if made of other materials, and because of the reduced amount of fric- tion require less repacking.

# Proper Accident Prevention Pays Large Return

## Usually Four Stipulations Confront An Engineer When He is Making Safety Plans for a Plant—Safeguarding The Immediate Work of the Operator—The Real Trouble with Circular Saws

By C. P. TOLMAN

PROPERLY conducted accident prevention work pays a larger return on investment and operating cost than any other department of the ordinary industrial plant." This sounds like a rather sweeping statement, but in his address before the joint meeting of the Cleveland Engineering Society, and the Engineering Section of the National Safety Council, C. P. Tolman, chief engineer and chairman, Manufacturing Committee, National Lead Co., and president National Safety Council, stated that from carefully recorded data, the reduction in accidents of eight well known companies employing some 36,200, had been reduced over 70 per cent. He also told the following stories:

A certain small company operating a coal mine with 100 men reduced accident cost per ton, 68 per cent., while a larger corporation made a profit from its safety work of $1,000,000 per year. These are not suppositions, but actual figures, and as Mr. Tolman says, "They tell us nothing of the incidental profits from better relations between men and management, and give no credit for the saving of human life and suffering."

"Usually the engineer find for his problem a plant equipped and operating. He is required to make it as safe as possible with the following stipulations: (a) He must not interrupt operations; (b) He must do nothing which would decrease output or increase cost; (c) He must not make changes of a character or in a manner to cause labor trouble; (d) He must not make changes which will affect the character of the product; otherwise he has free rein.

This seems to leave little chance for accomplishment. But hundreds of engineers are doing effective safety work under just such restrictions. The work is limited of course to the more common measures, such as guarding machines and transmissions, general betterment of of ventilation, lighting and floor conditions; etc. It is well worth while, profitable to the industry, and calls for real ability. The design of a gear guard is not beneath professional dignity. A gear guard which answers all requirements satisfactorily calls for skillful design.

Among other requirements we have, for example, the following: (a) It must be securely attached; (b) It must be readily opened or removed; (c) It should be easier to close it than to leave it open; (d) It must not interfere with oiling or adjustment of the machine; (e) It should not drip oil or grease on the floor to make a slipping hazard; (f) It should be designed for economical manufacture; (g) The means for attaching and opening should be of a kind familiar or obvious to the average workman; (h) Insofar as possible, it should permit inspection of gears without opening or removing. Properly designed guards may save considerable in first cost, will save much in maintenance, and will remain in use. Improperly designed guards may not afford proper protection, and, if awkward to replace, are usually left of, once they have been removed.

Leaving the more obvious measure incidental to safeguarding machinery, let us consider the less obvious measures for safegurading the immediate work of the operator. At once we are in a much more profitable field of work. Most of the profit in the earlier class comes through saving in cost through the prevention of accidents, whereas in the latter class, by bettering operation from the safety standpoint, we not only reduce accident cost, but if our work is properly done we invariably increase production or save waste. As an example of the latter, in the white lead industry portable dust collectors were developed and used for sanitary reasons. Purely out of curiosity the lead dust saved was weighed. The average of all factories showed a saving of lead amounting to a return of over 30 per cent. on the investment.

As an example of increased production:—In the manufacture of steel drums, using toggle drawing presses, a factory was started about ten years ago with presses operating ten strokes a minute. At this rate the loss of fingers was alarming. The presses were therefore slowed down to seven strokes a minute. The accidents were reduced, but still were serious. The superintendent then devised and installed a method of operating the clutch by a solenoid magnet. The electric circuit led through two switches connected in series. These switches were arranged to open by springs and be closed by hand. One switch was located on each side of the press frame. To operate the press the workman had to use one hand on each switch. He could not get his hand or fingers in the press while it was operating. The presses were then speeded up to twelve strokes per minute, making an increase in production of 70 per cent with safe operation.

This is not an unusual case. Semi automatic press feeds will, while making the operation safe, increase output from 10 to 100 per cent. Full automatic feed will better this. Ejectors or kick-out give similar results. Lest we get the impression that results of this sort are confined to punch presses, suppose we consider another class of machinery in famous for mutilation of hands, the circular saw.

### The Circular Saw

At the National Safety Council's Congress in Milwaukee last year, during session of the Engineering Section it developed that 70 per cent. of saw accident originate in bad condition of the saw-dull, not properly set, or not properly gummed. There were men present ranging from youth to rugged age, who had lived with woodworking machinery, and they were unanimous on this point. They were then asked if saws and other woodworking machinery were kept in proper condition as compared with the average condition, what increase in production would result. Again they agreed—at least 20 per cent. In other words, by keeping the saws in reasonable order the average woodworking plant would eliminate the source of 70 per cent. of saw accidents and make a net gain of 20 per cent. in production with the same equipment, the same labor, and less power.

Once again that we may remember we are dealing with a broad general principle and not with any one class of machinery, let us consider the machine shop. Here we have the usual groups of accidents: (a) The kind which may befall any workman; (b) Selective accidents: those select the careless, indifferent, or ignorant workman, or that select the best of the mechanics.

Aside from the labor turnover this last is a pretty serious proposition. The statement that there is a type of accident which selects your best men requires some proof. The best known example of this type happens when your machinist uses his hand as a brake on the rim of the face plate of his lathe. The man who does this is the man who wants to see his work progress. He is not content to stand idle while his lathe comes slowly to rest. He wants to get his micrometer on the work and see the result of the cut—to get the piece out when finished, and get in the next one. So he disobeys orders—he does just what you or I would do—he is interested in his job and he takes the chance. This hazard can be wiped out. The correction measure involves an important fundamental principle in safety work.

### Do It the Safe Way

In this case the thing to be done is stop the lathe. The power must first shut off. The remedy is obvious. Equip the lathe with a brake; if it is a belt driven lathe, use a foot pedal which when pressed first shuts off the power

**PROBLEMS TO MEET.**

Usually the engineer finds for his problem a plant equipped and operating. He is required to make it as safe as possible with the following stipulations.

He must not interrupt operations.

He must do nothing which would decrease output or increase cost.

He must not make changes of a character or in a manner to cause labor trouble.

He must not make changes which will effect the character of the product; otherwise he has free rein.

On the face of it, these restrictions would seem to bar safety engineers from accomplishing much, yet hundreds of engineers are accomplishing wonderful results under such restrictions.

An engineer preparing for safety work must become familiar with organized safety work and the practical data which has been patiently accumulated in the course of such work. He must respond to the spirit of the safety movement for data alone will not serve him.

and then applies the brake. The almost instantaneous effect of the powerful foot brake leaves no incentive to use the hand on the face plate. If the lathe is direct motor driven, use a controller designed for dynamic braking.

The International Harvester Company, at its Milwaukee shops, equipped the spinning lathes with foot brakes as described. The accident hazard was eliminated and the increased production is paying an enormous return compared to the cost of this home-made attachment.

Gratifying as are the results from careful analysis and treatment of hazards where found in a growing plant, there is another broader fundamental method of treatment which is occasionally open to the engineer where a new plant is being built. Shall we digress a moment to make the principle clear by an illustration. The personal experience I am going to relate is one you have all had. Recently I visited a plant for which an expensive addition was being planned. Upon going through the plant I found an unusual equipment of machinery specially designed for the work. The machines, although performing what would be considered difficult operations, were simple in that way which speaks the genius of the designer. But the arrangement of the machines was haphazard. Additions had been made from time to time and original "flow sheet" was lost to view. Had the designer of the machines viewed his whole plant as one great machine, he would have done with it as he had done with the individual machines, and the additional building, machinery and labor would not be needed. This is the general opinion of engineering revision as applied to safety: Regard the whole plant as a machine. Make the whole, as well as each part, function for safety. The production returns incidental to safe methods for the individual machine are multiplied again when the whole plant is co-ordinated on a safety basis.

Provision for clear aisles is a safety measure. It also facilitates transfer of materials and lowers production costs. Racks and bins properly placed reduce accidents from falling objects; they also save material from injury and facilitate production. Correct lighting equipment and correct location of machines with respect to natural light prevent eye strain; waste from faulty manufacture is also saved, and production increased.

Grouping equipment involving special hazards or bad working conditions make it possible to treat these conditions effectively, and avoid exposure of other employees than those engaged in the particular work. For example, furnaces so grouped can be hooded to carry off heat and fumes; special cool air supply can be provided. The advantages of grouping apply also when chemicals are used or dusty operations are involved. While some of these measures can be applied to a degree regardless of general plant arrangment, all of them can be applied much more effectively if it is feasible to treat the plant as a whole.

With the growth of an industry in volume it is usual to add more and more of the small capacity units which, although suitable as to capacity in the earlier days, have been outgrown, and too many units are needed to produce the output. It is engineering revision in respect to the custom of such an industry to redesign such equipment, increasing the capacity of the unit. The reduction of hazard is two-fold when this is done—first, there are fewer men exposed; second, in redesigning, the equipment can always b made inherently safer, and the reduction in manufacturing cost is obviously large.

In the steel industry we have a strik-example of just such revision. It is sometimes possible to make radical changes in the general process of manufacture avoiding hazardous features and effecting large economies in operating cost. This is all work for the engineer, some phases of it calling for broader training and experience than others. To do any of it thoroughly and well we must include that factor which we have thus far omitted, the human equasion. The engineer preparing for this work must become familiar with organized safety work and the practical data which has been patiently accumulated in the course of such work. He must respond to the spirit of the safety movement, for words and data alone will not serve him. I have tried thus far to establish in your minds two basic principles: Properly conducted accident prevention work pays a larger return on investment and operating cost than any department of the ordinary industrial plant, and that you should make it easier and most effective to do it the safe way.

I have shown you the opportunity for the engineer in this field of work. I do not mean that he is forthwith to christen himself safety engineer. On the contrary, he is not true to the ethics of his profession or to the interest of his client, if, knowing the effectiveness of the safety viewpoint, he fails to make safety a part of his professional attitude towards all his work. The untiring effort of hundreds of men during the last nine years has built up an organization for the advancement of safety through the interchange of ideas."

### MELTING ELECTRIC FURNACE.

An interesting new type of electric furnace for brass-melting has been perfected by a British firm. Its main feature is the practically indestructible character of the heating elements. They are of the resistance type and do not oxidize. Several years of invention and experiment were occupied in achieving this result, which abolishes all maintenance costs on the furnace. Three of these furnaces are in operation, each of 100 kilogrammes capacity and each taking 25 units of electricity. A charge of brass is melted every hour, with a consumption of 300 units of electricity per ton. The lining of the furnace can be used for years without renewal, so that practically the only cost is for electricity and labor.

### OIL ENGINE BOOK.

Vickers-Petters, Limited, of Ipswick, England, has recently issued a new catalogue featuring their stationary and marine types of oil engines for working on crude and residual oils or refined petroleum, in capacities of from 10 to 450 brake horse power. The 50-page, 8 by 10 booklet illustrates and describes a large number of these engines, setting forth many of the advantages and details of construction. Vickers-Petters are represented in Canada by R. S. Griffith, 371 St. James St., Montreal.

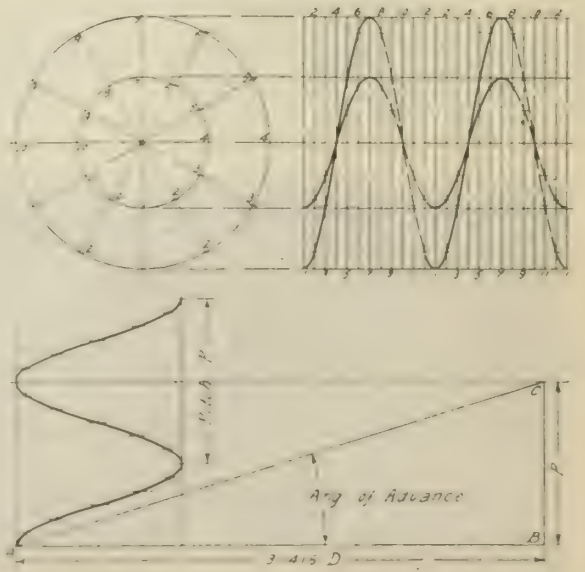
# *Screw Threads*

## *Developing the Helix*

As all screw threads are based on the curve called the helix, a knowledge of its construction should be acquired. The helix is a uniformly advancing curve around the circumference of a cylinder, one complete turn being designated as the pitch. This curve developed on a flat surface would be represented by the straight line A C, which forms the hypotenuse of a right-angled triangle, the base A B being the length of the circumference, and the height B C the pitch of the helix, the inclination of the curve being the angle B A C.

A graphical construction of the curve is shown above. A circle of the required diameter is first drawn and divided into any number of equal parts. A rectangle is projected to one side and the pitch distance on the horizontal lines divided into as many equal parts as the adjoining circle. These divisions are numbered as shown and the intersection of corresponding lines determines the path of the helix. The more divisions the greater accuracy.

It will be noted that for the same pitch the smaller diameters have the greater angle of advance.




*Canadian Machinery*

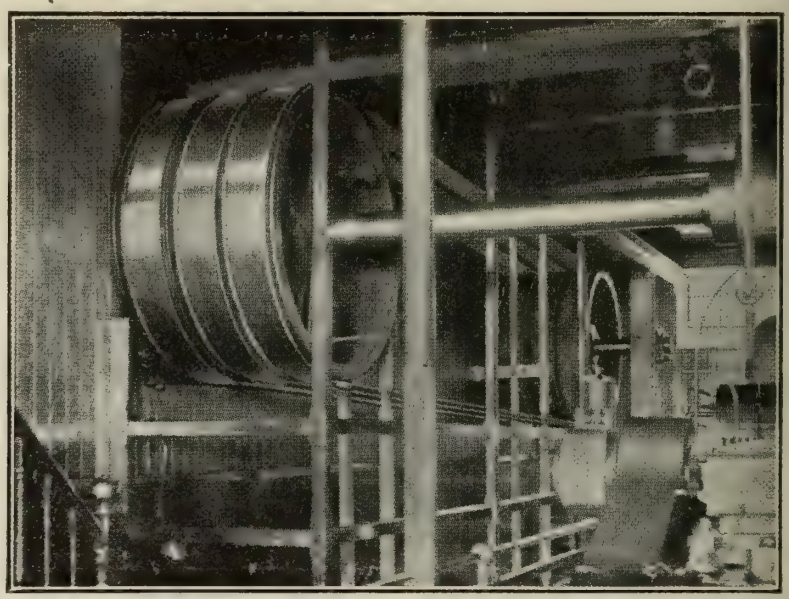
# Steel Belting As a Means of Transmission

## Material Used on Such Belts is a Carefully Hardened Charcoal Steel—Process of Preparation a Secret—Claims Made for This Belting—Safeguards—Stories of Installations

THE LOSS in power in transmission from the engine, whether steam or electrical, to the point of application is a difficulty which has always exercised the minds of engineers wherever mechanical power is used. Experimental attempts were made in employing driving belts of metal, but, after a short period of use they invariably broke when subjected to any considerable increase in load. Persistent failure also attached itself to the various connections used in joining the ends of the bands together. Subsequent experiments showed that these unsatisfactory results were attributable mainly to mistaken conceptions as to the conditions under which steel bands should be used. In previous experiments it was found that consideration was not given to the fact that the metal belt employed is subjected to a flexure constantly varying from zero to a maximum, and that to ensure durability with such a demand it was not sufficient for the belts to be calculated in the usual manner. The error consisted in not regarding the result of philosophical researches first undertaken by Wohler, according to which a tension constantly varying from zero value to a maximum and frequently applied to a body causes self destruction if the maximum tension is not confined to half the breaking stress of the material.

The present system is therefore based on the knowledge that a fracture of the belt even with a constantly varying demand on its flexibility can be avoided with certainty if the maximum demand likely to occur is kept so low that it does not attain half the value of the limit of fracture. Exhaustive series of trials have been carried out in England. According to the present method the breaking of belts is avoided, and the durability made unlimited by the thickness.

It was found that owing to the high modulus of elasticity of steel that it was very necessary to determine the length of a driving belt with considerable accuracy; a short extension compelled by cutting the belt too short in the first instance set up very serious stresses. To accomplish this purpose an ingenious device has been invented for determining the necessary length for the purpose of obtaining a truly correct working tension.



IN THIS CASE THREE 8 IN. STEEL BELTS REPLACED FOURTEEN 1¾ IN. ROPES. THE PULLEYS ARE 5 FT. 6 IN. EACH, AND THE SHAFT CENTERS 20 FT. 8½ IN. THE VELOCITY IS 2,400 FT. PER MINUTE, AND THE H.P. 340. THE BELTS RUN AT 142 R.P.M. THE DRIVE HAS BEEN IN USE SINCE 1915.

In the patented joint clamping plates are shaped to suit the pulley profile, stresses at the joint are distributed evenly over the whole width, and one of the most prolific causes of fracture in the early installations is thus avoided.

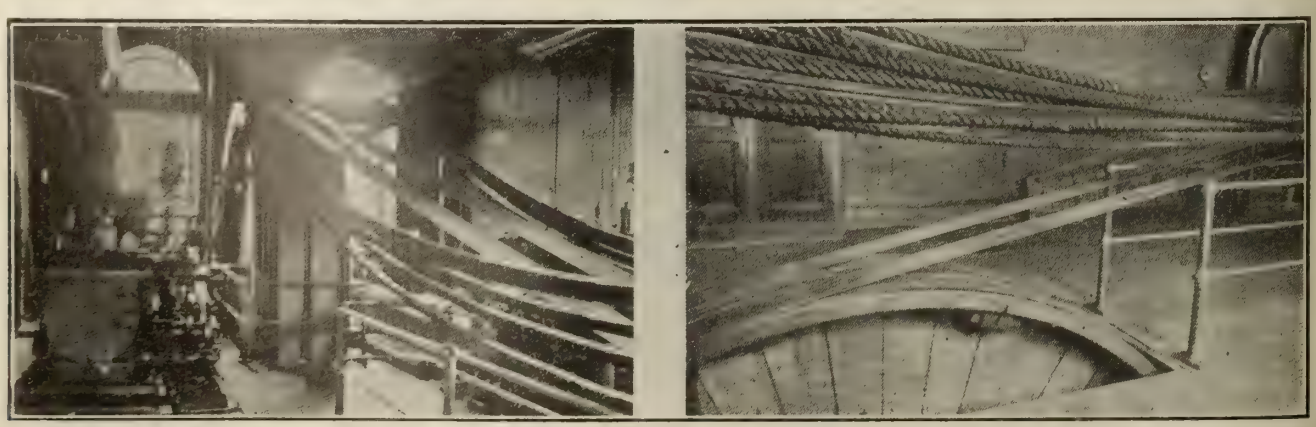
The material used is a carefully hardened charcoal steel, prepared by a secret process, rough rolled at a red heat, and then brought to 0.2 to 0.9 mm. thickness and 12 to 200 m. m. in width by cold working. The tensile strength of the finished material is about 95 tons to the square inch. The edges are rounded and finely finished, so enabling the belt to be safely handled even when running at high velocity. The elasticity remains unimpaired with use.

### Friction Covering on Pulleys

So that metal does not run to metal and to prevent any possible slip, a friction coating consisting of a layer of canvas, to which is glued fine sheets of cork, is placed over the pulley rim, and to avoid stripping under variable load the pulley rim is first serrated by a rough file or chisel nuts. A special cement is available for use in very damp situations.

It is claimed that steel belts have replaced cotton rope drives in a number of cases and that the simplicity of the conversion is such that the conversion of a complete rope race can be undertaken on a Saturday noon and be completed with the steel belts ready for running the following Monday morning. The conversion is said to usually increase the horse power available at the driven shaft by 7 to 25 per cent., this being the result of a number of tests in actual installations. Where space is cramped and drives are running to various floors, steel driving belts are said to be very adaptable.

The requirements necessary to the successful employment of steel belt transmission are simple, but neverthe-



A 450 H.P. DRIVE. SHAFT CENTERS ARE 40 FT. 3 IN. PULLEY DIAMETERS 15 FT. 2 IN., AND 12 FT. 7½ IN. TWO 8 IN. STEEL BELTS REPLACED ELEVEN 1¾ IN. ROPES. THE SPEED RANGES FROM 70 TO 90 R.P.M. THIS DRIVE HAS BEEN IN USE SINCE 1915.

less important, and given suitable conditions, the results are definite and certain. When it is understood that steel belts must run perfectly true on to the pulleys, the tension to remain exactly as when fitted, the conditions demanded will be easily comprehended. The shafts, bearings and fixings must be of a solid construction, strong enough to transmit the maximum load demanded. The shafts must also be parallel, and the pulleys running true, and without vibration.

It should be clearly understood that the steel belt is only a part of what actually is a highly scientific system of power transmission. As already explained, the process of preparing the steel and the mounting of the belts is carried out on highly scientific lines.

### Safeguards

With ordinary care steel belts are perfectly safe, as in case of fracture the belts will not fly, but fall between the shafts. The edges are rounded, and can be handled whilst running. In every country where used they are placed under precisely the same laws and regulations as applied to ropes or leather belts.

Here are a few claims made by the makers of the type of belt we have been describing:

An efficiency in power delivery of 99-99½ per cent. Great steadiness: a necessity for electrical machinery, textile purposes, paper mills, etc. A perpendicular drive is no disadvantage for steel belt driving.

Absence of stretching—a steel belt does not stretch by use, as has been seen by eight years' experience. Even running, free from slip.—As there is no actual measurable slip, it follows that transmission by steel belts is uniform and invariable.

Great power under present conditions. —In cases where the pulleys are limited in size it is often possible to get an increased power transmitted by the use of steel belts without any re-arrangement.

Cool bearings.—Owing to the exact calculations of the necessary tension for each particular drive, together with the great reduction in the weight of steel belt. Cleanliness.—No messy dressings are required.

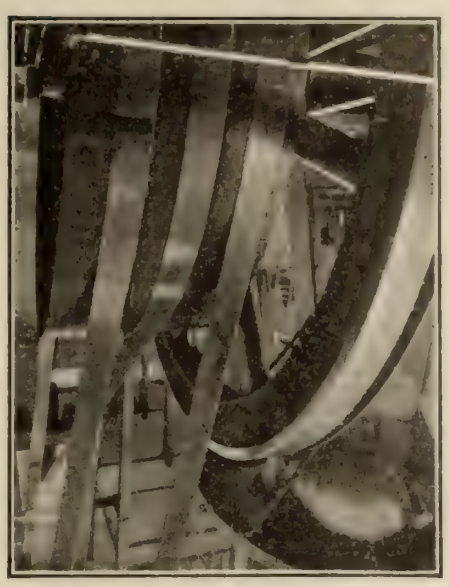
Unwearability. — Steel driving belts have now been in operation for eight years, and tests made of the belts first fitted show no signs of deterioration whatever. It seems evident therefore that the life of the steel belt is unlimited.

### Breakages

Where the conditions are in accordance with the requirements, it is only in very isolated instances in which a fracture occurs. These instances are invariably due to a flaw in the material itself, and will show within the first eight weeks of running; by this is meant that if a steel belt runs for eight weeks it is a practical certainty that it is free from flaw and will run indefinitely. To cover any serious stoppage caused by a faulty belt, the manufacturers will, if requested, supply with every drive a duplicate or reserve belt, measured and ready for immediate fitting.

Steel belts vary in width from 2½ in. to 10 in., and thickness 0.4 m. m. to 1.0 m. m.

Several steel belt drives are performing good service in England where there are over 50,000 H. P. varying from 20 to over 800 H. P. drives in successful operation, some of these steel belt drives having been in operation over eight years. As steel belts may be applied in multiples there is no limit to the possible power to be transmitted.



ANOTHER COMPACT STEEL BELT DRIVE.

## INCLINING TORCH WHEN CUTTING

Straightaway cutting with the hand torch is facilitated by inclining the head of the torch backward after the cut is well started. The degree of inclination will vary somewhat with the thickness of the metal and other conditions. A fairly conservative figure is 65 to 75 degrees angle from the plate behind the torch to the torch head. The effect of inclining the torch is to speed up cutting considerably. The gases directed at an angle preheat the thin edge of the undercut metal ahead of the igniting temperature more rapidly than when the tip is held squarely with the plate. The gases and products of combustion turn backward, passing through an arc of say, approximately, 90 degrees and shooting down and back. Often the drag or lag of the cut will be as much as one-half or even three-quarters inch on half-inch steel. When cutting with the torch inclined it should be uprighted just before finishing the cut in order to sever the metal at the end. Otherwise a wedge of uncut metal will be left due to the oxygen's shooting by the corner as the torch reaches the end of the cut. The "drag" part of the cut will be left untouched. Uprighting of the torch cuts this portion off cleanly and lets the piece drop.

Expert hand cutters are able to cut one-half inch steel plate with a very narrow kerf and low oxygen pressure, often working at speeds up to 24 inches per minute and sometimes faster. The experienced cutter learns to follow the cut with great precision, going no faster than permissible but still following the combustion rate so closely that there is little or no loss of cutting efficiency. This is very important. The cutter who tries to work too fast "loses the cut" and makes a mess of things. The cutter who works too slowly wastes gas and time, while the one who knows just how fast to cut approximates 100 per cent. efficiency in time and gas.—Antogenous Welding.

## REMOVING BUCKLES IN PLATES

When a section of a steel plate is heated with the oxy-acetylene torch, expansion of the heated metal is restrained by the surrounding cold metal, the result being that the hot metal is slightly upset and made a little thicker. When the metal cools it shrinks, continues Acetylene Journal, and advantage of this is taken to remove buckles from plates. Buckles can be eliminated very nicely with the torch by operators who understand the mechanics of the trick. The buckle should be located closely and circled with chalk. Three or four spots should be marked, depending on the size of the buckle and the thickness of the metal. Heating the spots results in the complete disappearance of the buckle, due to the upsetting and subsequent contraction of the metal. It might be explained that a buckle in a plate is simply a result of excess metal at that place. When the metal is shrunk the buckle lies flat.

The operation has been found to be easy in accomplishment, and invariably satisfactory in the desired result.

## A CHAIN FRACTURE

Last autumn an explosion occurred on an oil tank barge on the Thames. In the official report there is a description of how a chain broke, which gives some indication as to how great may be the forces thus produced and how suddenly they may be applied.

The chain in question was a set of 1½ in. chain slings and a large ring suspended from a set of sheer legs. After the explosion some of the links of the chain were missing and others fractured. Shackle pins were also missing or distorted, and the large top ring, of 3½ in. metal and 12 in. inside diameter, was cracked diametrically, but not appreciably distorted. The condition of the various fractures, etc., indicated that the slings had been subjected to very severe stresses suddenly applied. There is conclusive evidence that before the explosion the ends of the slings were resting upon the port side of the top of the tank, but they were not secured to any part of the tank or barge. The depressions noted near the rugged hole in the tank top were such as might have been produced by a very violent blow on the plate from the rounded ends of heavy chain links or shackles. The metal at the edges of the hole was bent inwards, and this effect would be produced by the resistance which would be offered by heavy slings and the plate beneath them to the force of an explosion within the tank. It appears, therefore, that the ends of the slings penetrated the tank top owing to the violent upward movement of the latter, and, as the whole of the tank top was ripped up along the port side and turned over from the port to the starboard side, the slings caught in the ragged metal of the hole, and in this way were subjected to a tremendous sudden jerk which caused the fractures in the chain links and ring. It is estimated that a total pull of at least 135 tons was necessary to fracture the large ring.

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The mechanical properties of medium carbon steel are changed but little by a wide variety of rolling conditions, according to the Bureau of Standards

# Method of Training Machine Shop Workers

## Training Department A Progressive Step—Equipment Provided—Old and New Method of Induction—Pieces Produced are Counted Several Times Each Day and Student Has Chance To Judge His Own Progress

By GEORGE A. SEYLER

SPEAKING on the subject of "Training Machine Shop Workers," the author, who is works manager of the Lunkenheimer Co., Cincinnati, Ohio, had the following to relate to the National Metal Trades Association:

During the machinists' strike in Cincinnati last year it was necessary to induct new workmen into the shops to fill vacancies, and after giving the subject careful thought the decision was reached to install a training department in the plant of the Lunkenheimer Co. After an experience of eight months with the department and careful observation of the graduates and their wrok, the plan has proved to be one of the most progressive steps ever taken in our plant.

To determine the required number of men to supply a 100 per cent. turnover, it was found necessary to create a training department of sufficient size and with proper equipment to graduate 10 men per week, to maintain a force of approximately 500 men in the several manufacturing departments. It was assumed that the average period of training would be not longer than two weeks, the idea being to train specialized operators and not to teach apprenticeship courses.

The proper equipment of a training department should be based, first, upon the nature of the work in which the students are to be trained, and, second, on the desired number of students to be kept in training, together with the length of time required to obtain necessary efficiency to graduate or promote the students to regular production work.

### Equipment Provided

The equipment provided for our training department comprised the following: One testing apparatus, to be manned by two men; one boring mill, one speed lathe, one punch press, two drill presses, five monitor lathes of various sizes, one heavy duty production lathe, one hand screw machine, one forming lathe, one hand-operated two-spindle milling machine, one air-operated two-spindle milling machine and an assembly bench, with ample space and equipment for four men.

In selecting a location it was decided to isolate the training department from the production departments. Students have their own workroom and locker room and do not come in contact with any of the workmen until they graduate into the main shops.

Under the old method of inducting new workers into the shops, a beginner is required to gain a great amount of knowledge and information in very short time. Upon entering the employment department he is interviewed by the employment manager and required to give the following information: Name, address, date of birth, nationality, married or single, number of dependants, and possibly to answer other questions.

He is then told about the plan whereby every employee is insured by the company. He is told the number of his registration card on the time clock and is given a key for his locker. He is escorted to the time clock and instructed how to register in the morning, noon and night. He is taken to the locker room and shown the location of his locker. Next he is to escorted to the department in which he is to work. He is introduced to the foreman, who presents him to the assistant foreman, who in turn takes him to his machine or bench and tells him his machine and tool check numbers.

The man is ready to work, but his head is crammed with preliminary instructions, locations, numbers, names, etc. Sense of location is lost, he has forgotten the name of his foreman and possibly the number of his locker, and while racking his brains in a futile endeavor to remember these things he is being given instructions in the use, setup and oiling of his machine. Perhaps all this has taken place in less than an hour. In the meantime, he has become confused with the vision before him, the maze of wheels and belts, and is trying to find his bearings by glancing at some of the workmen near him. Perhaps in a few hours' time he will be left alone to try his own hand at producing, and observing the regularity of production by the fellow next to him and comparing that with his own small output, he begins to feel that he won't be able to make good. When the signal sounds for the lunch hour at noon we might find him devising ways and means of getting out of the shop. Now, as for the induction of a man into our training department: After his interview with the employment manager, he is turned over to the director of training who puts him at his ease. The director is able to speak to him in a moderate, pleasing tone as it is not necessary to shout to be heard above the din of machinery, as in the main shop. He does not bother the man about his registration card as this matter has been attended to for him. He also gives him a memorandum card upon which is written the clock number, locker key number and machine number, and tells him to carry this with him to remind him of the numbers. He is extremely careful not to crowd the new man with too many impressions, realizing that it is futile to begin teaching additional points until the first have been assimilated. There is no confusion in the beginner's mind, he is informed that everyone else in this department is undergoing training.

### New Plan Proves Superior

Under the old method of inducting a worker into the shops, he was instructed in each step as he progressed by the simple means of being told what to do; he followed out a series of commands to do this first, then that, then the other thing, and so on. The instructor, after giving about 15 or 20 direct commands, usually asked the question "Do you understand?" The new workman, for fear of being criticized or being judged as dense would answer "Yes." It is possible for a man to mimic perhaps 10 or 12 motions. He is able to reduce them to a habit and thereby pass muster as a man who will "pick up," during which time he forms bad habits of posture and manipulation of his implements which take months to correct.

Without proper training, a beginne in many instances, following the line o least resistance, or through fear of be ing reprimanded, will turn to the ma working next to him for help.

This action immediately establishes bond between the two men which ma work to the material disadvantage of the beginner, especially if the "old hand' might be radical or tricky. The best friends of the beginner in the shop are the director of training and his assistants, to whom the student may appeal at any time for additional instruction. These men think straight and are able not only to teach and instruct the beginner in the manipulation and handling of his machine or tools, but also to give him a viewpoint that is extremely difficult to be overcome by the soap-box agitator.

One of the principles in a training department is that a man learns by doing. It is not necessary for an instructor to touch a machine when training a student, but he can have the student do all the work himself, providing the instructor can teach by means of reasoning each step as they progress.

Suppose you were called upon to teach a man to operate a lathe. Where would you begin? With the shifter or with the tool and the tool-post, tail stock, lead screw, or spindle, or like a great many instructors, would you teach a little of this and a little of that? The effect on a pupil being taught by an instructor who has not analyzed a progressive method of teaching is like reading a magazine or a book wherein the pages fail to come in regular sequence.

To discover whether or not a student is reasoning during the process of teaching, it is necessary to know what is going on in his mind, and the way to find this out is to ask a question that will make him think in order to give a proper answer. The question "Do you understand?" with the answer "Yes" or "No," does not mean anything, but the question "Why did you push that lever?" causes the student to think, to give a reason for his action.

The number of pieces of work produced each half-hour is counted for the student and registered on a card, and he is able 16 times a day to judge his own progress. From our experience it is found that 75 per cent. of the students can reach a given standard of production in about 10 days, and during the balance of the second week of training this standard is maintained or even bettered.

Since its installation last fall, more than 80 men have passed through our training department. We have found but two who did not fit in and had to be dismissed because they lacked latent mechanical ability. Of the balance who graduated from the department six have left our employ. As a part of the routine the graduates are brought to the office of the works manager for a little personal talk, and they consider it a privilege to go up into the main shops. Incidentally they find that the "bosses" are human beings like themselves.

After 10 of these graduates had been placed on production in various departments of the main shops, inquiry was made of the foremen as to their opinion of them. In every case the opinion was that the employment manager had selected extraordinary men for training. The standard of intelligence and efficiency had shown such marked improvement the foremen concluded that in the past the employment department had provided them with men of the poorest quality obtainable. The foremen were then asked as to how the students qualified in comparison with men trained in the production shop under old methods and the answers were that the students at the time of entering the shops were equal to men who had been working in the shops from six to nine months. New high records were made by some of the students from the training department within a short time after being put on production work.

Appreciating the many advantages in training men for production, the thought was impressed upon our minds that the function of the training department, its equipment and organization could be extended by giving the assistant foremen what might be called a post-graduate course. This training is now in progress and the results are most encouraging. Thirty-six assistant foremen are in training, divided into classes of six each, each class having an hour's instruction during the day. Two nights per week are devoted to class ensemble, under the direction of an assistant professor of the University of Cincinnati. The attendance is purely voluntary on the part of those enrolling. The night classes as a rule extend beyond the time allotted, due entirely to the enthusiasm and interest of those attending.

# The Use of Sirens in Industrial Plants

*By O. S. BURKE

THE USE of electric sirens as a means of fire protection in industrial plants is extending more and more every day as their varied and unique value is appreciated. One of the siren's outstanding dominant or predominant qualities is its clear, shrill, penetrating sound which cannot be confused with any other signal, and which is easily distinguished above the roar of machinery in industrial plants. When located outside, sirens can be heard for miles around.

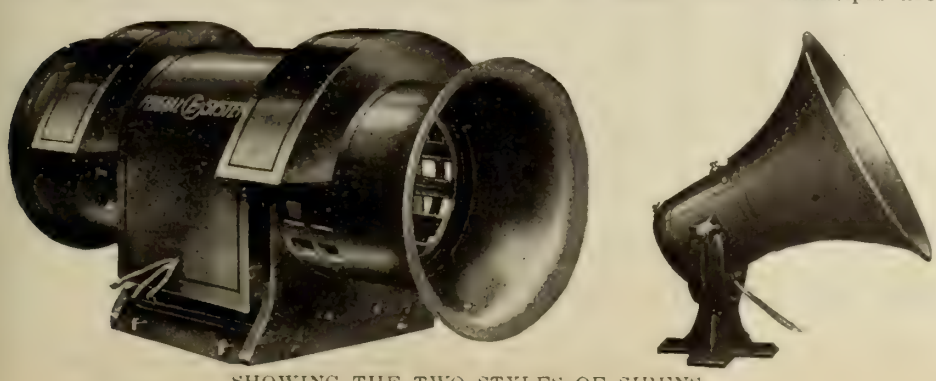
Another great advantage of the siren as a fire signal and alarm device is that it may be set in motion from as many different places as desired by merely pushing a button. Furthermore, it can be arranged so as to give signals indicating the location of a fire within the plant instead of giving only a general alarm. Electric sirens are built in various sizes, the larger being commonly known as single head, and double head, meaning that one size has one large rotor only, while a larger size has a larger rotor on each end of the machine, the motor being in the middle. It can easily be seen that the larger siren will have a much further penetrating power. Because of the fact that these style sirens are used primarily for exterior use, they are absolutely weatherproof.

An occasional oiling is all that is necessary to keep them running smoothly year in and year out—they require little or no attention, and the cost of operation is really negligible, rarely more than two or three dollars a year. In large industrial plants, such as ship building yards, steel mills, etc., one or more double head sirens are used. Some are designed to give only a general alarm to notify the plant's fire corps, voluntary or paid, that there is a fire. Others give signals to indicate where the fire is located and then stop. Others automatically continue to repeat the signal until they are shut off. The number and kinds used vary with the conditions in the plants in which they operate. The Bethlehem Steel Works, for example, has sixteen double head sirens.

Large concerns in isolated locations and which have volunteer fire departments, prefer the large electric siren to give a general alarm, which not only serves as a warning of fire to the fire corps and employees, but also notifies the nearest municipal fire station of the fire. Where the siren serves this double purpose, it is located outside of the plant.

Industries of average size use either the single horn siren or the small type, shown alongside of the larger one. The single horn siren which emits a much louder sound than the Type "A", as we term it, is preferred where there is much noise caused by the operation of the machinery such as punch presses or hammering devices. In such plants, a signal system is generally devised so as to indicate the location of the fire. The small type is used inside of smaller plants and in larger places where there is little noise, such as warehouses, storage plants, schools and offices where these are located within municipal fire limits. Concerns located outside of the municipal fire limits invariably use the double-horn siren. Besides acting as a warning of fire which is distinctive and which cannot fail to be heard, they are often used as quitting and starting signals.

*Manager Siren Dept., Federal Electric Co.



SHOWING THE TWO STYLES OF SIRENS.

## THE EFFECT OF NICKEL AND COBALT ON CAST IRON

Various researches have been made from time to time on the additions of special elements to cast irons, with a view of improving their properties. In a recent issue of "Stahl und Eisen," Bauer and Piwowarsky describe some experiments which they have carried out on nickel and cobalt additions to cast iron. The raw material used was a Swedish charcoal pig iron, containing 3.90 per cent. total carbon, 2.80 per cent. graphite, 0.048 per cent. phosphorus, 0.18 per cent. manganese and 0.69 per cent. silicon. After melting in crucibles, suitable additions of nickel were made and the metal poured into dry sand moulds. Suitable samples were taken for analysis, tensile tests, impact tests, compression and hardness tests. From the tables given the addition of 1 per cent. nickel shows the best figures. The increase in bending strength as compared with the original cast iron is approximately 30 per cent., the compressive strength is increased 30 per cent., and the tensile strength by 18 per cent. The following are the mean figures for an addition of about 1 per cent. of nickel: Total carbon, 3.89 per cent.; graphite, 2.85 per cent.; nickel, 0.87 per cent. Bending strength, 31.3 kg. per sq. mm.; deflection, 6.8 mm.; tensile, 12.5 kg. per sq. mm.; compressive strength, 74.75 kg. per sq. mm.; Brinell hardness, 171. For the manufacture of high quality castings for machine parts, gear wheels, etc., the addition of up to 1.2 per cent. of nickel is recommended. The results obtained by cobalt additions show that its effect is opposite to that of nickel, and the authors consider that there is no possibility of using cobalt for improving the qualities of cast iron.—Engineering Review.

## SHALLOW WATER VESSELS.

The problem of finding a satisfactory means of propelling craft in very shallow waters is one which is of great practical interest in many parts of the world. A British engineer who has given special attention to it has evolved a method of jet propulsion which gives very satisfactory results. A centrifugal pump fitted on an upright spindle draws water in at the centre and discharges it by two mouths at the sides. When the jets are thrown aft, the boat moves forward; and since the pump can be turned round it affords a means of steering as well as propelling the boat. Should the boat run aground, the pump can be used to squirt water on the mud or sand, so as to gradually wash it away and enable the boat to get clear. A weed cutter is provided at the mouth of the pump to remove any vegetable growths which may collect there. Although this method of propulsion is not so efficient as the ordinary screw, it is much better adapted to the navigation of shallow weed-clogged waterways. Tests which have been carried out on about two hundred miles of derelict waterways have proved the practical value of the invention.

# Have You Tried This Contest Yet? If not--- Do so Now

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.




The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

## What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

Several contestants submitted correct answers to all the questions in June 2nd issue. Following are the names of those who submitted correct lists. J. B. Smith, Canadian Link Belt Co., Toronto; J. H. Wood, St. Catharines; C. Newman, St. Catharines; B. Back and F. E. Regan, both with the P. B. Yates Machine Co., Hamilton. In the elimination test, J. B. Smith was the name picked as winner. We still receive letters stating that correct lists were forwarded which we don't acknowledge. Such lists never reach us, otherwise we would mention them.

**CONTEST FOR JUNE 23RD ISSUE**

**Contestants are required to write us, stating to which advertisements we refer in this number.**

1—Something that uses a 10 H.P. Motor
2—A very essential quality in a W——?
3—How to waste—or save.
4—A small——? for a big job.
5—Something that means lower costs.
6—What to do if you require special machinery
7—A development of 74 years' policy.
8—Two opposites handled with smoothness and accuracy.
9—Something used for all kinds of general D——?
10—A case where space was too small.
11—A product that set a new standard.
12—Something dated Sept., 1920, which is most important.

**These are Correct Answers for List from June 2nd Issue:**

1—Hamilton Gear & Machine Co.
2—National Electro Products, Ltd.
3—The Canada Metal Co., Ltd.
4—Canadian Steel Foundries, Ltd.
5—Canadian Blower & Forge Co., Ltd.
6—La Salle Tool Co.
7—Pilot Steel & Tool Co., Ltd.
8—Nicholson File Co.
9—Hull Iron and Steel Foundries, Ltd.
10—Parmenter & Bullock Co., Ltd.
11—Dominion Steel Products Co., Ltd.
12—Hamilton Engineering Co., Ltd.

## Closing Date for This Contest is July 14th



# WHAT OUR READERS THINK AND DO



### LIFTING DISC WHEELS

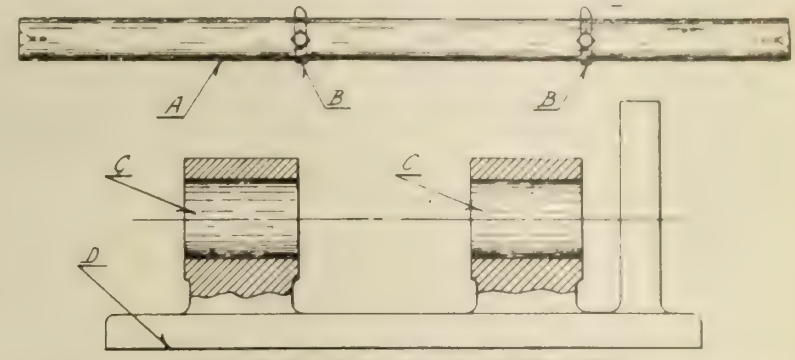
By JOHN S. WATTS

To get a hitch on a plain disc wheel, such as an idler sprocket or crank disc, with a narrow rim, that will be safe under all circumstances, and will not interfere with the placing of the wheel on its shaft, is a problem that is sometimes met with, and the proper and safe way to do this is not as well known as it ought to be.

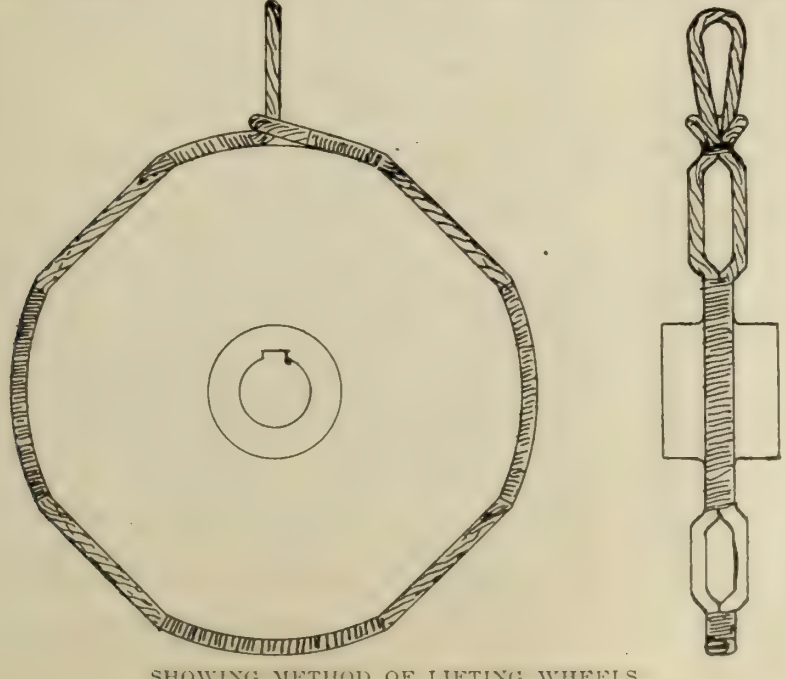
The sketch accompanying this article shows how the rope should be laid, that is by tying the two parts of the rope sling together at intervals, and letting the wheel rim slip in between the two ropes between these intervals. When the wheel is heavy, the safe way is to tie the ropes together at about the spaces shown, by serving the double rope with heavy cord or marlin.

It is obvious that the sling will grip both sides of the rim of the wheel, holding it in what is practically a cradle, and that it is impossible for the wheel to get out of the sling while its weight is supported by the rope. The wheel when slung this way can be handled with perfect ease, as it will hang vertically, and can be slipped onto its shaft with facility.

When handling such parts out on the job, away from the cranes, the novice is apt to waste considerable time in skidding it around. If the wheel is lying flat on the ground, by placing a round stick or pipe in the bore, and wedging it there, the wheel can be easily tipped up vertically, because of the leverage of the pipe, and once having it in this position it can be rolled to its destination quite easily, even if of considerable weight, as the pipe furnishes a means of controllng its movements.




PLEASE SEND IN YOUR REPLIES PROMPTLY.



SHOWING METHOD OF LIFTING WHEELS.

### PARAFFIN ENGINE.

Several British engineering firms have been giving attention to the production of small robust petrol or paraffin engines specially adapted for agricultural use or in other situations where expert supervision is not available. In one of the latest products of this class, separate cooling tanks (which take up a great deal of space and make the equipment much less portable) are eliminated, and the cooling of the cylinder is affected by means of the water in an extension of the cylinder jacket. No pump, piping, radiator, or other complication is used. A three horsepower engine of this type weighs 382 lbs., and runs at 600 revolutions per minute. It operates equally well on petrol or paraffin and is built to give reliable service under the most exacting conditions.

### BORING WORK QUERY.

(By R. James).

In using the bar A for boring out the holes C C in the piece shown in the sketch, what would be the result if the lathe centers were out of alignment? Wold the holes be parallel or tapered? Would the holes be parallel or tapered? other? The work is secured to lathe saddle, and the bar held between the centers.

### BORING TOOL SET

A boring tool set with several distinct features has been developed by the Cascade Tool Company of Cohoes, N.Y. The sets consist of a holder, clamp bolt, two eccentric spring sleeves and three boring bars, each fitted with high speed steel bits. The tool holder is made in two pieces permitting it to be swung to any desired angle, and the tool may be used for turning the outside of work when same could not be done with the ordinary boring tool.

### VANADIUM STEEL.

"Vanadium in War and Peace" is the title of an illustrated booklet issued by the Vanadium Corporation of America, New York. It is introduced with a short history of the metal and the ore, particularly the supply of the latter. Then follows a large array of short illustrated articles on the various applications of vanadium steels in aircraft, automobiles, artillery, locomotives, etc. Charts of the physical properties of vanadium steel at different draw-back temperatures are included as well as an alphabetical list of given applications of vanadium steel.




## Old Machinery Lowers Profits

WRITING on the subject of "Getting Back to Economical Manufacturing," W. R. Basset, of Miller, Franklin, Basset & Co., claims in a recent issue of "Factory" that the scrapping of antiquated machinery often saves money. He writes as follows:—

The amount of supplies to be used for a given job can often be standardized just as the amount of productive material to be used is predetermined.

This method has been worked out by many different industries and for many operations. A careful study should, of course, be made, and if it is possible to standardize, it is well to do so. At the end of the month, by comparing the total amount of supplies used with the total number of units produced, a prompt check is had as to whether or not the standard methods are being lived up to. It is often possible to offer incentives to operators to meet the standard.

So much attention has been given in recent years to efficient methods of handling materials that it does not seem necessary to lay much stress upon that feature here. The development of industrial trucks and conveyors has been widespread, so that the proper equipment for nearly any condition can be readily chosen.

A word of warning would perhaps not be out of the way. That is, that an executive's enthusiasm for efficiency may here lead him into spending an undue amount of money for equipment. I have in mind an instance in which one man's time was given up to doing a certan bit of trucking. As it was considered in this plant to be inefficient to have a man doing a machine's work, a conveyor was installed which required not only a man to load the conveyor, but another at the other end to unload it, obviously a poor investment. Then, too, I have seen plants which although equipped with the most modern haulage devices, were so poorly laid out that their trucks were travelling from two to five times as far in a day as would have been necessary had the plant been rearranged so that sequential operations would have been closer together.

Another source of loss which is not uncommon is that of using antiquated machinery. I have in mind a plant which was using three old machine tools rather than spend the several thousand dollars which would have bought new ones. As a matter of fact, the management did not realize the losses that were occurring. A study of production, however, showed that these tools were turning out only about 75% as much as they should have, and that three or four times as much money was being spent for repairs to them as new tools would have required. When this condition was translated into dollars and cents, the new equipment was purchased and the old tools given a complete and thorough overhauling which put them into such condition that they could be used for other purposes without undue loss.

While at the present time few manufacturers are in a humor to replace old equipment with new, the savings which can be made are worthy of thought, for such savings continue year after year.

## The True Executive

IN speaking to the Civic Development and Advertising Council at the Chicago Association of Commerce, J. George Fredrick, president of the Business Bourse International, Incorporated, handed out a few hot liners of truths.

Among other things he said: "We have put on long pants—been boys in business, both domestic and export, long enough. We are guilty of criminal failure because we do not look facts in the face and anticipate situations, guilty of ineffective planning and of inflated ideas.

The traditional big boss who made all the decisions for the firm has been abandoned. The true executive is not a boss; he's a coordinator. He picks the right man for the right place and puts responsibility on him till he "cracks"—then he knows this man's capacity.

We have had vast resources to back us and easy sledding in their development. That is all passing. We are doing business on lower margins; we must handle finer adjustments, as Europe has done before us.

Sales methods must be trimmed and revised to meet such big forces as chain stores and cooperative societies. England has 9,000,000 cooperative buyers out of 40,000,000 people. This is coming to us. The public will not stand high prices. It wants to know why it at times costs five times as much to sell as to produce; a situation without justification.

Scientific purchasing compels the manufacturer to engineer his selling to meet the buyers' demands. Selling in the future must be accomplished by sincere cooperation between the sales department and the jobber and dealer.

Business success is based on these essentials,: men, information, policies. If we handle these properly we take the "hunch" out of business.

## Aerial Photography

SPEAKING on aerial photography, F. E. Haggvist, in Textile World, has the following to say:—

Before the world war aerial photography was practically unheard of. During the war its development was rapid because observers without cameras could not be depended upon to report with sufficient certainty to be of great material use.

Aerial photography opened up many new fields, among which is the photographing and mapping of industrial plants and grounds.

Photographs show truthfully all scrap piles, littered grounds, and poor arrangement, and when they are to be used for advertising or publicity work may be improved in appearance by retouching. Pictures are especially useful in the careful analysis of a plant for future planning and extensions.

Quite as important as the large aerial photograph is the mosaic picture or series of pictures, in which may be shown the complete plant, dams, canals, water supplies, railroads, streets, houses, and undeveloped property.

The use of aerial photographs saves expensive surveys. Sections to be studied may be printed and used for making notations, laying out work, or planning future development.

## Rules for Industry

CAN we make rules for industry? According to a recent article in Daily Financial America, we can, and here is how they present their claims:

The findings of the commission which has been studying the economic situation in Belgium might be considered with profit. Among the recommendations made by the commission are the following:

To market cheaply industry must be improved by the most modern technique, and the most up-to-date improved machinery. In organizing the industries, specialization and standardization needs must be taken into account, and the mechanism must be designed and adapted to meet these requirements. Industries and manufacturers are advised to combine for the economic handling of credits, and so on, through banks and export agencies, acting for the collective interests of all. Appeals should be made to agents of industry and well-informed workmen for increased production, and, in addition, methods of remuneration that will incite workers to produce more should be applied. To avoid conflicts with workers, committees of employees should be set up to control the internal or domestic mechanism of the industry.

By following these recommendations Belgian industry has already made notable strides toward recovery. The lesson may well be followed by industry in other countries.

## Important A. S. M. E. Papers

The recent convention of the American Society of Mechanical Engineers at Chicago, Ill., was a huge success, many papers of importance being presented. The section on machine shop practice met simultaneously with the fuel section, the presiding officer being F. O. Hoagland, vice-president and works manager Bilton Machine Tool Co., Bridgeport, Conn. Four of the papers presented had to do with the influence of the automobile on the machine tool industry and the fifth, entitled "Fundamentals of Interchangeable Manufacture," was presented by the author, C. B. Lord, works manager Advance Rumely Co., Battle Creek, Mich.

A paper on the influence of the automobile on the machine tool industry in general, written by F. K. Hendrickson, Reed-Prentiss Co., Worcester, Mass., was read by Forrest E. Cardullo, chief engineer C. A. Gray Co., Cincinnati. Luther D. Burlingame, industrial superintendent, Brown & Sharpe Mfg. Co., Providence, R. I., read a written discussion of Mr. Hendrickson's paper. Mr. Burlingame pointed out that the influence of the automobile industry was not only to be noted in the machine tools directly used in automobile production but also in the gauges and tool equipment required in the interests of accuracy and precision. He also mentioned grinding machinery as a type of equipment which had been developed rapidly under the impetus of the demands of the motor output. Without grinding machines, he said, it is doubtful whether the automobile industry would be commercially possible. He asserted that hardened gears, curved tooth and bevel gears and worm gear drives have all been brought out and developed because of the demands of the motor industry.

Sol Einstein, chief designer for the Cincinnati Milling Machine Co., read a written discussion. He pointed out how another automobile work influenced the design of milling machines and how it resulted in bringing out automatic feeds and intermittent feeds and returns on milling machines first developed by his company in 1910.

In commenting on Mr. Hendrickson's paper, J. A. Smith, general superintendent General Electric Co., Schenectady, N. Y., stated that there is an increasing demand for strength, power and speed in machine tools and for better quality and durability of the materials of which the machines are made. Precision and specialization in machine work brought to the fore by the automobile industry are possible greater degree in shops doing work involving little variety.

Mr. Smith laid particular emphasis upon lubrication, contending that machine tool builders are less up to date in matters of lubrication than in other particulars. It has been the experience of the General Electric Co., he said, that the majority of machine tool repairs are due to lack of lubrication. He attributed this to the fact that many oil holes are difficult to find and machine operators often forget to take care of the oiling. In a shop where duties are specialized he said it is not possible to induce workers to give the same attention to oiling that is given by the old-time all-round machinist. He asserted that machine tool designers should provide larger and more easily accessible holes and should reduce the number of the holes.

### The Machine of the Future.

Mr. Lord asserted that from a manufacturing standpoint specialized tools, in the sense that they can perform numerous operations, are not wanted. The machine of the future he asserted will not be a complex machine doing multiple operations, but a simple machine doing a multiplicity of one operation, or in other words getting out a maximum output of one kind of product. He asserted that too many feeds and speeds are objectionable because they provide too many ways of getting out of order.

In commenting on the subject of lubrication brought up by Mr. Smith, Mr. Cardullo asserted that the trouble lay in the fact that oiling has not been functionalized like other operations in a specialized shop. If a responsible employee were deputized to keep tools properly oiled, he remarked, there would be little further trouble along this line. Much of the present difficulty is due not alone to the failure to oil but to the use of oil of improper viscosity. He stated that machine tool designers cannot build machine tools with a tight housing so that they may be flushed with oil like an automobile, but that certain parts by the very nature of things must be left exposed.

### The Question of Painting.

Mr. Hoagland brought up the matter of painting machine tools, stating that in the textile industry all machines are painted green, probably because that color is restful for the eye. Mr. Smith stated that to his mind gray would be the best color for machine tools, as it is an excellent reflector of light and would be kept clean. He mentioned, however, that unless machine tool builders adopted a uniform color other than the black now in use, the effect would be anything but desirable in a large shop. In a small shop, of course, all of the machines could be repainted to one color by the buyer.

Mr. Cardullo did not take kindly to the suggestion that an excess of weight in the machine tool is a desirable feature. He stated that each machine is in itself an engineering study and that only enough pig iron should be used for the castings to give the machine durability and sufficient rigidity to withstand vibration from unbalanced work.

Henry J. Eberhart, secretary Newark Gear Cutting Machine Co., Newark, N. J., read a paper on the influence of the automobile on gear cutting and gear cutting machinery. In it he traced the history of the development of gear cutting and pointed out how remarkably accurate were the forecasts of pioneers in this work. In commenting on the paper Mr. Cardullo stated that although theoretically gears of 20 deg. angle and over should operate as quietly as gears of 15 deg. angle and less, that was actually not the case.

The relation of the power press and dies to the automobile industry, was the subject of a paper presented by Neal W. Dorman, machine designer, Toledo Machine & Tool Co., in the absence of the author, Henry J. Hinde, president and general manager of the company. Erwin E. Wood, sales manager Jones & Lamson Machine Co., Springfield, Vt., read a paper on the influence of the automobile on lathe practice in the absence of the author, Ralph E. Flanders, manager of that company. In speaking informally on the subject of his paper on the fundamentals of interchangeable manufacture, Chester B. Lord stated that engineers often fixed small tolerances when actual practice did not demand it and that greater accuracy was possible when operations were simplified and the tolerances were small than when wider tolerances were provided for and a multiplicity of operations was attempted on one machine. Subdivision of work, he asserted, is a function of accuracy.

### Machine-Tool Standardization.

Following the reading of a letter from Mr. DuBrul, manager of the National Machine Tool Builders' Association, asking for the standardization of the commoner machine-tool parts as well as the placing of a limit on the number of sizes of different types of tool, a motion was passed asking that the secretary recommend to the council that a committee on standardization of machine tools be appointed. In his letter Mr. DuBrul pointed out that there are 72 different sizes of upright drills, of which 28 are made by one manufacturer whereas he proposes 8 different sizes to meet the demands of the users. In the discussion it was brought out by various members that lathe spindle tapers and lathe spindle noses were among those things which might well be standardized.

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## Good Times Are Actually Here

THERE was never more opportunity than now. One has only to look to see it." Elbert H. Gary, chairman of the board, United States Steel Corporation, makes this statement in a recent issue in "System," where an article termed "The Better Way to Plan Ahead" appears.

Among other important matters he touches upon the question of prices, and says as follows:—

The price equation is a very delicate one and I think that reason is a safer guide than emotion in approaching this entire subject of prices. It does not do either to raise or to cut prices without thought of the consequences—without thought as to what will be the effect on to-morrow's business.

The fair price is that which yields to an investment fair return for capital under efficient management—which pays adequately for the service that it renders. The same rule holds with labor. In the end that is all any of us can be paid because we are paid only out of what we produce. We cannot alter the equation—although we can try to forget it for awhile. Therefore I hold that:

(a) The depression has been wholly salutary in that it has served to bring us back to the fundamentals of business. Without the practice of the fundamentals no progress is possible.

(b) Unreasonably high prices will serve only to hold back the natural growth of the country, for they disturb the balance between the sections of society and curtail the strongest purchasing power.

(c) Unreasonably low prices will equally retard growth—for we shall have no surplus to grow on.

(d) Fair prices are an indication of prosperity. Unreasonaby high prices indicate that the period is nearing an end. The safe price is the one that returns a fair measure for work but returns nothing without work—whether the work be individual or corporate.



# DEVELOPMENTS IN SHOP EQUIPMENT



### WEB THINNING ATTACHMENT.

Herbert Hunt & Sons, Old Trafford, Manchester, have introduced a new feature to their patent twist drill sharpening machine. This attachment is to be used for sharpening and thinning the web of a drill without removing it from the original setting.

When the drill is in position for grinding the cutting lips, it is constantly rotated, and by a cam motion which repeats itself twice per revolution, the correct clearance is given to the cutting edges.

In the thinning of web position, the drill remains stationary, and the grinding wheel is situated in order to grind across the lips completing the grinding on one side before dividing round a half turn and grinding the other side. The drill remains in the chuck and centralizing bush for both operations. It is only necessary to move the cross slide from one position to the other and the drill will then engage with the correct grinding wheel; no re-setting whatever is required.

The arrangement for thinning is of simple construction, the auxiliary wheel being driven from the main spindle by means of friction rollers which can be engaged or disengaged at will. The thinning arrangement mounted on ball bearings swings round the main spindle, and can be adjusted for height by means of a knurled screw which comes in contact with stop. Behind the chuck which holds the shank of the drill is fitted a notch plate and latch for dividing for two positions 180 degrees apart. As the drill is originally set with the lip in a horizontal position whilst the latch is engaged in one of the notches an absolutely accurate means of equal depth of grinding is easily obtained for both sides of the drill.

### CUT-OFF SAW TABLE.

The Oliver Machinery Co., Grand Rapids, Mich., have placed on the market a new swing cut-off saw table. It is 16 ft. long, 19½ inches wide, and 30 inches high, being designed for use with the overhead swing cut-off saws. The top is made of kiln dried rock maple with angle iron girths and one piece cast iron leg sof rigid design.

The table is composed of two parts or sections. On the rear of the right hand section is mounted the scale rail, the scale rail being graduated in eighth inches from 0 inches to 96 inches, plainly marked and accurate. On the left hand section is mounted a patent automatic swing cut-off saw gauge which comprises a square rod graduated in eighth inches from 0 inches to 96 inches, plainly marked and accurate. Four automatic malleable iron stops, one center and two end rod holders are mounted in place. This automatic saw gauge is said to be a wonderful time saver where any number of parts are to be cut off to the same length. After the gauge is once set it is thereafter unnecessary to measure any board which is to be cut off to the ength designated by the stop. Rollers are inserted in both sections of the table in every other opening the full length of the table. A dust chute is fastened between the two sections of the table, having 6 inch diameter pipe opening connecting to exhaust system.

### INDEXING TABLE.

An indexing table for use in connection with machine tools has been brought out by the Industrial Engineering Company of Detroit, Mich. Two sizes are made, the tables being 10 and 16 inches in diameter. The table may be moved through 180 degrees and clamped in position by one movement of the operating handle. The bearings are of large diameter and the low height of the fixture makes it a very rigid device. The control of the indexing is by means of a special lock which automatically takes care of its own wear. Positive alignment of jigs or fixtures is tained by means of a slot across table. T-slots are provided for clan ing purposes.

### IMPROVED PNEUMATIC RIVETER

A Sheffield firm has introduced a ne type of snap for pneumatic riveters, th is said to be an improvement over fo mer snaps which have a tendency break. The weakness in the new sty is claimed to be eliminated.

The head of the snap shapes in grad ally towards the shank and a loos washer fits over the shaped part, thu providing the square shoulder require to fit the hammer head This loos washer also takes the rebound of th hammer but it does not bear any of th force of the blow. The net effect is t give much greater strength to the snap Careful tests have been carried out o structural and shipbuilding work, show ing that the improved head stands up t its work much better than the usua form. The material used is a specially tough steel intended to resist crystal lization due to repeated shock.

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# CANADIAN MACHINERY
## AND MANUFACTURING NEWS

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## The Careless Employee

CARELESSNESS, unfortunately, is a rather common commodity in any industrial plant. We are sure to find some fellow that leaves a file in his drawer, sticking long end out, because it would have taken a second or so longer to open the drawer up correctly.

Then there is the worker who piles castings loosely and carelessly, not because he wants them to fall on someone's foot, as they usually do, but simply because he has learned the careless habit. And so it goes.

The latest example of carelessness that has come to our attention has been reported by C. W. Graham of the Buntin Gillies Co., Ltd., Hamilton. In this case the carelessness of one of the employees in leaving a tap running amounted to between $2,000 and $3,000.

Late in the evening, water was seen emerging from the front door of this concern. Upon investigation, it was found that a tap on the third floor had been left unchecked. Only a water tap—yes—but how easy it would have been to turn it off correctly.

## A Regrettable Incident

"ON Account of Irregularities," thirteen students have had their examination results canceled this year at the University of Toronto. Eight of these have suffered expulsion.

What does this word "Irregularities" mean? Unfortunately, when boiled down to hard and cold facts, it means that four students have been expelled for impersonation; one student has been expelled because of his expulsion from the college of the university in which he was registered; three students have been expelled because they secured a copy of the paper on which they should have written and on the excuse of writing on another subject left the university halls, completed the writing of the paper elsewhere, and in the confusion at the close of the period of examination submitted their answers to the presiding officer.

"In the case of the expelled students the examinations of this present year are canceled, and they are debarred from registration in any faculty or department of the University of Toronto.

"Another student has had his May results canceled because of copying, and has been refused registration for the session 1921-1922 and 1922-1923, and admission to any examination earlier than May, 1923.

"In the case of another student, who denied any irregularity until the evidence against him was so strong that confesson had to be made, it has been decided to cancel the examination results, to debar him from registration in any faculty or department of the university for the session 1921-1922, and to permit him to regiser in the session 1922-1923, but without examination until May, 1923.

"Still another student, who when charged at once admitted his guilt, has had his results canceled, has been refused registration in any faculty or department of the university for the session 1921-1922, and is debarred from examinations earlier than September, 1922.

"Two other students have had their results for the year canceled on account of copying; they at once admitted their guilt and are refused registration for the session 1921-1922, but may come up for examination in May, 1922

"Irregularities" is indeed a mild word to use in such a case. Dozens of appropriate titles rise to our mind, "Downright Deceit" and "Ungentlemanly Conduct" being two of the mildest we can think of. When we look back on the days when a man entering college had a code of honor that prevented "cribbing" in any shape or form, we cannot help but think that times have changed for the worse.

If this is so, and we believe it is, steps should be taken at once to remedy the trouble. We have faith enough in the majority of our college students to state that this untortunate occurrence is more a regrettable incident, than a common practice, yet no stone should be left unturned in the effort to stamp out the new-found evil. Temptation is a hard thing to overcome, especially when examinations come round, and those in charge should see to it that such an incident can never occur again.

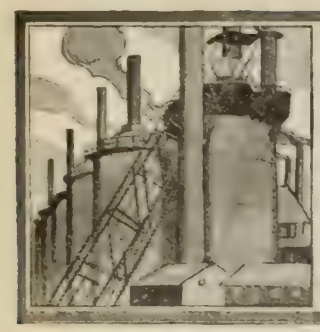
There is no short cut to success. The road to that desired of all goals, "Success," is beset with many an obstacle. There is only one real way to overcome these difficulties, and that is by "Good Hard Work."

## The Art of Knowing How

THERE is a story told, and a true one, of an express train running between Philadelphia and New York, that came to a sudden stop on an extremely hot day last summer. Accordingly to the tale, the passengers first joked, then grumbled, and finally grew impatient.

A man, white-haired, but youthful in motion, climbed down from a chair car and marched up to the engine, which was the center of a ring of passengers. "What's wrong?" he asked. In effect, the engineer said that the engine had quit and he didn't know what the several things were that were the matter with it. The big man peeled off his coat and waistcoat and rolled up his shirt sleeves. Then he sort of disappeared in the interior of the unwilling engine and the ring of watching passengers grew. Half an hour later he emerged with a smudged face and grimy hands and said, "She's all right now," put coat and waistcoat over his arm and walked back to his chair car, wiping his hands on a handful of waste he'd picked up in the cab.

Doubtful, the engineer tried the engine out, and lo—she worked. Later on it was discovered that the friend in need was none other than Samuel Matthews Vauclair, president of the Baldwin Locomotive Works.



# MARKET DEVELOPMENTS



THE situation in the steel business shows no signs of improvement, and it is possible that the immediate future will show a further decline. The one hopeful sign is that there seems to be a movement in the direction of liquidating stocks on hand, which though slow at present, may assume greater proportions as the harvest season comes along.

The independent mills are running at about 15% capacity, while the Steel Corporation has increased from 30% a week ago to about 35% at present. The increase in the Corporation's output is attributed to the fact that all buying is for prompt shipment, and the Corporation having always got a mill running somewhere, can give delivery more satisfactorily than the independents. There is some chance of more mills being shut down altogether next month. It is pointed out that this is no remarkable thing, but on the other hand it was at one time a common practice, which has been dropped under the greater volume of production of recent years.

Steel prices remain the same, there being no temptation to reduce them under present market conditions. While steel buyers are undoubtedly waiting for a reduction before doing any extensive buying, sellers figure that there is nothing to be gained by making reductions on small amounts, but rather wait till a reduction would induce a large volume of buying. With such a condition their production costs would decline, and the cut would not mean so much to them as it would at present.

Pig iron of the basic grade has shown a little reduction from $21.50 to $21 Valley, while Bessemer remains at $23 and foundry $22.50. These prices would probably be shaded on a large contract.

## BUILDING TRADES LABOR SLOW IN STRIKING AN AVERAGE

THE situation in the steel business shows no signs of improvement, and it is possible that the immediate future will show a further decline. The one hopeful sign is that there seems to be a movement in the direction of liquidating stocks on hand, which though slow at present, may assume greater proportions as the harvest season comes along.

The independent mills are running at about 15% capacity, while the Steel Corporation has increased from 30% a week ago to about 35% at present. The increase in the Corporation's output is attributed to the fact that all buying is for prompt shipment, and the Corporation having always got a mill running somewhere, can give delivery more satisfactorily than the independents. There is some chance of more mills being shut down altogether next month. It is pointed out that this is no remarkable thing, but on the other hand it was at one time a common practice, which has been dropped under the greater volume of production of recent years.

Steel prices remain the same, there being no temptation to reduce them under present market conditions. While steel buyers are undoubtedly waiting for a reduction before doing any extensive buying, sellers figure that there is nothing to be gained by making reduction on small amounts, but rather wait till a reduction would induce a large volume of buying. With such a condition their production costs would decline, and the cut would not mean so much to them as it would at present.

Pig iron of the basic grade has shown a little reduction from $21.50 to $21 valley, while Bessemer remains at $23 and foundry $22.50. These prices would probably be shaded on a large contract.

PITTSBURGH, June 23.—Undoubtedly progress is being made in the liquidation that must precede a recovery in the demand for steel. There are stocks of steel in the hands of jobbers and of manufacturing consumers that must be worked off, and still larger stocks of finished wares, such as agricultural implements, hardware, tools, cutlery, machinery, etc., that must be distributed. Steel manufacturers express conviction that even now there is some liquidation in these things, and they expect the liquidation to grow more rapid within a few weeks. In particular they think the farmers will become buyers again when they begin receiving payments on their crops.

According to the common analysis of the situation, these things must work out first, before there is any increase in demand upon the steel mills. There must also be a revival in building. In that direction conditions are probably improving, but certainly quite slowly. Building trades labor, striking an average of the whole country, is very slow in accepting readjustments, by way of wage reductions and greater performance.

The actual volume of specifications and orders received by the steel mills has decreased farther, much as might be expected, and if for no other reason on account of the season of the year, there is no likelihood of any increase in the next few weeks. The inflow of business probably averages between 15 and 20 per cent. of mill capacity and it may be still less in July. A further decline in production is therefore to be expected.

### Operations.

Current estimates are that the independent steel mills are operating at about 15 per cent. of capacity, against close to 20 per cent. say a fortnight ago. The Steel Corporation's operations are up to 35 per cent., having dropped to 30 per cent. a week ago. Precisely what has occurred to cause these changes is not known definitely, but a reasonable theory seems to be that on account of nearly all buying being for very prompt shipment the Steel Corporation has a decided advantage over many if not the majority of the independents. It is a case of "to him that hath shall be given," for the Steel Corporation nearly always has a mill running on which it can immediately schedule a specification received, while with the independents, some small mills have been closed entirely for months, and some have been running intermittently, say one week out of each three, and others while having some sort of an operation each week, taking the plant as a whole, have entire departments closed at times. Then, too, there are the Steel Corporation contracts, amounting to 5,482,487 tons at the beginning of this month, while the independents have little contract tonnage on books.

At 15 per cent. for the independents and 35 per cent. for the Steel Corporation, the average operation of the steel industry as a whole would be between 23 and 24 per cent., against about 23 per cent. a week ago, representing in general no material change for two or three weeks. Nevertheless the probability is that the rate of operation will go below 20 per cent. in July, a recovery coming in August.

One large independent mill has been closed tight. Previously it was only small mills that were closing completely, but by the beginning of July it is probable that several large plants will be closed entirely, not because they have no orders at all, but because operating plants at such very light rates is extremely expensive. It is not a matter of fixed charges, since they go right on when a plant is closed, but of high labor cost, for the number of workmen requisite does not decrease in full keeping with reduction in output. It is no remarkable thing for mills to close entirely at this season. Years ago that was a common practice but in recent years the practice died out.

### Steel Prices.

Inquiry is so very light that there is little temptation to sellers to shade prices. Perhaps they would not in any event, but the practical point is that the opportunity is lacking. Every mill knows by contact with its customers that orders would not be increased by reducing prices. The customers do not want to buy more than they are buying, and have no occasion to do so. They can fill their orders out of stock, or by their present production, and as to buying ahead, they can get shipment in most cases in two or three days after filing a specification or order and there is no indication that this condition will disappear. When there is a case of a mill not being able to fill an order promptly it is because the mill is idle, not because it is already full of business.

Ten days ago there were reports of shading in sheet prices by $2 or $3 a ton by several sellers. Now it appears that if these sellers were shading they have withdrawn the cut prices. At any rate, it does not appear that in general sheets can be bought at less than the regular or "April" prices. Heavy gauge blue annealed sheets are an exception as they frequently are, since from some mills they can be bought on the plate schedule..

Evidently practically all buyers of steel expect lower prices at some time, and before they buy to any extent. Sellers make no particular effort to combat this view. They admit the probability that prices will be lower, but they want to see a prospect of more business before they make regular reductions. No doubt their philosophy is that a well timed reduction would encourage buyers to take hold, while if reductions were made now they would simply fall flat. The mills would be giving something away for nothing, and it seems much better to save the reductions for a time when they will count. On account of light operation, most mills are probably having losses as it is and increased losses would only be invited if an eventual compensation were promised. If larger operation should result, then the production cost would decline.

### Coke and Pig Iron.

Two small contracts for Connellsville furnace coke have been closed, by the Colonial Iron Comany, Riddlesburg, Pa., and the Empire Steel & Iron Company, the Empire Steel & Iron Company, Catasauqua, Pa., respectively. Each is for about 7,000 tons a month, one being for July, August and September delivery at $3 per net ton at ovens, the other being for delivery to about December 1, at $3.15. In this price divergence the coke market runs according to its traditions, for as a rule coke has been worth more in winter. The prices are the lowest since the summer of 1916. In single carload lots standard furnace coke for spot shipment has sold at $3.10 to the consumer, $3.25 having been the minimum until quite recently. Foundry coke is easier at $4.50 to $5 for spot, according to brand.

Basic pig iron has slid off from $21.50 to $21, valley. Bessemer remains quotable at $23 and foundry at $22.50, but an inquiry of any size would probably develop concessions in the case of each grade.

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The General Accident Assurance Co. of Canada, Ltd., Continental Life Bldg., are contemplating the erection of an eight or ten-storey office building.

## POINTS IN WEEK'S MARKETING NOTES

**Blast furnace operations are down to about 20 per cent. in the Pittsburgh, Valley and Wheeling districts. The amount of new business in pig iron, semi-finished steel and finished steel is also very low.**

**Consumers are not purchasing any more than they urgently need. Price changes, such as they have been, are unimportant. There is not even enough business to tempt makers to cut prices.**

**Consumption, in some districts at least, is equal to, or even ahead of production. This means that stocks are exceedingly low, and this fact is proven by the urgent mark when any orders are placed.**

**Pig iron, according to some dealers, is almost stagnant, and may drag along as it is for some months yet. Some look for lower prices, while others feel things have hit the bottom.**

**Practically nothing is being done on semi-finished steel, and sheet and tin plate mills are not running at more than 25 per cent. capacity. The Carnegie Steel Co. has no less than seven of its steel plants idle, and there is at present no indication of an increase in demand for billets or sheet bars.**

**The machine tool market is still very quiet, and dealers are none too optimistic about the future. The waiting policy is still in force.**

**There is no change for the better in nuts, bolts, or rivets, while some makers of hot rolled strips report a slight improvement in business. Several makers are even shading prices in an effort to get business.**

## TRADE RESIGNED TO PRESENT CONDITIONS

TORONTO:—The machine tool market is still very quiet, and dealers do not look very optimistically on the immediate future. Inquiries continue to be fair, but they are mostly in the nature of feeling out the market, to see if there is any chance of a price reduction. The general policy of waiting to see the turn of events on the part of buyers is still very much in evidence. What business is being done is in small tools such as sensitive drills, and the amount is very small.

The trade seems to be resigned to the prevailing conditions, and while not neglecting any openings, are prepared for a further period of slack business. The usual pious hopes of the effect of the harvest bettering conditions are expressed, but the situation is so world-wide, that local factors cannot have much of a permanent effect.

Steel warehousemen are in no better position than their fellows in the machine tool trade. While there are some enquiries, they are mostly for very small items, and even on these customers are inclined to haggle over prices. One dealer mentioned in this respect that he had filled an order this week for a piece of ⅜ bar, and this had to be delivered a matter of six miles out of town. There is a certain amount of business doing in black and galvanized sheets, but these lines are being ordered in very small quantities. Where bundles would be ordered formerly, orders for two or three, and in some cases single sheets are now received. On these small orders customers ring up two or three different dealers in order to get the best prices. Buyers of boiler tubes are also keeping strictly to the lowest limits of their requirements, and orders for tubes are sent in for quantities of two, three, or four at a time, eight being about the limit. The lack of construction work has of course, been keenly felt by steel warehouses, and there is not likely to be any large work going on until a reduction in building trade wages has been effected. While the production at the mills has been reported to be higher this week, steel warehousemen are inclined to think that the published figures are over, rather than under the actual amount.

The old material market shows no change, stocks in dealers' yards being about the same, and little buying being done.

## Pig Iron Markets

Following the long continued decline in pig iron prices, concessions are still being made. Prices on foundry irons are at least 50 cents lower in Cleveland and Chicago, and resale basic is a disturbing factor in the Pittsburgh district. Buffalo furnaces are competing actively and Chicago iron is being sold at low prices as far distant as Ohio.

Not a merchant blast furnace in the two Valleys or in the Pittsburgh district is in operation and all are likely to be idle for some months. Furnaces are shipping from stocks, the small orders for iron, they are getting. The only sale during the week of any size was one of 2,000 tons bought by a Shenango Valley open-hearth steel plant from a Youngstown steel interest at the reported price of $21 at furnace. A sale was made of 500 tons of No. 2 foundry for last quarter delivery at about $23 Valley furnace.

The ruling price in the Chicago district for No. 2 foundry and malleable ranges from $21 furnace for tonnage to $21.50 and $22 for carload lots. Even lower prices are being named on tonnages taken outside of this district where the competition of nearby furnaces must be met, and 500 tons of No. 2 foundry was sold in Ohio at $20 Chicago furnace. About 2,000 tons of resale foundry has been put on the market recently—no prices have been named on this iron, but offers have been solicited.

There is little doubt that the Buffalo market has reached the lowest ebb since the inception of the slump in business. Two factories have reported no sales and an announcement comes in from a producer that with the completion of orders on hand, its only furnace now in blast will be blown out. The price situation is responsible for the declaration —not fewer sales. A number of carload sales were made by a producer and in each instance the price was arranged mostly at a $23 base level.

A lot of 100 tons of Birmingham iron

was sold at Birmingham at $23.50 for silicon 2.75 to 3.25. This shows how the silicons operate on a $22.50 base. It is a differential of 50 cents for each of the higher silicons. Local iron melt is picking up owing to larger operations at stove and radiator plants.

Two sales of 500 tons each and another of 150 tons of foundry iron are the only sales of importance reported on the Philadelphia market during the week. Business for the week was mostly in carload lots. Eastern furnaces are quoting $24 for No. 2 plain, $25 for No. 2X and $26 for No. 1X, f.o.b. furnace.

The Cincinnati market has shown few developments in the past week. The Standard Sanitary Mfg. Co. bought 500 tons of Southern iron for prompt delivery to its Louisville, Ky., plant, and the National Cash Register Co. took 160 tons of Southern for its Dayton plant. The latter company is expected to close for an equal amount of Northern iron in a few days. Southern Ohio iron is still being quoted at $23, Ironton, for the base grade. Belfont stack at Ironton was blown out on Thursday. A local foundry has been asked to bid on castings for the New York harbor tunnel, involving approximately 150,000 tons of castings.

New York reports that a Connecticut consumer of foundry iron has offered to buy 5,000 tons if a substantial reduction in price were made and 5,000 tons more if the iron can be held for a satisfactory period in furnace yards for future delivery. This offer is one of many examples of the pressure that is being brought to bear to obtain lower prices and even the most optimistic sellers expect to see further concessions. 300 tons of Buffalo No. 2X was sold at a $22 base to a New York consumer. One consumer is offering $20 for iron and is confident of being able to buy at that price.

Cleveland reports that the Ford Motor Co. has sent out an inquiry for 60,000 tons of ore, but there seems to be some uncertainty whether this ore will be purchased. Many mining companies made another wage reduction on June 15th. This reduction brings wages back about to those that were placed in effect April 1st, 1918.

There is absolutely no business developing and practically no inquiry, in the St. Louis market, aside from the occasional sale of a car lot. The stove foundries seem likely to get along for some time on their yard stocks, the commercial foundries are operating on 25 per cent. or less capacity and generally the business is in a very dull state. The lowest price so far found here for No. 2 Southern is $22, Birmingham, but there is no business and therefore no competition to develop any definite price.

## Scrap Metal Markets

Consumers of scrap in the Pittsburgh and Valley districts are not operating their plants to more than 25 per cent. of capacity and are not interested at any price in offerings made by dealers, as they seem to have heavy stocks of scrap on hand. It is probable that on a firm offer, machine shop turnings could be bought at $7.50 per gross ton, delivered. Selected heavy steel scrap is being offered quite freely at $13 per gross ton, delivered, but there are no buyers. Prices are very largely nominal and there is little new business moving on which to base actual prices.

On the Chicago market consumers continue to buy sparingly, but such purchases as have been made indicate lower prices. 500 tons of heavy melting steel was bought at $11.50 per gross ton, 250 tons of No. 1 railroad wrought at $10 per net ton, 250 tons of No. 2 wrought at $9.75 and 200 tons of carwheels at $13.75 per gross ton. Offerings are not being absorbed as fast as a short time ago.

Boston reports machinery cast is easier in the absence of orders and greater competition among dealers. It is available at $17 to $17.50 delivered, even at points as far north as Biddeford, Me. Owing to the continued buying of stove plate by a railroad supply manufacturer, the prices are still firm.

The scrap market at Philadelphia has been in a nervous state during the past week, due to the depressed situation in the securities market. Prices remain easy and there has been no improvement in the demand.

At Cincinnati the market is stagnant and dealers are only buying to fill old contracts. Heavy melting steel is quoted at $10.00 to $11.00.

The volume of trade continues very light and prices have further declined on the Cleveland market. Cast iron borings, heavy melting steel, and mixed borings and turnings, are 50 cents a ton lower. Machine shop turnings have declined locally about $2 a ton, owing to the fact that dealers are not buying this grade for stock and the only market for it is in Brackenridge where this scrap is bringing $7.75. A Youngstown dealer is inquiring for 500 tons of shoveling turnings and 500 tons of compressed steel scrap, offering $9.25 for the former and $10 for the latter, delivered Wierton.

There is so little change in the market at St. Louis, that it is practically impossible to record any new feature. The softness of the market continues to prevent railroads and industries from offering any material and it is very doubtful if even the most daring of the dealers would make any purchase unless for actual needs on existing contracts.

## Trade Gossip

Plans are being prepared by Gascon and Parant, architects, 502 St. Catharine St. E., Montreal, for the construction of three-storey garage. The building will be 60x120, and of reinforced concrete construction.

The Canadian General Electric Co., 158 St. Antoine St., Montreal, have received the contract for electrical equipment and motors for asbestos and reducing mill costing $40,000 for Canada Asbestos and Chrome Co., Ltd.

The general contract for erecting garage costing $30,000 for Car Owners Garage Co., London, Ont., has been awarded to R. G. Wilson and Sons, 193 College St.

The Canadian Johns-Manville Co., Ltd., 450 St. James St., Montreal, has plans and will receive tenders, no closing date set, for general and steel contracts for two factories at Asbestos, Que.

W. T. Rawleigh, 55 Liberty St., Freeport, Ill., will erect a six-storey factory on Adelaide St., London, Ont., at a cost of $150,000.

H. Pelandeau, Ltd., 1211 Ontario St., Montreal, is in the market for complete planing mill equipment.

Dunker Bros., Louisa St., Kitchener Ont., are building a service station for Reinhart and Doerr, 192 King St., at a cost of $15,000.

W. Mahoney, 162 Anger St., Montreal, is in the market for two lathes and other machine-shop equipment.

D. W. Burnett, 1424 Richardson St Victoria, B.C., have received the general conract for installing battery of new boilers for sawmill at cost of $10,000 for the Alberni-Pacific Lumber Co Toronto Letter

The manufacture of lignite briquettes by the plant at Bienfait, Sask., will start in July, according to J. M. Leamy Manitoba Power Commissioner and a member of the Lignite Utilization Board. The chief engineer of the board, R. D. L. French, made the final inspection last week. A meeting of the board will be held soon in order to determine the price of the briquettes which will likely be about $11 per ton.

The Hydro-Electric Power Commission has arranged to get 1,000 kilowatts electric energy from the Campbellford plant. The accident at the Healey Falls Power Plant, makes it necessary for the Hydro to get all the power available so as to compensate in loss of power at the Falls. The City of Peterboro is 40 per cent. short of its normal supply of power.

The Palatine Mining and Development Company, which is rebuilding the blast furnace and opening up the Paulson Iron Mines near the international border, has asked the city to sell 200 acres of land at Bare Point for the construction of ore docks, to have a capacity of 500,000 tons. They also are planning to build 200 houses for workmen.

Mr. A. W. Rodger, chairman of the Southland Electric Power Board, Invercargill, New Zealand, who arrived in Toronto on June 16th from Niagara Falls, stated that "power companies in New Zealand are anxious that their orders for electrical machinery be supplied either by Canadian or British firms." Mr. Rodger stated that he would try and get contracts placed in Toronto and Hamilton for electrical machinery, insulators, and other products of electrical companies, that he would try and place contracts for the most up-to-date electrical cooking machinery within the next few days. The amount which he intends placing here and in Hamilton will amount to about a million pounds sterling.

Members of the Minto Coal Operators' Association, have been awarded contracts for the first coal from the Grand Lake coal areas of New Brunswick for use on the Canadian National Railways. The contracts call for delivery of 10,000 tons during the next six months and 5,000 more tons during a subsequent period. This announcement was made by John Henderson, chairman of the association on his return from Toronto.

Distinction has come to Montreal in the conferring by the University of Toronto of the honorary degree of Doctor of Science on two of the leading engineers of this city, Commissioner R. A. Ross of the Administrative Commission, and J. M. R. Fairbairn, chief engineer

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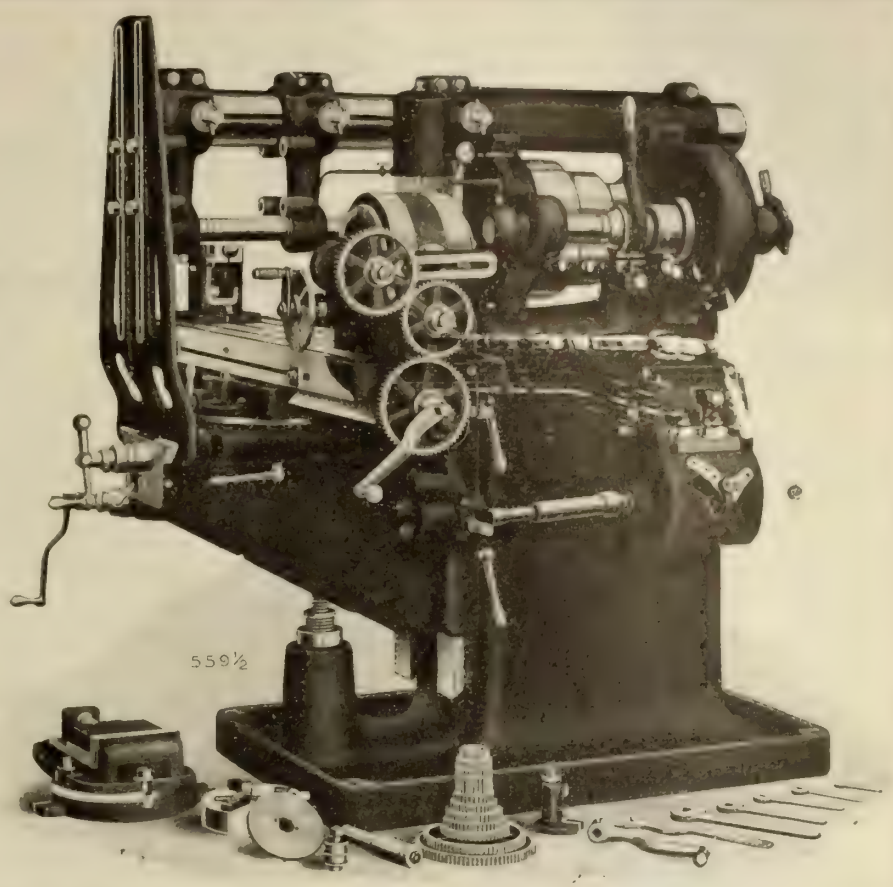
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The Transportation Commission has laced an order with the United States teel Products Company, for street railay tracks and intersection material mounting to $400,000. Of this order about 75 per cent. is for steel rails. The order might have been placed in England had not the strike tied up transportation. Deliveries will begin in about two weeks and the entire order will be on hand by September 1st. Only one tender was received from a Canadian firm, and was for only a portion of the work, and the price about 12 per cent. higher and deliveries not so good.

## SALES TAX RESOLUTION AMENDED CERTAIN EXEMPTIONS ARE GRANTED

The recent resolution respecting ales tax has been amended. The bill, n its present form however, contains he same provision as last year, to the ffect that the purchaser shall be furished with a written invoice of any ales, which invoice shall state separtely the amount of such tax to at least he extent of 1½%, but such tax must ot be included in the manufacturers, roducers or wholesalers costs on which rofit is calculated; and the tax shall be ayable by the purchaser to the wholealer, producer or manufacturer at the ime of such sale. Here is the working f the provisions of the bill as passed y the House of Commons.

That in addition to the present duies of customs and excise there shall e imposed, levied and collected an exise tax of one and one-half per cent. n sales and deliveries by Canadian anufacturers or producers, and wholealers or jobbers, and a tax of two and ne-half per cent. on the duty paid alue of goods imported, but in respect f sales by manufacturers to retailers r consumers, including sales to his lajesty, whether in the right of His lajesty's Government of Canada or His lajesty's Government of any province of Canada for the purpose of re-sale, the excise tax payable on the duty paid value shall be three per cent. and on goods imported by retailers or consumers, including importations by His Majesty, whether in the right of His Majesty's Government of Canada or His Majesty's Government of any province of Canada for the purpose of re-sale, the excise tax payable on the duty paid value shall be four per cent.; that the purchaser shall be furnished with a written invoice of any sale, which invoice shall state separately the amount of such tax to at least the extent of one and one-half per cent., but such tax must not be included in the manufacturer's, producer's or wholesaler's costs on which profit is calculated; and the tax shall be payable by the purchaser to the wholesaler, producer or manufacturer at the time of such sale, and by the wholesaler, producer or manufacturer to His Majesty in accordance with such regulations as may be prescribed, and such wholesaler, producer or manufacturer shall be liable to a penalty not exceeding five hundred dollars, if such payments are not made, and in addition shall be liable to a penalty equal to double the amount of the excise duties unpaid; that the term "duty paid value" means the value of the article as it would be determined for the purpose of calculating an ad valorem duty upon the importation of same into Canada under the laws relating to the Customs and the Customs Tariff whether such article be in fact subject to ad valorem or other duty or not, and in addition the amount of the Customs duties, if any, payable thereon.

Provided that in respect of lumber an excise tax of two per cent. shall be imposed, levied and collected on sales and deliveries by the Canadian manufacturer and of three per cent. on importations and that no further excise tax shall be payable on re-sale.

There are various exemptions to this tax, but following are the items which will chiefly interest our readers: Ores of metals of all kinds; fuel of all kinds; gold and silver in ingots, blocks, bars, drops, sheets or plates unmanufactured, newspapers and quarterly, monthly and semi-monthly magazines, and weekly literary papers unbound; materials for use only in the construction, equipment and repair of ships; calcium carbide; electricity; gas manufactured from coal; and calcium carbide or oil for illuminating for heating purposes. The Governor-in-Council has power to add to this list if he deems it wise

It is further provided that the excise taxes specified in this section shall not be payable on goods exported, or on sales of goods made to the order of each individual customer by a business which sells exclusively by retail, under regulations by the Minister of Customs and Inland Revenue, who shall be sole judge as to the classification of a business and a draw back may be granted by ninety-nine per cent. of the said taxes paid on materials used, wrought into or attached to articles exported.



# INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES



## CANADA'S TRADE BY COUNTRIES BRITAIN SECOND BEST CUSTOMER

THE trade returns for Canada for the year ending March 31st, 1921, are unusually interesting in that they indicate the new direction in which markets lie. Markets are the paramount question, for both in respect to raw and manufactured products the Dominion is producing a great deal more than can be consumed at home. The question of markets is the more interesting because the rate of exchange is militating so against exports to certain countries which formerly bought heavily of Canadian products, that other markets must, if possible, be found.

Total exports were $1,210,428,119, as compared with $1,286,658,709 for the year 1919-20. The decrease in the exports of domestic exports was not, however, so large, amounting to approximately $50,000,000. On the whole this is to be attributed to decline in prices more than to a decreased volume of shipments. Dealing only with exports of domestic produce, the United States was by far Canada's best customer last year, having taken $542,304,456 worth of commodities as compared with $464,028,183 for the preceding year, or approximately $78,000,000 more than in 1919-20.

The United Kingdom was Canada's second best customer, having taken $312,842,921 worth last year as against $489,152,921 in 1919-20, and $540,750,977 in 1918-19. During the last three years, while exports to the United States have increased from $454,873,170 to $542,304,456, those to the United Kingdom have decreased from $540,750,977 to $312,842,921.

**Trade With the Empire.**

The British Empire took last year a much less volume of commodities than it did during the preceding year. The figures were $403,470,602 in 1920-21 and $561,788,003 in 1919-20. This is explained chiefly by the decline in exports to the United Kingdom. During the year, exports to Australia increased by $6,750,000; to British Guiana by $585,000; to British South Africa, $8,000,000; to the British West Indies, $2,161,000; to Hong Kong, $657,000; to Newfoundland, $520,000; to New Zealand, $4,900,000. To other portions of the British Empire, there was a falling off to the extent of $3,000,000.

Turning to other countries, exports to Italy increased by nearly $41,000,000, to the Netherlands by $15,000,000; to the Argentine by $2,000,000; to other countries by $5,750,000. On the other hand, there were some notable decreases. Exports to France fell from $61,108,000 to $27,248,000; to Greece from $29,588,000 to $20,834,000; to Japan from $7,732,000 to $6,414,000.

Coming to imports, those from the United States increased by $55,516,112; from the United Kingdom by $87,148,000; from British Guiana by $1,676,000; from British South Africa by $690,000; from the British West Indies by $2,769,000; from Newfoundland by $640,000; from New Zealand by nearly $800,000; from Belgium by $3,750,000; from China by $683,000; from Cuba by $13,000,000; from France by $8,376,000; from Italy by $750,000; from the Netherlands by $2,000,000. Imports from the British East Indies declined to the extent of $2,000,000; Argentine by $1,000,000 and Japan by $1,578,000.

**Imports From British Empire.**

In the year just closed, Canada imported from the British Empire $265,877,691 of commodities out of a total of $1,240,125,056 from all countries; in the year 1919-20, the amount was $174,351,659 out of a total of $1,064,000; from China by $683,000; from 528,123; in 1918-19, it was $123,671,540 out of a total of $919,711,705. In other words, whereas in 1918-19, 13 per cent. of Canada's imports were drawn from the British Empire, last year the percentage was 20. At present it seems improbable that this percentage will be maintained. The marked increase during the year just closed was due to heavy buying in Britain during part of the year, which has since fallen off. The extent of the decline is to be seen in the trade returns for March, when the imports from the United Kingdom were $16,373,874, as compared with $25,460,316 for the preceding March.

Among the imports, iron and steel easily led with $208,288,669, cotton being next with $99,816,594. Then followed sugar and molasses, $86,070,230; bituminous coal, $72,239,952; wool, $67,017,640; anthracite coal, $39,058,148; silk, $29,720,792; vehicles, $27,694,577; wood, $30,237,528; chemicals, $24,621,000; and breadstuffs, $21,014,801.

**Country's Trade Widening.**

On the whole, the returns show that the basis of the country's trade is widening. It is true that last year approximately two-thirds of its total value was with the United States; but on the other hand, the proportion of trade with foreign countries generally increased. While the volume of trade generally with the Mother Country has declined, still more is being done with the other portions of the Empire. The premium on American funds has strongly stimulated commercial intercourse with the United States, and as the premium will undoubtedly continue for some time, it is reasonable to conclude that, in spite of the temporary obstacles, the volume of trade between the two countries will continue to be large. The indications at present are that the value of imports from the United States will appreciably decline during the current year, that process now being well under way.

## A GOOD IDEA

Can you imagine a Milling Machine as part of office equipment? It hardly sounds feasible, and yet the Ford-Smith Machine Co., Ltd., Hamilton, Canada, find that the placing of a miller in their office is mighty good business.

This concern, who manufacture a full line of milling machines, both plain and universal, decided it would be good policy to bring one of their machines right into the main office, so a suitable place was prepared; a universal miller was brought in from the machine shop, and there it stands. Anyone interested can inspect it to their hearts content, and in many cases the very fact of its being there, has caused favorable comment.

## TENDERS ASKED

It is announced that J. A. C. Cameron, master-in-chambers, at Osgoode Hall, will receive tenders for the sale of the assets of the Dominion Shipbuilding and Repair Co., Limited, Toronto.

These assets, estimated at more than $1,500,000, include a leasehold on the waterfront from the Harbor Commission. The area covers thirteen acres, and has a front of 1,868 feet. The lease, dating from July, 1919, is for 42 years. For the first 21 years the annual rental shall be $22,100.

The buildings and plant, erected three years ago, represent an investment of $1,570,149. There are five permanent shipways, and three electrical gantry cranes.

## WAGE DISPUTES

According to figures just published by the Ministry of Labor, Italy lost 55,000,000 days of work last year because of strikes. This figure includes labor disorders of every kind—wage disputes, loss occasioned by the occupation of the factories by workmen from last July to September and disorders in the farming districts.

Wage disputes caused the major part of the loss, with 16,500,000 days. The Communist agitations of last year when the factories were occupied are calculated to have resulted in 10,000,000 lost days. Political strikes and other suspensions not included in the other classes are said to have lost 15,500,000 days.

The textile workers engaged in 212 strikes, the largest number in any trade, throwing out of work nearly 150,000 workmen. The most costly dispute was that of the transportation workers who had 137 strikes, affecting 241,359 workmen and losing 2,523,057 days of work.

Right on the Lead

# WHY BORROW TROUBLE?

**If you have not reduced your tap breakage to the minimum, you are borrowing trouble.**

Does it mean anything to you that there is a High Speed Tapping Device on the market which is

**SUPERIOR**

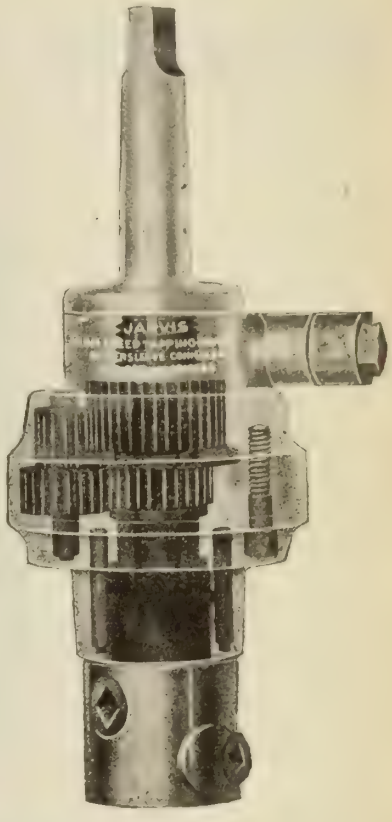
to any other known method.

Just get these few points now, and then send for the circular which will give you the rest of the story:

There is a Ball Drive and Ball Reverse. You can see how easy this makes the action, with no clinching or binding.

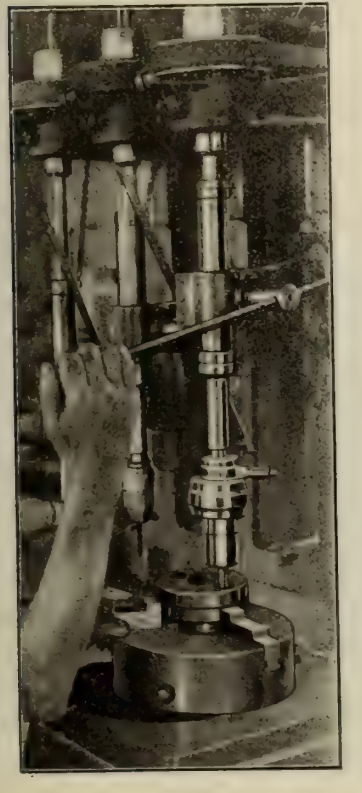
The ball Drive gives direct drive from the spindle to the work. The gears operate only on the reverse.

Reverse motion is much faster than the drive.



Special Taps are not required.

It makes no difference whether the tap is forced against the work in a Drill Press, or the piece is pushed towards the tap in a Speed Lathe.



There are two styles of this Tapping Device. The Positive Style M and the Friction Style N. Where the tapping is in tool steel or any tough metal, or when a blind hole is tapped, the Cone Friction Chuck, Style N, is better.

Seven sizes of this Jarvis High Speed Tapping Device accommodate a range from zero up to 2 in.

And the PRICE—that, too is reduced to the minimum.

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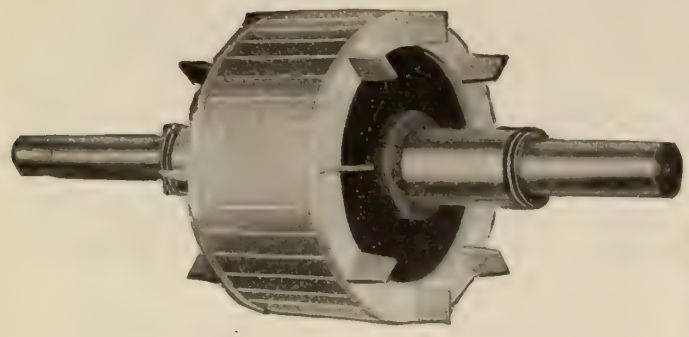
One more important fact attaches to this Tapping Device. It is recommended and furnished by the Geometric Tool Company as a fitting adjunct to their line of Threading Tools.

## THE GEOMETRIC TOOL COMPANY

NEW HAVEN CONNECTICUT

*Canadian Agents*

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**No Soldered Joints or Bolted Connections in—**

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¶The greatest improvement in modern induction motor design—no soldered joints to melt and cause arcing or open circuit and no bolted connections to work loose.

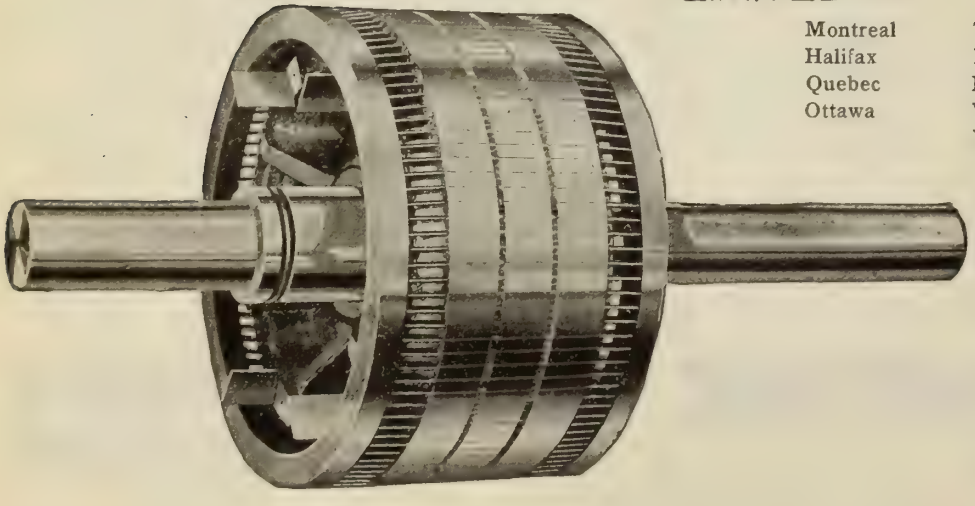
¶The entire Rotor Winding of small squirrel-cage induction motors is cast of aluminum alloy—in one operation. Thus, the complete winding is one integral structure.

¶The medium and large size Rotors have liberal section copper bars and the end rings are cast-welded, making perfect contact.

*In stock at our houses, who will furnish full technical data on request*

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# Making Fine Tools

*An Interesting Operation, Economically Performed by Means of a DUMORE Grinder*



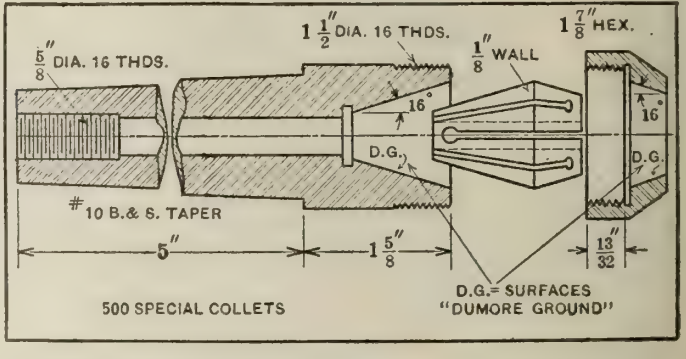
This photograph — taken at the City Engineering Company's (Dayton, Ohio) plant shows a Dumore Grinder finishing the main shank and head of a special draw-in collet. There were 500 put through in this special lot and the time for the operation shown averaged 8 minutes per piece.

The second operation; grinding the internal face of the collet nut, was also performed by this convenient precision tool.

Dumore Grinders are popular here as in every plant where fine tools are made. Their accuracy makes them useful for the finest finishing work; their simplicity and convenience make them practical for many difficult, almost inaccessible jobs.

Dumore Grinders transform any lathe into a precision grinder; they make fine finishing possible in every machine shop.

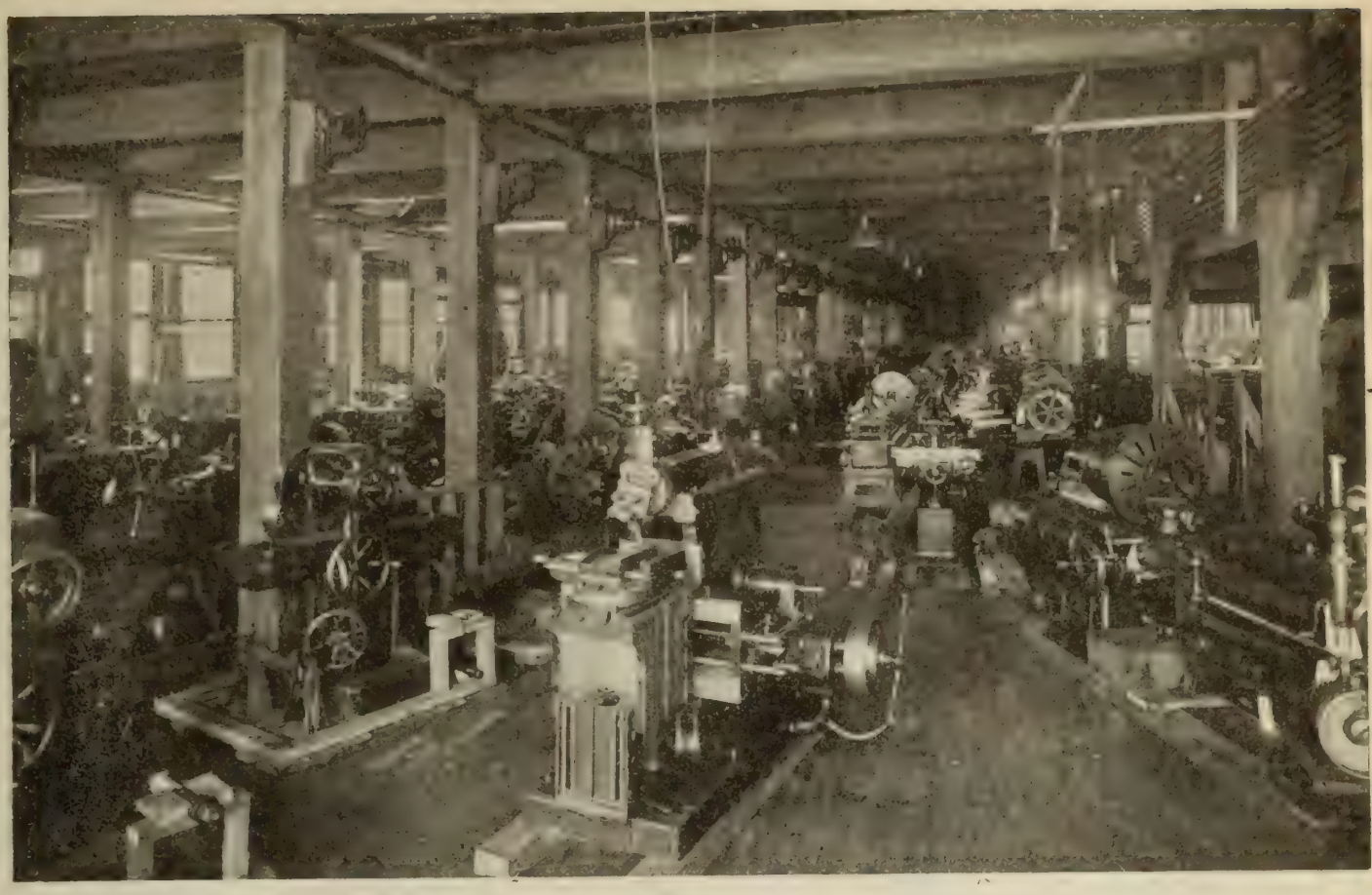
***May we tell you more about them?***




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# DUMORE HIGH SPEED GRINDERS

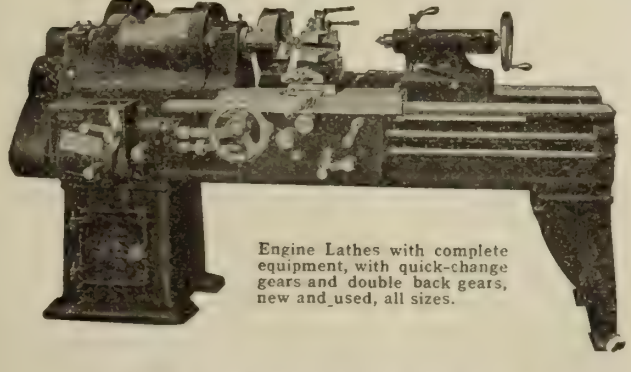


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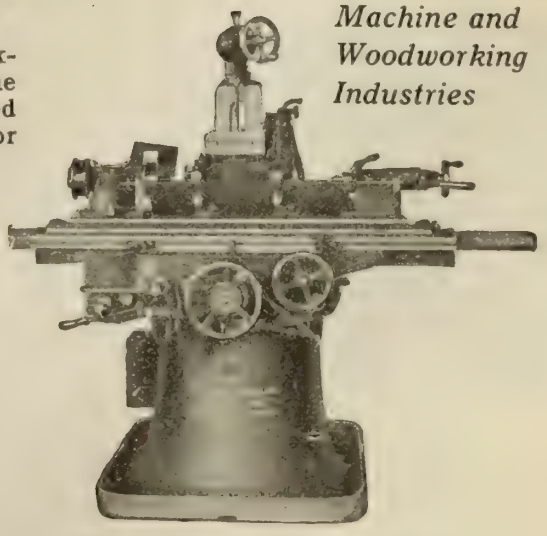
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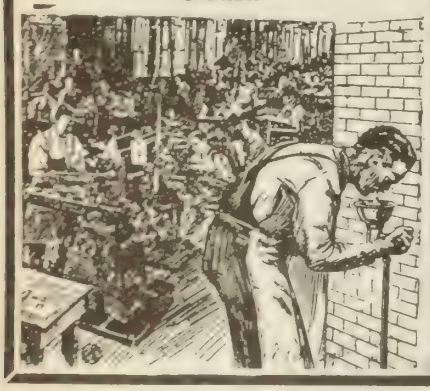
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The only bowl with a bowl that prevents [illegible] the babbler paid its moderate cost over and over in all those well-ordered plants where [illegible] measures successfully barred the Spanish influenza. PURO saves lives, time and water. Write

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# WASTE IN INDUSTRY EXISTENT FINDINGS AND RECOMMENDATIONS

Speaking on the waste in industrial processes, the recent report of the American Engineering Council's Committee on the elimination of waste in industry, states that this waste is causing enormous annual loss to the United States. What is true there, is equally true here, and following are a few of the points brought out in this report:

The report deals exhaustively with housing and building; ready-made men's clothing; shoes; metal trades, and printing.

**Intermittent Employment.**

The wastes of interrupted production are summarized as follows: "The margin of unemployment amounts to more than a million men; cyclical industrial depressions are causes of waste through idle men, plant, equipment and materials. Intermittent employment is not merely the cause of one of the largest wastes in industry, it is also the one big problem for which labor demands a satisactory solution. Waste results from conflicts between management and labor, but the amount is much less than is popularly supposed. Large inventories of raw materials and finished product and unbalanced production are causes of waste resulting from idle materials. Large sums of money are invested in idle equipment, and over-equipment and factory buildings in many instances are larger than necessary."

In attributing waste to faulty management, the report says: "The average method of management is far behind standards which have demonstrated their practical value; billions of dollars are tied up in idle equipment and there is a large additional waste through maintenance and depreciation charges. Manipulations in raw material result in serious losses and present sales policies are a contributing cause of irregular production." High labor turnover is given as a rough index of one of the commonest wastes in industry.

As to restricted production, the report says: "Both employer and employees restrict output, the former usually by limiting the total output of an industry the latter by limiting the rate of speed of output of individual workmen."

The committee's recommendations for the elimination of waste include the following: "A national industrial information service should be established to furnish more timely, regular and complete information covering current production and consumption and stocks of commodities. A national statistical service should be established covering employment requirements and a national policy regarding public health should be fostered and encouraged. The national program for inustrial rehabilitation should be encouraged and should offer opportunities for education and placement to those having physical defects as well as those handicapped because of industrial accidents. A nation-wide program of industrial standardization should be encouraged in conjunction with industrial interests, and the government should recognize the necessity for a revision of such federal laws as interfere with stabilization of industry." It is also recommended that a body of principals should be accepted which could be developed for the adjustment and settlement of labor disputes.

After outlining the support and help to be contributed by the public and by trade associations, the report takes up the responsibility of plant management. It declares that administrative policies should cover improvement of organization, administrative and management control; the stabilization of production; introduction of effective employment methods; creation of individual or collective research departments; industrial education; curtailment of practice of adjustments, cancellations and returns where customary; development of purchasing schedules; correlation of sales policies with production and accident prevention.

Organized labor was also urged to cooperate to develop a policy for increasing output, and idle material was shown to cause a large loss. The report mentions that the average plant in the metal trades group is from 25 to 30 per cent. behind the best plant in output per employee, while the building industry is given as about 60 per cent. efficient, and the waste in the shoe industry put at about 35 per cent.

A discussion on the report followed. Mr. McClellan a member of the board, representing the American Institute of Electrical Engineers, and F. J. Miller, Bucks County, Pa., representing the American Society of Mechanical Engineers, criticised the report adversely, while L. W. Wallace defended the accuracy of the report. Mr. Miller said that the report gives conclusions without setting out the facts on which the conclusions were based. It charges, he said, inefficiency to large groups of industries in general, whereas it is more than probable that the facts from which the conclusions are drawn apply only to a few individual members of this group. Mr. McClellan said the report did not define the waste alleged nor cite the committee's authority for the charges made.

It was stipulated that the report be sent back to the committee for revision and members of the board are to receive all the information on which the committee based its conclusions and the board members may suggest any changes they may deem desirable to the committee in writing. As soon as completed and approved by the board, the full report will be given out for publication.

# WAGE CUT EFFECTIVE JULY 1st

The employees of the Canadian railway companies have been told that on July 1st they will be advised to accept a twelve per cent. wage reduction. This will affect roughly speaking, about 150,000 men, and the reduction will become effective July 1st.

The reasons given for the decrease are:

1. Inability of the railways to continue present wages, despite short time in shops and elsewhere and the adoption of every economy possible.

2. A deficit of $11,000,000 being earned by the Grand Trunk this year.

3. The action of the United States Railway Labor Board, whose decisions have always been copied in Canada, in declaring a wage reduction of twelve per cent.

The union representatives here state they will report the proposals of the railroads to their respective unions. The men were not told what would happen if they refused the decrease in wages, and when railway officials were asked they replied that they did not anticipate any refusal.

## A. S. M. E. GET A REAL TREAT

The Ontario Section of the American Society of Mechanical Engineers were indeed lucky when the plant of the Steel Co., of Canada was opened up for their inspection on the afternoon of Friday, June 17th.

Over forty members took advantage of the opportunity, and under the guidance of Mr. Givan, the chief chemist, Mr. Hilton, the blast urnace supervisor; Mr. Hilton, the blast furnace supervisor; and Mr. Jeffries, hte chief electrician; the various departments were thorocghly explained.

First of all a furnace being relined was open for inspection, after which the party viewed the ovens used for preheating. The air drying power section was next explained, where considerable time was spent in this most interesting department.

Next came the coke-making section of the plant, and as luck would have it the party were just in time to see an oven of coke being pushed into a waiting car. This company have 80 ovens, these being in two batteries of 40 each, and of course the time of cooking the coke varies upon conditions. However, when the coke is ready here is what happens.

A car is brought up under the oven about to be unloaded, and from the other side of the oven, a large ram or pusher, shoves the complete contents of the oven into the car, which by the way, moves slowly along the track as the coke is being pushed out. Once the coke is all out, off goes the car to the quenching station, where for 50 to 55 seconds a stream of water is played on the burning coke.

From here the party proceeded to the various by-product sections, where the tar, benzol, amonium, sulphate, etc., etc., are taken out of the gases coming from the furnaces.

The amonium sulphate section was particularly interesting, as in this case the process was easier seen. The material, which is used chiefly as a fertilizer, comes out in the form of a wet pinky white mass. In this condition it is put into centrifugal drying machines where the moisture is taken out, leaving it in a dry powder form.

From this point on, the party went all through the yards, viewing the pig casting machines, the basic open hearth furnaces, the rolling mill dept., and various other sections of the plant.

The rolling mill caught the eye of many. Here was seen huge billets that were handled with perfect ease, and reduced rapidly to any desired size. The wire drawing section was perhaps the most interesting of all. At the finishing point, the wire attained a speed so great that everything is guarded to prevent accident should the wire break or fly out of the guards. The speed at which this wire is drawn is nothing short of marvellous. We would like to deal with each dept. in detail, but space does not permit. Sufficient to say that when the party came to the conclusion of the tour, they all voiced the same opinion, viz., that it had been the most profitable afternoon they had spent in a long time.

### RIVERDALE TECHNICAL SCHOOL.

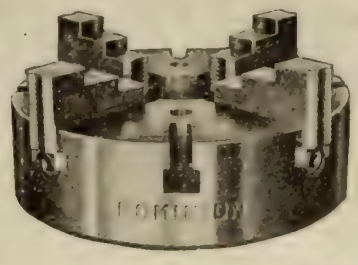
The tenders for constructional work on the new Riverdale Technical School are now out. Canadian Machinery had the privilege of looking over some of the plans, and the industrial section has been well attended to.

A space of approximately 150 ft. by 172 ft. has been devoted to the various industrial departments; a hallway coming in between the 172 ft. dimension. The rooms used for the different trades are approximately 40 x 32, with the exception of the construction shop, which is still larger. Following are the trades being provided for:

There is a wood turning and carpenter shop; a construction shop with exceptionally high roof, so that even constructional work on houses can be taught successfully, and a brick shop where the art of clay products generally will be taught.

There is also a sheet metal dept., where sheet metal patterns will be made; a machine shop; and a motor mechanics department.

So far no arrangements have been made as to the style of equipment that will be used in the various sections, but we hope to acquaint those interested with full particulars in the near future.

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We are equipped to handle all kinds of general or special machine work. All operations in our plant are done under the most careful supervision and we can satisfy you as to price. Always available for consultation.

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Expert Metal and Wood Pattern Work. Our advice and estimates will save you money.
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If you have machinery which your plant has outgrown, advertisell it.

Or if you have a factory building which you have outgrown, advertisell it.

That is, advertise in our Classified Opportunities section and ***sell*** what you have for sale.

**CANADIAN MACHINERY**
143-153 UNIVERSITY AVENUE, TORONTO, ONT.

# Canadian Machinery BUYERS DIRECTORY

If what you want is not here, write us, and we will tell you where to get it. Let us suggest that you consult also the advertisers' index—last page of book, after having secured advertisers' names from this directory. The information you desire may be found in the advertising pages. This department is maintained for the benefit and convenience of our readers. The insertion of our advertisers' names under proper headings is gladly undertaken, but does not become part of an advertising contract.

**Abrasive Discs**
Norton Co. of Can., Ltd., Hamilton, Ont
Oakey & Sons, Ltd., John, London, S.E., Eng.

**Abrasive Materials**
[illegible] Ltd., Hamilton, Ont.
[illegible] Ltd., Montreal, Que.
Norton Co. of Can., Ltd., Hamilton, Ont
Oakey & Sons, Ltd., John, London, S.E., Eng.
[illegible] Co. of Canada, Limited, Niagara Falls, Ont.

**Acetylene, Dissolved**
L'Air Liquide Society, Toronto, Ont.

**Accumulators, Hydraulic**
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que.
Stewart & Co., Duncan, Glasgow, Scot

**Air Cocks**
[illegible] Mass.

**Air Lifts**
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Analyses, Chemical**
Toronto Testing Laboratory, Toronto, Ont.

**Angle Bars**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Anvils**
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I.
Columbia Hdwe. Division, Cleveland, O.
Peddie, Ltd., H. W., Toronto, Ont.

**Arbors**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Cleveland Twist Drill Co., Cleveland, O.
Ford-Smith Machine Co., Hamilton, Ont
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Jacobs Mfg. Co., Hartford, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg Co., Milwaukee, Wis.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.

**Axles, Car**
Dom. Foundries & Steel, Hamilton, Ont

**Babbitt Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont
Magnolia Metal Co., Montreal, Que.

**Balls, Brass, Bronze and Steel**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian SKF Co., Toronto, Ont.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

**Barrels, Tumbling**
McDougall Co., Ltd., R., Galt, Ont.

**Bars, Boring**
Armstrong Bros. Tool Co., Chicago, Ill.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis
Madison Mfg Co., Muskegon, Mich

**Bars, Boring, Portable**
[illegible] Corp., H. B., Philadelphia, Pa

**Bars, Bronze Cored**
Morse & Son Tool, Montreal Que

**Bars, Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Bars, Steel**
Algoma Steel Corp., Ltd., Sault Ste Marie, Ont.
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal Que
Dom. Foundries & Steel, Hamilton, Ont
N. S. Steel Co., Ltd., New Glasgow, N.S.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Pilot Steel & Tool Co., Montreal Que
Steel Co. of Canada, Ltd., Hamilton, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.

**Bearings, Ball**
Canadian SKF Co., Toronto, Ont
Chapman Double Ball Bearing Co., Toronto, Ont.
Lang Mfg Co., Guelph, Ont
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Railway Roller Bearing Co., Syracuse, N.Y.

**Bearings, Bronze**
Railway Roller Bearing Co., Syracuse, N.Y.

**Bearings, Die-Cast**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y
Tallman Brass & Metal Co., Hamilton, Ont.

**Bearings, Journal**
Fisher Motor Co., Ltd., Orillia, Ont.

**Bearings, Roller**
Can. Fairbanks-Morse Co., Ltd., Montreal
Lang Mfg Co., Guelph, Ont
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que
Railway Roller Bearing Co., Syracuse, N.Y

**Belt Cement**
McLaren Belting Co., J. C., Montreal, Que.

**Belt Dressings and Fillers**
Aikenhead Hardware Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.

**Belt Fasteners**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Belt Hooks**
Torrington Co., Ltd., Upper Bedford, Que.

**Belt Lacing**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que

**Belt Lacing, Steel**
Flexible Steel Lacing Co., Chicago, Ill

**Belt Lacing, Hinged**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing, Flexible Steel**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing Machines**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
McLaren Belting Co., J. C., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Belt Joiners, Conveyor**
Flexible Steel Lacing Co., Chicago, Ill

**Belt Tools**
Graton & Knight Mfg. Co., Worcester, Mass

**Belting, Chain**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Belting, Fabric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Consolidated Rubber Co., Ltd., Montreal Que
Can. Fairbanks-Morse Co., Ltd., Montreal.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
McLaren Belting Co., J. C., Montreal, Que.
Sumner & Co., New York City.

**Belting, Leather**
Atkins & Co., Inc., E. C., Indianapolis, I
Can. Fairbanks-Morse Ltd., Montreal, Q.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Smith Belting Co., Toronto, Ont.
Sumner & Co., New York City.
Tullis & Son, Ltd., John, Glasgow, Scot.

**Belting, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.
Quaker City Rubber Co., Philadelphia, Pa.

**Belts, Abrasive**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.

**Bench Countershaft Standards**
Ford-Smith Machine Co., Hamilton, Ont.

**Benches, Work**
Aikenhead Hardware Ltd., Toronto, Ont.

**Bending Machines, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bertrams Ltd., Edinburgh, Scotland.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Bins, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Blocks**
Ford Chain Block Co., Philadelphia, Pa.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Chain (See Hoists, Hand)**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.

For list of Dealers see the last page of This Buyers' Directory

**Blocks, Die**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Blocks, Pillow**
Can. Link-Belt Co., Toronto, Ont.

**Blowers**
Can. Blower & Forge Co., Ltd., Kitchener.
General Combustion Co. of Can., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Sturtevant Co., B. F., Boston, Mass.

**Bolt and Nut Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Greenfield Tap & Die Corp., Galt, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Bolt and Nut Machinery, Automatic**
National Acme Co., Cleveland, Ohio.

**Bolts and Nuts**
London Bolt & Hinge Works, London, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio
N. S. Steel Co., Ltd., New Glasgow, N.S.
Petrie, Ltd., H. W., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Bolt Threading Die Heads**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa

**Boosters**
Sturtevant Co., B. F., Boston, Mass

**Boring and Turning Mills, Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.

**Boring, Drilling and Milling Machines, Horizontal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa.

**Boring, Drilling and Milling Mach., Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Boring Heads**
Aikenhead Hardware Ltd., Toronto, Ont.

**Boring Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Gisholt Machine Co., Madison, Wis.

**Brakes, Magnetic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Brass**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Brass Valves**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Brass Pipe Fittings**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Bricks, Fire**
Elk Firebrick Co. of Can., Ltd., Hamilton, Ont.

**Bridges**
Hamilton Bridge Works Co., Ltd., Hamilton Ont.
MacKinnon Steel Co., Sherbrooke, Que.

**Broaching Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Bronze**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bronze, Phosphor**
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bucket Carriers, Pivoted**
Can. Link-Belt Co., Toronto, Ont.

**Buffing or Polishing Machines (See Polishing and Buffing Machines)**
Blount Co., J. G., Everett, Mass.
Can Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O

**Bulldozers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Burners, Oil and Gas**
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

**Bushings**
Fisher Motor Co., Ltd., Orillia, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Cabinets, Oil**
S. F. Bowser & Co., Ltd., Toronto, Ont.

**Calipers**
Brown & Sharpe Mfg. Co., Providence, R.I.
Starrett Co., L. S., Athol, Mass.

**Cams**
Canada Foundries & Forgings Co., Welland, Ont.

**Can-Making Machinery (See Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

# BUYERS' DIRECTORY

**Cars, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Castings, Aluminum**
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.

**Castings, Brass and Bronze**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.

**Castings, Copper**
Canada Metal Co., Ltd., Toronto, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.

**Castings, Marine**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Castings, Die Molded**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Ferro-Alloy**
Can. Steel Foundries, Montreal, Que.

**Castings, Iron**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Castings, Hyd. Press**
Can. Steel Foundries, Montreal, Que.

**Castings, Malleable Iron**
International Malleable Iron Co., Guelph, Ont.
Kennedy & Sons, Ltd., Wm., Owen Sound, Ont.
Smith's Falls Malleable Castings Co., Smith's Falls, Ont.

**Castings, Monel Metal**
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

**Castings, Naval Bronze**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Nichrome**
Can. Driver-Harris Co., Walkerville, Ont.

**Castings, Nickel**
Can. Hanson & Van Winkle Co., Toronto, Ont.

**Castings, Semi-Steel**
Davidson Mfg. Co., Thos., Montreal, Que.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

**Castings, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

**Cements, Iron**
Smooth Mfg. Co., Jersey City, N.J.

**Centering Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Chains (See Sprockets and Chains)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chains, Driving**
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chasers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chemists**
Toronto Testing Laboratory, Toronto, Ont.

**Chucking Machines**
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio

**Chucks, Drill**
Jacobs Mfg. Co., Hartford, Conn.

**Chucks, Drill and Tap**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Lathe**
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Magnetic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**
Columbia Hdwe. Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

**Cleaners, Metal, Waste, General**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Clocks, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Clutches, Friction**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**
Can. Link-Belt Co., Toronto, Ont.

**Cocks and Faucets**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass

**Collars, Shaft or Set**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

**Collets**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compressors, Air**
Curtis Pneumatic Machinery Co., St Louis, Mo

**Compressors, Air and Gas**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**
Ford-Smith Machine Co., Hamilton, Ont
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Conveyor Belt Joiners**
Flexible Steel Lacing Co., Chicago, Ill.

**Copper**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Cored Bronze Bars**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Cotter Pins**
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Counterbores**
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Countershafts**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Couplers, Car and Locomotive**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Couplings, Flexible**
Holden Co., Ltd., Montreal, Que.

**Couplings, Rigid**
Bernard Industrial Co., A., Fortierville, Que.

**Couplings, Shaft**
Bilton Machine Co., Bridgeport, Conn
Can. Link-Belt Co., Toronto, Ont.

**Cranes, Electric**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.

**Cranes, Hand (See Hoists, Hand)**
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

**Cranes, Locomotive**
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que

**Cranes, Traveling**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Crank Pin Turning Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia, Pa.

**Cutters, Flue**
Holden Co., Ltd., Montreal, Que.

**Cutters, Gear**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Bilton Machine Co., Bridgeport, Conn
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Madison Mfg. Co., Muskegon, Mich
Pilot Steel & Tool Co., Montreal, Que
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Milling**
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Milling Machine Co., Cleveland.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.

**Cutters, Stay Bolt**
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Thread**
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa

**Cutting-Off Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Etna Machine Co., Toledo, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Cutting-Off Machines, Pipe (See Pipe-Cutting and Threading Machines)**
Landis Machine Co., Inc., Waynesboro, Pa
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Cutting-Off Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Pilot Steel & Tool Co., Montreal, Que.

**Cutting Oil Filters (See Oil Filtering Systems)**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Cataract Refining Co., Toronto, Ont.

**Cutting, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

**Cutting, Oxy-Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Dealers, Machinery (See Searchlight Section)**
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Deckle Straps**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Diamonds, Black and Rough**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond, Carbon and Bortz**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Desmond-Stephan Co., Hamilton Ont.
Ford-Smith Machine Co., Hamilton, Ont
Wheel Trueing Tool Co., Detroit, Mich.

**Diamond Crossings**
Can. Steel Foundries, Montreal, Que.

**Die-Castings**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Dies, Pipe-Threading**
Jones & Lamson Machine Co., Springfield, Vt.

**Die Sinking Machines, Automatic**
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich

**Die Sinkers**
Kimber & Hillier, St. Catharines, Ont

**Dies, Screw and Thread Cutting**
Ackworthie, Ltd., John, Birmingham, Eng
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Galt, Ont
Jardine & Co., A. B., Hespeler, Ont
Jones & Lamson Machine Co., Springfield, Vt
Landis Machine Co., Inc., Waynesboro, Pa
Murchey Machine & Tool Co., Detroit Mich.
National Acme Co., Cleveland, Ohio

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**
Armstrong-Whitworth of Canada, Ltd Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Toledo Machine & Tool Co., Toledo, Ohio

# BUYERS DIRECTORY

**Dies, Forging**
[illegible] of Canada, Ltd., [illegible]
[illegible] Hamilton, Ont.
[illegible] Atlas Crucible Steel Co., Ltd., [illegible]
Kerner & Hunter Mfg. Co., St. Catharines, Ont.

**Dies, Hammer**
[illegible] & Hunter St. Catharines, Ont.

**Dies, Self-Opening, Adjustable**
[illegible] Montreal
[illegible] New Haven, Conn.
[illegible] Alfred, Toronto, Ont.
[illegible] Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
[illegible] Detroit, Mich.
National Acme Co., Cleveland, Ohio.
[illegible] Toronto, Ont.
[illegible] Ont.
Victor Tool Co., Waynesboro, Pa.

**Dies, Threading-Opening**
[illegible] Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
[illegible] New Bedford, Mass.
[illegible] Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Disc Cement**
Ritchey Supply Co., Toronto, Ont.
Warren Abrasives Co., Chicago, Ill.

**Dividing Heads**
[illegible] Birmingham, Eng.
[illegible] Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Dogs, Lathe and Milling Machine**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drafting Boards and Tables**
[illegible] Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Drafting Materials**
American Lead Pencil Co., New York City, N.Y.
[illegible] Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Dressers, Grinding Wheel**
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Drill Holders**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drill Rods**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Drill Speeders**
Canada Machinery Corp., Galt, Ont.

**Drilling Machine Heads**
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

**Drilling Machines, Automatic**
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

**Drilling Machines, Bench**
Beacon Engineering Co., Tipton, England.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Electric and Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Gang**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drilling Machines, Heavy Duty**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Multiple Spindle**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

**Drilling Machines, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Drilling Machines, Portable**
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Radial**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Drilling Machines, Sensitive**
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Turret**
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

**Drilling Machines, Vertical**
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng.
Streidinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Drills, Center**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drills, High Speed Twist**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Drills, Twist and Flat**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Pilot Steel & Tool Co., Montreal, Que.

**Dust Handling Equipment**
Can. Blower & Forge Co., Ltd., Kitchener.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Electrical Instruments**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Electrical Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O.

**Elevating Trucks (See Trucks)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Elevators and Conveyors**
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Emery Wheels (See Grinding Wheels)**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Hart Products, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Engines, Capstan**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Engineers, Mechanical**
Dominion Engineering Works, Ltd., Montreal, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.

**Expanders, Tube**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Eyeglasses, Safety (See Goggles, Safety)**
Prest-O-Lite Co. of Can., Toronto, Ont.
Willson Goggles, Inc., Reading, Pa.

**Fans, Electric**
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Northern Electric Co., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Exhaust**
Can. Blower & Forge Co., Ltd., Kitchener.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Ventilating**
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**File Handles**
Ingersoll File Co., Ltd., Ingersoll, Ont.

**Files and Rasps**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Filing Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Filler, Iron (See Cements, Iron)**
Smooth Mfg. Co., Jersey City, N.J.

**Fire Extinguishers**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Fittings, Pipe**
International Malleable Iron Co., Guelph, Ont.

**Flexible Shafts**
Aikenhead Hardware Ltd., Toronto, Ont.

**Flux, Galvanizing**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Fluxes, Welding**
L'Air Liquide Society, Toronto, Ont.

**Forging Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Forgings, Drop**
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd., Toronto, Ont.

**Forgings, Hammer**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Foundry Equipment**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Foundry Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Frogs, Spring or Rigid**
Can. Steel Foundries, Montreal, Que.

**Fuel Oil Burning System**
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Coal**
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Oil and Gas**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces and Ovens, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd Hiram, Walkerville, Ont.

**Furnaces, Tempering and Annealing**
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furniture, Machine Shop**
Garlock-Walker Mchy. Co., Toronto, Ont.

**Gages, Comparator**
Jones & Lamson Machine Co., Springfield, Vt.
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont.
Perdue, W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass.

**Gages, Measuring (See Tool Work)**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Q.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont
Starrett Co., L. S., Athol, Mass.

**Gages, Recording**
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.
Taylor Instrument Co., Toronto, Ont.

# BUYERS' DIRECTORY

Ackworthie, Ltd., John, Birmingham, Eng.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Standard**
Armstrong Whitworth Co. of Can., Ltd. Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis.
Johansson Inc., C. E., Windsor, Ont.

**Gages, Thread**
Ackworthie, Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Gas, Coal Compressed**
L'Air Liquide Society, Toronto, Ont.

**Gas, Compressed**
Prest-O-Lite Co. of Can., Toronto Ont.

**Gaskets**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

**Gauges, Vacuum and Pressure**
Taylor Instrument Co., Toronto, Ont.

**Gear Blanks**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear Counters**
Hart Mfg. Co., R. A., Battle Creek, Mich.

**Gear-Cutting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

**Gear Testing Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.

**Gears, Cast**
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

**Gears, Cut**
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hamilton Gear & Machine Co., Toronto, Ontario.
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Gears, Dressed**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Gears, Forged**
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Gears, Herringbone**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

**Gears, Machine Moulded**
Can. Steel Foundries, Montreal, Que.

**Gears, Rawhide (See Gears, Cut)**
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear, Silent Chain**
Gardner & Son, Robt., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Can. Link-Belt Co., Ltd., Toronto, Can.
Hans Renold of Canada, Ltd., Montreal, Quebec.

**Gears, Worm**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.

**Generators, Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Generators, Electric**
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Goggles, Safety**
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

**Grab Buckets**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Grease Cups, Pressed Steel and Brass**
Can. Winkley Co., Ltd., Windsor, Ont.

**Greases, Lubricating**
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

**Grinding Discs**
Ritchey Supply Co., Toronto, Ont.

**Grinding Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**Grinding Machines, Abrasive Belt**
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Automatic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Bench**
Aikenhead Hardware Ltd., Toronto, Ont.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Grinding Machines, Center**
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines Chaser**
Jones & Lamson Machine Co., Springfield, Vt.

**Grinding Machines, Cutter and Reamer**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Cylindrical**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Die**
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

**Grinding Machines, Disc**
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Drill**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Face**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Floor and Tool**
Beacon Engineering Co., Tipton, England.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Grinding Machines, Internal**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Portable**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Power Oscillating Tool**
Herbert Ltd., Alfred, Toronto, Ont.

**Grinding Machines, Ring Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Snagging**
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Surface**
Garlock-Walker Mchy. Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machinery, Tool Post**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Universal**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont

**Grinding Wheels**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Guards, Emery Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Guards, Machinery and Window**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Guards, Electric Lamp**
Flexible Steel Lacing Co., Chicago, Ill.

**Gun-Barrel Machinery**
Steinle Turret Machine Co., Madison, Wis.

**Hack Saws, Power**
Ackworthie, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Hamilton, Canada.
Garlock-Walker Mchy. Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hammers, Chipping**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hammers, Drop**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

**Hammers, Electric**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Hammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Hammers, Power**
Bertram & Son Co., Ltd., The John. Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hammers, Rivetting**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hangers, Shafting**
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Terry & Co., John C., Birmingham, Eng.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hardening, Case-Hardening and Tempering**
Hamilton Gear & Machine Co., Toronto, Ont.

**Hardness Testing Apparatus**
Shore Instrument Co., Jamaica, N.Y.

**Heating**
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo

**Hobbing Machines**
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hobs**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Hoists, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

**Hoists, Hand**
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Hoists, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Holders-On, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill

**Hose, Flexible Steel**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Hose, Industrial**
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Hose, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Foamite Firefoam Co., Hamilton, Ont.

**Hydraulic Leather**
Graton & Knight Mfg. Co., Worcester, Mass.

**Hydraulic Machinery**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.

**Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Index Centers**
Dickow, Fred. C., Machinery Co., Chicago, Ill.

**Igniters, Gas Engine**
Canada Foundries & Forgings Co., Welland, Ont.

**Indicators, Speed and Test**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.

**Insulation**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Iron Valves**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Jacks, Hydraulic**
Norton, A. O., Boston, Mass.

**Jacks, Planer**
Armstrong Bros. Tool Co., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.
Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que.
Crescent Machine Co., Ltd., Montreal, Q.

# BUYERS' DIRECTORY

**Jigs and Fixtures (See Tool Work)**

**Keyseating Machines**
Bridgeport, Conn.
Toronto, Ont.
Muskegon, Mich.
H. W., Toronto, Ont.
& Co., of Canada Ltd.,

**Keys, Machine**
Hamilton, Ont.
Toronto, Ont.
Muskegon, Mich.

**Knives, Machine**
Indianapolis, I.
Galt, Ont.
Grand Rapids, Mich.
Montreal, Que.

**Knurl Holders**
of Canada, Ltd.,

**Lacing Leather**
Grand Rapids, Mich.
Montreal, Que.

**Lamps, Electric**
Toronto, Ont.
Montreal, Que.

**Lathe Attachments**
Galt, Ont.
Torrington, Conn.
St. Louis, Mo.
Toronto, Ont.

**Lathe Pans, Portable**
Galt, Ont.

**Lathe Tools**
Chicago, Ill.
Ltd.,
Toronto, Ont.
Madison, Wis.
Torrington, Conn.

**Lathes, Automatic and Semi-Automatic**
Whitworth of Canada, Ltd.,
Madison, Wis.
Toronto, Ont.
Springfield, Vt.
Galt, Ont.
Cleveland, Ohio.
Madison, Wis.

**Lathes, Bench**
Montreal, Q.
Ltd., Toronto, Ont.

**Lathes, Boring**
Galt, Ont.
Madison, Wis.

**Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Galt, Ont.
Montreal.
Madison, Wis.
Springfield, Vermont.
Galt, Ont.
Madison, Wis.
Cleveland, Ohio.

**Lathes, Engine**
Montreal, Q.
Canada Machinery Corp., Galt, Ont.
Montreal.
Geo. F., Montreal, Que.
Toronto, Ont.
Chicago, Ill.
Toronto, Ont.
Torrington, Conn.
St. Louis, Mo.
Galt, Ont.
Rapids, Mich.
Rockford, Ill.
Toronto, Ont.
Sidney, Ohio.
Windsor, Ont.
Jackson, Mich.
Montreal, Que.

**Lathes, Extension and Gap**
Ltd., The John, Dundas, Ont.
Galt, Ont.
Madison, Wis.
Galt, Ont.
Rapids, Mich.

**Lathes, Heavy Duty Projectile Boring**
Ltd., The John, Dundas, Ont.
Ltd., Montreal
Sidney, Ohio
Madison, Wis.

Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio.
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio

**Lathes, Polishing (See Polishing and Buffing Machines)**
Ford-Smith Machine Co., Hamilton, Ont

**Lathes, Reliving**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Lathe, Universal Hand**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Lathes, Screw-Cutting**
Jones & Lamson Machine Co., Springfield, Vt.

**Lathe, Speed and Hand**
Blount Co., J. G., Everett, Mass.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich

**Lathes, Spinning**
Terry & Co., John C., Birmingham, Eng.

**Lathes, Threading**
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

**Lathes, Vertical Turret**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

**Lathes, Wood Turning**
Blount Co., J. G., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Lead Pipe**
Canada Metal Co., Ltd., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Lighting Fixtures**
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont

**Linoleum Mill Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Liquid Air Plants**
L'Air Liquide Society, Toronto, Ont.

**Lockers, Clothes**
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

**Lubricants**
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Lubricating Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Machinists**
Parker Co., Charles, Meriden, Conn

**Machinists' Small Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Stronger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Mandrels, Expanding**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Mandrels, Solid**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont

**Measuring Machines**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Metals, Alloy**
British Smelting & Refining Co., Ltd. Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Metal Workers**
Parker Co., Charles, Meriden, Conn.

**Micrometer Calipers**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Milling Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Milling Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**Milling Machines, Automatic**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Bench**
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Hand**
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

**Milling Machines, Horizontal and Planer Type**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Milling Machines, Plain**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Milling Machines, Universal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Milling Machines, Vertical**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

**Monel Metal**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Motors, Electric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Moulded Rubber Goods**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Nail Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Nails and Staples**
Canada Metal Co., Ltd., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Nickel, Bars, Sheets, Wire, Etc.**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Nickel Plating Outfits**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Nickel Silver**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Nitrogen**
L'Air Liquide Society, Toronto, Ont.

**Nut Tappers (See Bolt and Nut Machinery)**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

**Nuts, Finished and Semi-finished**
Galt Machine Screw Co., Galt, Ont.

**Nuts, Machine Screw**
Torrington Company, Ltd., Upper Bedford, Que.

**Nuts, S.A.E., Plain and Castellated**
Galt Machine Screw Co., Galt, Ont.

**Oil Cocks and Burners**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Oil Filtering and Storage Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oil Storage Engineers**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oils**
Canadian Oil Companies, Ltd., Toronto, Ont
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Hole Covers**
Can. Winkley Co., Ltd., Windsor, Ont.

**Oils, Soluble**
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oxygen**
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

**Oxy-Acetylene Apparatus**
L'Air Liquide Society, Toronto, Ont.

**Packing, Hydraulic**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

**Packing, Steam**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

**Paper Mill Conveyors**
Bertrams Ltd., Edinburgh, Scotland.
Dominion Engineering Works, Ltd., Montreal, Que.

**Patents**
Fetherstonhaugh & Co., Ottawa, Ont.
Marion & Marion, Montreal, Que.

**Pans, Wet and Dry**
Frost Mfg. Co., Chicago, Ill.

**Pattern-Shop Machinery (See Woodworking Machinery)**
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Patterns, Wood and Metal**
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Wraggis Pattern Works, Galt, Ont.

**Penstocks, Steel**
MacKinnon Steel Co., Sherbrooke, Que

# BUYERS' DIRECTORY

**Phosphor Tin**
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.

**Photographic Duplicating Machines**
Commercial Camera Co., Providence, R.I.

**Pig Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Bending Machines**
American Pipe Bending Machine Co., Boston, Mass.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

**Pipe Couplings**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Cutting and Threading Machines**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**
Landis Machine Co., Inc., Waynesboro, Pa.

**Pipe Fitters' Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa.

**Piston-Ring Machines**
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Planers, Parallels**
L. & P. Mfg. Co., Niagara Falls, Ont.

**Planing Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Planing Machines, Rotary**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Plumbers' Brass Goods**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Pneumatic Tools**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**
Ackworthle, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Blount Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Pots, Steel**
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Pressed Steel Parts**
Ackworthle, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich.
Can. Fairbanks-Morse Co., Ltd., Montreal.
L. & P. Manufacturing Company, Ltd., Niagara Falls, Ont.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Presses, Drop and Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Foot and Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

**Presses, Forcing**
Atlas Press Co., Kalamazoo, Mich.
Stewart & Co., Duncan, Glasgow, Scot.

**Presses, Hydraulic**
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

**Presses, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Protractors**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Propellers**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Pulleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal and Fibre**
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Pulp and Paper Mill Equipment**
Dominion Engineering Works, Ltd., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.

**Pumps, Barrel and Boiler-feed**
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coalant**
Trahern Pump Co., Rockford, Ill.

**Pumps, Geared and Hand**
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**
Can. Fairbanks-Morse Co., Ltd., Montreal
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Dominion Engineering Works, Ltd., Montreal, Que.
Hepburn Ltd., John T., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

**Pumps, Lubricant and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Jardine & Co., A. B., Hespeler, Ont.

**Punches, Power**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

**Punching Machines, Horizontal**
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Taylor Instrument Co., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Racks, Cut**
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**
Holden Co., Ltd., Montreal, Que.

**Reamer Holders**
Cleveland Twist Drill Co., Cleveland, O
Gisholt Machine Co., Madison, Wis.

**Reamers, Expanding**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Reamers, Solid**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Reamers, Taper**
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Recorders, Temperature**
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Recorders, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Regulators, Temperature**
Taylor Instrument Co., Toronto, Ont.

**Rheostats**
Northern Electric Co., Montreal, Que.

**Resistance Materials**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Rivets**
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

**Rivet Heaters**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.

**Riveting Machines**
Bilton Machine Co., Bridgeport, Conn
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**
Stewart & Co., Duncan, Glasgow, Scot

**Rolls (Rubber Covered)**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rudder Frames, Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Rubber Goods, Mechanical**
Quaker City Rubber Co., Philadelphia, Pa.

**Rubber Machinery Makers**
Can. Consolidated Rubber Co., Ltd., Rubber Machinery Shops, Kitchener, Ont.

**Rules, Steel**
Chesterman & Co., Ltd., J., Sheffield, Eng.

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Rust Preventatives**
Oakley Chemical Co., New York, N.Y.

**Sand Equipment**
Can. Link-Belt Co., Toronto, Ont

**Sand Mills**
Frost Mfg. Co. Chicago, Ill.

**Sanding Machinery**
Oliver Machy. Co., Grand Rapids, Mich.

**Sand Rammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Saw Frames and Blades, Hack**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Sawing Machines, Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Sawing Machines, Power Hack**
Ackworthle, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Saw Sharpening Machines**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saw Tables, Universal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Hot and Cold**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Saws, High Speed Steel**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Metal Band**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saws, Metal, Power**
Clemson Bros., Inc., Hamilton, Ont.

**Saws, Metal Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

**Saws, Milling**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Saws, Screw Slotting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Swing Cut-off**
Oliver Machinery Co., Grand Rapids, Mich.

**Scales**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal, Q.

**Screens**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Screens, Paper**
Dominion Engineering Works, Ltd., Montreal, Que.

**Screw Drivers, Optical, Jewelry and Novelty**
Torrington Co., Ltd., Upper Bedford, Que.

**Screw Driving Machine**
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Screw Extractors**
Cleveland Twist Drill Co., Cleveland, O.

**Screw Machine Work**
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio
Tallman Brass & Metal Co., Hamilton, Ont.

# BUYERS' DIRECTORY

**Screw Machinery, Wood and Lag**
[illegible] Co. Bartholomew Conn.

**Screw Machines**
[illegible] Mfg. Co. Providence R.I.

**Screw Machines, Automatic**
[illegible] Machine Tool Co. Toronto Ont.
[illegible] Ltd. Alfred, Toronto, Ont.
[illegible] Co. Cleveland, Ohio.

**Screw Machines, Plain or Hand**
[illegible] Machine Tool Co. Cincinnati, Ohio
[illegible] Tap & Die Corp., Galt, Ont.
[illegible] Ltd. Alfred, Toronto, Ont.
[illegible] & Whitney Co., of Canada, Ltd., Toronto, Ont.
Warner & Swasey Co., Cleveland, Ohio

**Screw Machine Products**
[illegible] Company, Ltd., Upper Bedford, Que.

**Screw Plates**
Acme Hardware Ltd., Toronto, Ont.
[illegible] & Co., Inc. Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

**Screws, Cap and Set**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio
[illegible] Company, Ltd., Upper Bedford, Que.

**Screws, Lock Cap**
[illegible] Company, Ltd., Upper Bedford, Que.

**Screws, Machine**
Barnes Co., Wallace, Bristol, Conn.
Stow Co. of Canada, Ltd., Hamilton, Ont.
[illegible] Company, Ltd., Upper Bedford, Que.

**Screws, Safety Set**
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Screws, Side Knob**
[illegible] Company, Ltd., Upper Bedford, Que.

**Screws, Thumb**
[illegible] Company, Ltd., Upper Bedford, Que.

**Second-Hand Machinery**
[illegible] lists of dealers
Petrie, Ltd., H. W., Toronto, Ont.

**Separators, Moisture and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Separators, Oil and Waste**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Shafting**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Shapes, Cold-Drawn Special Steel**
Union Drawn Steel Co., Hamilton, Ont.

**Shaping Machines**
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Wallott Lathe Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Shapers, Wood**
Oliver Machinery Co., Grand Rapids, Mich.

**Shears, Hand**
Can. Blower & Forge Co., Ltd., Kitchener.

**Shears, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y.
[illegible] & Co., Duncan, Glasgow, Scot
Toledo Machine & Tool Co., Toledo, Ohio
Williams Machinery Co., A. R., Toronto, Ont.

**Shearing Machines, Angle, Iron Bar and Gate**
Bertrams Ltd., Edinburgh, Scotland.

**Sheet Lead**
[illegible] Metal Co. Ltd. Toronto, Ont.

**Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio.

**Sheets, Nickel, Resist, Alloy**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Sheets, Nickel, Monel and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Side Frames, Locomotive**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Slotting Attachments**
Ford-Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Rockford Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

**Slotting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

**Solders**
British Smelting & Refining Co., Ltd., Montreal, Que.
[illegible] Metal Co., Ltd., Toronto, Ont.

**Snap Flasks**
Oliver Machy. Co., Grand Rapids, Mich

**Special Machinery and Tools**
Brown Engineering Corp., Ltd., Toronto
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Specialties, Swaged and Headed Work**
Torrington Company, Ltd., Upper Bedford, Que.

**Springs**
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

**Spring-making Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Sprockets and Chains**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Squares**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Stamping, Metal**
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Metal Stamping Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Stamps, Steel**
Diamond Saw & Stamping Works, Buffalo, N.Y.

**Stairways, Wrought Iron**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Steam Specialties**
Crane Ltd., Montreal, Que.

**Steel Plate**
Dom. Foundries & Steel, Hamilton, Ont.

**Steels, Tool**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa

**Steel Blooms and Billets**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steel, Cold-Rolled Strip**
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Steel Castings**
Dom. Foundries & Steel, Hamilton, Ont.

**Steel Forgings**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Sheets, Open Hearth Steel**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steel, Shafting and Free Cutting Screw**
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

**Steel, Sheet**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

**Steel, Stainless**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel Wire Rods**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steels, Alloy, Open Hearth and Electric**
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
United Alloy Steel Corp., Canton, Ohio.

**Steels, Alloy and Carbon**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steels, High-Speed**
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel, Magnet**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel, Structural**
MacKinnon Steel Co., Sherbrooke, Que.

**Steel Tubing, Close Joint and Welded**
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

**Stern Frames, Cast Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Straightening Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Studs**
Galt Machine Screw Co., Galt, Ont.

**Surface Plates**
Bilton Machine Co., Bridgeport, Conn.

**Swaging Machines**
Atkins & Co., Inc., E. C., Indianapolis, I
Etna Machine Co., Toledo, Ohio.

**Swaging Machine Parts**
Etna Machine Co., Toledo, Ohio.

**Switches, Railway**
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Aikenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

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MacKinnon Steel Co., Sherbrooke, Que.

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Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

**Taper Cutting Dies**
Jones & Lamson Machine Co., Springfield, Vt.

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Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taper Pins**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

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Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass.

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Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

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Can. Fairbanks-Morse Co., Ltd., Montreal
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont
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Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

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National Acme Co., Cleveland, Ohio.
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Toronto Testing Laboratory, Toronto, Ont.

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Taylor Instrument Co., Toronto, Ont.

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Greenfield Tap & Die Corp., Galt, Ont.
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Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

## DIRECTORY OF DEALERS

THE Buyers' Directory of CANADIAN MACHINERY was originally intended to contain information regarding lines actually manufactured by our advertisers. We now carry the advertising of leading machinery dealers, some of whom represent scores of manufacturers in addition to being manufacturers themselves in some cases. This necessarily widened the scope of our Directory, but it would be impracticable to list all the lines handled by all the dealers. We recommend, therefore, if our subscribers cannot find what they want in our Directory that they communicate with the dealers whose names appear herewith.

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The Garlock-Walker Machinery Co., Toronto, Ont.
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H. W. Petrie Limited, Toronto, Ont
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A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Yeates Machinery Co., London, Ont

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Greenfield Tap & Die Corp., Galt, Ont.
Charles Parker Co., Meriden, Conn.

**Vises, Planer and Shaper**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Superior Machine Co., London, Ont.

**Vises, Wood Workers'**
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Carter Welding Co., Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.

**Welding Filler Rods**
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Prest-O-Lite Co. of Can., Toronto, Ont.

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Holden Co., Ltd., Montreal, Que
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Volta Mfg. Co., Welland, Ont.

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**Winches, Stoplog**
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Northern Electric Co., Montreal, Que
Steel Co. of Canada, Ltd., Hamilton, Ont

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**Wire Rope**
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Schuster Co., F. B., New Haven, Conn.
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Prest-O-Lite Co. of Can., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

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Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

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Canada Foundries & Forgings Co., Welland, Ont.

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Greenfield Tap & Die Corp., Galt, Ont.

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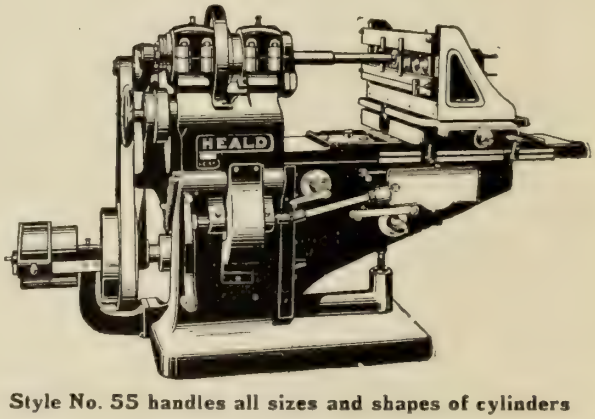
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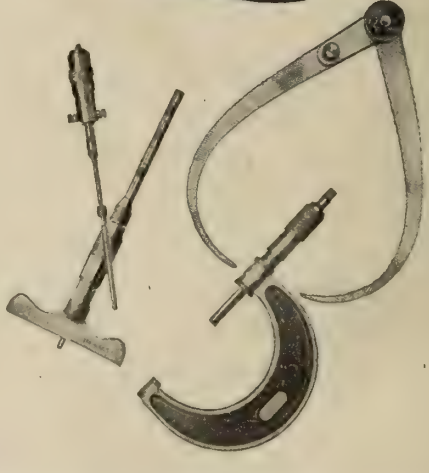
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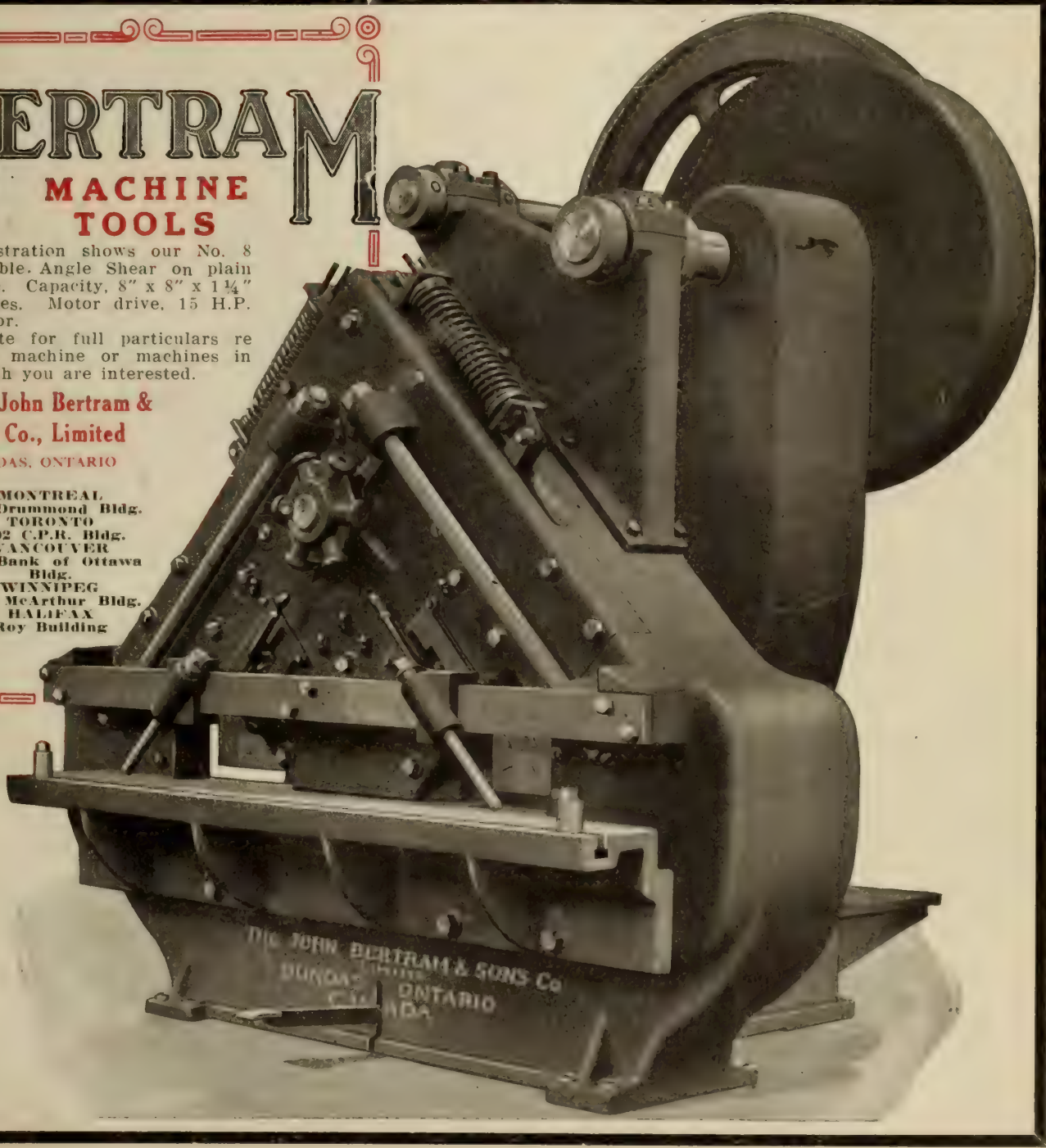
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You can't help noticing the good qualities of

## Pratt & Whitney Taps

Their free cutting qualities, their extreme accuracy and their extraordinary ability to outlive others distinguish them.

The non-eccentric relief—a distinctive P & W feature—is the secret of their goodness. One-third of the cutting edge is concentric. The remaining two-thirds has eccentric relief. Taps can be sharpened at the only correct point—on the face of the cutting edge. Sharpening in no way effects their size.

Yes, they cost a little more than some others, but they're well worth the difference. Carried in stock as are all other P. & W Small Tools at our sales offices and agencies as listed.

**PRATT & WHITNEY COMPANY OF CANADA, LIMITED**

**Works : DUNDAS, Ontario**

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# The BERTRAM Page

## MACHINE TOOLS

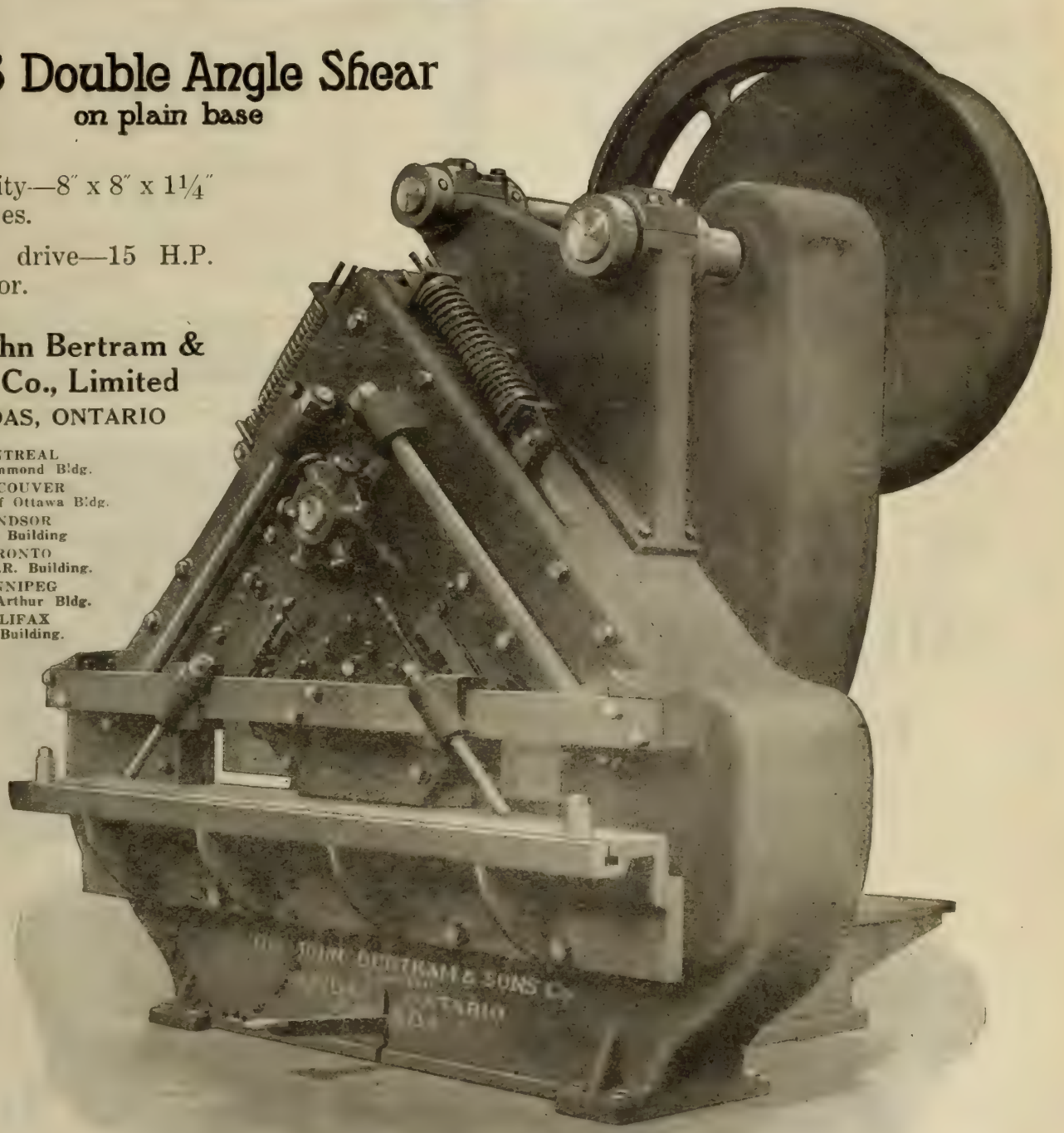
## No. 8 Double Angle Shear
on plain base

Capacity—8″ x 8″ x 1¼″ angles.

Motor drive—15 H.P. Motor.

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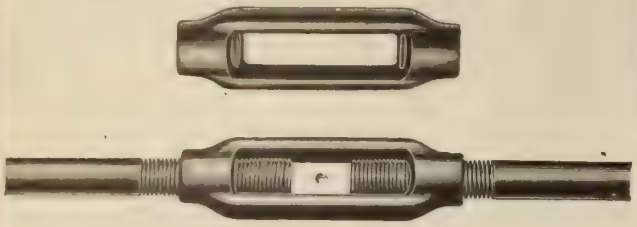



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Drop Forged Steel



SOLID—NOT WELDED

16 Sizes with / without } Stubs

Canada Foundries & Forgings
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Increased Output
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follow the use of
P.H. and IMPERIAL FILES.

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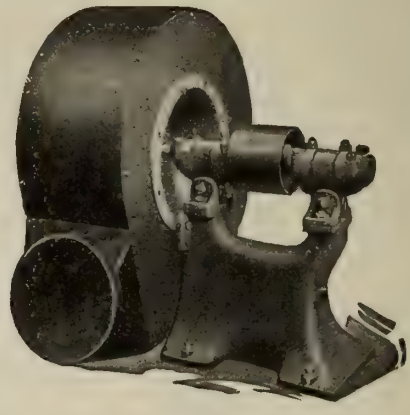
John Morrow Screw and Nut Company Limited,
Sole Distributors,
Ingersoll, Ontario.

IMPERIAL

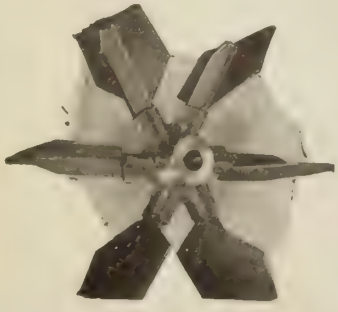
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*Handle Any Material*



The Canadian Standard Mill Exhausters will handle any kind of material efficiently—sawdust, shavings, cotton lint, or stringy material, gases, fumes, smoke, etc.



They are adjustable to any angle of discharge instantly—have universal type of wheel and carefully constructed, self-aligning oil-ring bearings.

Catalog 410-77—gives technical data and prices. Write for a copy.

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*QUICK DELIVERIES*

**High Carbon Steel**
**Manganese Steel**
**Chrome Steel**
**Mild Steel**

*QUALITY GUARANTEED*

Sizes—½ lb. to 5,000 lbs. each

**THE WILLIAM KENNEDY & SONS,**
*LIMITED*
OWEN SOUND, ONTARIO
ESTABLISHED 1860

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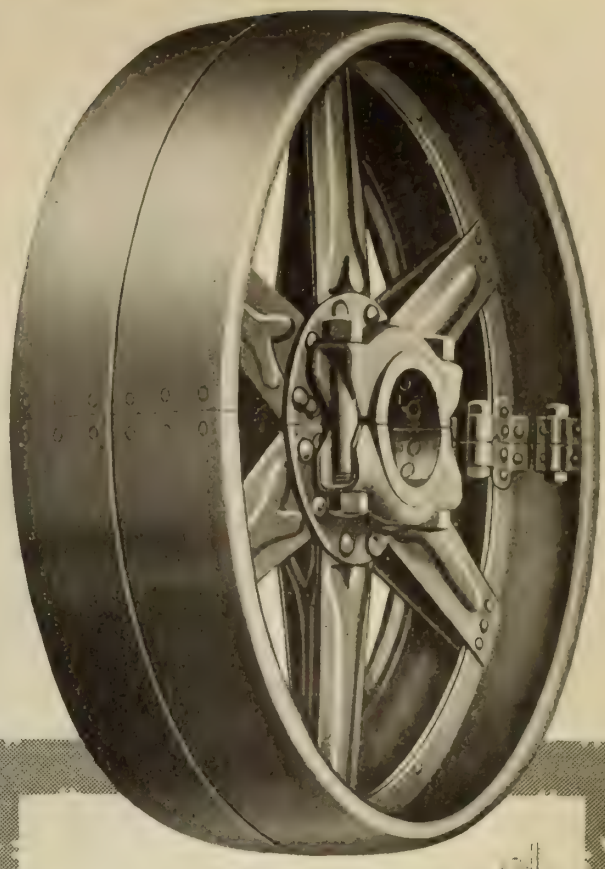
**Made in Canada**

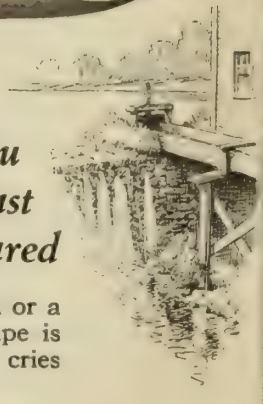
## L-XX HIGH-SPEED
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for Machine Tools, Automotive Parts, etc.
Noted for their uniformity

**Hot Rolled, Forged Blocks and Discs**
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*The Waste You Can See is Least to be Feared*

A HOLE in a dam or a leaky steam pipe is not to be feared; it cries aloud for attention.

It's the hidden leaks—such as excessive weight of pulleys on the bearings—air fanning and belt slippage that steal your power and add to its cost.

How to overcome these losses is explained in our book, "Getting Maximum Pulley Efficiency." Yours for the asking.

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**Philadelphia, Pa.**

# AMERICAN STEEL SPLIT PULLEYS

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## Our Engineering Staff is at Your Service

OUR Engineering staff understand Canadian Manufacturing conditions thoroughly. Why not put your problems up to them? They are prepared to give you the benefit of their wide and varied experience without obligation. Their advice has been of practical value to others and no doubt they can serve you just as well.

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Canada's Dependable Machinery and Supply House



Everything You Need for Your Machine Shop

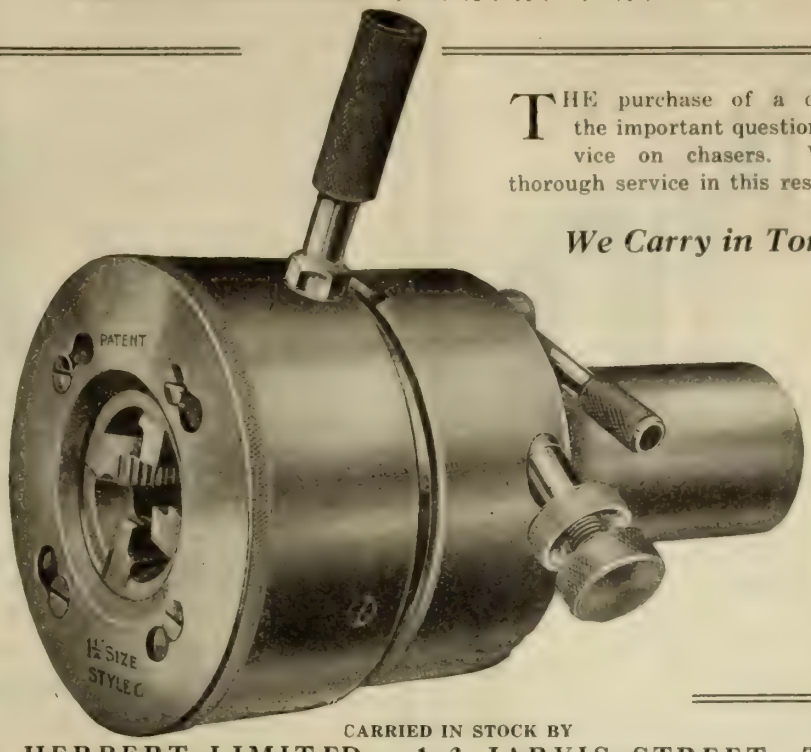
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# The Coventry Patent Self-Opening Diehead

MADE IN SEVEN SIZES—5/16", ½", ¾", 1", 1¼", 2" and 3"

THE Coventry Diehead produces clean smooth threads, accurate in form and pitch. The Coventry chaser grinding system ensures exceptional life to the chasers and the greatest ease in grinding; all chasers are ground together on any type of surface grinder.




THE purchase of a diehead involves the important question of prompt service on chasers. We offer very thorough service in this respect.

*We Carry in Toronto Stock*

Chasers With
U.S. Standard Thread
Briggs Pipe Thread
A.S.M.E. Thread
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Section H. describes our Die-head and Chaser Grinding System in Detail. A copy will be sent on request.

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# STEEL *for*

## Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

**We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open - Hearth Steel on the Shortest Notice.**



Steel Ingots
*by the*
**HARMET**
Liquid Process

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ELEVATING TRANSMITTING CONVEYING
BELTING

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That ensures a big measure of efficient and economical

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We carry in stock Leviathan and Anaconda Belting, from 1" up, all plies, and are prepared to supply any length of belt at any time whether for conveying, elevating or transmission.

The belting comes in rolls of 500 ft., but we can supply any portion of this or one or more rolls at a moment's notice. Stocks carried at all points given in addresses below.

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There is some outstanding feature of all La Salle Grinding Machines that lends it exceptional productive ability.
The American Drill Grinder is especially adaptable for grinding twist, flat and three-lipped drills, because it has automatic lip rest and caliper jaw device, which assures proper clearance on all sizes of drills automatically. Send for descriptive matter covering our entire line of grinding machinery.



American Drill Grinder
For Wet or Dry Drill Grinding 1/8" to 2¼". Also 1/8" to 3½" dia.

**LA SALLE TOOL CO.**
**La Salle, Illinois, U.S.A.**

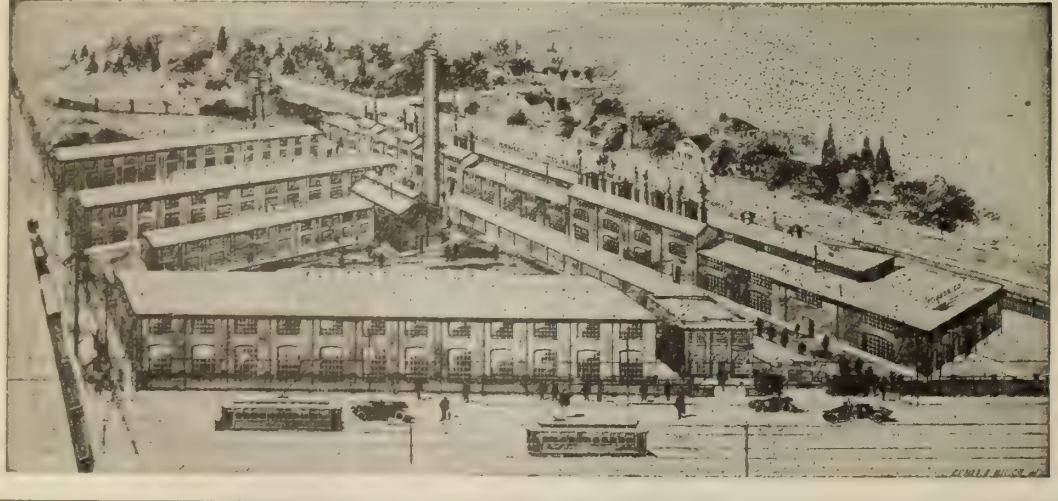
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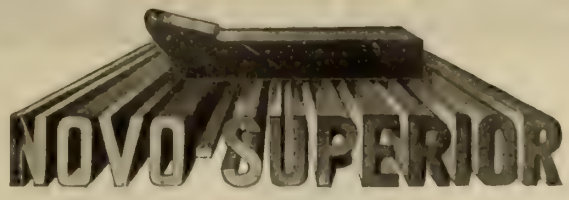
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"HISCO" machine-moulded gears, while requiring no pattern, insure accuracy, dependability, quality, and the price is minus the cost of patterns—which in these days of high prices of lumber is something to be considered.

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HIGH SPEED STEEL
INTRA STEEL GIBRALTAR STEEL
Tool Steel for Every Purpose
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Twist Drills, Taps, Hack Saw Blades, Milling Cutters, Files, Etc.; Music Wire for Springs, Steel Balls, Cold Rolled Tool Steel in Strips and Sheets, Circular Saws, Machine Knives.

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Sole Agents for
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**IMPERIAL GENUINE**




For Heavy Engines and Extraordinary Hard Work

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For Donkey Engines, Saw Carriages, Small Motors, Transmission Line Shafting and all steady heavy pressure duty.



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Suitable For Slow-Moving Bearings
Write For Prices

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*Talk About Saving Time and Labor—*

# Murchey Collapsing Taps and Self-Opening Dies

will boost your production fifty per cent. and at the same time turn out better and more economical work than ordinary tools.



Murchey Tools are built for long, hard service. The fine materials and workmanship, their extremely simple design and rugged construction, enable clean, accurate threading under all conditions.

**If you would experience a new kind of tap and die satisfaction send for a trial order of Murchey Taps and Dies.**



## Murchey Machine & Tool Company

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# THE JOHNSON FRICTION CLUTCH

## The Case Against the Countershaft

The old familiar countershaft drive, through cross belts and tight and loose pulleys, stands accused of the following offences against efficiency:

1. Involves needless equipment.
2. Costs too much to set up.
3. Prevents economical and systematic use of space.
4. Operates sluggishly.
5. Multiplies belt troubles and the resultant cost of upkeep.

Modern practice has discarded the antiquated countershaft for the simplicity and efficiency of the clutch drive direct from lineshaft.

**Adopt the Johnson Lineshaft Drive**

The economical, efficient and durable method of power transmission through friction control.

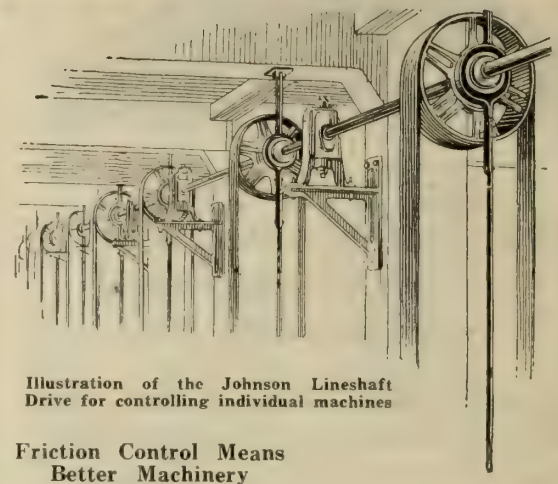
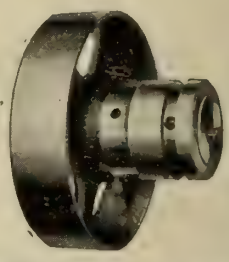


Illustration of the Johnson Lineshaft Drive for controlling individual machines

**Friction Control Means Better Machinery**

Whether it is applied overhead or in the machine itself.

**Write for our Booklet "Clutches as Applied to Machine Building" and our Yellow Catalog.**



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## CLEVELAND "FOUNDRY" CHIPPERS

*Are Dust-Proof* *Easy To Hold* *Easy To Control*

**A Remarkable Tool for Fast Chipping**

Made in "Seventeen" sizes with "Open" or "Enclosed" handles—Outside or Inside Latch.

## CLEVELAND FOUNDRY RAMMERS

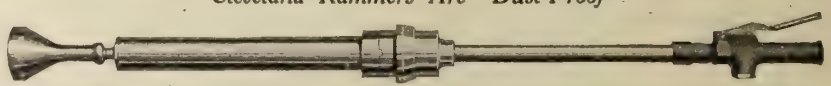
**For Floor - Flask - Bench or Core Work**

**Run Fast Hit Hard**



**Have No Vibration**

*Cleveland Rammers Are "Dust-Proof"*



*They cost less for "Up-Keep" than any Rammer made.*

## BOWES AIR HOSE COUPLINGS
*AND*
## CLECO PRESSURE-SEATED AIR VALVES

*"Are Standard Equipment Everywhere"*



Style P.O.



Cut shows Never-Slip Clamp Attached.
Write for Bulletins Nos. 44-48



Style A.

**IN STOCK: Riveting Hammers, Piston Air Drills, Corner Drills, Compound Drills, Portable Grinders, Etc.**

## CLEVELAND PNEUMATIC TOOL CO., OF CANADA, LIMITED

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Bolsters
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**MANGANESE-STEEL**

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**OTHER ALLOYS**

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Guard Rail Clamps
Complete Intersection

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Cast Steel Circuit Breaker

# Electrical Machinery

**Parts of every description in cast steel**

**Small Forged Motor Shafts**

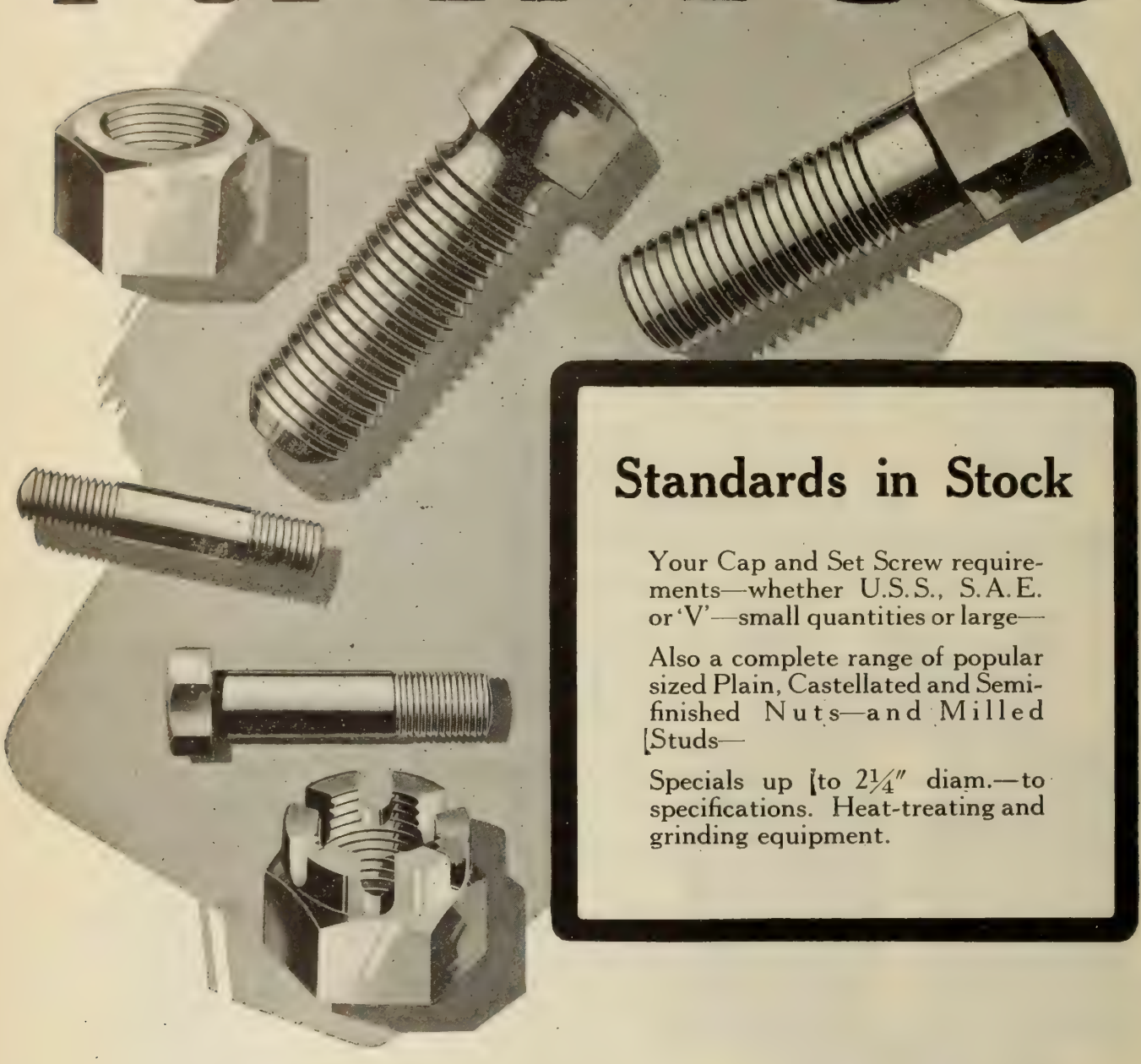
**Steel Sheets and Plates**

**Alloy Steel Gear Blanks**

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HAMILTON, CANADA

# NAMCO



## Standards in Stock

Your Cap and Set Screw requirements—whether U.S.S., S.A.E. or 'V'—small quantities or large—

Also a complete range of popular sized Plain, Castellated and Semi-finished Nuts—and Milled Studs—

Specials up to 2¼" diam.—to specifications. Heat-treating and grinding equipment.

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# No Confused Readings

Another advantage in using Starrett Tapes is found in the marked difference in size between the foot and inch figures.

All standard Starrett Steel Tapes have black enameled surfaces with sharply contrasting figures and graduations.

And remember that the markings on Starrett Steel Tapes are *etched into the metal.* Every line and figure is clean cut —permanently easy to read.

Write for the Starrett Catalog No. 22.

Starrett Steel Tapes are furnished in lengths varying from 25 ft. to 100 ft. Graduated in feet and inches on one or both sides; feet and inches on one side, and feet, 10ths and 100ths of a foot on the other; metric measure on one side, or both sides, or metric measure on one side and feet and inches on the other; feet, inches and 16ths of an inch, or other markings, on one side only; and in other combinations of markings. Tapes are supplied with or without cases in various styles.




**THE L. S. STARRETT COMPANY**

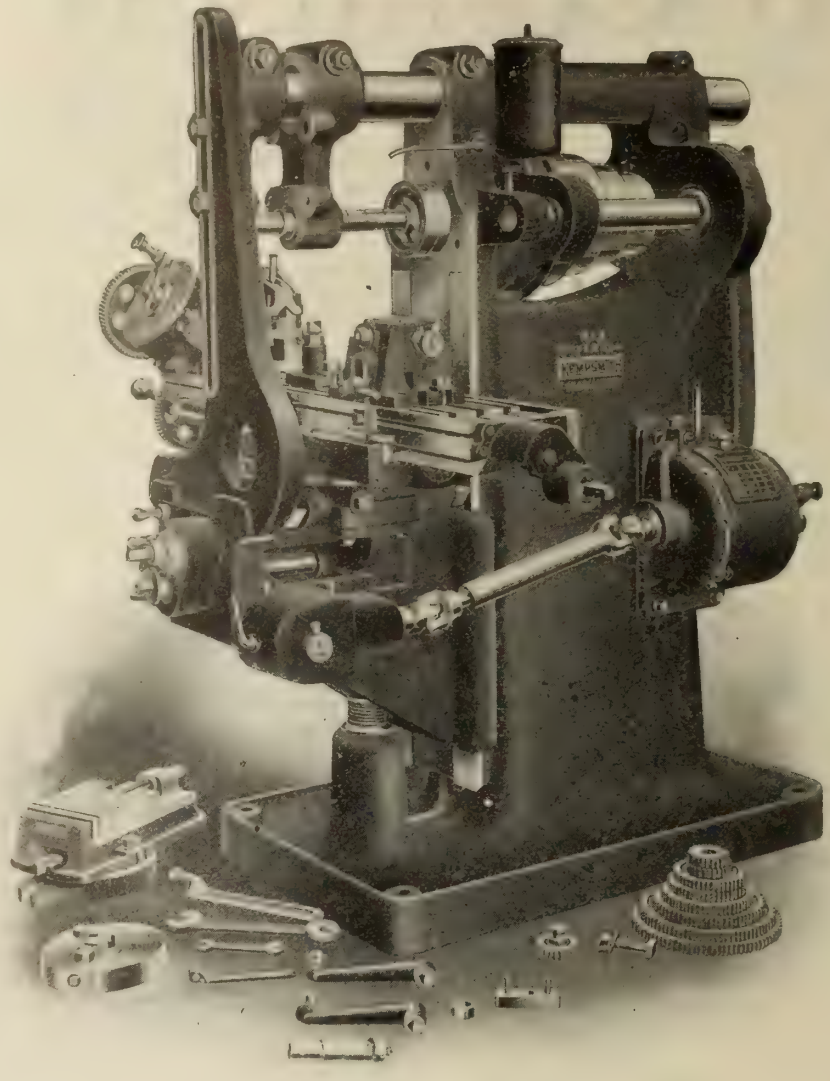
*The World's Greatest Toolmakers*
*Manufacturers of Hack Saws Unexcelled*

**ATHOL, MASS.**



# Starrett Tapes

# KEMPSMITH



## No. 2 UNIVERSAL

Thirty-two years ago the Kempsmith Company began its career in a small one-story frame building. To-day there are four main buildings, aggregating 106,000 square feet of floor area, besides various storage sheds, etc. Every building of the plant is a model of its kind.

It has always been, and will continue to be, the purpose of the Kempsmith Company to produce machines of the highest quality only, suited to the most advanced practice.

Every machine, whatever size or type, is put to test under cuts and conditions purposely more severe than it will encounter in even the most progressive shops and when it leaves our factory it has our positive and definite guarantee back of it.

***Literature will be gladly sent upon request***

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CANADIAN DEALERS.—The Geo. F. Foss Machinery & Supply Co., Limited, 305 St. James St., Montreal, Canada; General Supply Co., 38 Toronto St., Toronto, Canada.

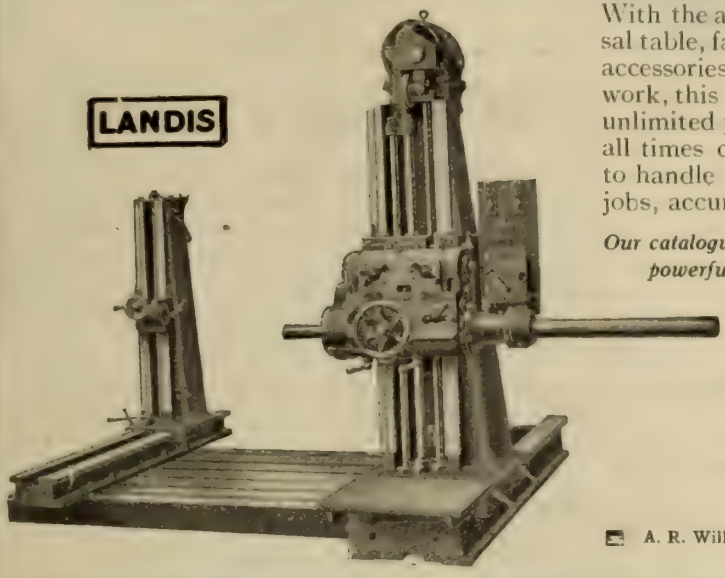
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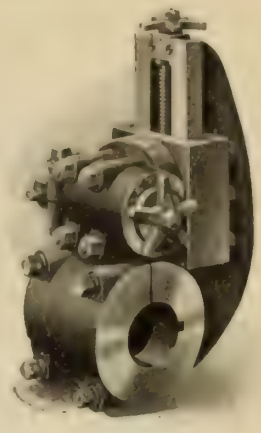
# Widen The Scope of Machining Operations

THE Horizontal Boring, Milling and Drilling Machine with its various attachments, is a highly important factor in any plant.

In machining parts requiring a series of boring, milling, reaming and drilling operations, the Landis is noted as a time saver, because these varied machinings can be accomplished with a single set-up of work. With the addition of a universal table, facing heads or other accessories best suited to your work, this boring machine has unlimited possibilities, and at all times can be relied upon to handle the most difficult jobs, accurately and quickly.

*Our catalogue tells more about this powerful tool. Write for it.*



20" Swiveling Facing Head

## LANDIS TOOL CO.

**Waynesboro, Pa.**

New York Office - 51 Chambers St.

CANADIAN AGENTS

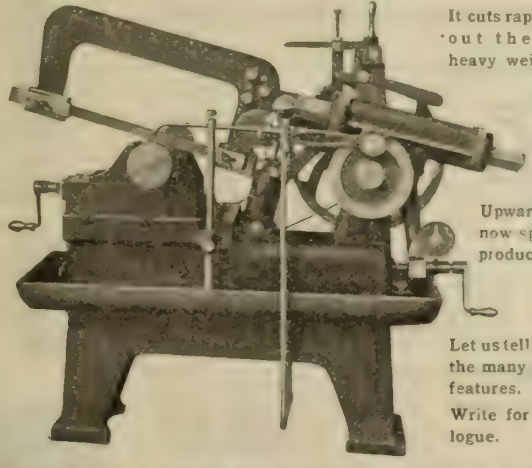
A. R. Williams Machinery Co., Toronto; Williams & Wilson, Ltd., Montreal.



## Fast Cutting Economy on this

# "Rapid" Saw

THIS No. 1 "Rapid" Sawing Machine is built to cut—and cut it do s. It operates sp dily, easily, minimizing "wast" an l demanding littl for upk ep op ration. Note the powerful rigid construction an l extreme simplicity. This is a positive insurance of longer life. Mad in sizes to take bars from 6" up to 26".



It cuts rapidly without the use of heavy weights.

Upwards of 3000 now speeding production.

Let us tell you about the many important features.

Write for our catalogue.

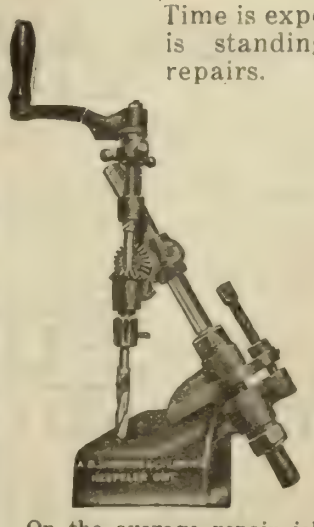
## WILLIAMS & WILSON, LIMITED

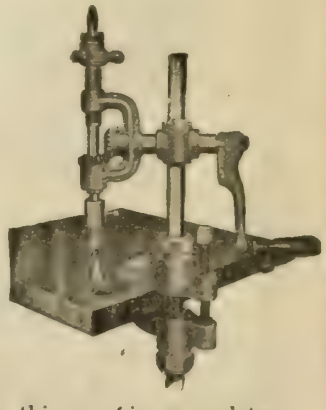
84 INSPECTOR ST., MONTREAL.



# Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.





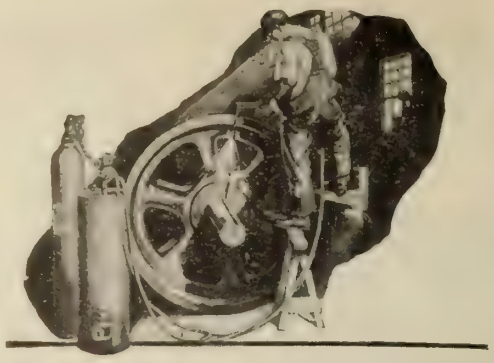
On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

**Weight, 40 lbs. Price, $26.50 net.**

**Sold by all Machinery and Supply Houses.**

## A. B. JARDINE & CO., Limited

HESPELER, ONTARIO



# *A job like this is all in the day's work*

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Our entire organization—technical and sales—is always at your service.

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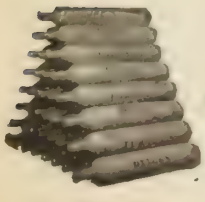
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**TORONTO FACTORY**
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# The Wild Carnival of High Prices is Over

The Printers' Unions of Toronto pay their dues and take their orders from their head office in the United States.

Some time ago they got instructions from their head office in Indianapolis, Ind., to demand shorter hours and more wages, and if these orders were not acceded to, to strike.

The Toronto Publishers and Employing Printers refused to grant these demands. So on June 1st, the Printers struck.

There is no use in the Toronto Printers, or any other body of men, blindly failing to realize that the wild carnival of High Prices is over.

If the members of the Printers' Union go out to buy boots to-day, they do not expect to pay more than they did a year ago.

They demand, and get, cheaper boots.

They are not willing to pay more for clothes, or foodstuffs, or any other commodity.

They expect to pay, and do pay, less.

And the public is not tolerant of any scheme or arrangement which is going to make its printing cost more. It is lower prices they are looking for. Why should printing costs advance, when prices of everything else are going down? That is why the Publishers and Employing Printers are resolutely and unalterably opposed to the granting of shorter hours and more pay, because it, of necessity, means dearer printing, and the public will not buy dearer printing.

That is why we are resisting and refusing to obey the mandate from the United States that the Local Printers demand more wages and shorter hours.

The Purchasing Agents' Association of Toronto at their meeting, held June 8th, 1921, passed the following resolution:

> "We endorse the attitude of the Toronto Typothetae in their efforts to prevent increased cost of printing and deplore the action of some Employing Printers in granting the Unions' demands, which, necessarily will result in an increased cost of production, when at this period economic conditions demand that production costs be lowered rather than increased."

The MacLean Publishing Company are fighting these unreasonable demands not only in the interests of their own business (and this includes the employees who are on strike) but in the interests of business conditions generally.

Good times and healthy business conditions cannot return unless we all do our part to get through the readjustment period in a sane and reasonable way.

## THE MACLEAN PUBLISHING CO., LIMITED

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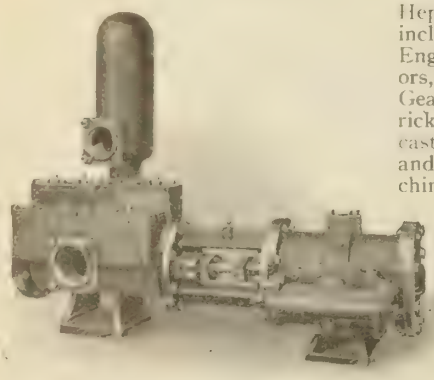
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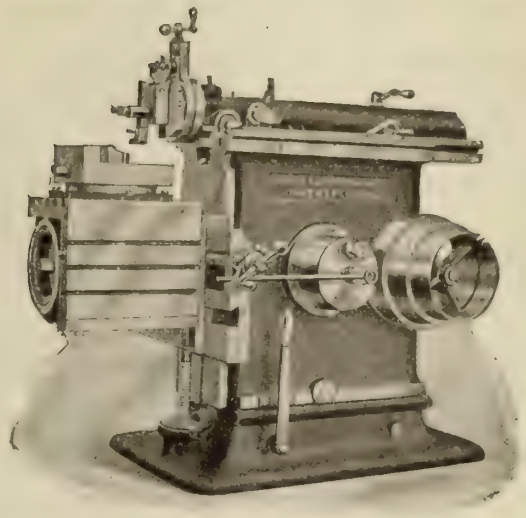
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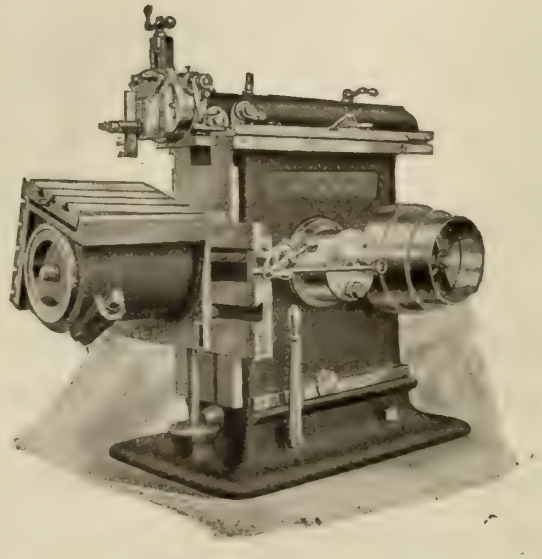
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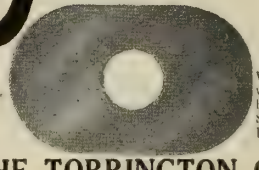
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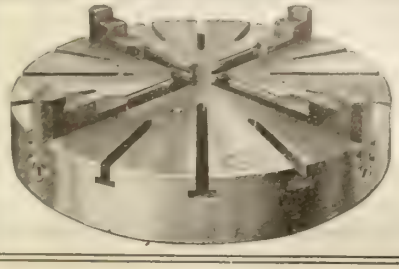
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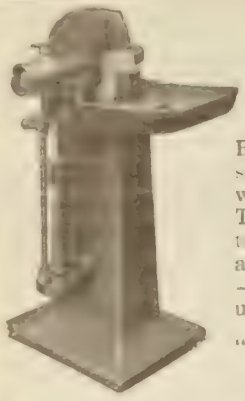
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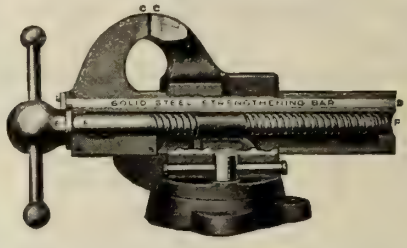
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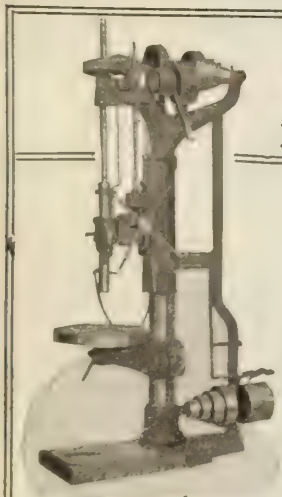
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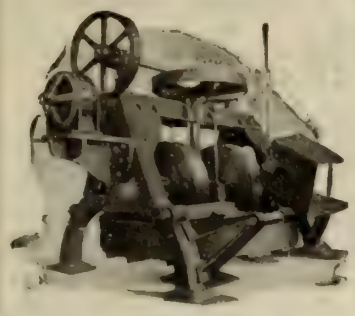
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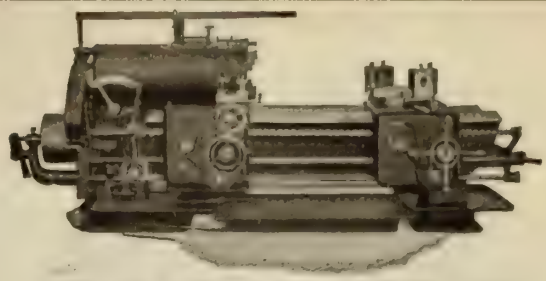
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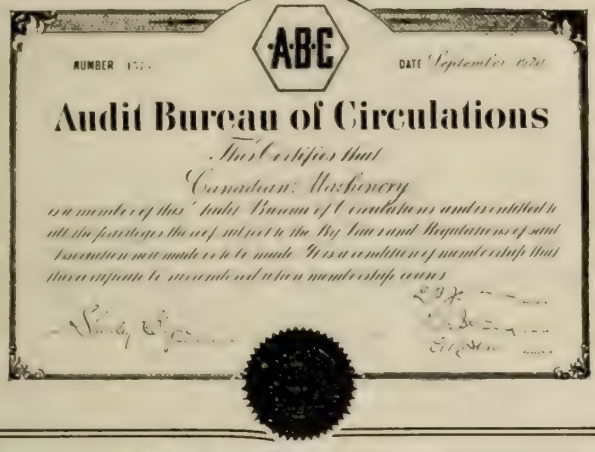


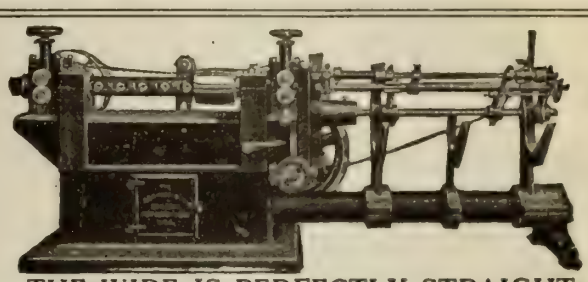
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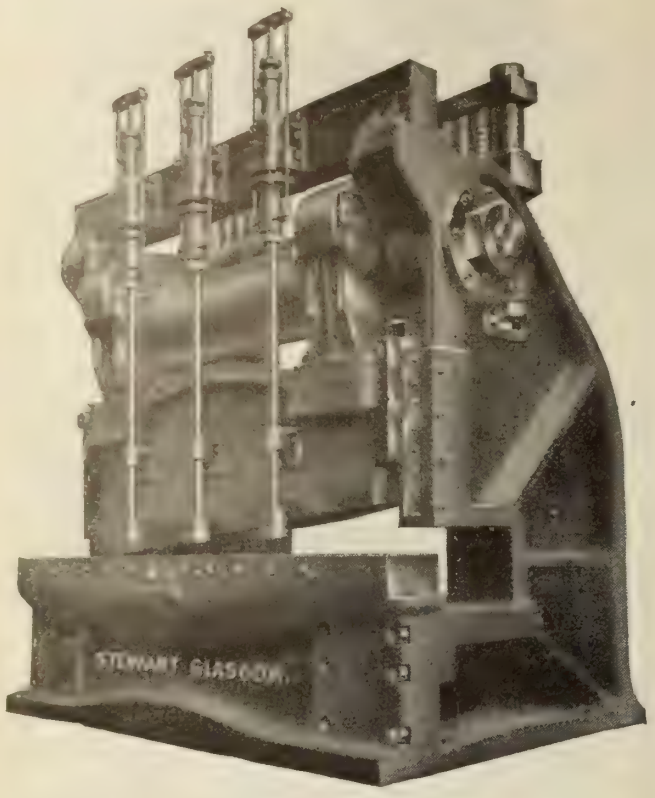
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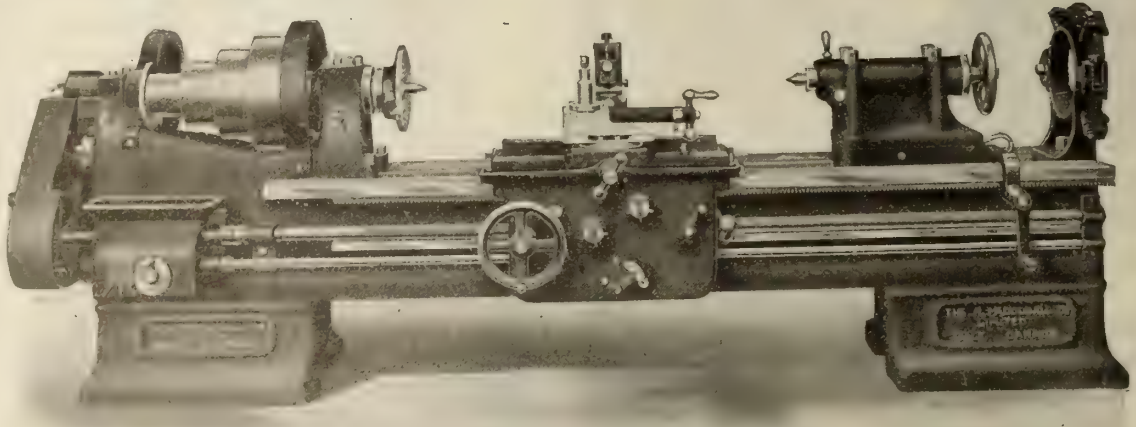
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# EXPERT Workmanship

IS MUCH IN EVIDENCE IN THE CONSTRUCTION OF

# McDOUGALL Engine Lathes

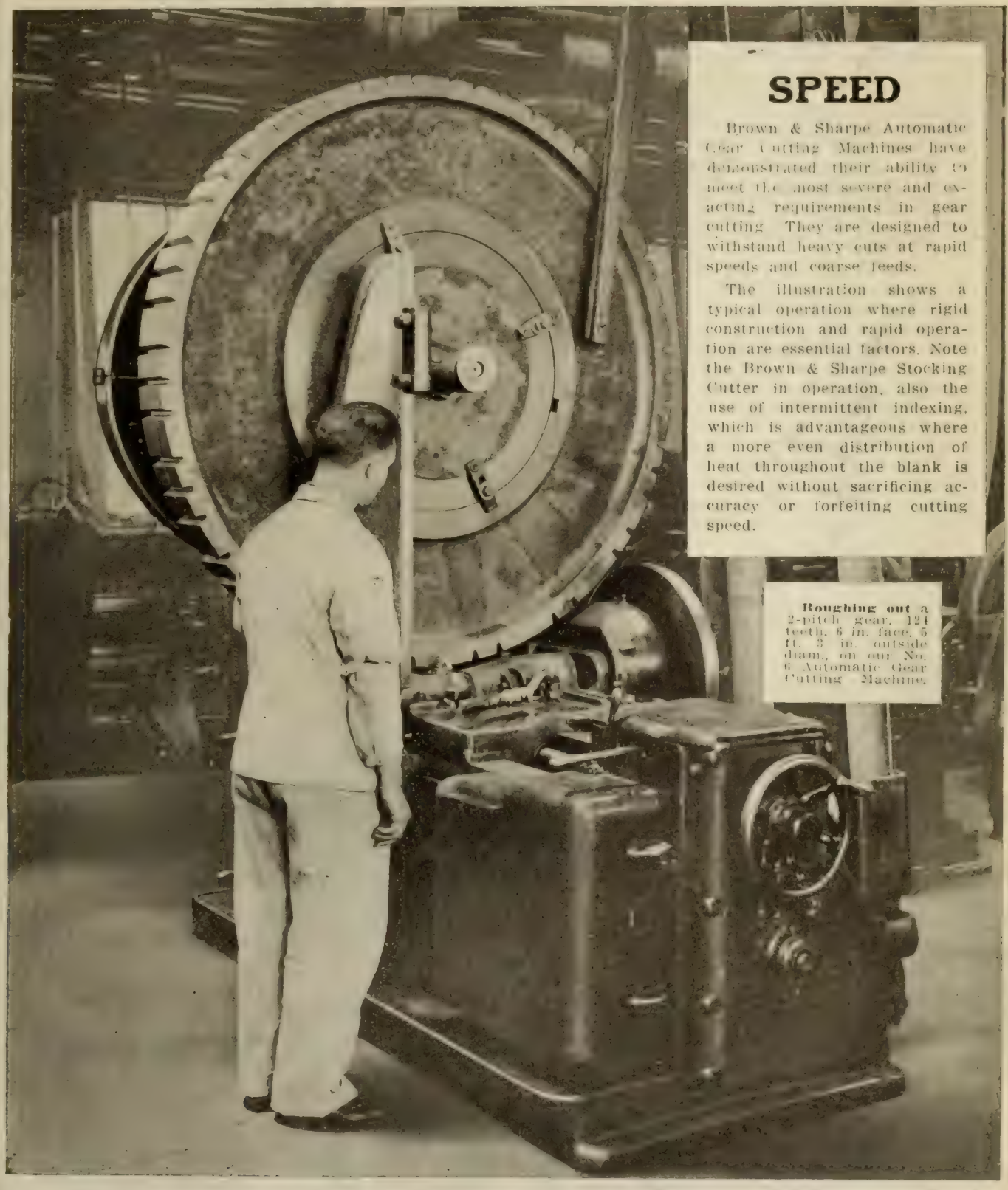


No pains are spared in the construction of this machine to make its accuracy and finish consistent with its perfect design.
McDougall Engine Lathes possess all the features which ensure economical production, dependable accuracy, and ease of operation.
Shall we send you our literature describing this lathe in detail?

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# AUTOMATIC GEAR CUTTING MACHINES



## SPEED

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The illustration shows a typical operation where rigid construction and rapid operation are essential factors. Note the Brown & Sharpe Stocking Cutter in operation, also the use of intermittent indexing, which is advantageous where a more even distribution of heat throughout the blank is desired without sacrificing accuracy or forfeiting cutting speed.

**Roughing out** a 2-pitch gear, 124 teeth, 6 in. face, 5 ft. 3 in. outside diam., on our No. 6 Automatic Gear Cutting Machine.

**BROWN & SHARPE MFG. CO., Providence, R.I., U.S.A.**

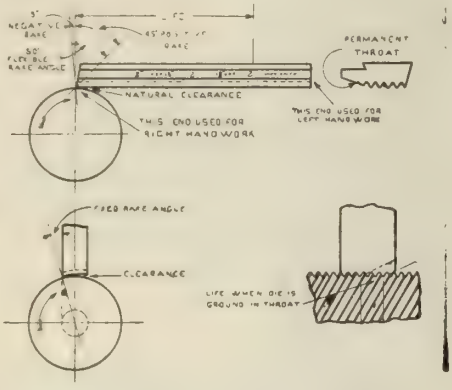
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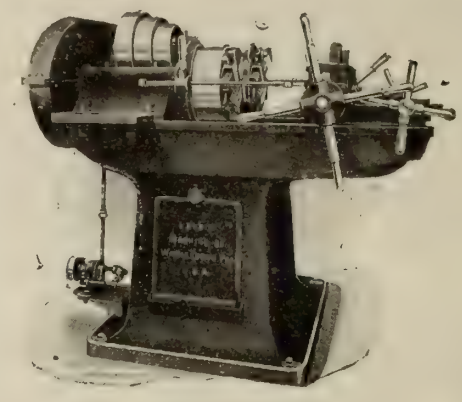
# Landis Threading Machines

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The diagram illustrates the main characteristics of the Landis Chaser as compared with the hobbed type die. It shows the long life of the Landis Chaser, and the fact that both right and left hand threads can be cut with the same set.



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# Fairbanks-Morse

CANADIAN MACHINERY
AND
MANUFACTURING NEWS

June 30, 1921

# Gashing Teeth of a Large Gear on the Slotter

## In Addition to Showing the Gashing of Teeth on a 74 Tooth Gear, the Examples Cover the Cutting of Keyways in Wire Wheel Hubs—Machining a Cross Shaft Bracket—and Slotting Connecting Rod.

DURING the last quarter of a century, unprecedented improvements in machine tool design and manufacturing methods have taken place. High speed steel, and standardization are only two of the important factors that have caused the speeding up of industry generally. The use of high speed steel meant better and more rugged machines to withstand the additional working capabilities of tools made of such metals, and, in many cases special single purpose machines have been brought forward, which are suited for certain classes of work only. We now have the single purpose lathe; the continuous miller of various types, and many other notable special machine tools. These machines have their own particular field, but how about the all-around tool, the one capable of quickly adapting itself to the work in hand. Has such a machine, like the all-around mechanic, disappeared?

Luckily we can answer in the negative, for any mechanic who has watched a modern slotter at work could never grumble as to its versatility. When we say modern slotter we mean modern in the full sense of the word. We do not refer to the antiquated models one sometimes bumps up against in an odd corner of an old-time machine shop, for the slotter of today is just as much a manufacturing tool as any other, with its versatility added.

The design of such machines has been continually improved upon, until they are now able to handle the heaviest or lightest machining operations with equal accuracy. If required for standard work they can be tooled to suit the job, but should the need arise, they are capable of being adjusted quickly to special work of any nature. About as good a method of proving this statement would be to illustrate, and also give word pictures of operations that have been performed on slotters.

Take for example Fig. 1. This shows an operation being performed at the plant of the Standard Roller Bearing Co., who have been using slotters on automobile work for several years. The machine is cutting keyways in Packard wire wheel hubs, and two keyways 5-16 in. wide, and ⅛ in. deep, are cut at right angles to each other in a tapered hole approximately 1¾ in. by 1 5-16 in. The length of the keyway is 5⅛ in., so that the closely confined space in which the keyways have to be cut is readily apparent. Twenty of these hubs are turned out per day, while at a second operation on the same piece, six additional slots are cut, close up to a shoulder.

Fig. 2 shows the gashing of a 74-tooth gear of rather large size. This work is being completed at a gear works plant, and is typical of similar gear work that

*Illustrations through the courtesy of the T. C. Dill Co., Inc., Philadelphia, Pa.

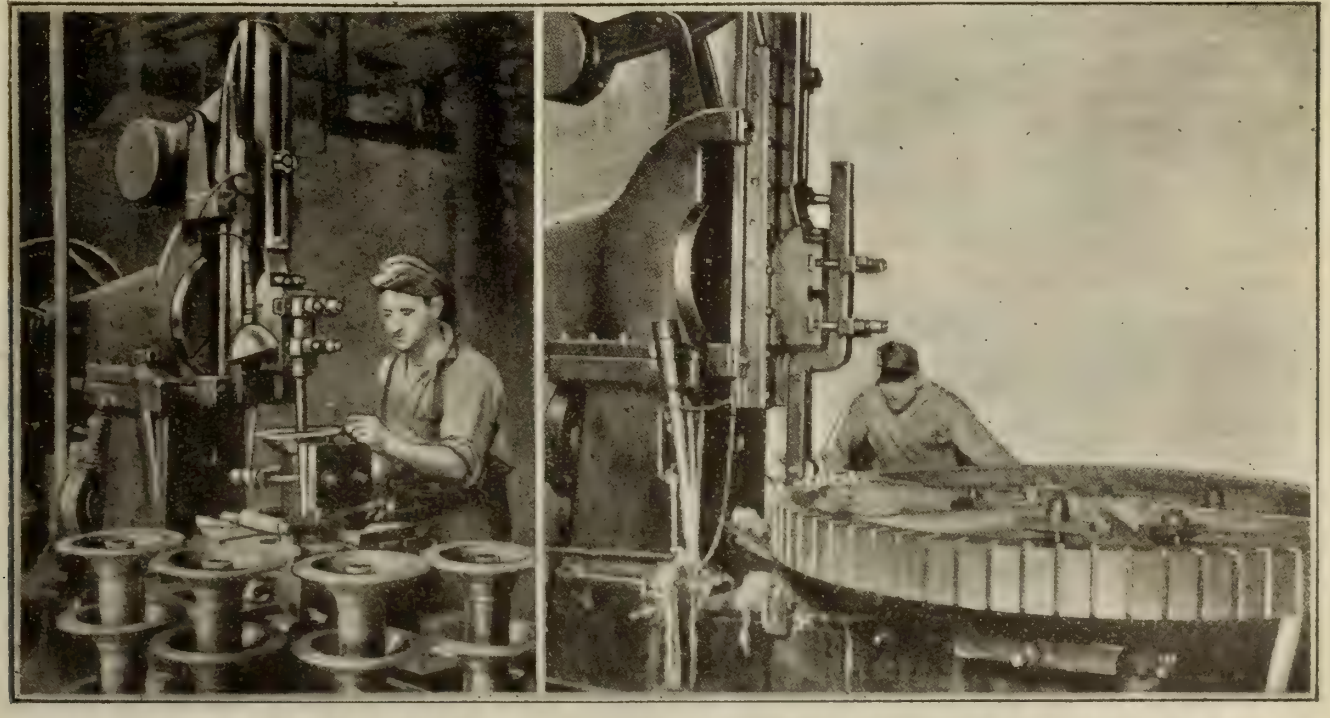


FIG. 1—CUTTING KEYWAYS IN WIRE WHEEL HUBS.

FIG. 2—GASHING THE TEETH OF A 74-TOOTH GEAR.

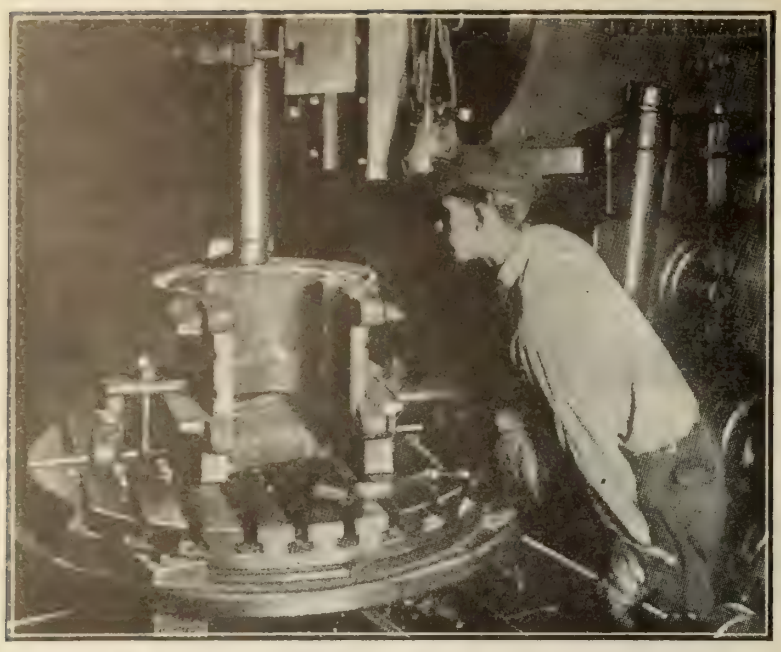


FIG. 5—MACHINING A CAST STEEL DRIVING BOX.

is partially finished on such machines. The particular machine shown had been on this class of work for about a year when photographed.

Fig. 3 illustrates the machining of a big cross shaft bracket, the requirements in this case being to face the base and the two half bearings for the bearing cap location. The series of operations are completed in 55 minutes including time for setting up, so that our former statement about the modern slotter being a manufacturing tool is verified by this production figure.

In a certain structural steel plant they use a slotter for almost a little bit of everything, but here is one job that is rather novel and interesting. They use the machine to put a radius on the end of pieces of angle iron, and a double radius tool takes the cut. The operator sets up two pieces of angle iron at one time, feeds them up to the tool and starts the machine. The time to complete both pieces is two minutes.

In another plant, this time the repair shop of the Wilmington Steel Co., they use a slotter for machining the end of a chain rod for a 25-ton crane. Another job on the same machine that was accomplished just previous to the one we refer to, was the cutting of a 5-foot keyway one inch square, in a blooming mill engine cap that weighed 6,000 pounds. That's why we have termed the slotter a versatile machine.

At another shop the guides in gate valves are machined on the slotter. Running down to the solid bottom of valve, these guides are in a blind cut, thus giving no chance to mill, plane or shape. The slotter in this case met the need nicely.

At the plant of the Shepherd Engineering Co. they used slotters for engine work. On deciding to turn out lathes, they found that the slotters accomplished work on these lathes that even surprised themselves. One of the operations completed was machining the bottom of the lathe tailstocks at the rate of one per hour, floor to floor time. Other operations were completed in like proportionate time.

Railroad shops find slotters very useful. Here are a few of the jobs at present being performed in such shops. In one plant they cut out the slots in heavy forged steel locomotive main drive rods two at a time, while in another shop the side rods of locomotives are machined. One-eighth to one-quarter inch of metal is cut from each side of a ten-inch slot simultaneously, reaching a continuous downward cut of 12½ in. at the deepest point.

Fig. 4 depicts a good example of railroad work. In this case the work is slotting the large hole at the end of the connecting rod shown. In order to facilitate handling, a special supporting truck is used, this being equipped with four caster wheels spread quite a bit apart. Six sides of the holes have to be machined, and when shifting is necessary to bring another section to the slotting tool, all that is required is to roll the truck to a new position.

Another interesting example of railroad work is shown at Fig. 5. The work being machined is a cast steel driving box, and as this box receives the crown brass, or upper portion of a locomotive bearing, it must be accurately machined. As the cutting tool travels up and down, the work is automatically revolved.

In another plant they use a slotter to machine parallel flats on pump plungers. Of course if this operation was to be turned out in quantities, a slotter would not be the best machine to use, but we mention the operation to point out the machine's versatility.

The Philadelphia & Reading Railroad use their slotters for many purposes, but one interesting job is the machining of the crown brasses for a locomotive. The usual method to finish such brasses is to plane the top and bottom, then mount them on an arbor and turn the outside; after which they are again reset and the ends planed to fit the driving box. Here is how they handle it on the slotter.

The top and bottom of the rough brasses are planed as usual, then the radius is marked in the regular manner and lined up in the slotter by means of an indicator fulcrumed on an arbor in center of table. The clamping nut is tightened, and a roughing cut run over the work. A finishing cut follows; then the ends of the brasses are finished, including the off-sets, using the same slotting tool. In other words the work is finished right on the machine. The size of these brasses run from 8 to 13 inches in length, and the slotter time varies from 7 to 22 minutes per piece.

It can be readily understood that the photographs and descriptions given barely scratch the surface of the possibilities of slotter work. One must pass through different types of manufacturing plants, viewing the slotters in actual operations, before they can realize the variety of work that comes to the tables of such machines. This is particularly true of railroad shops, for in one day a slotter often makes the acquaintance of a dozen jobs.

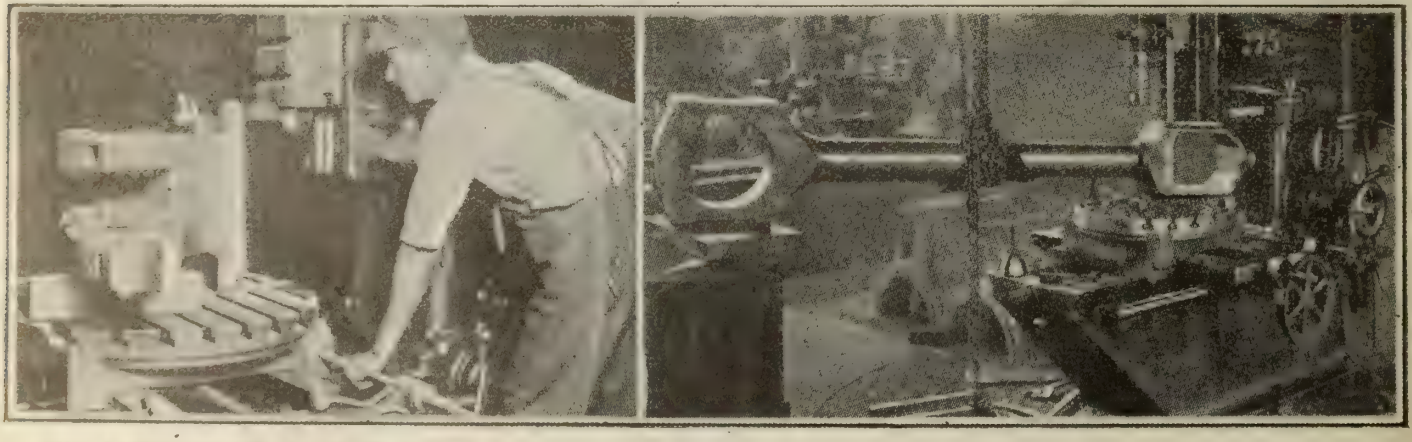


FIG. 3—MACHINING A CROSS SHAFT BRACKET.

FIG. 4—SLOTTING THE HOLE IN A LARGE CONNECTING ROD.

# Some Pioneers of the Machine Tool Industry

## A Short Survey of the Lives and Labors of the Early English Toolmakers. The Method of Making Threads—Punch and Shear Machines—Steam Hammers—Steam Pile Drivers—and Other Machine Tools

By JAMES PEARMAN

THE successful construction of all machinery depends on the perfection of the tools employed, and whoever is a master of the art of toolmaking possesses the key of the construction of machines. The contrivance and construction of tools must therefore ever stand at the head of the industrial world."

As far back as 1851 C. Babbage uttered the above words in a speech at the great exhibition in that year, and the above author uses them very nicely in introducing an article in a recent issue of the "Machine Tool Review," on the subject as above titled. He continues as follows:—

I have long held the opinion that the lives and works—yes, and the triumphs also I may say en passant—of the men who have by their inventions founded our craft as we understand it, have been in the past mainly ignored and their contributions to mechanical science forgotten. In 1851—70 years ago—Mr. Babbage pointed out the importance of our branch of the mechanical art; how much more true it is today the recent war has shown, when statesmen declared that it was "an engineers' war." It is my intention to outline the work of some of the great men who have left their mark on our daily lives.

In the forefront of these I unhesitatingly place Henry Maudslay, who was the inventor of the slide rest and of the screw-cutting and self-acting lathe. Before his inventions, screws of all kinds had to be produced by the most primitive means—in a single word, by hand. The screws, with threads of angular form, were cut with a triangular—or in shop parlance three square—file, and, as may be imagined, had no semblance to form or pitch. In consequence it was necessary to make each nut to suit one particular screw, and it would not mate up with any other except by sheer accident.

### Making Square Threads.

As for square threads, they were made with hammer and chisel and finished by filing. An early authority gives a description of the manner of making the nuts to suit these latter. They were produced, it appears, in the foundry. The screw was first coated with oil and the nut was cast around it, as we do to-day with babbit when we need a quick repair. But with what metal they made their nuts! With lead—and it is easy to imagine the hard and poetical words of the early mechanic when he had to separate the two.

Think of the work in "chipping" with a cross cut around a round bar. It is enough to make a present-day mechanic tremble. Happily it is not necessary, thanks to the labors of Henry Maudslay, who solved the problem for us.

Henry Maudslay was born in the seventeen seventies at Woolwich in a house in an alley at the rear of the Salutation Inn, which was nearly opposite the Arsenal gates. He commenced work in the Arsenal as a powder monkey, filling cartridges at the early age of twelve years, as it was then the custom to begin young so as to contribute something to the family coffers. Two years later he was transferred to the carpenter's shop, where he first became acquainted with tools and the art of working in wood and iron.

The blacksmith's shop was close to the carpenter's, and young Maudslay would often stray away from his job to watch the smiths, for, as he remarked in after years, his heart was always in metal working instead of wood. So strong was his leaning towards smith's work that his foreman eventually got him moved to the smithy at his own request. Here he was in his element, and his heart being in his work, he soon made rapid progress, becoming at 18 years of age one of the best smiths in the shop. So skilled was he that he soon became to be spoken of in the London shops as one of the most dexterous hands in the trade.

**IS THERE ANYTHING NEW?**

Joseph Clement, who was born in 1779 was really the founder of processes and of systems of standardization, which others following him have claimed as their own.

In 1828 he began the making of fluted taps, and he performed the fluting operation by means of a revolving cutter running on an arbor between the lathe centers.

Joseph Bramah, who had invented a series of locks, was about this time in search of someone to help him out in the manufacture of them, as he found great difficulty in getting them made in sufficient quantities. In his dilemma he consulted an ingenious old German, who was working in Whitechapel, but they could not solve the problem, so someone in the shop suggested putting it up to Maudslay. Maudslay was called in, and although a very young man, successfully solved the problem, and became foreman and afterwards general manager. He was soon looked upon by all who did business with him as "Bramah's right-hand man."

I may say in passing that at no time during his stay at this place did he receive more than $7.00 per week. It was while Maudslay was with the Bramah concern that he invented the cup leather that is used to this day in hydraulic and pneumatic cylinders without any alteration or improvement although a century has elapsed. Bramah was the father of the hydraulic idea, but he could find no means of preventing water from passing the piston. Maudslay suggested that a bit of leather squeezed up like a cup would hold all right. This was done, and has never been improved upon.

Whilst he was there he married his employer's servant—Sarah Tindal—and, as he afterwards said, he found in her an ideal helpmate. Some time afterwards he decided to start on his own account, which he did in 1797, in a small shop and smithy in Wells Street, Oxford Street. He found the place in an awful state, but he and his wife cleaned it up, and in two days he was ready to start. His first customer was an artist, who required some art metal work done, which he executed to his patron's complete satisfaction.

At this time he was devoting his time to improving the primitive machine tools which then existed. It was whilst he was following along this line that he made his first important discovery—namely, the slide rest. It was in the Bramah shop that he first made this epoch-marking tool, where it continued to be used long after he had left the works. "I have seen the slide rest," says Mr. James Nasmyth, the inventor of the steam hammer, "the first that Henry Maudslay made, and in it were all those arrangements which are found in the most modern rest of our own day, all of which are the offspring of that of Maudslay's original. If this tool be still extant it ought to be preserved with great care, for it was the beginning of those mechanical triumphs which give to the days in which we live so much of their distinguishing character." (1853).

We find that the French as a nation were very skillful in turning, and an elaborate treatise was published in Paris in 1754 by one Jean Plumier called "L'Art de Tourner" (The Art of Turning). It was after Maudslay had developed his idea and produced his screw-cutting and self-acting lathe that one of the French refugees from the revolution of '93, named M. de Bacquancourt, was passing the little shop in Wells Street and was attracted by a fine specimen of screw-cutting exhibited in the window of the shop. Being himself an amateur turner, he stepped into the shop to inquire as to the method of its production, and was so struck with the personality of the young craftsman that he introduced him to one of his countrymen—M. Brunel—who had important work on hand for the British Admiralty. Of this man more anon.

Orders followed quickly after this, and Maudslay had to remove to larger premises in Cavendish Square. This again became too small, so he took a building which had been a riding school in Westminster Road, Lambeth, and founded the celebrated firm of Maudslay Field & Co. Here he took in hand the improvement of the steam engine, especially that of the marine engine, the type in use until the steam turbines came along. The engines for the "Regent," the first boat which plied between London and Margate in 1816, established his reputation as an engine builder.

### Punch and Shear.

Another of his inventions was the punching and shearing machine, exactly as used to-day in all shipyards of the world, by means of which he reduced the piercing of plates for cooling tanks from about $2.00 per tank to 18c. He continued to devote himself also to the development of the lathe, which he regarded as the master machine, which indeed it is; the other machine tools are but modifications of it.

In his system of screw-cutting with taps, dies etc., he laid the foundations of all that has been done in this essential branch of machine construction. Many men who have since made their mark, such as J. Whitworth, J. Clement, J. Nasmyth, were trained in his shop. Mr. Nasmyth says of him "that you could see the man's character reflected in whatever work he turned out, and as a connoisseur in art will exclaim 'This is Turner' or 'This is Reubens' at the sight of a picture, so would a mechanic of that day say of a piece of work, 'This is Maudslay'."

Every mechanical idea that he studied was brought forth from his hand re-arranged, simplified, and made new. He at once stripped the subject of all unnecessary complications, for he had a wonderful faculty of knowing what to do without, which is as necessary sometimes as knowing what to do with.

Mr. Nasmyth goes on to say that "It was a special and constant practice with him on a workman's holiday or on a Sunday morning to take a walk through his workshops when all was quiet, and then and there examine the various jobs in hand. On such occasions he carried with him a piece of chalk with which he would record his remarks in the most pithy terms. Any want of setting things square or in "flat filing," which he held in high esteem, or in not sweeping down the bench and putting the tools in order, was sure to have a record in chalk made on the spot. These chalk jottings were held in the highest respect by the men, whether in praise or blame, as they were sure they were deserved, and when the men next assembled it soon became known who had received the honor or otherwise from the master.

He died on February 14th, 1831, and was buried in Woolwich Churchyard in a cast iron tomb made to his own design. He was always proud of his connection with Woolwich, and Woolwich had good reason to be proud of him.

### Founder of Standardization.

Another man who followed close upon the heels of Henry Maudslay in invention was Joseph Clement, the founder of processes and of systems of standardization which other men following him have claimed as their own. Joseph Clement was born at Great Ashby, in Westmorelandshire, in the year 1779. His father, though only a weaver, was a man of culture and education, being, however, entirely self-taught. He was an ardent student of natural history; his great speciality was entomology, to which he gave most of his spare time.

Old Clement was also an amateur mechanic, and such leisure time as he did not devote to his nature study was employed in working at a lathe of his own crude construction on which he used to turn his bobbins. His son Joseph was set to work at a very early age, and received little education. He was, however, a lad of character and determination, and saw the necessity of education. He made up his mind to educate himself, as far as he was able, during his leisure hours.

His father needed his help at the loom, where he worked for some years. As trade became bad in that line of business, at the age of 18 he became a thatcher, and followed that calling until he was 23. He made a friend of the village blacksmith about this time, whose smithy he used to frequent, and there learned to handle the hammer and file. A cousin of his named Farer, a clockmaker by trade, having returned to the village from London, brought with him some books on applied mechanics, which he lent to Joseph, and this decided his future career.

He found employment in a small factory at Kirby Stephen, some thirteen miles from Great Ashby, where he worked at building power looms. His next move was to Carlisle, where he worked on the same class of machine, afterwards going to Glasgow, where he made the acquaintance of Peter Nicholson, an architectural draughtsman and a noted writer on these topics. He took lessons in drawing from this man, and soon became proficient. He was one of the pioneers in mechanical drawing, and for some years stood out alone, as mechanical drawing was an entirely new branch of study.

**LOCOMOTIVES IN 1836.**

Nasmyth was born in 1808, and in 1836 built twenty large express engines in record time, earning an additional bonus for his firm. This attainment later led to the invention of the steam hammer and the story of its development is worth reading. The steam pile-driver was another of Nasmyth's inventions.

Towards the end of 1813, having saved roughly $500.00 out of his wages, Clement resolved to go to London to improve himself in his trade. He obtained employment at Mr. Alexander Galloway's, in Snow Hill, Holborn, where he worked at the lathe. He found that the tools used in the shop were so bad that it was impossible to execute satisfactory work with them. He at once went to the forge and began making a new set for himself. The other men in the shop, to whom such a proceeding was entirely new, came round to observe his operations, and were much struck by his manual dexterity.

He created such an impression, and the work he performed with his own tools was such a revelation that he was soon recognized as the best mechanic in the shop. He did not stay long, however, at this shop.

He called on Mr. Bramah at Pimlico (where he had been preceded by Maudslay). He took some of his drawings with him, and after examination of these, Bramah engaged him for a month, after which he became his chief draughtsman. Whilst here Clement displayed much ingenuity, taking great pride in upholding the standard of excellence for which Bramah's was then noted. At the death of Mr. Bramah, Clement transferred his activities to Maudslay and Field's, where he held the position of chief draughtsman. He did a great deal in the design of the marine engines for which they were becoming famous.

### He Could Save.

As he always had a desire to commence business on his own account, and being a man of very frugal habits, by 1817 he had saved roughly $2,500. Encouraged by the Duke of Northumberland, who was an excellent amateur turner and a frequent visitor to Maudslay's, he decided to launch out on his own, and took a small workshop in Prospect Place, Newington Butts, London, where he began business as a consulting engineer, maker of instruments and small precision machinery. From the time when he took lessons in drawing from Nicholson at Glasgow in 1807, he had been steadily improving in his technique, and he was regarded by general consent to be the finest exponent of this art, which he regarded as being the A.B.C. of engineering. So skillful was he that when the Royal Society required any drawings made of any intricate device, which was to be discussed at any of their sittings, Clement was always the man selected to put their ideas on paper. In 1818 the Society of Arts awarded him their gold medal for his instrument which he had invented for drawing ellipses.

Nothing pleased him better than to have a tough job to tackle, as it stimulated his inventive faculty. In 1820 he was working upon a device for regulating the speed of the lathe when taking facing cuts on work of large diameter. As is known to everyone who has worked on the lathe, as the diameter of the work decreases, owing to the tool getting nearer the centre, so the surface speed decreases also. Clement saw this, and his improved lathe had a device for accelerating the number of revolutions per minute in accordance with the diameter of the work being performed. He was awarded the Society of Arts Isis medal for this achievement in 1827.

Next year he gained their Silver medal for yet another improvement to the lathe which was known as the "Clement's Driver." This was a balancing device which drove on both sides of the centre at once and with equal pressure on any piece of work done between centres.

The writer worked on a lathe with such a driver when a lad, and although the device had much to recommend it, it has apparently dropped out of use. To use the "Clement Driver" the turner had to use a special double-tailed carrier, and this manner of transmitting motion was particularly useful where long and slender pieces had to be machined.

### The Making of Fluted Taps.

In the year 1828 Clement began the making of fluted taps, and he performed the fluting operation by means of a revolving cutter running on an arbor between the lathe centres. This cutter he called a mill-wheel, because of its resemblance to the wheel of a water mill, which was in general use at this time as a means of generating or transmitting power. The development of this mill-wheel is our own familiar milling cutter, which takes such a large part in all kinds of manufacturing and tool-making processes to-day. This, I think is the first time this type of tool is mentioned in Mechanical History, and the results arising from it have surpassed the wildest dreams of its inventor.

His next invention was the headless tap, which makes it possible to pass a tap right through a piece of work without backing out, and which Mr. Nasmyth says is so valuable an invention that "if he had done nothing else, it ought to immortalize him among mechanics." This is in use every day in every engineering shop in the world.

Another of Clement's inventions was the planing machine. Up to this time the method of producing a flat surface in metal which was too large to swing in the lathe was to chip it all over by means of hammer and chisel, and finish the surface by filing. This, as may be imagined, was a very cumbrous and lengthy operation, involving quite a lot of muscular energy and manual skill. He prepared no models of his machine, but made it direct from his

own working drawings, and it was so well constructed that it went together without a hitch, and continued to work until forty years afterwards, which is pretty good proof of the soundness of its construction. Mr. Clement took out no patent for his invention, so that we find no record of it at the Patents Office, as in the case of most other inventions which have revolutionized our craft, but a very complete account of it is to be found in the Transactions of the Society of Arts for the year 1832. (Transactions of the Society for the Encouragement of Arts, Vol. XLIX, Page 157.)

The great value of the planing machine induced the Society to apply to Mr. Clement for permission to publish it, and Mr. Varley, a noted writer on mechanical matters, prepared it. The machine, it appears, was constructed on somewhat different lines from those in use to-day. The table ran on roller bearings, naturally of a very primitive kind. The writer in the "Transactions" says that "the rollers on which the planing machine travelled were so true that if you put a paper shaving under one of them it would stop at once all the rest."

As it was the only machine of its kind it was very much in request, and was kept running day and night. It may be imagined that it brought in a very good income for its owner, as it took work up to six feet square and the charge for planing was roughly $90 per square foot.

Another important departure which he made was in the standardization of screw threads. Until this time, each manufacturer would have his own fancy pitch and form (such as it was), and indeed it was common to find (so the writers of the period tell us) that on an engine bolts of the same diameter would often have various pitches. Clement's orderly mind soon saw the drawback of this, and he therefore laid down standards, which Mr. Whitworth, who was a journeyman in his shop, copied, elaborated and developed, and in after years claimed as his own. Clement was ahead of all the men in his line of business in his own time, and although he was a super-mechanic he had very little business or commercial acumen. He was a heavy-browed man without any polish of manner or speech, for to the last he continued to use his strong Westmoreland patois or dialect. He was not educated in the literary sense, for he read but little and could write only with difficulty. He was eminently a mechanic, and had achieved his exquisite skill by observation, experience and reflection. His head was a complete repertory of inventions on which he was constantly drawing for the improvement of mechanical practice. Though he never had more than 30 workmen in his shops, they were all highly skilled, and the example which Clement set before them of extreme carefulness and accuracy in execution made his shop one of the best schools of its time for the training of thoroughly accomplished mechanics. Mr. Clement died in 1844, in his sixty-fifth year, but his works live on, and have helped along what we call civilization.

The following notes deal with the lives of two men—James Nasmyth and Joseph Whitworth—both of whom were associated with Maudslay and Clement. They both contributed their quota to the advancement of mechanical arts, each in his own particular manner, and both gave great impetus to the engineering trade by the invention of labor-saving tools and processes.

James Nasmyth was born in 1808 at York Place, Edinburgh. From boyhood he had a great desire to become an engineer. During a visit to Edinburgh in 1817 James Watt called on Nasmyth Senr., who was an artist. He had such a story to tell of the success of his steam engine that filled James with enthusiasm and decided his career. His father fitted up a little workshop for him, and as he had a natural gift of mechanical ability, he spent most of his time in constructing models.

He went for a time to Messrs. Carmichael's at Dundee, and whilst there he heard from several of the leading men of Maudslay's in London, of the wonderul work which was being carried out in the workshops of that firm. His father had been introduced to Mr. Maudslay some years before, so he brought his son to London, by boat (there being no railways available between the two cities at this period), and called at the works at Lambeth. The result was that Mr. Maudslay engaged him as his own personal assistant, after inspecting some of the models and drawings that he had brought with him. He felt that in the position which he now held all external obstacles to his progress were removed and that his success in life depended solely on his own exertions. He determined that efforts on his part should not be wanting to make the most of the golden opportunities which he enjoyed.

Nasmyth's workshop life brought him other advantages than practice and technical knowledge. He enjoyed an occasional conversation with not a few distinguished men whose business or tastes had made them acquainted with Maudslay and who came from time to time to consult with him or to talk over matters of common interest. Amongst these were Sir Samuel Bentham, Mr. Barton (Superintendent of the Royal Mint), Bryan Donkin (who was associated with Barton and Maudslay in fixing the standard yard, and who was also the leading authority on the properties of steam), and Sir Marc Isambard Brunel, the celebrated Frenchman mentioned earlier in the article, who was the constructor of the Thames tunnel from Wapping to Rotherhithe.

Nasmyth stayed with Maudslay, Field and Co., until after the death of Mr. Maudslay in 1831. He then commenced on his own account in Manchester. He rented a large flat in a factory building, and started making and repairing all kinds of engines and machinery, but his chief business was in designing and building machine tools. These latter were so well designed and made, that their fame spread far and wide, and orders flowed in very quickly. Soon the premises became too small to accommodate the increasing trade.

He therefore built a factory at Patricroft, on the Bridgwater Canal, in 1836. This he called the Bridgwater Foundry. As the business still continued to grow very rapidly, he took into partnership a gentleman named Mr. Holbrook Gaskell, whose business it was to look after the commercial side of the concern, and the firm became Nasmyth and Gaskell. As the railway boom was at its height at this time, Nasmyth and Gaskell turned their attention to the construction of locomotives with great success.

The Great Western Railway Company invited the firm to tender for twenty of their large express engines, and offered a bonus of $500 per engine beyond the contract price if at the end of a month they proved entirely satisfactory. The firm supplied the engines and won the promised reward.

### The Steam Hammer.

This connection with the Great Western Railway Company is very important, because it led to Nasmyth's greatest invention, the celebratd steam hammer, with which his name is everywhere associated. This is the story of its invention.

The large paddle steamship "Great Western" had proved so great a success that the Great Western Company decided to build another of even larger dimensions, and the machinery for it was partly constructed when a difficulty arose in forging the crankshaft on which the paddle-wheels were to be fixed. With the hammers in use at the time it was impossible to forge so large a mass of iron. The matter was referred to Nasmyth by the chief engineer of the Company, with the result that after careful thought he sketched out in a book which was kept by him, and which he called his "scheme book," the first plan of his steam hammer. This was on 24th November, 1839. He communicated the particulars of his idea to the engineer of the company who was delighted with it, as were also the directors of the company. It would certainly have been made and used, but just at this juncture the Company decided, on the advice of M. Brunel, to adopt the screw propeller, which had just been invented, and the large shaft was not required to be forged. Mr. Nasmyth sent drawings of his labor-saving tool with descriptions of its use to the leading ironworks in the kingdom, but whilst he received many congratulations he got no orders, so the steam hammer stood in abeyance for a time.

There were many visitors, both English and foreign, to the Bridgwater Foundry who came to inspect and buy machine tools. Amongst others there had called one day, when Nasmyth was absent on business, M. Schneider, proprietor of the great ironworks at Creuzot, in France. (The elder of my readers will remember that the guns used by the Boers in the siege of Ladysmith, called at the time "Long Toms," were made at these works.) He was accompanied by his manager, M. Bourdon. After they had visited the works, the "scheme book" was shown them in the office, with the design of the steam hammer in it. Of course Nasmyth was informed of their visit, but the inspection of the "scheme book" was not mentioned, being a matter of every-day occurrence.

In 1842 Mr. Nasmyth was requested to inspect the French arsenals and dockyards and to suggest improvements in the methods of manufacture. Happening to pass near the Creuzot Ironworks, he took the opportunity of paying them a visit. M. Bourdon showed him over the works. Amongst other things he noted was an enormous crank for a marine engine, and, being struck by its size, he asked how "they managed to forge it." Great was his astonishment when he was told that it was forged by his own steam hammer! M. Bourdon explained that he was much struck by the design in the "scheme book," and when he returned to France he had tried it out with great success.

This lent an unexpected interest to Nasmyth's visit, and he was at once taken to see the steam hammer at work, the offspring of his own brain. The success which he had predicted in the working of the machne was fully realized in practice, and he took out a patent for it in June, 1842. Hundreds of these were afterwards constructed at

the Bramah Foundry and sent to every part of the civilized world.

Another of his many inventions was that of the steam pile-driver. This was tried out at Devonport Dockyard, with the result that a pile which took twelve hours to drive by the old methods was driven home in four and a half minutes, effecting a saving of 11 hours 55½ minutes per pile.

He retired from business in 1859 and lived to a ripe old age. He was (in common with other men that have made their mark in industry) never without a hobby, his chief pastime during his retirement being the study of astronomy upon which he obtained recognition as an authority.

Joseph Whitworth was born at Stockport, in Cheshire, on December 21st, 1803. He commenced work at the age of 14 in a cotton mill in Derbyshire, belonging to his uncle, and there he made his first acquaintance with machinery. After four years of this he was transferred to a Manchester workshop. Here he worked to such good purpose that when in three years' time he removed to London he was able to hold his own in the famous workshops of Maudslay and Clement, where he was esteemed as a very clever workman. It was in these shops that machine tools, and the methods of their manufacture, could best be studied, and Joseph Whitworth soon showed that he appreciated the importance of perfect tools as the fundamental condition in the production of perfect work. He readily grasped the fact that all machine tools for the production of plane surfaces were merely copying machines—that is to say, that the surfaces produced were but copies of the truth or otherwise of the slides that the work or tool, as the case may be, moved upon.

### Machine Tools.

He set up in business on his own account in Manchester in 1833, and he advertised himself with no more pretentious title than "Joseph Whitworth, Toolmaker, from London." He commenced building a complete line of improved machine tools, and he found that the production of truly plane surfaces up till that time was an impossibility. The method then in vogue was to plane the pieces and then correct the surface by filing and finally by rubbing two surfaces together with emery and oil between them—in other words, lapping them. This method he found to be very slow and produced poor results. The idea of scraping occurred to him, and he tried it out himself with three plates in the now well known way and produced three practically perfect plane surfaces.

Since then (1840) this method has been adopted in every engineering and toolmaking shop in the world. When he first introduced scraping into his workshops his workmen were very hostile towards what they called a new-fangled scheme. However, he soon won them over, and afterwards they were loudest in their praise of it.

As mentioned previously, Clement had standardized a system of screw threads, but he never published the results. Whitworth elaborated the idea, and laid down the formula for the thread system which bears his name. He was the first man to realize that to produce first-class work it is necessary to work to "fine limits," as we call it to-day. He set about producing a perfect screw, and as it is an impossibility to produce a mathematically perfect one, he worked until he had produced one of sufficient accuracy for his purpose. He made the first measuring machine that embodies the idea of measuring by means of a screw. It will be seen from this that he was the father of the micrometer caliper.

He made a machine to measure one-millionth of an inch, and he exhibited this at the Great Exhibition of 1851. For further particulars of this machine I would refer my readers to Prof. Shelley's "Workshop Appliances," pages 8 to 13. Though this work is somewhat out of date, still there is much in it that has now become mechanical history.

In the year 1868 he offered $500,000 for the advancement of technical education, and he endowed the famous scholarships which bear his name. For this he was created a baronet. His achievement may be summed up in the words of a writer of the period (W. T. Jeans in "Creators of the Age of Steel"): "This celebrated mechanician has invented a whole set of machine tools that have revolutionized the labors of our workshops. He has also invented means for improving the metal from which the tools are made, and has provided for the improvement of that technical education upon which depends the success of future generations in the skilful use of tools."

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## VALUE OF EXPERIMENTAL WORK.

SPEAKING of their experimental work, and the value of this department to them, the Alfred Herbert Co. make some interesting comments. They claim that the experimental department has been of the greatest value in determining the best materials to use on machines, also the best allowances for the various fits. They continue as follows:

By the use of suitable experimental apparatus we have been able in many cases to give a machine, in a few hours, a test which would be equivalent to many years' working under ordinary conditions, and have thus been able to arrive at conclusions very much more quickly than by the ordinary method of trying machines out in the customers' works. The result is that in some cases constructions which might be criticized by casual observers are retained in use because exhaustive experimental tests have definitely proved them to be satisfactory.

Here is an example of a test of this kind which was made on the forward and reversing clutches of a 6½-in. single pulley head as fitted to two of our machines.

In the early days of single pulley heads trouble was experienced with friction clutches, partly owing to the material from which they were made, partly owing to the methods of machining and the allowances for fit and wear. The tests in question were made with clutches of various materials, and the particulars given refer to one series of tests.

A special reversing lever was fitted to the headstock and was connected to a simple worm driven crank motion rigged up for the purpose and driven by a pulley from overhead so as to reverse the spindle 18 times per minute. In order to thoroughly test the reverse a very heavy pattern chuck was fitted to the spindle, the weight of the chuck being 105-lbs. and the momentum such as to severely stress the friction clutch at the moment of reversal.

At the beginning of the tests the chuck speed was 224 r.p.m., and it was noted that after 1,620 reversals the clutches became very hot but caused no trouble. After 3,783 reversals the reverse clutch was adjusted and the head restarted, the chuck speed being raised to 334 r.p.m., which was continued throughout the entire tests. At 6,923 reversals the forward clutch was adjusted. At 10,163 reversals the reverse clutch was again adjusted.

At 12,323 reversals the clutches were taken apart and examined; it was found that the friction rings and shells showed no appreciable signs of wear except at the corners of the rings, where slight wear was evident due to lack of roundness when sprung open. The clutch parts showed some signs of over- heating, so the speed of reversal was reduced to 8 reversals per minute, the chuck speed being as before, 334 r.p.m.

At 47,483 reversals the forward and reverse clutches were adjusted and the head taken to pieces for examination and cleaned out. The clutches were in good condition, and the grinding marks in both rings and shells were still visible. At 57,923 reversals the forward and reverse clutches were adjusted.

The machine was then run until the number of reversals reached 101,603, which was considered sufficient, and the test was terminated.

On inspection of the clutches they were still found to be in excellent condition, the only wear in the rings being near the corners, where expansion is at a maximum, and grinding marks were still visible in both friction rings and shells. During the whole of the tests the forward clutch was adjusted five times and the reverse clutch six times.

The head was reversed 43,680 times after the last adjustment of the clutches, there being no further need for adjustment, and the clutches were in good condition at the end of the tests.

The above tests represented one stage in the progress of the friction clutches in question, further improvements having been made later on and further tests of a similar character carried out.

The conditions under which these experiments were made were very much more severe than anything which could take place in practice, as reversal of these heads in practice is only an occasional operation, and the heating effect caused by the constant reversal at high speed with a heavy chuck on the spindle would never take place in ordinary practice.

The knowledge that experiments of this kind gives us is of the greatest value in ensuring that our machines shall work in a satisfactory manner after leaving our works, and results in something of value in the machine which cannot be represented by catalogue particulars but only by the reputation of the maker founded upon the performance of the machines in the works of the user.

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## GOOD WELDING JOB

The joints in a long gas main of 12 in. and 16 in. steel pipe, laid near Philadelphia, U. S. A., were made with the acetylene blow pipe before the pipe was lowered into the trench. Sections about 300 ft. long were thus joined up, and the pipe was rolled over as the welder worked, to bring it into a convenient position for him. The sections were tested and subsequently welded together in the trench. It is said that rolling over the pipe effected a considerable saving, as compared with welding without turning, and that the joints cost only about 50 per cent. as much as screwed joints.



# WHAT OUR READERS THINK AND DO



## GRINDING THE PROFILE OF DISC CAMS.

By G. LAIDLER

In making tapered poles for wagons or agricultural implements it is necessary to have several sets of cams on the machine for feeding the cutters. A typical pole is shown at the lower left of Fig. 1 and the cam arrangement is seen in Fig. 2, with the details shown in Fig. 3. Each set consists of two planing and two chamfering cams, operating cutters on either side of the pole while it is passing through the machine. The planing cutters operate in advance of the chamfering cutters, the cams for the latter having a relieved portion A B C which keeps the cutter clear of the work until the point of entry C is reached. As the poles are uniformly tapered, the working portion of the cams is made with a contour of a volute, or curve of uniformly increasing radius, and it is essential that all cams of a set be smoothly finished and with the same rise per degree. The cams are made of cast iron and designed with two cored slots D D, diametrically opposite. After being machined the cams are cut in halves through the cored slots, so that they may be easily mounted on the cam shaft, set for timing, or exchanged for other sets, the sections being securely locked by means of retaining nuts and collars.

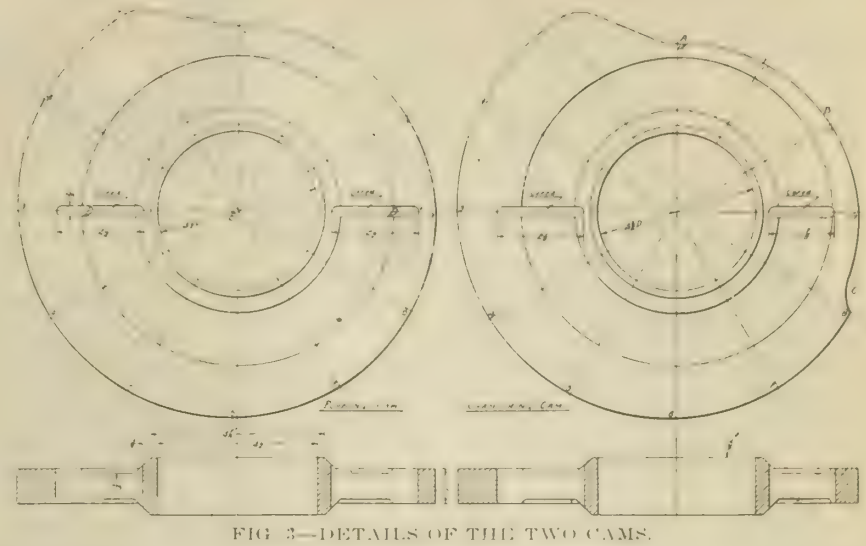


FIG. 3—DETAILS OF THE TWO CAMS.

Although "third place" accuracy of profile could be obtained by milling the working portion of the curves in a universal milling machine with spiral head attachment, it was found better to make an accurate pattern and to finish the profile by careful grinding on a hand operated fixture. A sheet steel template, shown to the right of Fig. 1, was laid off in 15 degree sections with the proper rise per degree. Each pair of points was connected by a curve of single radius. On filing to the line thus drawn a tolerably accurate volute was obtained. This curve was made to overlap the complete circle by 30 degrees, as shown, and a large central hole cut out in the sheet metal pattern. The patternmaker then builds up his pattern blank leaving a turned portion in the centre to fit the hole in the template. After marking off the maximum radius E F in Fig. 3, to his contraction rule, he placed the template over the pattern and turns the template counter clockwise until the larger part of the curve and the point in question coincide. He then scribes off the curve as far as the cam requires it, and finishes the pattern to this line, allowing no draft.

Due to imperfections in moulding the periphery of the cast cam may be lumpy or otherwise untrue. After machining the faces and the bore the cam is

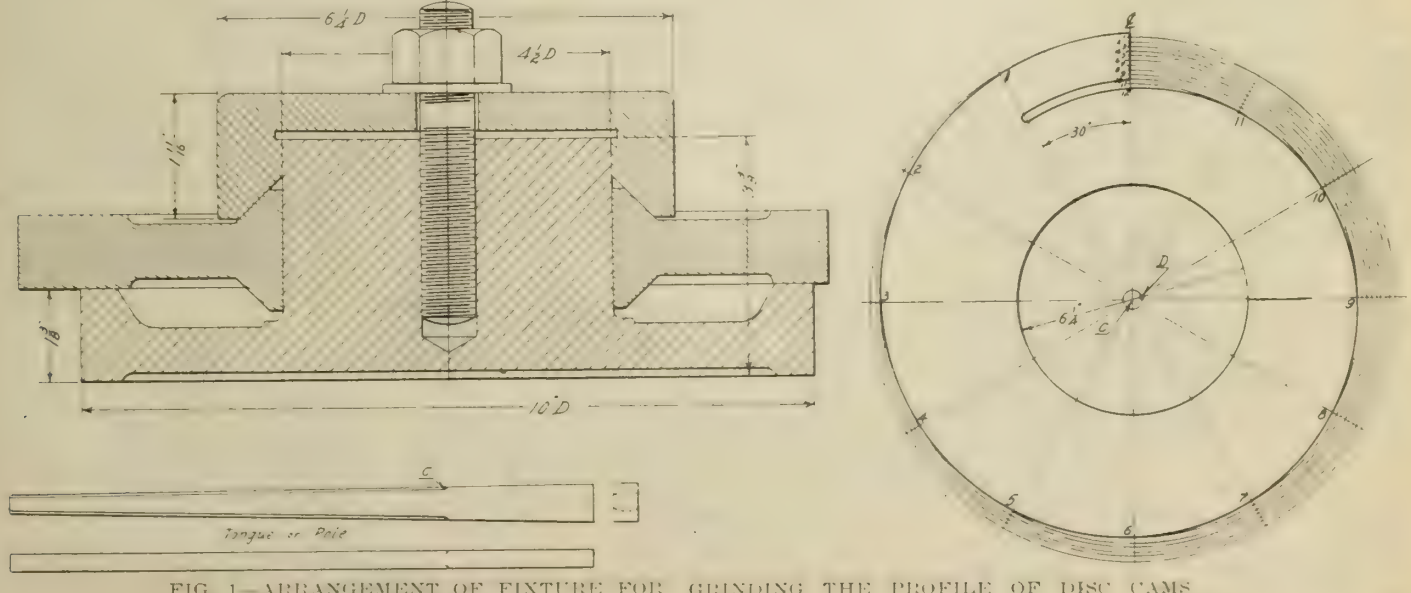



FIG. 1—ARRANGEMENT OF FIXTURE FOR GRINDING THE PROFILE OF DISC CAMS

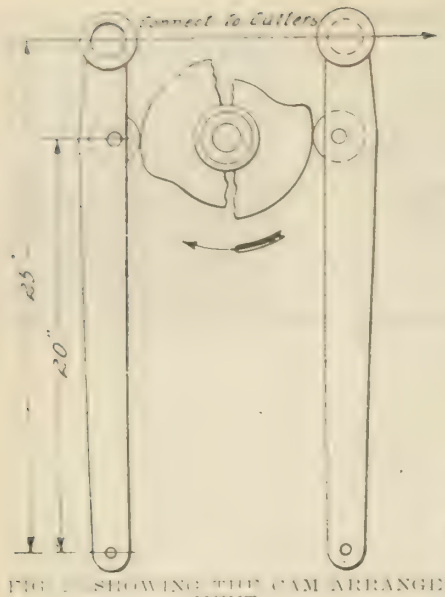



FIG. 1 SHOWING THE CAM ARRANGEMENT.

clamped in a circular grinding fixture, shown in the upper left of Fig. 1. The template is located over the clamping washer and turned in either direction until the outline exposes a minimum of margin on the casting. The outline is scribed on the cam, the template removed and the excess of metal ground away on a large size grinding machine of the Besley type. For this purpose the rocking table is clamped and the fixture is rotated and fed slowly, by hand, until the ground edge "splits the pops." The contour is then finished with a smooth file. The template and fixture is common to all cams.

By means of this adjustable template it may well be that all cams are not identical, point for point, but regarding the radius of the curve, they will have the same rise per degree, therefore the four cutters will have exactly the same feed from similar parts of their respective cams.

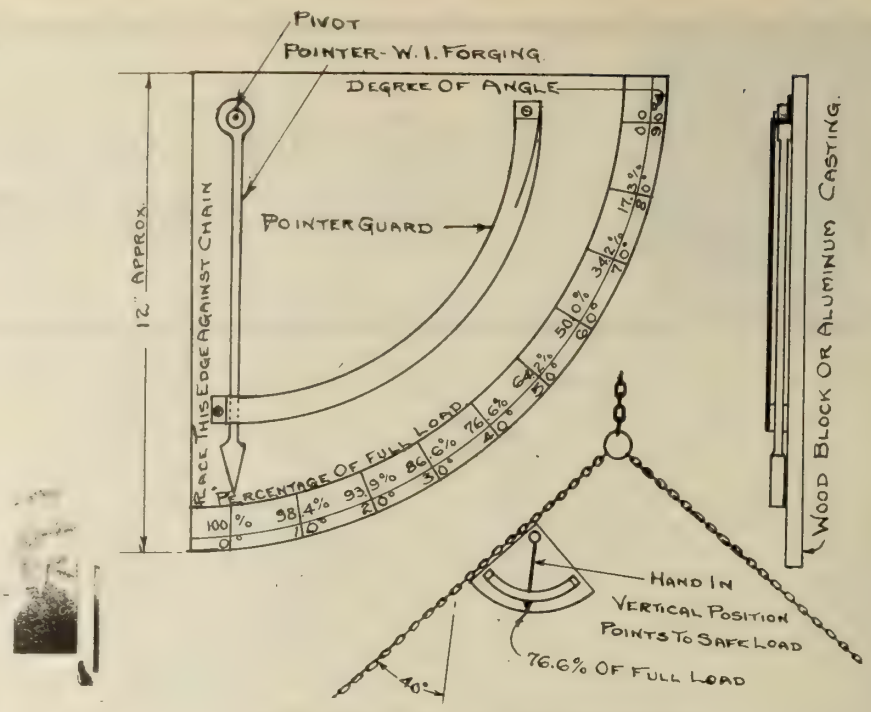
## CHAIN CAPACITY INDICATOR

By M. C. ALLIN

The instrument shown in the illustration will be found very useful where the handling of heavy machinery is involved, such as long planer and lathe beds or any long articles which require to be held at both ends when lifted by an overhead travelling crane. The hoisting chains in these cases are necessarily set at a fairly large angle to the vertical, thus reducing the load carrying capacity of the chain to a considerable extent.

This instrument will instantly show the safe carrying capacity of the chain, no matter what angle to the vertical it may be resting at. The instrument is shown graduated in percentages of full load but may be specially graduated in pounds to suit any particular chain or rope.

It may be made of any suitable light material such as aluminum, hardwood with sheet brass graduated scale, etc. The pointer should be freely suspended and heavy enough at the lower end to cause it to keep a vertical position whenever the frame of the instrument is placed against the chain. The pointer will then indicate the percentage of the full load the chain will carry when hoisting a heavy weight, the chain being at any angle to the vertical as fixed by the shape of the object to be lifted. This method of quickly checking the safe carrying capacity of a chain should help produce safe loading and prevent unnecessary accidents.




DETAILED VIEW OF THE INDICATOR.

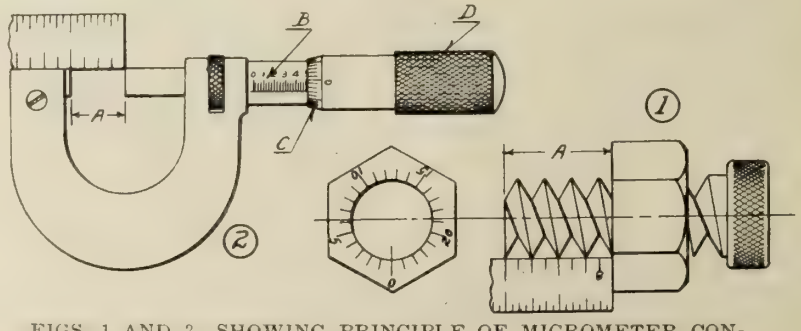
## PRINCIPLE OF THE MICROMETER

By F. M.

The idea here given is by no means new, but will probably be interesting to many readers. Fig. 1 illustrates a screw and nut adapted to explain the principle of the micrometer. The face of the nut is graduated into 25 equal divisions, and as the screw has four threads per inch, one revolution of the nut will move the same ¼ inch, or .250 of an inch, the 25 graduations on the end indicating various portions of a revolution; therefore, taking any fraction of a revolution and noting its relation to the zero line and dividing into .250, the result is the number of thousandths movement of the scale if kept in contact with the nut. For instance, if 5 was on the zero line the movement would be .250 divided by 5 equals .050 inch. The principle in the micrometer is identical with the exception that the screw has 40 threads per inch. Referring to Fig. 2 the barrel of the micrometer has 25 graduations at C, and it requires 10 revolutions of the thimble to move it .250 inch. Reading any of the lines at B in multiples of 25, together with the indicated reading at C gives the micrometer calibration at A. This simple method of instruction will be of great assistance to instructors of apprentices and machine operators in explaining the operations of the micrometer caliper.

## REORGANIZATION SCHEME.

A scheme for the reorganization of the Oakoal company (Canada), limited, in liquidation, has been placed before the master-in-ordinary at Osgoode Hall, by A. C. Master, counsel for the shareholders. The plan is to form a new company, with nominal capital of $400,000, divided into 400,000 common share. Each holder of fully paid preference and common shares in the present company would be entitled to five common shares in the new company, with 75 cents credited as being paid on each share. Provisional directors in the new company are: Douglas Cooper, H. J. Birkett, W. T. Pember, W. R. Jackson, all of Toronto, and R. W. Dixon, Oshawa.




FIGS. 1 AND 2—SHOWING PRINCIPLE OF MICROMETER CONSTRUCTION.



# WELDING AND CUTTING



# Have You A Standard Method for Testing Welds?

## These Specifications, Prepared By The American Bureau of Welding Are Intended To Serve As A Standard Basis for Testing And Comparing Sample Welds As Distinguished From Welds In Structures

THE welding industry in general will no doubt welcome the specifications for standard tests of welds, recently issued by the American Bureau of Welding. As C. A. Adams, the director of the Bureau states:

"We are submitting herewith specifications for Standard Tests of Welds. Standardization of the procedure in making a test of any kind is obviously necessary before results obtained by different observers can be compared. The chief difference between testing a specimen of steel that includes a welded joint and testing an ordinary specimen is the non-homogeniety of the welded specimen. The welded specimen has its center, a section composed of material that usually has physical, chemical and metallurgical characteristics distinctly different from the adjoining metal. Furthermore, the section of the added metal is more or less irregular in shape and variable in size. Consequently the procedure prescribed for testing of ordinary specimens is not applicable to specimens containing welded joints.

Differences in details of procedure have caused widely divergent results that comparisons are frequently impossible, with the results that the usefulness of much of the research work on record is generally restricted and in many cases the results are actually misleading.

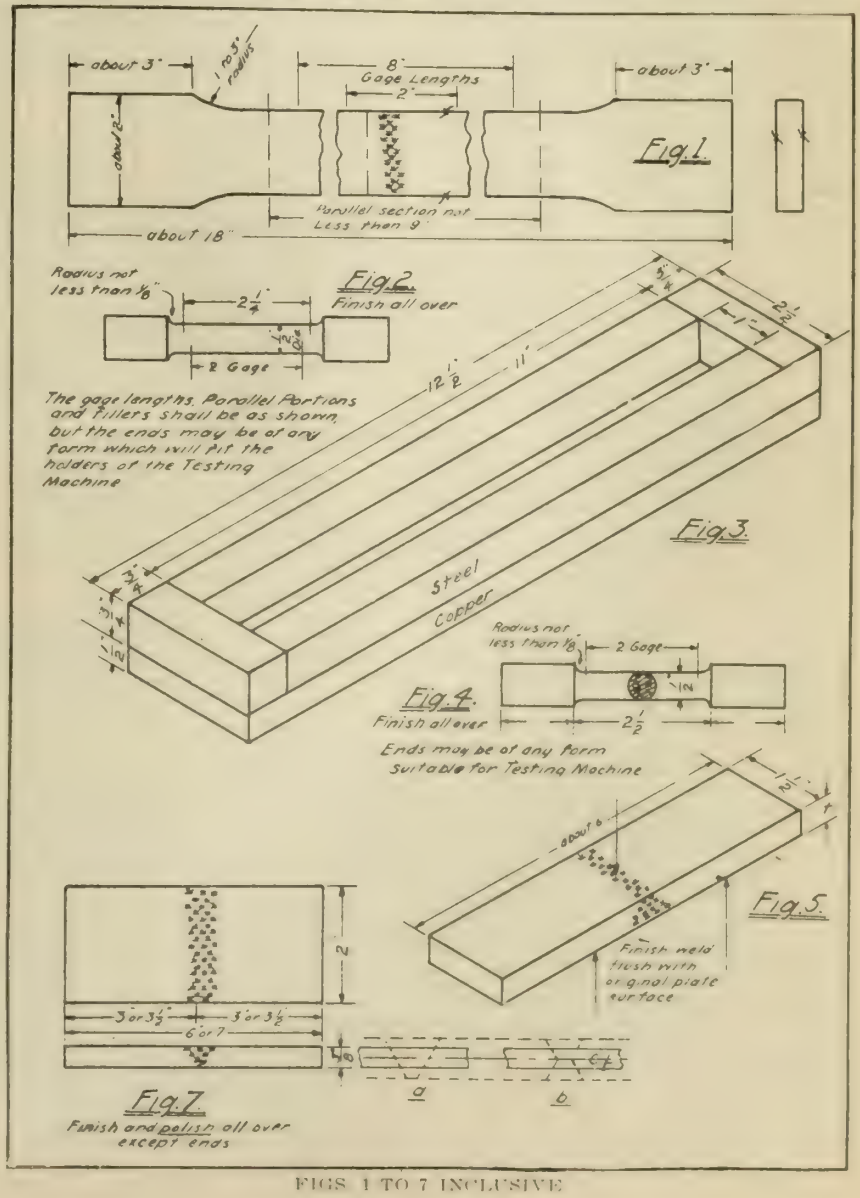
Although more thorough research work in this field may develop more satisfactory standards for tests of welds, the need for some immediate standards is so great that the universal use of the accompanying specifications is urged upon all those who have to do with the testing work in this field. Criticisms and suggestions are invited. The present standards will be valid for a period of one year and at the end of this period they will be modified if it is found desirable.

**Report to the Bureau of Welding of the Committee on Standard Tests for Welds.**

The committee held a meeting on February 3, 1921, at the Engineering Building, New York. After some discussion of its two fields of activity, namely preparation of standards for comparing welds and standardization of tests to be applied to welds in finished structures, it was concluded that (a) the committee should first work on standards for comparing welds and (b) the material prepared by a similar committee under the Welding Research Committee of the Emergency Fleet Corporation, which was the result of a great deal of work on the part of several men, should be utilized as fully as possible.

The committee in preparing the "Standards for Testing Welds," which are transmitted herewith, proceeded on three assumptions as follows:

1. The fundamental basis of measuring the effectiveness of a joint between two pieces of metal is the best metal without a joint. A joint is a necessary evil in a structure which is avoided when it is possible. Therefore the value of a joint is best determined by comparing the characteristics of a section of the structure which includes the joint with those of a similar section which has no joint. In other words, a




FIGS. 1 TO 7 INCLUSIVE

work is a joint and the practical basis of evaluating a weld is in terms of the metal of the parts joined together.

2.—Three standards are desirable as follows:

(a) **Shop Standard.** In the shop a standard test is required for such purposes as checking the work of a welder from time to time, testing a new lot of electrodes in electric welding or of welding wire in gas welding, testing the effect of some change in conditions which may have taken place, et cetera. Such a standard must necessarily be as simple as possible and preferably a single test. The technique of the procedure in making the test must be of a simple character.

(b) **Commercial Standard.** There are many cases where more than one test or test should be made, but where the circumstances do not justify a complete investigation. There is, therefore, a need for what might be termed a commercial standard for making, for example, comparisons between different commercial welding processes or between different kinds of electrodes in electric metal-arc welding or different wires in gas welding.

(c) **Research Standard.** When a complete investigation of a weld is to be made for research or other purposes, all tests and examinations are made which will contribute any information in regard to the characteristics of the weld. It may be necessary to make tests of a special character in special kinds of welds or where application under unusual conditions is contemplated, but there should be a standard list of tests which will give information which is complete as far as all ordinary requirements are concerned.

3. The details of the procedure in making the various mechanical tests should be carefully prescribed. It is believed by the committee that standardization in this respect is of the greatest importance because comparatively small differences in procedure have a marked influence in certain mechanical tests and unless these are eliminated the results are not comparable.

The committee recommends that the proposed "Standards for Testing Welds" be adopted, at least tentatively, and be offered by the bureau for general use. It may very well be that experience will show the desirability of making changes but that can only be determined after the standards are in use. Respectfully submitted, W. J. Beck, S. W. Miller, R. E. Wagner, H. L. Whittemore, F. M. Farmer, Chairman.

### Standards for Testing Welds.

Note: These specifications are intended primarily to serve as a standard, uniform basis for testing and comparing ample welds as distinguished from welds in structures. The testing of the latter must necessarily be by non-destructive methods which would therefore be, in general, quite different from those employed in examining sample welds (test welds) made, for example, for the purpose of testing a welder's proficiency, comparing welding wires or comparing welding methods.

### Definitions.

The following are definitions of terms employed in this specification.

(a) A Weld is a solid union of metallic pieces formed by uniting or consolidating by hammering or compressing with or without previous softening by heat.

Note: This definition is quoted from the Century dictionary. It is the broad definition of a weld and therefore includes forge welding and resistance welding by either the butt or spot process. While these specifications are prepared specifically for fusion welds, it is obvious that some of the tests can be applied to other types of welds.

(b) A fusion weld is a weld formed by heating to a fluid state the edges of the pieces to be joined and allowing the metals to flow together (with or without additional molten metal being supplied) wthout any pressure being applied. The heat may be supplied by a gas flame, an electric arc thermit or otherwise.

(c) In a fusion weld, the base metal is the material composing the pieces to be united by the weld. Unless otherwise expressly stated, it will be understood that a weld joins two pieces of identical material.

(d) In a fusion weld, the weld metal is the material which has been used in forming the weld. It may consist entirely of a base metal adjacent to the weld or of the material added to the fused base metal from a welding rod or electrode, or other material.

(e) Filling metal is the metal added during the welding process to form part of the weld. In gas welding it is supplied by means of a welding rod, in carbon arc by filling rod and in metal arc welding by the electrode.

(f) A test weld refers to a sample of welding which has been performed under known conditions and upon which mechanical tests are to be made.

(g) A test specimen is a prepared piece on which a mechanical test is to be made.

### Shop Standard.

Bending test only.

### Commercial Standard

(a) Bending test.
(b) Tensile test.

Note: It is probable that eventually it will be desirable to include a fatigue test when a method is standardized which will be suitable for commercial application.

### Research Standard.

**A. Tests of Base or Parent Metal.**

1. Chemical analysis. To include carbon, manganese, silicon, phosphorus and sulphur.
2. Mechanical Test.
   (a) Tensile. To include yield point, ultimate strength, total elongation and reduction of area.
   (b) Bending.
   (c) Fatigue.
3. Metallographic. Photomicrographs at 100 diameters.

**B. Test of Weld.**

1. Mechanical Test.
   (a) Tensile. To include yield point, ultimate strength, total elongation and reduction of area.
   (b) Bending.
   (c) Fatigue.
   (d) Impact.
2. Metallographic. Photomicrographs at 100 and 500 diameters respectively at (a) the junction between the base metal, and the filled-in metal, (b) the base metal adjacent to the junction, (c) the center of the filled-in metal.

**C. Test of Filled-in Metal.**

1. Chemical analysis. To include carbon, manganese, silicon, phosphorus and sulphur.
2. Mechanical tests. Standard round specimen to be prepared from ingots deposited in a base-metal mould of such dimensions that normal cooling conditions will be approximated.
   (a) Tensile. To include yield point, ultimate strength, total elongation and reduction of area.
   (b) Bending.
   (c) Fatigue.
3. Metallographic. Photomicrographs at 100 and 500 diameters respectively.

### Standard Procedures for Mechanical Tests.

**1. Preparation of Test Welds.**

No detailed instructions for the preparation of test welds can be given as the dimensions, material, etc., will depend upon the purpose for which the weld is being made. The test weld should, however, duplicate as nearly as practicable the commercial welds which it represents and should preferably be of such a size as to permit preparations of enough specimens from the one test weld to make all of the mechanical tests which are to be made.

When the test weld is made with material in sheet or plate form, the longest axis of the test specimen should, in general, be parallel to the direction of rolling.

**2. General Procedure.**

(a) Wherever applicable, the standard procedure of the American Society for Testing Materials as given in the A.S.T.M. for 1918 (serial designation E-1-18) shall be followed.

(b) Three duplicate specimens shall be tested in any one test and the average taken as the value of the property determined by this test.

**3. Tensile Tests—Base Metal.**

**(A) Test Specimens.**

(a) **Sheet or Plate Material.** The test specimen for sheet materials is shown in Fig. 1. The thickness of the specimen may be any that is desired, but a thickness exceeding ¾-inch would require a testing machine in excess of 100,000-pound capacity. If the specimen is cut from standard sheet material, it is usually not necessary to machine the 1.5 inch faces of the specimen.

(b) **Cast Material.** The test specimen for cast or brittle materials is indicated in Fig. 2*. It is particularly important to use swivel specimen holders when testing such specimens in order to entirely eliminate undesirable stresses.

**(B) Test Results to be Recorded.**

(a) **Ultimate Strength.** Unit stress (lb. per sq. in.) computed from the area of the original section.

(b) **Yield Point.** Unit stress (lb. per sq. in.) at which marked increase in deformation of the specimen occurs without increase of load as indicated by a sudden dropping of the beam of the testing machine or by a sudden increase of the rate of elongation as shown by dividers.

(c) **Contraction of Area.** Expressed in per cent. of the original area.

(d) **Appearance of Fracture.** The appearance of the fracture as determined with the aid of a low power magnifying glass (such as jewelers use) should be recorded. The characteristics described by the following nomenclature should be covered indicating as far as possible the per cent. of the total area which is involved. For example, "10 per cent. not welded" would signify that approximately 10 per cent. of the total area of cross section at the fracture is exposed base metal—that is, not welded.

Spongy: Full of small cavities; the structure resembles that of a sponge; porous.

Slag inclusions: Foreign matter entrapped in the weld.

Gas pockets: Small or large cavities more or less isolated (i.e., not of a regular spongy structure).

*The diameter of this specimen may be 0.505 inch if desired. This diameter gives an area of exactly 0.200 square inch.

Not welded: Exposure of any portion of the surface of the base metal indicating imperfect fusion between the base metal and the filling metal.

Laps: Imperfect fusion between adjacent portions or between successive layers of filling metal.

(The recording of the following data is optional.)

(e) **Proportionately Limit.** Unit stress (lb. per sq. in.) at which the deformation ceases to be directly proportional to the load.

Any type of extensometer may be used but in precise work the deformations of two opposite elements of the specimen, preferably on the edges, should be obtained. For ordinary purposes deformations in only one element of the specimen need be measured, but in that case the gauge marks should be on the center of the line of the 1.5-inch side.

The gauge length may be either 2 or 8 inches.

(f) **Modulus of Elasticity.** Unit stress (lb. per sq. in.) computed from data obtained from a specimen having an 8-inch gauge length; measurements to be taken on two opposite elements, one on each edge of the specimen.

(g) **Total Elongation.** Gauge marks shall be laid off every inch along a line at the center of one of the 1.5-inch faces of the specimen before placing in the testing machine and the total elongation in every inch after rupture recorded. The total elongation in the 1-inch, 2-inch and 8-inch (if any) length which included the break shall be reported.

**4. Tensile Tests, Weld Metal.**

**(A) Test Specimens.**

The shape and dimensions of the test specimens are shown in Fig. 2. It shall be prepared from a bar of weld metal, ¾ by 1 by 11 inches. This bar shall be formed entirely by depositing filling metal in an open box of the shape shown in Fig. 3, employing exactly the same method used in making the corresponding test weld. For metal electrodes this box shall consist of a copper plate ½-inch thick, upon which is secured a frame of steel bars, ¾-inch square. The parts of the box were secured in any convenient manner. The copper plate, during this operation shall rest upon a steel plate. After the bar is formed, the copper plate and the frame may be removed by any suitable machining operation.

For gas welding, the copper plate should be replaced by a steel plate. For thermit, a box of suitable refractory material should be used.

**(B) Test Results to be Recorded.**

These shall be the same as those prescribed in Section V, 3-B (base metal) except those involving an 8-inch gauge length. If, however, the modulus of elasticity is desired, a specimen similar to that shown in Fig. 2, with a gauge length of 8in. shall be employed.

**5. Tensile Tests, Weld.**

**(A) Test Specimens.**

The shape and dimensions of the test specimen are shown in Fig. 1 with the weld at the center. If the material is cast or brittle, the specimen shown in Fig. 2 shall be used with the weld located at the center.

It is especially necessary that the 1.5 inch sides of the specimens be machined, particularly if the two pieces of base metal are offset or if they form an angle at the weld. Tests made in the latter case, where the specimens are not machined, are not reliable. Furthermore, care must be taken that specimens having the latter defects are not "straightened" before being machined because such treatment is likely to materially decrease the strength of the weld. A roughening cut in a planer or shaper which will just "close up" the surfaces of the specimen is sufficient.

**(B) Tests Results to be Recorded.**

The requirements for test results given in Section V, 3-B (base metal) shall be followed.

**6. Bending Tests, Base Metal, Weld Metal and Weld.**

**(A) Test Specimens.**

(a) **Base Metal and Weld.** The shape and dimensions of the specimen are shown in Fig. 5.

In the case of welds in flat rolled material, the surface of the weld shall be machined substantially flush with the surface of the specimen unless the specimen is bent or offset, in which it shall be machined all over. Cast and other irregular specimens shall be machined all over. It is essential that the edges of all specimens be machined to remove material in a condition likely to cause premature failure.

The thickness, t, of a weld specimen shall be as nearly that of the base metal as possible.

(b) **Weld Metal.** A specimen may be prepared from a bar of weld metal prepared as prescribed for tensile tests (Section V, 4-A). The box, Fig. 3, shall however have a width of 1.75 inches and the thickness, t, of the specimen shall be that of the test weld. These specimens shall be machined all over.

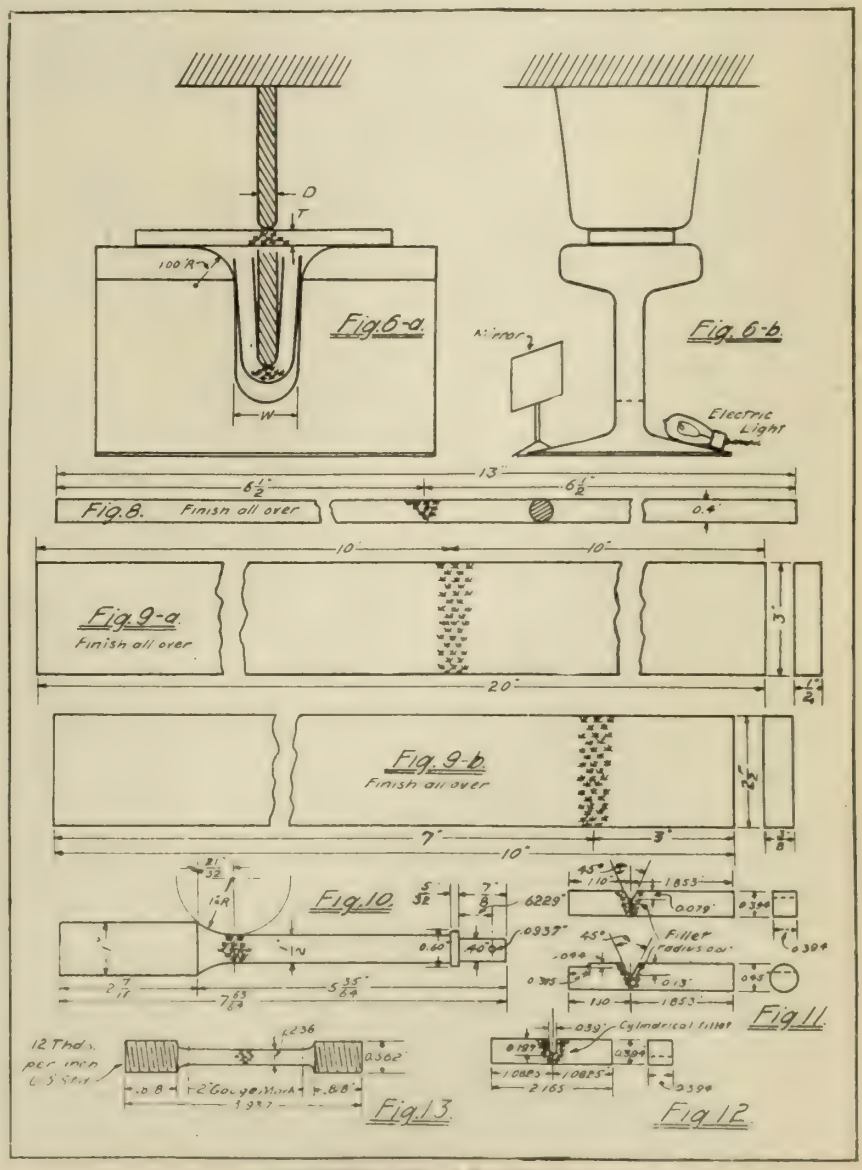
**(B) Apparatus.**

In order to load the specimens so that as large a part of the bend as possible shall occur in the weld metal, the special fixture outlined in Fig. 6a and 6b shall be used. It is most conveniently used with any standard universal testing machine but may be operated by any other convenient mechanical means.

The cylindrical surface, D, (Fig. 6a) about which the specimen is bent shall conform to the requirements of the American Society for Testing Materials for bending tests of the base metal. This piece is attached to the under side of the moving head of the testing machine. Upon the platform shall be fastened two blocks having machined top surfaces and polished corners of radius, R, of 1.00 inch. These blocks shall be separated by a distance, W, equal to D plus 2T plus ⅛ inch. A lubricant of lard oil and graphite or similar compound shall be used on these surfaces.

Two specimens shall be tested. The load shall be applied at the center of the weld,—in one specimen to the open side of the "V" and in the other specimen to the closed side.

The rate of application of the load shall not exceed that at which the beam can be kept balanced at all times or a maximum of 2 inches per minute.




SHOWING FIG. 6 TO FIG. 12

the specimen which is reversed during each revolution of the machine.

Specimen shown in Fig. 7. The distance between the jaws of the machine shall be ½ inch. If the specimen is a weld specimen, the jaws shall be equidistant from the center of the weld metal.

(c) **Farmer Machine.** This machine was designed specially for testing weld specimens. It tests the specimen as a simple rotating beam with free supports at the ends and two equal loads on a section at the middle. Specimen shown in Fig. 8. If the specimen is a weld specimen, the weld metal shall be at the center.

(d) **Strohmenger Reverse Torsional Machine.** Comparative results only can be obtained as there is no means of determining the stress. This machine loads the specimen in torsion which is reversed for each revolution of the machine.

Specimen shown in Fig. 9a.

(e) **Strohmenger Bending and Impact Machine.** Comparative results only. The machine strikes the specimen which is held as a cantilever beam, bends it and releases it. This operation is repeated upon the other side of the machine. The weld, if any, is placed just outside the clamp in such a position as to develop the maximum stress in the specimen.

The specimen is shown in Fig. 9b.

(f) **Moore Machine.** This machine was designed for the Bureau of Standards for testing large size specimens of joints, both welded and riveted. It loads the specimen as a simple beam at the third point and the direction of loading is reversed for each revolution of the machine.

Specimens. Any thickness not exceeding about 1 inch, width 8 inches, length 32 inches. If the specimen is a weld specimen, the weld metal shall be at the middle of the length of the specimen.

(g) **White-Souther Machine.** This machine loads each end of a rotating specimen as a cantilever beam. It is then rotated.

The specimen is shown in Fig. 10.

**(B) Test Results to be Recorded.**

(a) Number of cycles of the stress required to cause failure. A cycle is the period of time at the end of which the repetition of the variations of stress is begun.

(b) The stress developed in the specimen (if possible).

## INSPECTING CLOSED BOXES BY X-RAYS.

X-rays are a form of light which has the power of penetrating substances which are opaque to ordinary light. The more dense the substance the less it is penetrated, so that the rays falling on a composite body, such as a box with metal nails and hinges, throws a kind of shadow picture of the hidden parts on a photographic screen. This fact has been utilized in the examination of manufactured articles. Recently a British Government Department brought out a portable X-ray outfit for examining large numbers of boxes, without opening them, in order to see whether they contained all the essential parts. The apparatus is placed on wheels and is solidly built to stand rough use in the workshop. In place of a photographic plate a fluorescent screen is used so that the operator can actually see the shadow picture thrown by the contents of the boxes. By the use of this equipment an immense amount of time has been saved in the inspection of thousands of articles.

## THE NAMING OF PIPE.

When should we use the term "Wrought Pipe?" Here is how "Mechanical Engineering" solves the question:—

Whether the pipe-maker takes a length of steel skelp or a length of wrought-iron skelp and forms it into a pipe, he performs exactly the same operation in either case, that is, he bends the skelp into tubular shape and welds the edges. Quite correctly, therefore, the American Society for Testing Materials in its specifications uses the word "welded" in reference to both wrought-iron and steel pipe made by the welding process.

Probably some thirty years ago, after the introduction of welded steel pipe, the term "wrought pipe" or "wrought steel pipe" was coined by steel-pipe manufacturers. This term gradually came into use by dealers and jobbers; thus steel pipe would be billed and listed as "wrought pipe." Many purchasers of pipe, not being acquainted with this trade name, frequently labor under the impression that it means wrought-iron pipe.

The manufacturers of wrought-iron pipe, actively aided by the American Institute of Architects, have therefore taken up with the supply associations the matter of clarifying these so-called trade names, suggesting instead names that would ultimately result in eliminating all confusion of pipe made from puddled wrought iron with that made from soft steel. As a result the National Pipe and Supplies Association at a recent meeting voted that the terms employed by the American Society for Testing Materials in differentiating between iron and steel pipe, namely, (1) welded wrought-iron pipe, and (2) welded steel pipe, should be accepted and adhered to by the distributors of both iron and steel pipe.

This step should result in the term "welded pipe" being applied when both wrought-iron and steel pipe are referred to, and in the latter two terms alone, namely, "wrought-iron pipe" on the one hand and "steel pipe" on the other hand, being used and interpreted, respectively, to mean exactly what these terms imply. Thus "wrought-iron pipe" will mean only pipe which is made from genuine puddled wrought iron, and "steel pipe" will be used exclusively to designate pipe made of soft bessemer or open-hearth steel.

## STETHOSCOPE IN WORKSHOPS.

Most of us are unfortunately, more or less familiar with the stethoscope, which the doctor uses when listening for the signs of defective action in our lungs or heart. It is not so widely known that the same kind of instrument can be employed to detect abnormal noises in moving machinery. The latest development in this workshop stethoscope, due to a British engineer, lies in the use of a kind of telephone receiver in place of the stethoscope rod. The advantage of this device is that every bearing and every gear in a factory can be fitted permanently with a receiver and all the receivers can be connected by electric wires to a single board in the manager's office or any other convenient spot. By means of suitable switches the manager can examine each bearing or gear in succession without moving from the board. Since abnormal internal noise is often the first sign of trouble which may lead to breakdown this simple and rapid means of detection is an invaluable aid to the factory owner.




## Seven Successful Rules for Selling

CONSIDERABLE experience can be gained in a space of 45 years, especially in the selling end of a business. H. Hamlin Childs, in a recent issue of "System," brings this home very forcibly in an article entitled "What 45 Years in Business Have Taught Me About Selling." Among the many valuable suggestions contained in this article are seven selling principles that experience has proved to be not only satisfactory, but efficient in working qualities. Mr. Childs comments as follows:

1. "The business that merely offers its product for sale will never get anywhere. Everything has to be positively sold.

2. "Energy devoted to fighting a competitor is apt to be a wasted energy. A more satisfactory return will be had by forcing one's own affairs forward.

3. "One of the easiest ways to draw attention to the fact that one's product is best, is to charge a higher price than competitors charge.

4. "Above all, it is not possible for even a month to let up on the advertising pressure. That must be continuous.

5. "No one will buy from you simply because you want to sell. People will buy from you only because you have something that will do them good in proportion to the price you charge.

6. "It is extremely difficult, as a business grows, to avoid a public expression of satisfaction in the growth—and to remember the public is interested only in superiority of service.

7. "The value to my mind of the various trade-marks that we have established and the reputation of the company itself, which has been trade-marked by a distinctive signature, is greater in actual business value than all the material assets we carry on our books."

## Hot Oil as Hardening Medium

SPEAKING on "Hardening in Hot Oil," H. E. Twigg, in a recent issue of American Machinist, tells a humorous story of a foreman who wanted some information as to why hot whale oil hardens steel harder than when it is cold. He mentions that this foreman always prepared his oil bath for hardening cast steel cutters by getting a small die red hot and plunging it into the oil to warm the oil preparatory to hardening.

The author continues:

When another foreman was recommended to try this he ridiculed the suggestion, expressing the futility of it. He instanced the provision of circulating water to keep oil cool in the hardening bath by those who know all about such things. He was asked to try it nevertheless, and I suppose he did as he could not be induced to make any further remarks upon the subject although repeatedly asked to do so.

I may say that some time ago I hardened about 30 cutters 2 in. in diameter by ⅞ in. thick. The quenching tank held about two or three pints of oil and the cutters were quenched singly. The last one quenched made the oil so hot that it boiled over and left the previously hardened cutters bare. I went over them all with a file to test them, thinking I had gone too far, but found that they were "all right."

I can quite understand that the boiling point of whale oil is considerably less than that of linseed or tempering oil, but I should like to know the reason for hot oil hardening better than cold oil. It may be because it is more fluid; at any rate some of your hardening experts probably could enlarge upon this subject. My father, who had some knowledge of the steel button trade in the early fifties told me that he had heard a hardener remark that the oil hardened better at the end of the day when it had become well warmed up.

Our cutters are now heated by natural draft gas furnaces and quenched in hot or warm water, but I should imagine that on the question of warping, or on tricky work, hot oil would be better. I may add that in my first experience of using linseed oil for tempering springs, during which more heat was wanted and more coal was put on the fire, the oil boiled over until the flames nearly reached the ceiling. The top of the thermometer was blown off, though this was not noticed until later. Why the thermometer broke I did not understand, particularly as the maker subsequently informed me that mercury boiled at 620—but I expect he is wiser now as this happened thirty years ago.

## Centrifugal Casting Process

A process for the centrifugal casting of pipe has been patented by L. Cammen, New York. The process as described in "Iron Age," is carried out in four stages.

The metal is first melted and cast into bars, which when solidified are weighed, cut off to exactly proper weight, and while still hot are transferred to a pipe mould. This mould has an outside steel shell ½ in. to 1 in. thick, to give mechanical strength and act as container. Inside of this is a lining made up of hard-baked clay-rings, ¾ in. to 4 in. thick and 2 in. to 3 in. long. Inside of these is a graphite lining made up of tubes ¼ in. to 1 in. thick and 18 in. to 24 in. long. The mould is closed at both ends by graphite blocks, terminating in copper insulated leads.

The moulds are placed on a rack and electric current is supplied to the terminals from a bus-bar. They are left on the racks until the metal inside has thoroughly melted, which of course is determined by the strength of the current and the time elapsed. The moulds are then transferred to the spinning machine. The speed at which the moulds are spun is determined primarily by the diameter of the tube to be cast and the thickness of the wall. Spinning continues until the metal has solidified, the time varying according to the kind of metal and to a certain extent on the initial temperature of the metal; 60 to 90 sec. appear to be ample. When the metal in the tube has set, it is allowed to cool until the contraction of the diameter of the tube is sufficient to pull it out of the mould. It is then subjected to such heat treatment as may be necessary.

The advantages reported for the process are control of composition of the metal of the tube, absence of gases in the mould, also the production of wrought-iron pipe, chromium tubing, Monel-metal tubing, and even high-speed steel pipe for use in modern high-pressure high-superheated steam for power plants.

## The Care of Ropes

IN ordinary use ropes have not a very long life if safety in sustaining heavy strains is considered; but, provided they can be kept dry, the decay is chiefly caused by the breakage of fibres, machine-made ropes being less durable than hand-made ones of equal diameter and weight. Of course, a machine-made rope laid up with close and short coils of strands looks better than the more loosely laid up hand-made rope, but under a heavy strain the machine-made article breaks up quicker owing to the disposition of the fibres which are under greater initial tension, and it will be found that dressings do not really much alter this, although they do not increase the strength of the ropes at any time. For working purposes, continues Practical Engineer, a tarred or otherwise dressed rope maye be taken at approximately a third less power in a direct pull owing to the fibres sliding over each other instead of gripping firmly; but as few persons put the fullest load on a rope, this does not seriously affect working as a general thing, and it may be taken that while a good rope of 1 in. diameter will, when new, lift a ton safely, a tarred rope of equal size will not be altogether safe with a load of more than about 13 cwt. Fibre—not coir—ropes appear to be best steam-dressed with Stockholm tar, but other things are used to suit the ideas and prices of different persons; in all cases, however, the object of the dressing being to prevent damage from moisture.



# DEVELOPMENTS IN SHOP EQUIPMENT



### SIMPLIFIED MOTOR DRIVE.

The Dreses Machine Tool Co. Cincinnati, Ohio, have recently brought out a simplified design of motor drive for radial drills.

A pinion on the motor meshes directly with a large gear on the horizontal back shaft of the arm, this eliminating two pairs of bevel gears, three spur gears, eight bearings and two long and one short shaft in the driving mechanism. This simplification is said to permit the using of a motor of one-third less capacity than if placed at the base of the drill.

The controller is placed in front of the motor and the controlling handwheel brought within easy reach of the operator by means of a universal joint, shaft and bracket. The hand wheel rim is beveled and marked to show the spindle revolutions at the different stations of the controller. A fixed pointer reaching over the hand wheel serves as an indicator. This arrangement eliminates several parts that are necessary when the controller is placed in the rear of the motor and arm.

The motor is placed on a sub-base so that any make may be used without making a change in the arm.

### DRILLING MACHINES.

The Cincinnati Hy-Speed Machine Co., Cincinnati, Ohio, have placed on the market a line of drilling machines to be known under the name of Hy-Speed. Various features are claimed for these machines, among them being the single-pulley, direct, overhead drive and the dry-plate clutch operating in connection with the externally clamping, adjustable, air-cooled brake. By means of a single handle directly in front of the operator, the machine can be instantly started and stopped, adding considerable speed and convenience to the operation of the machine.

The elevating mechanism of the table is so arranged as to allow drills and taps to pass through the center of the table. This construction, combined with the use of the quick-releasing chuck, allows tapping without reversal. The spindle speeds are controlled by a handle on the side of the column. An automatic power feed and an automatic tapping attachment can be arranged on any spindle. Unit construction is embodied in the machine. The entire clutch, brake and the initial driving gear form a separate unit that is set into the top bracket of the machine.

The machine is built in various types for either floor or bench use, with a single speed if desired, or a belted motor drive, an automatic power feed or an automatic tapping attachment.

### CUTMETER.

O. Zernickon, New York, N.Y., have placed a device on the market called the O-Z Cutmeter. This tools is intended for determining the cutting speed of machine tools of all types. It may also be used for such purposes as ascertaining the speed of rolls in paper mills and the linear speed of belts and ropes.

When in operation the device is held by means of the handle, and a small wheel is placed in contact with the moving works or machine table, the surface speed being shown directly on the dial. The meter operates on the governor principle, and it is said that its accuracy is not affected by changes in temperature, by moisture or by the presence of magnetic fields. A damping mechanism is incorporated, so as to prevent vibration of the indicating hand, the mechanism serving to neutralize shocks and vibration which would be transmitted from the machine or work being tested. When fitted with the pointer provided for the purpose, the device may be used to indicate revolutions per minute. It is not necessary to use a watch to time the period of test, nor to calculate the speed. The device is said to operate equally well in any position. By means of the three separate ranges, the device may be used to indicate revolutions per minute from 30 to 1,200 and speeds in feet per minute from 20 to 800.

### RAPID STONE-CUTTER.

Machines for cutting marble and other stone have a pedigree stretching back to very early days in civilization, and they still often bear the marks of their primitive ancestry. Recently, however, a British engineering firm introduced a type which more closely resembles a machine tool than the crude equipments with which our forefathers were content. It is intended mainly for cutting and moulding but it may be used also for slab and block work. The stone to be cut is placed on a table surmounted by a saddle carrying a carborundum wheel or a "diamond saw," which runs at 1,200 revolutions per minute and is kept cool by streams of water. A diamond saw is built up by arranging individual diamonds in metal "saddles" on the rim of a disc. Each saddle is drilled from behind, the diamond inserted in the hole and electrically welded over, and then mounted on the rim. The metal covering the diamond is ground away leaving the diamond exposed. Wheels of this type make very rapid and efficient cutters of stone and the use of the machine is expected to lead to remarkable economies over the older methods.

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# CANADIAN MACHINERY
## AND MANUFACTURING NEWS

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## Canada and Export Trade

THE visits of Sir John Hendrie and Sir Edmund Walker closely following each other, led to comments strikingly similar in character from both gentlemen. They each point out that under certain conditions there can be worked up a reasonable export trade to this part of the world, but point out very strongly that the manufacturer who wishes to get a share of this trade must live up to the rules, and play the game squarely.

The buyer in Latin America is usually a man of great discrimination, and as far as articles in domestic use are concerned, a very much more critical buyer than his contemporary in North America. This is due to his inherent tastes, and his long intimacy with the best that Europe can produce. The best that Europe can produce is a great deal ahead of the best that can be produced in Canada, although perhaps it may be treason to suggest such a thing. Therefore, the goods that are to be sold must be honestly described, and the goods themselves must live up to their description and sample where there are samples used. Smart tricks of business, or in other words sharp practice will not get a firm or an individual very far in dealing with these people, or any other, and the statement is made that there are millions of dollars worth of goods lying on the wharves of South American ports, rejected because of not coming up to the sample they were sold on.

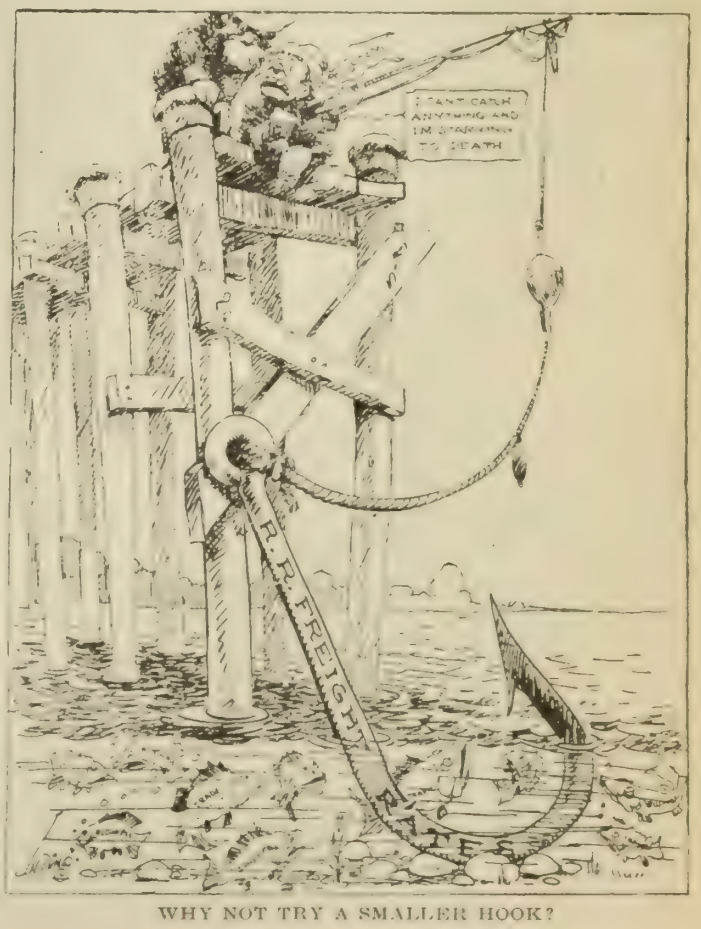
The English manufacturer and merchant, who has been engaged in export trade since the days that there was such a thing, holds his markets by the excellency of his products, and a strict honesty that has made him famous all over the world. That reputation has been built up by a scrupulous integrity in all his dealings, and when a competing nation goes out to capture a foreign market, they have that reputation to live up to. On this continent it is a fact that strict probity in business is not considered essential, so long as a little sharp dealing can be got away with. The fact is recognized by all parties, and the attitude is taken that one must be smart enough to avoid being caught. In dealing with buyers in overseas market that attitude must be forgotten, and the fact borne in mind, that if only because it pays best, honesty is the best policy.

## Have You a Cost System?

"WHAT does your product cost?" Sounds like a reasonable queston, and yet, how many manufacturers could give an intelligent answer. Cost accounting, unfortunately, is something that has been too little understood to be generally used. Up to a short time ago, everybody was turning down orders rather than looking for them. Prices were high, in fact there was almost no limit to the prices one could demand, so naturally the cost of a product was a minor consideration. The manufacturer was more interested in getting out the goods, rather than keeping tab on his costs. His profits were large, so why worry about the cost of production. This, briefly, was the state of affairs previous to the present inactivity.

But now the situation is reversed. Instead of turning down orders, the manufacturer is looking for some order of decent proportions. Prices are no longer sky high, and if a firm wishes to secure an order they must first submit a reasonable price. The man who overbids through overestimating the cost of his production seldom gets orders. The fellow who underbids loses so much money in a short time that he cannot remain in business.

This condition leads us to suggest that now, if ever, is the best time to seriously tackle the subject of costs. We do not suggest you install an intricate cost keeping system, for that will depend entirely on the size of your plant, but what we do wish to emphasize is the necessity of some kind of cost record, especially in view of the present conditions.




WHY NOT TRY A SMALLER HOOK?



# MARKET DEVELOPMENTS



## PRICES EXPECTED TO REACH THEIR LOWEST LEVEL BY BEGINNING OF AUGUST

PITTSBURGH, June 30.—Demand for steel continues to be of practically [illegible] proportions. Considering conditions of the past month or two [illegible] that could be expected for the market would naturally grow duller as the midsummer season was approached. There is however, some debate in the trade as to whether the season of the year is the dominant factor. It is generally admitted that the steel market is always extremely dull in July, but in some quarters it is claimed that if the market wanted to revive it would not permit itself to be blocked by the calendar. However, much weight is given to two other factors, the stocks of steel and of finished wares in the hands of manufacturing consumers, and the feeling among buyers that steel prices are going to be lower.

Nearly all steel manufacturers place the former of these items in the forefront. They assert that buyers would not take hold no matter what prices were quoted, that they are engaged in liquidating their stocks. It is asserted, and with citation of actual cases of importance, that manufacturing consumers do not want to see lower steel prices, because they have no occasion to buy steel while they do want to liquidate their stocks of goods, and if steel prices were lower, their customers would expect lower prices on the manufactured goods, agricultural implements, tools, machinery, etc., so that a reduction in steel prices would be very unwelcome to many large buyers. That, of course, applies simply to the present. When buyers see their way clear to go ahead they will naturally prefer to see steel prices thoroughly liquidated.

### Steel Production.

Several large steel interests are closing their plants entirely at the end of this week, some for stated periods, say three to six weeks, others for indefinite periods. They are tired of losing money on a light operation, running say at 15 to 25 per cent. right along, or perhaps at 25 to 35 per cent. in alternate weeks, and prefer to take the smaller loss involved in being entirely idle and paying fixed charges out of surplus. Many small plants have been closed for months. Production of steel by the independents as a whole in the second half of June has been at nearer 15 per cent. than 20 per cent. of capacity, and the rate is likely to be 10 per cent. or less by the middle of July. As to the Steel Corporation there have been only occasional reports. Three weeks ago the Corporation was reported as operating at 30 per cent., while a week later it was up to 35 per cent. Possibly it is not doing over 25 per cent. at present. The Carnegie Steel Company has 14 of its 59 blast furnaces in operation. Its previous low record, late in 1914, was 16 furnaces active.

### Prices.

The whole sheet market is down by $5 a ton at least from the prices developed about the middle of April. Instead of there being a gradual sagging, there was a straight decline. The Republic Iron and Steel Company finding, as it stated, several independents quoting cut prices to some of its regular customers, openly announced a straight reduction of $5 a ton. Other manufacturers heard of this promptly, and immediately Youngstown Sheet & Tube Company, Brier Hill Steel Company and Bethlehem Steel Company announced similar reductions. The Steel Corporation waited three days and then began selling at the reduced prices, which are: Blue annealed, 2.85c; black, 3.75c; galvanized, 4.75c. Possibly these prices are being shaded slightly in some cases and certainly the market is not quotable higher in any case.

It was on May 31 that the Steel Corporation decided to meet independent price cutting on wire products, and reduced its prices $5 a ton. The action in sheets was taken more quickly than had been the action in wire. It is to be noted particularly that in each case the reduced prices are not announced as regular official prices of the corporation, but are referred to simply as prices at which the corporation subsidiaries are selling at the moment. The inference is that the corporation considers itself free, should occasion arise, to sell at lower prices than those mentioned without making formal announcement of the fact.

On other steel mill products, bars, shapes, plates, hoops, pipe, etc., there is more or less shading of April prices by some of the independents, without the Steel Corporation having modified its prices so far as known. Such action, however, is probably only a matter of days.

The opinion is that buying has reached, or will reach, such a low ebb that an increase will be forced, and the Steel Corporation will probably see to it that when buyers get in mood to take hold at all they will be quoted such prices as will encourage them. As many independent mills will be closed, prices can probably be set without much difficulty at levels that would entirely discourage any disposition to shade them, and this would naturally stimulate buyers to take hold. Thus the final shake-out in prices is likely to occur within the next few weeks, and probably by August 1. Prices may afterwards decline more, at intervals, in the event of its being possible to get costs down, but by far the greater part of the general price readjustment will be accomplished.

### Pig Iron and Coke.

The local pig iron market has slid off 50 cents a ton on Bessemer and basic and $1 on foundry, making the market quotable at $22.50 for Bessemer, $20.50 for basic and $21.50 for foundry, f.o.b. valley furnaces, with $1.96 freight to Pittsburgh. The recent announcement of 1921 season prices for Lake Superior ore, at $1 reduction from 1920 prices, representing a return to the 1919 schedule, has not particularly affected the pig iron market, since a reduction of about this amount was discounted long ago. Indeed many if not the majority of furnaces wrote a dollar a ton off their ore inventories at the end of last year. Pig iron prices are made, not against the cost of producing the iron sold, nearly all the sales being out of furnace stocks, but against the probable cost of making iron when the furnaces have exhausted their stocks and have occasion to make more iron. The question is how long it will take to exhaust the stocks, for in time there will be reductions in freight rates, affecting the cost of assembling the raw materials at blast furnaces, and in all probability further wage reductions also.

Standard furnace coke has sold in single carload lots, to miscellaneous consumers, at $3 net to the consumer, brokers being allowed 10 or 15 cents margin. No sales to furnaces are reported. Considering the circumstances, it is thought probable that a furnace could buy, in fair sized lots, at about $2.75. Only a month ago furnaces thought they had made a great discovery when they found that if they offered a sufficiently attractive order they could probably buy at $3. Foundry coke is easier, and can be picked up at $4.25 for ordinary brands, some special brands being held at $4.50 and $4.75.

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## CANADA NOT BUYING

**Table of exports from Britain and United States—British exports of iron and steel to Canada show marked decrease.**

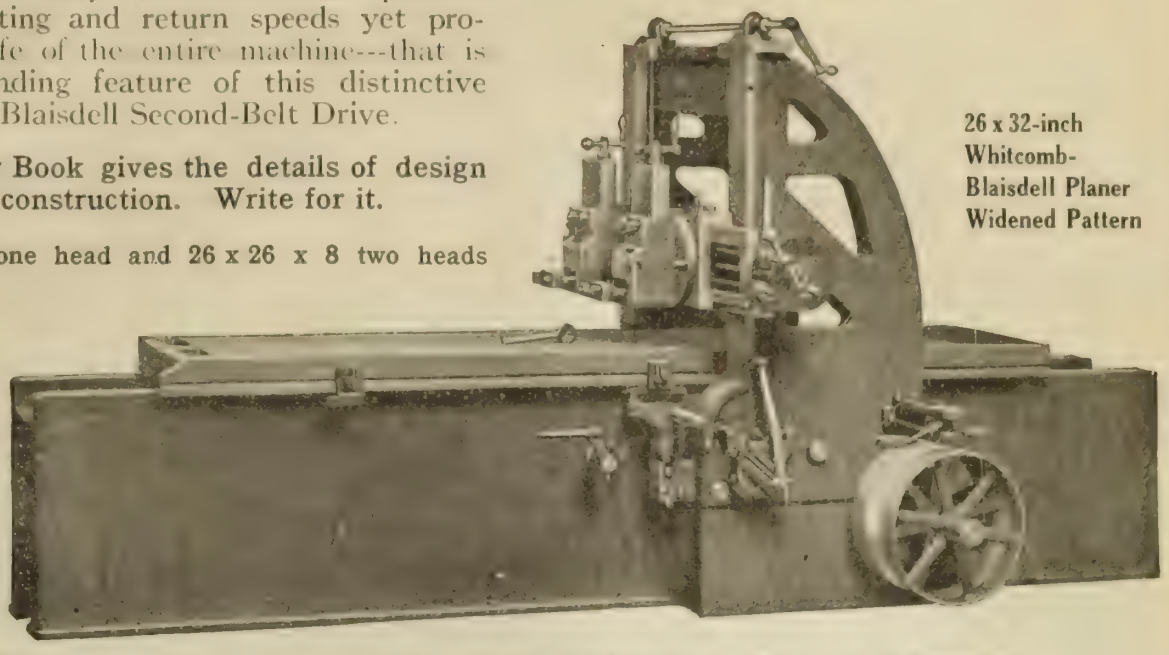
According to the latest reports, the buying of British iron and steel by Canadian consumers has almost disappeared. American steel, however, continues to be shipped into Canada in large quantities. In 1912 and 1913 Canada was a rather good customer of Great Britain, but since the war the majority of this business has disappeared. Below is given a table, which shows clearly the change in the situation. The data shows the mon-

# The Planer with the Second-Belt Drive

A smooth, easy reverse---which permits higher cutting and return speeds yet prolongs the life of the entire machine---that is the outstanding feature of this distinctive Whitcomb-Blaisdell Second-Belt Drive.

**Our Planer Book gives the details of design and construction. Write for it.**

**24 x 24 x 6 one head and 26 x 26 x 8 two heads in stock.**



**26 x 32-inch Whitcomb-Blaisdell Planer Widened Pattern**

## THE A. R. WILLIAMS MACHINERY CO., LIMITED

**Halifax, St. John, Montreal, Winnipeg, Vancouver**

**If it's Machinery—Write "Williams"**

**64 Front Street West TORONTO**


thly exports of iron and steel in gross tons over certain periods.

| | —Tons per month— Gt. Britain to Canada | Un. States to Canada |
|---|---|---|
| 1912 | 12,000 | 82,400 |
| 1913 | 12,200 | 82,000 |
| 1919 | 1,000 | 43,400. |
| 1920* | 2,300 | 55,286 |

*May to December.

This data clearly points out that in 1919 British exports of iron and steel to Canada were only 1,000 tons per month, or one-twelfth what they were in 1912. American exports to Canada fell in 1919 to about one-half the pre-war rate, but recovered substantially in 1920. That Canadian steel production has not been a factor is evident from the fact that the 1920 output was not far from the 1913 output. It was a case of 1,108,939 tons in 1920, against 1,168,993 tons in 1913.

## OPPORTUNITY FOR CANADIANS

DISCUSSING his experience in trying to gather up some Canadian lines to represent in South America, a commission merchant made some pointed references to the attitude of Canadian firms toward export trade. Speaking to this paper he said: "There is a great opportunity for many Canadian lines at present. The exchange situation is favorable to Canada, and freight rates are lower than for some time, and there is a splendid connection too. There is a preference there for British goods. I have seen about thirty-five Canadian firms, and in not over half a dozen have I found that there is a keen interest in export business. One of the chief difficulties is that they do not want to quote a price outside of this country. They will quote me at their factory or on board a boat at Montreal, but if I asked for a price in some South American center, they would not give it to me, and until they are prepared to do so there is very little chance of them sending any of their goods to that country.

"Without any slight on this country, I can say that many of the firms I call on do not know anything about it. They know where it is, and that is about all. They have about as good a knowledge of Canada as the average Canadian has of South America. In order to do business successfully the Canadian must be prepared to put the best quality in his goods, for he is coming into competition with the rest of the world. He has to reduce his prices to the money of that country, and he has to quote right there in their own language, which for the most part is Spanish.

"Just imagine going from Canada to Buenos Aires, where I am established, 8,000 miles away, and telling a customer there that a certain article could be secured in Toronto, Canada for $500. Many of them would have to find out where Toronto, Canada was, as a starter. Then they would have to find out what the freight rates were in this country, and what schedule the firm had. They would have to learn the shipping rates on the ocean, and the rates of duty. I can tell the Canadian exporter, or would-be exporter, very plainly, that the South American is not going to that trouble because the goods are to be had from other countries, laid right down there with all prices and figures furnished in their own tongue and their own currency.

"Canada ought to be able to do well in that country, but firms here will have to show first that they are seriously desirous of getting the business there. Too many of them seem to think that the people down there are looking here for goods. They are not, but they would take Canadian goods in preference to German, and the exchange gives them an advantage over the United States prices."

## Pig Iron Markets

The operation of blast furnaces and steel works is slightly below the rate of last week. The Carnegie Steel Company has blown out another blast furnace and now has only 14 in operation out of 59. There is no longer any strict adherence to the prices announced by the Steel Corporation as effective April 13th. Reports have gone through the trade that a formal announcement of lower prices would be made July 1st. Market developments appear, however, to be making any such formality unnecessary. Producers are meeting competition as it develops.

Some producers or dealers on the Pittsburgh market have been induced to cut prices even for the small amount of business that is being placed, and this week Bessemer, basic, and mill iron are at least 50 cents per ton lower, while foundry is $1.00 lower. Demand for foundry iron is mostly for carload lots, and standard grades can be bought in this way at $21.50 Valley furnace for No. 2 foundry, with reports that $21 has been done.

Several sales at Chicago indicate another drop in the market of 50 cents a ton. Two 500-ton lots of Northern foundry were sold in Chicago and vicinity at $20.50 base furnace and a car or two lots have been moved at the same price.

The St. Paul Railroad purchased 700 tons of malleable and 100 tons of No. 1 foundry and is reported to have paid $20.50 base furnace. 1,000 tons of foundry iron was bought by a Wisconsin sanitary goods manufacturer. Although prices have declined without interruption since last fall, there are those who believe that a reaction may occur in the near future. Only two blast furnaces in this district are on merchant iron, one of them being a steel works stack. The blowing out of either one would tend to stiffen the market as stocks on furnace yards are not large.

On the Boston market a circular addressed to the New England trade offering a nameless iron in 1,000-ton lots, with a Buffalo freight rate, at $21.75 for either silicon 1.75 to 2.25 or silicon 2.75 to 3.25, August and September delivery, followed by an inquiry for 5,000 tons silicon 1.75 to 2.25 from the H. B. Smith Co., Westfield, Mass., which will be closed this week, brought out new low prices for this movement on Buffalo and eastern Pennsylvania. The circular offer was met by one of $21.50 for silicon 1.75 to 2.25 with 50 cents differentials by a northern furnace. Buffalo iron is reported as offered the Smith company at $20 shipping point, which with freight brings the delivered price to $25.16.

Buffalo reports that keen competition in Buffalo iron has developed with the effort of a mill interest to sell its pig iron ordinarily used in its steel activity. No startling orders however, have been booked, although one inquiry for 5,000 tons from New England is mentioned. The total inquiry of one maker for the week was 7,000 tons, much of it being for delivery for the latter part of the year, but conforming to the policy which has prevailed for some time, quotations are refused.

At Philadelphia so little business is being done that prices are stationary. A few weeks ago, Eastern furnaces determined to go no lower than $24 for No. 2 plain, $25 for No. 2X and $26 for No. 1X f.o.b. furnace, and they have apparently adhered to these quotations. There has been no temptation to cut on orders as they have been chiefly for carload lots

The Cincinnati market has been very quiet during the week. The largest reported sales were 320 tons to the National Cash Register Co., Dayton, Ohio, and two others of 200 and 100 tons respectively. Inquiries are confined mostly to carload lots. Chicago iron is being quoted into this district at $21 and much of the iron sold comes from that district.

At New York Buffalo iron is offered for sale as low as $20.75 furnace for No. 2X and even lower prices are rumored. The steel companies in Buffalo now seem to be more active than merchant furnaces in trying to sell iron. An inquiry for 1,000 tons of foundry iron for export to Japan has been received. It would be possible to import foreign pig iron at low prices, but there is no demand for it. Extreme dullness prevails.

## POINTS IN WEEK'S MARKETING NOTES

**There is a general dropping off in the production of steel, some mills closing indefinitely.**

**Manufacturers of steel implements and machinery do not want a general drop in the price of steel in the present market condition.**

**There has been a straight decline in the prices of sheets, and they are selling in some cases at lower than the quoted prices.**

**General price readjustment will have been completed by the beginning of August, though there may be isolated cases after that date.**

**The scrap market continues to be inactive, and where quotations are given they show further declines.**

**Pig iron prices are stationary in most cases, but there have been some price changes, always to a lower level.**

## Scrap Metal Markets

On the Pittsburgh market reports have been made by the local dealers to the effect that conditions are worse in the past week, consumers absolutely refusing to listen to offers of scrap even at very low prices, saying they do not need it and will not buy until general conditions are better. Most consumers of scrap in the Pittsburgh and Valley districts are not operating at more than 20 to 25 per cent. of capacity and say they have enough scrap to run them at this rate for two or three months.

At Chicago most grades of scrap have declined 50 cents a ton or more. Buying is being done very sparingly by consumers. 1,000 tons of heavy melting steel was recently purchased at $11 per gross ton, 100 tons of No. 1 wrought at $9.50 per net ton, and 150 tons of No. 1 bushelling at $8.75 per net ton.

Although quotations have not been lowered, the market for machinery cast appears softer. A nearby foundry bought 100 tons No. 1 at $18, delivered, the high price of the week. Stove plate is easier due to the withdrawal of a Norwood, Mass., buyer from the market.

At Philadelphia scrap is being offered by many dealers and there are few places to which it can be shipped. As a result prices show further declines. For delivery at consuming points in this district, No. 1 heavy melting steel is quoted at $11.00.

New York reports that one New York broker is paying $7.50 or heavy melting steel, though $7 is the more common price. Cast scrap has been the most active item, but the market as a whole is inactive and it is believed that the bottom has been reached.

At Cleveland the market shows no change, expecting that prices have further declined on most grades. Many dealers are making no effort to do business. About the only activity reported is the purchase of mixed borings and turnings and compressed steel in lots of 500 tons and under by the Weirton Steel Co. Car lots of heavy melting steel are being picked up by dealers at $10.

## Trade Gossip

The Scottish steel interests are greatly stirred by the fact that for the first time in history a United States concern has secured a valuable contract for the supply of steel axles to the state railways of India. Glasgow firms were thirty per cent. over the United States quotation for the contract. It is said that the value of the contract runs into six figures.

Tenders will be called shortly for erection of garage to cost $45,000 for A. Benoit, 96 Parc Georges Etienne Cartier, Montreal.

A studio and garage are being built by A. T. Van Buskirk, 95 Lawton Blvd., Toronto, at a cost of $15,000.

Walter McLean, Wallaceburg, Ontario, is contemplating the erection of a planing mill.

The Provincial Paper Mills Co., Ltd., 56 University Ave., Toronto, are planning the erection of a boiler house at Mille Roches, Ont.

The Branson System of joist mould forms has been adopted for an office building costing $2,000,000 for the Canada Cement Co., 273 Craig St. W., Montreal. This building will be erected by the Canadian Steel Co., Ltd., 95 King St. E., Toronto, and 345 Union Ave., Montreal.

The Canadian Pacific Railway Company are contemplating the erection of station costing about $17,500 at Cardston, Alta.

Plans are being prepared by D. M. Morrison, architect for addition to car barns for London and Port Stanley Railway.

### ELECTRIC TRAMRAIL

The Cleveland Crane & Engineering Co. have recently developed what is known as an electric tramrail, which operates overhead like a crane yet is so flexible in character that it is said to be able to reach any desired corner of the plant.

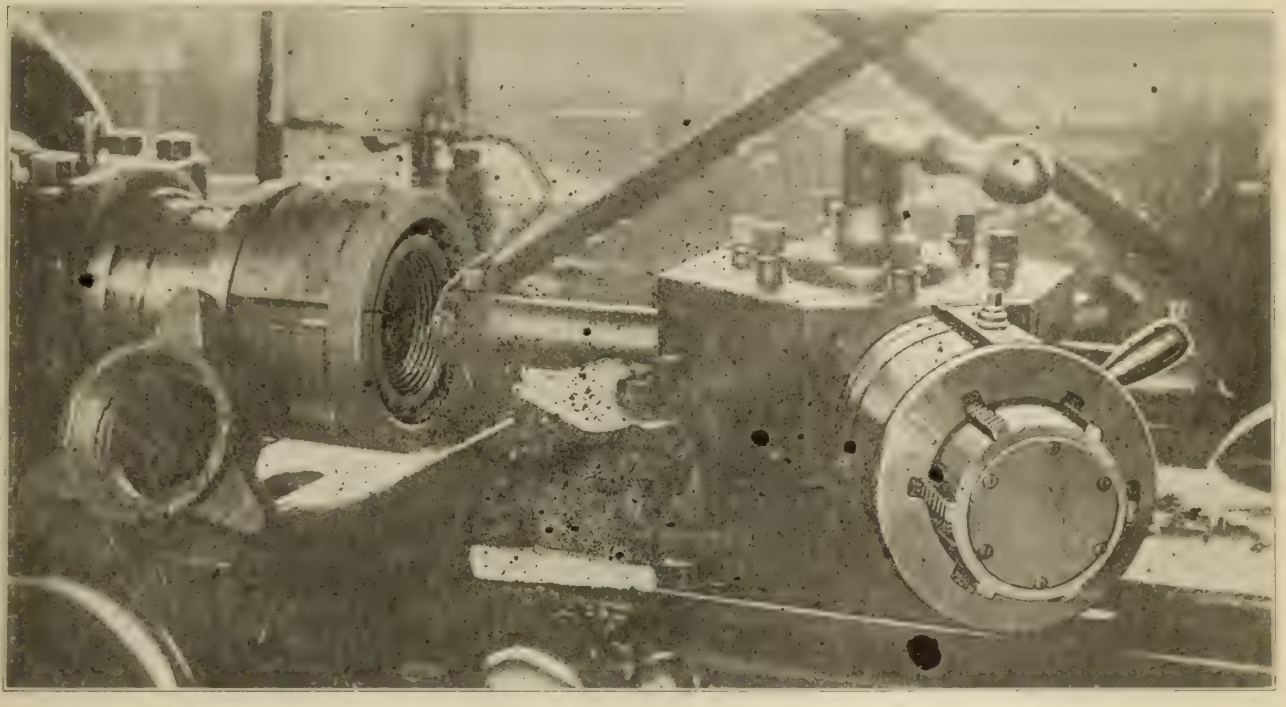
This device is used for handling material in all lines of industry, and is said to be so simple in design that any mechanic can lay out, order and install the system, including switches, curves, turntables, etc.

Another important feature is its ability to connect one department or building with another that is on a higher level up to and including a grade of 12½%. For transferring to higher levels than this, or to a floor above or below, the tramrail may be installed on any freight elevator and elevated. Consequently the tramrail can pick up its load, carry and put it down anywhere from the basement to the roof, with but one handling.

Right on the Lead

# GEOMETRIC COLLAPSING TAPS

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*The job shown is the tapping of Malleable Iron Hose Nuts, 4"–8V*

In the Railroad Shops where this photograph was taken, there are a great many Geometric Thread-Cutting Tools in use. They say their reason for using them is that they find the Tools give perfect satisfaction.

With the Geometric Collapsing Tap there is no backing out—thus cutting down the time and cutting out the waste of damaged threads. The Micrometer Adjustment allows for wear of the Chasers and keeps the size exact.

**Apply a Geometric Collapsing Tap to Your Screw Machine, Turret Lathe or Live Spindle—and Watch Production Grow**

**THE GEOMETRIC TOOL COMPANY**
**NEW HAVEN CONNECTICUT**

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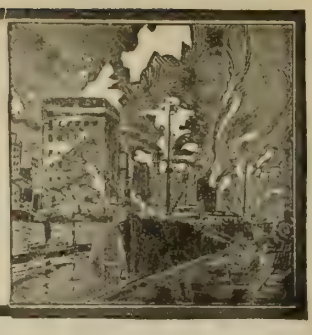
Williams & Wilson, Ltd., Montreal.

The A. R. Machinery Co., Ltd., Toronto, St. John, N.B., Halifax, N.S.



# INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES



## STOPPAGE OF COAL PRODUCTION HAS RESTRICTED OUTPUT IN METAL INDUSTRIES

In an interview with H. M. Trade Commissioner at Toronto, Canadian Machinery received some interesting information on the Machinery and Engineering Trades in England.

The outstanding feature of the past month, says Mr. Field, "has been the stoppage of coal production, which has caused the restriction of output in practically all the metal industries. As regards iron and steel, in view of the definite relationship between the price of coal and the price of materials produced, the reduction in the market price obtainable for steel products has necessitated some reduction in the cost of coal if competition with foreign countries is to be met. In this connection it is rather curious to find that while the United Kingdom is apparently exporting steel abroad at competitive rates, she is still importing supplies. While the true reason for this is not very clear, it may be suggested that the British suppliers are prepared to make some temporary sacrifice in order to retain trade which may prove much more profitable under other circumstances. Whatever may be the outcome of the crisis, a reduction in the cost of coal will doubtless be effected, with consequent effect on the prices of iron and steel and machinery and engineering products generally.

**Machinery Exported.**

Although there has been a gradual reduction in the export of iron and steel in the raw state since July of last year, no similar movement is noticeable with regard to machinery. As a matter of fact, allowing for variations from month to month due to the nomal fluctuations of trade, there is a general tendency for the export of machinery to increase. It must be remembered, however, that the volume of machinery exported is still much below the figures for the years immediately preceding the war. The value of the exports of electrical machinery is comparatively steady, for during the last 18 months it has fluctuated between £600,000 and £900,000 per month. Vehicles, on the other hand, have undergone some violent fluctuations and although the tendency was to increase during 1920, a gradual decline has taken place during the current year.

There will undoubtedly be a period following the present industrial crisis in which a reduced volume of trade is done on account of the difficulty in obtaining supplies of raw materials which are dependent on coal for their production. Unemployment in the engineering trades is high, even relatively, although the amount of orders being executed does not, on the whole, decline. While a certain amount of this unemployment is inevitable, being caused by the inaction in the coal and iron trades, there are many directions in which increased trade could be done if orders were placed now. It seems that in some markets buyers are holding off because they expect further big reductions in cost of the finished articles. Economic considerations would not, however, appear to be altogether in support of this view.

The heavier machinery trades, with the sole exception of some of the textile machinery branches, are undoubtedly in want of as many orders as they can get for execution and delivery over an extended period. If buyers are afraid of being caught by a reduction in the cost of articles it is always possible to make an arrangement similar to the one in operation during the war by which the ultimate price varies in accordance with the costs of production. Such a clause, which undoubtedly protected the seller during the period of rising costs, would similarly operate for the protection of the buyer while prices are coming down. Orders should not therefore be postponed because of the possibility of a change in the purchasing power of money.

## WHY CANADA'S MILLS LOST RAIL ORDER

**Conditions Made it Impossible to Handle the Business in This Country.**

The recent announcement from Toronto that the Transportation Commission had placed an order for 4,000 tons of rails in the United States, because Canadian mills could not compete with the prices offered across the border carried a rather unpleasant suggestion in industrial circles here. Inquiries made by The Corporation as to why it had not been able to "land" such an order for a Canadian plant, placed the inference in a much more favorable light.

In the first place the first order called for a 7-inch girder rail that has never been made in Canada before, much different from the ordinary 100-pound T rail used for steam roads. Then an alternative order called for T rails but the drilling was different and a length of 62 fet was essential as compared with the 32-foot length of the ordinary rail. This would have required new equipment in the form of hot tables, etc., and at the time the plants were starting up on an order from the Dominion Government that called for delivery on a special date. It would have been difficult if not impossible to get permission to suspend the Government order so as to complete the Toronto Commission's order.

## GERMAN GOODS FIND READY SALE

**Germany is Out to Regain Her Commercial Position. Average Daily Wage in Berlin is $1.20.**

"Germany is out to regain, on a great scale, her commercial position in the world, and at the pace she has begun, she has a good chance of achieving her objective." This briefly, is the opinion of Mr. Penton, secretary of the American Pig Iron Association, and president of the Penton Publishing Co., Cleveland, Ohio.

Mr. Penton has just returned to London, England, after investigating commercial conditions in Germany and France, and previous to this he studied conditions in England. He names the German industrial magnate. Hugo Stinnes, as the leading figure in the German World trade offensive.

"Herr Stinnes is, in the realm of commerce, what former Kaiser William was in international politics," says Mr. Penton. "The Kaiser dreamed of the political conquest of France and England, and the East. Stinnes has his dreams, too, but they are not political. Stinnes sees Germany capturing every market in the world, sees German ships in every port in the world, German banks in every business centre in the world, and Germans as pioneers in developing new territory which possesses commercial possibilities."

**Indemnity Will Be Paid.**

Regarding the payment of the indemnity by the Germans, Mr. Penton says that every industrial leader with whom he talked, including some of the biggest in Germany, plainly expressed the realization that the indemnity must be paid.

"And Germany is, I believe, going ahead to pay it," Mr. Penton continued. "For instance, Germany is going to float the biggest bond issues in the history of the world, and to institute by degrees the stiffest taxation in the world for this purpose. She expects to pay the indemnity and to build up her prosperity at the same time."

**Tells the Story.**

The figures Mr. Penton gives of the average daily wage in Europe are highly significant. In Germany it is $1.20; in Belgium, $1.60; in France, $1.70, and in England, $3.50. That goes a long way in telling the story why Mr. Penton saw German tools and machinery being bought in France in competition against French products. England, America, and almost every other country are buying some steel in Germany to-day.

"But it is really eastward, to Russia, that Germany is turning her eyes for trade. She is out to capture Russia's huge orders for manufacturers when that country begins buying again, and

# USED EQUIPMENT

4—Ed. Herbert Hack Saws.
2—16" L. & S. Lathes.
2—16" Reed Prentice Lathes.
1—20" Reed Prentice Lathe.
3—14" C.M.C. Lathes.
1—Bench Lathe.
1—¾" Cleveland A.S. Machine.
1—1¼" Cleveland A.S. Machine. . .
1—1¼" Gridley A.S. Machine.
2—2" Cleveland A.S. Machines.
1—2¼" Gridley A.S. Machine.
1—4¼" Gridley A.S. Machine.
1—Reinecker Plain Miller.
3—Cincinnati Plain Millers, Lincoln Type.
1—Hendey Centering Machine.
2—Wells Centering Machines.
1—Alfred Herbert Drill.
1—Avey Drill Press.
1—Bertram Drill Press.
1—¼" to ½" Holroyd Fluting Machine.
1—½" to 1" Holroyd Fluting Machine.
1—1½" to 2" Holroyd Fluting Machine.
1—3¼" Warner & Swasey Turret Lathe No. 2 A.
1—P. & W. Duplex Spindle Profiler No. 11.
1—No. 2 American Tool Oil Separator.
1—Hoefer Tap Threading Machine.
1—Noble & Westbrooke Stamping Machine.
1—Taylor & Hobson Etching Machine.
1—Holroyd Universal Relieving Lathe.
1—Flather Relieving Lathe.
4—A. W. Relieving Lathes.
1—Sand Blast.
1—No. 3 Walker Double Stroke Surface Grinder.
1—10" Walker Single Stroke Surface Grinder.
1—Norton Plain Grinder, 10" x 50".
2—No. 3 B. & S. Cutter Grinders.
1—Wells Grinder.
3—No. 2 B. & S. Cutter Grinders.
1—8" Heald Surface Grinder.
2—No. 11 B. & S. Plain Grinders.
2—No. 10 B. & S. Plain Grinders.
1—No. 13 B. & S. Surface Grinder.
2—No. 70 Heald Boring Grinders.
1—No. 3 Rivet Boring Grinder.
1—10" x 20" Landis Grinder.
1—12" x 42" Landis Plain Grinder.
Etc., etc.
1—Band Saw.
1—Circular Saw.
1—Aluminium Stamping Machine.
1—Wood Lathe.
1—Small Drill.
1—Morgan Eng. Tyre Rolling Mill.
1—Morgan Eng. Wheel Rolling Mill.
1—C. C. Twin, Rolling Mill Engine, 1,000 H.P.
1—Tyre Centering Press.
1—Tyre Stamping Press.
1—2,000-ton Press Steam Hydraulic.
1—1,000-ton Press Steam Hydraulic.
1—600-ton Press Steam Hydraulic.
1—Hydraulic Accumulator.
2—Tyre Charging Machines.
1—500-ton Forging Press.
1—3-ton Bertram Steam Hammer.
1—1-ton Massey Steam Hammer.
1—12 cwt. Massey Steam Hammer.
1—8 cwt. Massey Steam Hammer.
1—4 cwt. Massey Steam Hammer.
1—Brightside Roll Turning Lathe.
1—9" Boonton Rolling Mill.
1—12" Lamberton Rolling Mill.
1—Porter Allen Steam Engine, 350 H.P.
1—Todd Steam Engine, 1,000 H.P.
1—15-ton Wellman Seaver & Head Crane.
3—6-ton Heroult Electric Furnaces.
1—3-ton Heroult Electric Furnace.
1—5-ton Ladle.
7—10-ton Ladles.
1—Ladle Heater.
1—Coke Grinder.
1—7 ft. Wet Pan.
Swing Grinders, etc., etc.
1—Charging Machine, Open Hearth
1—Track Scale, 15 tons.
1—25-ton Crane, 37' 5" Span.
40—Charging Boxes.
20—Charging Box Trucks.
4—20-ton Ladles.
1—Swedish General Electric Steam-driven Generator, 375 K.W.
1—Bruce Peebles Motor Generator Set, 350 K.W. each.
Scales, Instruments, complete.
1—Tensile and Bending Testing Machine.
1—Micro-Photographic Instrument.
1—Brinell Testing Machine for hardness
1—Powdered Coal Plant, complete. Capacity, 5 tons per hour. Holbeck System.
2—500 H.P. G. & McC. Boilers.
1—2,000 H.P. Cochrane Feed Water Heat.
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Lightning Arresters.
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Current Transformers for overload relay.
Single Pole Disconnecting Switches.
3—300 K.V.A. Transformers, 22500/2200 V.
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Etc., etc.
1—Dump Car.
3—Oil Storage Tanks (underground)
Oil Pumps
1—Allis-Chalmers Electrically-driven Hydraulic Pump, capacity 550 gals per minute

## LARGE STOCK OF

**Small Tools, High Speed and Carbon Steels, Guaranteed Motors, Transformers, Etc. of all sizes for A.C. or D.C. Current**

*Plant can be viewed at Longueuil Works—Full details on application.*

## ARMSTRONG WHITWORTH OF CANADA LIMITED

**298 St. James Street - - Montreal**

[illegible] Russia's vast resources of [illegible] as the Krupp plants at [illegible] says Mr Penton. [illegible] locomotives being made for Rus[illegible]

## NEW PROVISION Re MARKING GOODS

At the session of Parliament, which closed recently, a new statutory provision was adopted which will require imported goods to be marked, where practicable, with the name of the country of origin. This new provision becomes effective on goods entering the country on and after Oct. 1st., 1921. Following are the particulars of the new provision.

That all goods imported into Canada which are capable of being marked, stamped, branded or labelled, without injury, shall be marked, stamped, branded, or labelled in legible English or French words, in a conspicuous place that shall not be covered or obscured by any subsequent attachments or arrangements, so as to indicate the country of origin. Said marking, stamping, branding, or labelling shall be as nearly indelible and permanent as the nature of the goods will permit.

Provided that all goods imported into Canada after the date of the coming into force of this section which do not comply with the foregoing requirements shall be subject to an additional duty of ten per centum ad valorem to be levied on the value for duty purposes and in addition such goods shall not be released from Customs possession until they have been so marked, stamped, branded or labelled under Customs supervision at the expense of the importer.

Provided further that if any person shall violate any of the provisions relating to the marking, stamping, branding, or labelling of any imported goods, or shall deface, destroy, remove, alter, or obliterate any such marks, stamps, brands, or labels, with intent to conceal the information given by or contained in such marks, stamps, brands, or labels, he shall be liable on summary conviction to a penalty not exceeding one thousand dollars, or to imprisonment not exceeding one year, or to both fine and imprisonment. The Minister of Customs and Inland Revenue may make such regulations as are deemed necessary for carrying out the provisions of this section and for the enforcement thereof.

It is possible that the regulations made by the Customs dept. for the purpose of carrying out the provisions of this new legislation may have to be added to as experience in its administration develops, but in any case the Customs dept. will soon be settling how the regulations will apply.

## MINING EXPOSITION ON A LARGE SCALE

The National Exposition of Mines and Mining Equipment to be held in Chicago, October 17-22 in conjunction with the 24th annual convention of The American Mining Congress, is said to be the first national exposition devoted exclusively to telling the story of the mining industries.

At the exposition each of the basic mining enterprises, iron, copper, coal, gold, silver, lead, zinc and many others will be represented by an exhibit. The salient facts in regard to these industries will be presented by means of maps, graphic charts, ore exhibits and the story of their growth will be thrown upon the screen for the benefit of visitors.

The United States Bureau of Mines is preparing a special series of motion picture films to illustrate the development of these industries and the methods now used.

**Importance of Mining Industries.**

Except when the glamor of new discoveries focuses public attention upon some phase of the mining industry, little attention is ordinarily paid to the hard work and difficult problems which confront the mine operator. Few people realize that the mining industries furnish sixty per cent. of the total volume of freight carried by the United States railroad systems or that the value of the mining products produced aggregate nearly three billion dollars annually, that the mining industry gives employment to over one million men. The mining industry is playing an important role in the new export trade development. In 1920 the exports of mine products including coal, copper and other metals, was valued at approximately six hundred million.

## BRITISH LETTER RATE IS DOUBLED

The British letter rate to Canada has been doubled, being now 4c. instead of 2c. There was a proposal to increase the postal rates on business and trade and technical newspapers sent to Canada but the Government after looking into the matter decided not to do so and when an announcement to that effect was made in the British House of Commons on June 9th it was, according to cables appearing in Canadian newspapers, greeted with tremendous applause. The Postmaster-General pointed out that even the leading daily newspapers in Great Britain opposed any increase of rates on technical and trade newspapers because it would hamper British spirit and enterprise overseas as compared with the United States and Germany and would retard the recovery of British export trade.

Sir Geo. Foster said that the British Trade Commission, of which he was a member, had found, chiefly on the evidence submitted to them in Australia, that the reason German manufacturers had secured such a powerful and increasing hold on the Australian market was their persistency in salesmanship. Sir George did not get the whole story, or, if he did, he failed to apply it. That salesmanship was spoken and written. The way for German salesmen was prepared in advance. Their advertising in the business newspapers—printed in English sometimes—preceded their salesmen for two or three years and it came to the desks of their customers weekly or monthly to supplement the calls of their salesmen—to work for them while their salesmen were not there. Germans were much better and more persistent advertisers than British in the Canadian field before the war.

### CROSS INDEXING MECHANICAL INFORMATION.

(By F. M.)

A very convenient method of indexing miscellaneous information, such as is usually accumulated from catalogues, notes and magazines, is shown by the accompanying chart. This chart may be used where the information indexed is placed in regular letter files, cabinets or most anywhere that a letter of numbered system is used.

Referring to the chart it will be noticed from the title that this index refers to "File number 1," from January 1918, to a date which is to be filled in when a new index sheet and additional file is developed. Below the title in the diagonal spaces are major titles such as Lathe, Milling, Planing, etc. In the column at the extreme left are a number of sub-titles. Intersecting lines running from both of these titles form spaces in which letter or numbers are placed and reading down from one column along the top and across from a column on the side; by noting the letter in the space which they form where they intersect, it is apparent that the subject matter so designated is filed under that letter or numeral.

For example, we will presume that it is desired to look up information that has been accumulated under "Advertising Forms." Looking along the top we find the word "Forms," and glancing down the left hand column we find "Advertise," while in the square where the two intersect, is the letter "V." One would therefore look into the file "V" for the information desired; likewise if it was desired to find information in regard to drilling machines, one would look along the top to the word drilling; along the left to the word machines, and at the intersection of the two is the letter K indicating the file to be looked up,

A chart of this nature can be easily compiled to suit individual requirements and may be more or less extensive. It can be pasted on a card and makes a very handy visible index,

### CHINA DESIRES TRADE WITH CANADA.

Writing to the Chambers of Commerce in Canada, C. C. Nieh, president of the Chinese General Chamber of Commerce at Shanghai, has the following to say:—

"Within the last decade the foreign trade of China has been doubled in spite of the revolutions and other internal disturbances. None can tell how many times greater her trade will expand during the next ten years. Her ability to supply the world markets with agricultural products and minerals is manifold; her capacity of consumption for foreign goods is multiplied by the rapid growth of modern industries. Many observers believe that China is on the verge of a great industrial revolution."

"Reviewing China's foreign trade in the past we regret to see that Canada has not taken as large a share as might be expected from her excellent transportation system with Chinese ports. This, we think, is largely due to the fact that the tremendous trade possibilities in China have not been sufficiently well-known to your business public. The Chinese General Chamber of Commerce of Shanghai, an association of some 400 representative merchants and manufacturers of Shanghai, desires to see more trade between Canada and China, and take this opportunity to express to the Canadian merchants and manufacturers its sincere wishes for closer relationship, which will, no doubt, result in mutual advantage and satisfaction, commercial and otherwise."

Here is an invitation that Canadian merchants generally would do well to look into.

# SKF



## SKF Engineers Gather the Mechanical News of the World

They come to your plant with a knowledge gained not only in Canadian plants, but in American, British, Swedish, Swiss, French, Japanese and many other industrial plants.

If your mechanical problems have been solved before in any part of the world, **SKF** engineers can tell you how it was done.

It is their mission in life to help manufacturers get:

—increased production
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—improved products.

Consult Canadian **SKF** Engineers about any problem in your plant. Their services cost you nothing.

**CANADIAN SKF COMPANY, LIMITED**

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THE "FLU" Stayed out of this PLANT

PURO SANITARY DRINKING FOUNTAIN

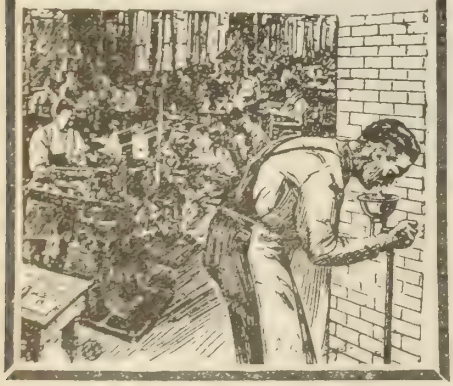
(MADE IN CANADA)

The only fountain with a bowl that prevents lips touching the bubbler paid its moderate cost over and over in all those well-ordered plants whose precautionary measures successfully barred the Spanish influenza. PURO saves lives, time and water. Write

**Puro Sanitary Drinking Fountain Co.**

888 F. St. Andrew St., Montreal, P.Q

CANADA



**BOLTS and RIVETS**

We are equipped to fill the requirements of the Marine trade promptly. Square head, hexagon head and all kinds of Machine, Deck, Carriage Bolts and Rivets.

QUALITY PRODUCTS

London Bolt & Hinge Works

LONDON, CANADA


# TORONTO FIRM SECURES CONTRACT

**Preliminaries of Detroit-Windsor Bridge Completed. Detail Design is Started—Particulars of Proposals.**

Announcement has been made by Chas. Evan Fowler, that the preliminary work on the Detroit-Windsor Bridge has been completed.

The work on the detail designs of the bridge will be begun at once. The investigations for this purpose must of necessity be very extensive, as the structure as now located and planned will be the longest and heaviest span in the world. The very great need for the highway portion of the structure, makes it advisable to proceed with the traffic bridge and complete that deck before adding the railway portion. The span will be 1,905 feet, and there will be two roadways, each 28 feet in width, paved with concrete; two 7 feet sidewalks also paved with concrete; and the two trolley tracks over which it is proposed to arrange for the operation alternately of Detroit and Windsor street cars, thus making it possible to give transfers to all parts of both cities. The current for the operation has been promised on a reasonable basis by the Hydro as soon as the new Niagara plant is completed.

### Foundations.

The foundations for the bridge will be sunk to bedrock at a depth of 100 feet by the pneumatic process, and this work will be done by the Bridge Company. The contract for the steel-work will be made as soon as the plans are fully developed, but arrangements have already been consummated whereby the wire for the cables will be furnished by the Roebling Company, who made the cables for the three great suspension bridges over the East River at New York City. These cables will consist of approximately 10,000 separate wires in each cable, with ultimate strength of 240,000 pounds per square inch. They will be placed by stringing one wire at a time until all eight cables are completed and wrapped with wire, the whole process requiring about eight months.

The contract has already been signed between the American Transit Company, which has the authority from Congress to span the river, and the Canadian Transit Company as chartered by parliament, for joint action in financing and building the bridge. The joint board of directors of eleven members will be elected in August, and the proposition of the R. T. Scott Company of Toronto, will then be accepted for the sale of the bonds for the full amount required for the construction. The proposition of this company will meet with the approval of those interested in the bridge, as it provides for a structure built and financed solely for the public benefit without profits accruing to the promoters, further than a reasonable compensation to the directors for their four to five years tenure of office.

### Electric Locomotives.

The plans as prepared by the chief engineer, who will also act as chairman of the board of consulting engineers, will be approved by a board consisting of George H. Pegram, chief engineer of the Interborough Rapid Transit Company of New York City; Col. C. N. Monsarrat, of Montreal, formerly chairman of the board of engineers of the great Quebec bridge; Pro. Wm. H. Burr, of New York, one of the board of engineers on the Panama Canal, and also for the East River bridges; Prof. C. R. Young of the University of Toronto.

The railway deck is planned to have four tracks, with the approaches on 1½ per cent. grades, and connect with the Essex Terminal Railway in Windsor, thus affording access to the Grand Trunk, Pere Marquette and Canadian Pacific Railways; and on the American side with all the railways entering Detroit. The operation would be by electric locomotives weighing about 120 tons each, which would ordinarily haul from 30 to 40 freight cars, but in emergency about 50 cars. This would provide for the increase in future years up to about five million cars per annum.

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# YOUNG MEN HAVE IDEAL OPPORTUNITY

Speaking before the graduating class of the Stevens Institute of Technology in Hoboken, the other day, Chas. M. Schwab, chairman of the board of the Bethlehem Steel Corporation, gave to the young men present some advice and encouragement that is well worth passing on.

"What would I not give—whatever of fame or wealth has come to me in life," said Mr. Schwab, "to be as one of you boys here to-day with the opportunity to live and develop in the years to come! People sometimes ask if a young man has as good opportunities as he used to have. I am not a prophet, but I firmly believe we are only now standing upon the threshold of an era which is to mark the greatest scientific and industrial advancement in the history of the world. And it is to young men like you will come the priceless opportunity to make yourselves invaluable in the rebuilding of civilization.

"I am not going to talk to you upon technical topics," he continued. "For there is something more in the world than technical engineering. I have noticed that men who have grown great in these constructive lines of effort have not relied too much upon their technical knowledge. There is one branch of engineering I wish to speak about—human engineering, the ability to collect from those with whom you come in contact the benefits of such knowledge and experience as they have accumulated.

"You will find, as I have found every day of my life, that there is nobody from whom you may not be able to learn something of value. When you go from here into the shop you will find you know some things the man in the shop does not know and probably that he knows many things that you didn't know. Keep your minds receptively open. Do not look down on the man in the shop. Do not treat him patronizingly. Try to win his regard. The best things I have learned often have come to me from the working man, ideas that have come to me from the man in the shop or the shop foreman and then have been developed perhaps by such technical knowledge as you learn here."

### IMPROVISED CASTING PATTERN.

By CHAS. E. HALL.

A jewelry manufacturing concern, having secured an order for a bishop's crozier in sterling silver 6 ft. 6in. high, which was to be made according to a specified design, and such articles not being in every-day demand, it was essential that the cost be kept as low as possible, particularly on account of the difficulty of estimating on a first order of this nature.

The crook section was about 18" over all, and a gradual taper from 1" in diameter at the large end, to ⅜" in diameter at the other. A local pattern-maker quoted $35.00 for a core box and pattern, a price which the estimate made prohibitive. It was decided to make the pattern in the shop, and the method adopted may help out in other fields.

A tracing was made of the outline of the crook from the drawing, with a center line drawn the entire length, as in Fig 1., and primed down on the drawing board. A piece of wire was bent to conform to the center line to obtain the exact length, and a straight tapered wooden pattern turned up, the length of the wire, ⅞" thick at the large, and ¼" at the small end. In other words, less two thicknesses of metal or ⅛". A piece of 2" pipe of suitable length, was used as a moulding box, and the wooden pattern rammed up in sand, and a lead cast taken. This was filed smooth and bent to conform to the shape of the crook, and lightly coated with bees-wax. Strips of paper were wrapped round the lead core; shellaced, and allowed to set. There happened to be on hand a few bolts of damaged silk ribbon about ½" wide which came in very handy.

This was then wound on, shellacing each layer, till it was built up to the diameter of the crook. Two or three layers of paper were now added, to allow for filing and polishing, and when perfectly hard, was cut into two halves with a sharp knife—as shown at Fig. 2, and lifted off the lead core, the bees-wax preventing it from sticking. Using these as patterns, the two halves were cast in silver, filed flat on the edges, hard soldered together, and the crook filed up.

By this method the whole job of making the pattern only occupied about three hours, which was a decided saving on a pattern and core box at $35.00.

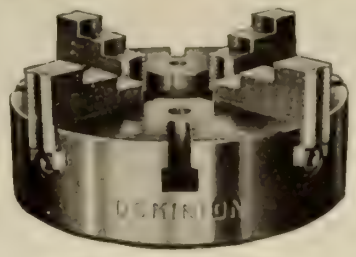
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### HAS QUADRUPLED IN CANADIAN MINES SINCE 1916.

A recent report issued by the Imperial Mineral Resources bureau shows that the output of zinc from Canadian mines has more than quadrupled since 1916.

Previous to that year the output was negligible and the bureau did not keep a record of it. According to figures given in the report, the output from Canadian mines in 1916 was 2,655. In 1919 production had jumped to 11,005 tons.

Reporting on the deposits within the empire the report attached special significance to the zinc-lead-silver ores in British Columbia and to the development of proper handling facilities at Trail, B.C. Much still remains to be done before the British empire can be considered self-supporting in the matter of smelter production, the report stated. In this connection the construction of a successful electrolytic-treatment plant at Trail, with a capacity of 15,000 tons of spelter a year, was given as a hopeful indication.

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STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY



All Screws Are Reversible

SCREWS are made of the best grade steel. Both ends are broached and are heat treated after machining. They are reversible, so that either end may be used, are large enough in diameter to stand the torsional strains applied by operator when setting up his work. They are made to give the best service—and may be depended upon to stand up under the hardest usage.

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*Engineers • Manufacturers*
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Send us your blueprints and specifications. Entrust your requirements to experienced workmen and up-to-date equipment. Have your dies made in Canada. First-class workmanship guaranteed.
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Special styles of all kinds to Order.
THE CLEVELAND WIRE SPRING COMPANY
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WIRE SPRINGS OF ALL KINDS
Machine Springs, Valve Springs, Automobile Cushion Springs, etc., of a quality that defies competition. Tell us your requirements. Send sample or specification for price.
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BLACK DIAMOND OVENS
OVENS
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BERTRAMS LIMITED
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Rubber Mill Machinery

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WANTED ONE 10 H.P., 3 PHASE, 25 CYCLE, 220 volts, one 25 h.p., 3 phase, 25-cycle, 220 volts. Complete with low voltage release starter, base and pulley. Box 781J, Canadian Machinery.

## SALESMAN WANTED

WANTED - BY WELL-KNOWN AMERICAN manufacturers of pneumatic tools enterprising salesman for Canadian field. Reply giving full experience, present connection, etc. All replies will be treated in confidence. Box 782N, Canadian Machinery.

## MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

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UP-TO-DATE MACHINE SHOP FOREMAN desires change, as foreman, general foreman or superintendent. Age 37. Apply Box 783, Canadian Machinery.

**MACHINE WORK WANTED**

We are equipped to handle all kinds of general or special machine work. All operations in our plant are done under the most careful supervision and we can satisfy you as to price. Always available for consultation.

**PERFECT MACHINE COMPANY, GALT**

Builders of Reliable Machinery.

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GENERAL MACHINE WORK

Turret Lathe and Automatic Screw Machine a Specialty. Let us quote on your work.

*With:* Garlock, Walker Machinery Co. 163 Dufferin Street.

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**WIPING CLOTHS**
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**98 John Street**
**TORONTO, ONT.**

*Prices on application*

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BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

**Used Machinery For Sale**

Slightly used Davis Bournonville Welding and Cutting Outfit, perfect condition, will sacrifice. Box number 784, CANADIAN MACHINERY.

**Used Machinery For Sale**

1—18" x 8' Mueller Lathe.
1—24" x 24" x 6' Putnam Planer.
1—32" Bandsaw.
1—30" Foot Squaring Shear, Brown Beggs.
1—96" Power Squaring Shear, Brown Beggs.
1—No. 3 Greenard Arbor Press.
1—10,000 lb. Olsen Testing Machine.

**CHAS. P. ARCHIBALD & CO.**
**285 Beaver Hall Hill, Montreal**

**Modern Marine Machinery**

Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

**Used Belting, Pulleys, Etc.**

We carry right in stock a large quantity of used Belting, Pulleys, Hangers, Shafting, etc., in good condition, which we sell at half the price of new. Inquiries solicited. In writing mention sizes wanted. L. S. Tarshis & Sons, 92 Wellington St., Montreal.

Machine Shop and Foundry for sale, St. Catharines, Ont. In the centre of the Welland Ship Canal and Hydro activities. Going concern capable of handling all classes of work. Turnover $50,000 a year. Good reasons for selling. Box 777, Canadian Machinery. (c5m)

**RATE FOR CLASSIFIED ADVERTISING**

Rates (payable in advance): Two cents per word. Count five words when box number is required. Each figure counts as one word. Minimum order $1.00. Display rates on application.

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WANTED—BY AN ESTABLISHED CONCERN. Twelve to fifteen thousand dollars for a period of from one to three years, to take care of business expansion. This concern will stand the fullest investigation. 8% is offered with ample security to principals only, with an opportunity of becoming permanent associates with the partners, if mutually satisfied. Box 767, Canadian Machinery. (etfm)

## FOR SALE

ELECTRIC STORAGE BATTERY LOCOMOtives for sale. Two. 36-inch gauge. Complete and in good condition. R. T. Gilman & Company, Dept. "E," 211 McGill Street, Montreal. (ctfm)

MOTORS FOR SALE — 5 H.P. CAN. GEN. Electric, 2-phase, 60-cycle, 1800 r.p.m., switch starter; 20 h.p., Fairbanks-Morse, 2-phase, 60-cycle, 1200 r.p.m., Auto starter (without low voltage release); 25 h.p., Can. Gen. Electric, 2-phase, 60-cycle, 1000 r.p.m., no starter; 30 h.p., Westinghouse, 2-phase, 60-cycle, 945 r.p.m., Auto starter (without low voltage release); 3 h.p., Westinghouse, 2-phase, 60 cycle, 1700 r.p.m., switch starter; 1 Smart-Turner Triplex Belt-driven Pump, 2 x 3. Box 780J, Canadian Machinery.

**Grey Iron Castings**

Light and Medium-Bench and Floor Repetition Castings; Capacity 15 tons per day.
Expert Metal and Wood Pattern Work. Our advice and estimates will save you money.
Semi-finishing operations on Lathe or Grill on Castings supplied if required.
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**THE KATIE FOUNDRY, GALT, ONT.**

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**DIES, PRESS WORK**

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Will handle medium Specialty Line — Manufacturing and Selling

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**CANADIAN MACHINERY**

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### 3 Phase, 60 Cycle

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| KVA 20 | 2300 | Fairbanks-Morse | 1800 |
| 25 | 2300 | Ft. Wayne | 1800 |
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| KVA 35 | 2300 | Allis-Chalmers | 1200 |
| 37½ | 2300 | Westinghouse | 1200 |
| 42 | 2300 | Electrical Machinery | 1200 |
| 45 | 1150 | General Electric | 1200 |
| 50 | 550 | Crocker-Wheeler | 1200 |
| 50 | 2300 | Fairbanks-Morse | 300 |
| 50 | 2300 | General Electric | 900 |
| 60 | 2200 | Warren | 600 |
| KVA 60 | 2300 | Electrical Machinery | 900 |

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Deep Drawing Crown Fender Stock—Deoxidized—Oiled.

10,200 lbs., 23 Ga., 30" x 96" Primes
5,785 lbs., 23 Ga., 30" x 96" Seconds

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8,265 lbs., 22 Ga., 30" x 96" Primes
1,435 lbs., 22 Ga., 30" x 96" Seconds

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20,765 lbs., 20 Ga., 30" x 96" Primes
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3,220 lbs., 18 Ga., 39" x 96" Primes

Cold-Rolled Strip Steel and Bars.

Sheets—Black, Galvanized, Brass, Copper Aluminum.

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**Over 20,000 square feet in our warehouse is filled with every variety of Equipment for Machine Shops and Woodworking Factories.**

**You will find Garlock-Walker service thoroughly dependable. Let us know what Machinery you require.**

**If you want Machinery Equipment, send us your enquiries.**

**A few Machines from our Toronto stock at exceptionally attractive prices are:—**

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1—144" x 12' Berg Pit Lathe (used).
1—36" x 18' Putnam (used).
1—30" x 12' Blaisdell (used).
1—30" x 14' Niles-Bement-Pond (used).
1—26" x 14' Niles-Bement-Pond (used).
1—24" x 10' Milwaukee (new).
1—20" x 6' Le Blond Heavy Production (used).
1—18" x 8' Bertram (rebuilt).
1—18" x 8' Rae (new).
1—16" x 6' Reed (used).
1—12" x 8' LeBlond (used).
1—8" Rivett, Bench, Cabinet and Attachments (used).
1—7" Cataract Precision, Standard Equipment.

**GAP LATHES**

1—22" x 40" x 16' McDougall (used).
1—20" x 38" x 12' C. M. C. (used).
1—18" x 24" x 10' Rahn Meyer (used).

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Several No. 4 Millhollands, Davis, Oliver, Garvin, Warner & Swasey, and National Acme.

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1—16" Rae B. G. Crank Shaper (new).
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1—42" x 42" x 20' Putnam, 1 Head (used).
1—48" x 48" x 14' Patch, 4 Heads.
1—36" x 36" x 24' Sellers, Open Side (3 Heads).
1—30" x 30" x 10' Pond, 1 Head.

**MILLING MACHINES**

1—Briggs High Duty Type "A", 22" Traverse (new).
1—Briggs High Duty Type "B" 42" Traverse (new).
1—Ryerson-Owen No. 3, Universal (new).
1—Ford-Smith, No. 3 Universal (used).
Several Plain and Small Hand Millers.

**DRILLS**

1—10" Burke Sensitive Bench (new).
1—15" Rockford (used).
1—16" No. 2B Edlund H. S. Sensitive (new).
20" "Sibley," "Champions," "Rockwell" and "Silver" (new and used).

**BORING MILLS**

1—Universal No. 2½ Horizontal, Table 42" x 22" (used).
1—Bullard "New Era" Type Vertical Turret, 36", Complete Equipment (new).

**POWER HACK SAWS**

1—No. 10 Racine 8" x 8" Cap. (new).
1—No. 7 Watkins, 9" Cap. (used).
1—No. 1 Racine, 6" x 6" Cap. (used).

**GRINDING MACHINES**

1—Landis No. 4 Universal (used).
1—Landis Plain, self-contained, 36" x 12" (used).
1—Fitchburg Cylindrical, 8" x 36" (new).
Tool and Cutter Grinders. New and used. "Globe," Stevens, LeBlond and Cincinnati.

**AIR COMPRESSORS**

1—8" x 8" Sullivan, Class W.G.-3, belt driven (used).
1—8" x 10" x 8" Bury, steam driven (used).
1—12" x 18" Ingersoll-Sargent, belt drive (used).
1—12" x 12" Can. Ingersoll-Rand, N.-E.-1 (used).

**PRESSES**

1—No. 0 Consolidated Inclinable Power Press (used).

**MISCELLANEOUS**

2—No. 4 Jno. Hall Pipe Machines (1 used), (1 new).
1—No. 4 Jno. Hall Nipple Machine (used).
1—Lennox Rotary Bevel Shear, 1" cap. (new).
1—6" Curtis Pipe Machine (used).
1—Beaudry Champion Power Hammer, No. 9 (used).
1—Grant Rivet Spinning Machine, No. 80A (new).
1—Grant Rivet Spinning Machine, No. 80B (used).
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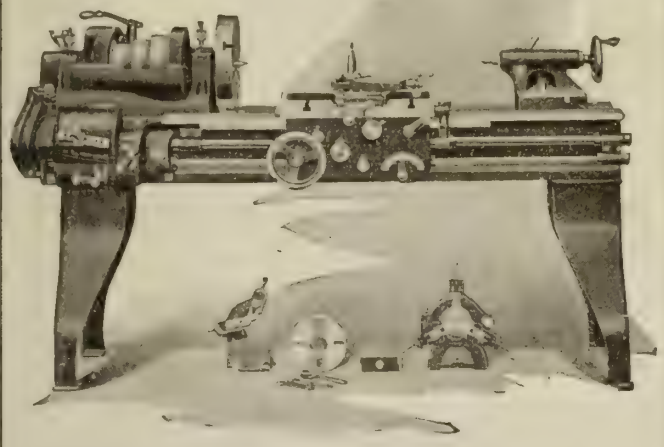
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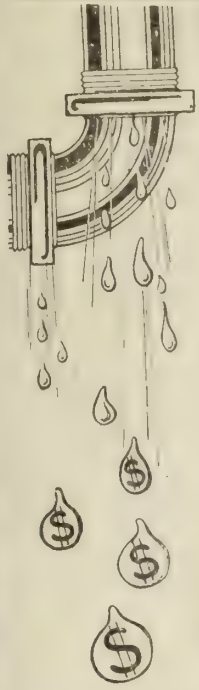
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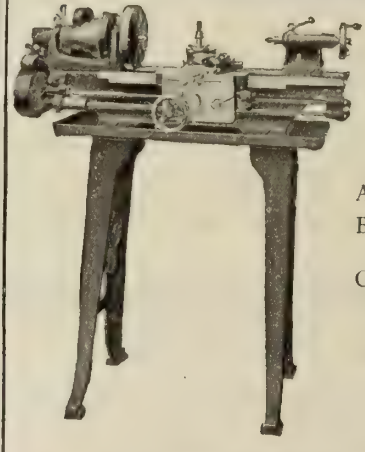
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Oakey & Sons, Ltd., John, London, S.E., Eng.

**Abrasive Materials**
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[illegible] Abrasive Wheel Co., Ltd., Montreal, Que.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.
[illegible] Grinding Wheel Co. of Canada, Ltd., [illegible], Ont.

**Acetylene, Dissolved**
L'Air Liquide Society, Toronto, Ont.

**Accumulators, Hydraulic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Air Cocks**
[illegible] Sanitary Drinking Fountain Co., Haydenville, Mass.

**Air Lifts**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Analyses, Chemical**
Toronto Testing Laboratory, Toronto, Ont.

**Angle Bars**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Anvils**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Columbia Hdwe. Division, Cleveland, O.
Petrie, Ltd., H. W., Toronto, Ont.

**Arbors**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Cleveland Twist Drill Co., Cleveland, O.
Ford Smith Machine Co., Hamilton, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Jacobs Mfg. Co., Hartford, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.

**Axles, Car**
Dom. Foundries & Steel, Hamilton, Ont.

**Babbitt Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.

**Balls, Brass, Bronze and Steel**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian SKF Co., Toronto, Ont.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

**Barrels, Tumbling**
McDougall Co., Ltd., R., Galt, Ont.

**Bars, Boring**
Armstrong Bros. Tool Co., Chicago, Ill.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Madison Mfg. Co., Muskegon, Mich.

**Bars, Boring, Portable**
Underwood Corp., H. B., Philadelphia, Pa.

**Bars, Bronze Cored**
Moore & Son, Thos., Montreal, Que.

**Bars, Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Bars, Steel**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.

**Bearings, Ball**
Canadian SKF Co., Toronto, Ont.
Canadian Double Ball Bearing Co., Toronto, Ont.
Long Mfg. Co., Guelph, Ont.
[illegible] Tube & Supply Co., Montreal, Que.
[illegible] Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Railway Roller Bearing Co., Syracuse, N.Y.

**Bearings, Bronze**
Railway Roller Bearing Co., Syracuse, N.Y.

**Bearings, Die-Cast**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Tallman Brass & Metal Co., Hamilton, Ont.

**Bearings, Journal**
Fisher Motor Co., Ltd., Orillia, Ont.

**Bearings, Roller**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Long Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

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McLaren Belting Co., J. C., Montreal, Que.

**Belt Dressings and Fillers**
Aikenhead Hardware Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.

**Belt Fasteners**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Belt Hooks**
Torrington Co., Ltd., Upper Bedford, Que.

**Belt Lacing**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

**Belt Lacing, Steel**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing, Hinged**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing, Flexible Steel**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing Machines**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
McLaren Belting Co., J. C., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

**Belt Joiners, Conveyor**
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Tools**
Graton & Knight Mfg. Co., Worcester, Mass

**Belting, Chain**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Belting, Fabric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
McLaren Belting Co., J. C., Montreal, Que.
Sumner & Co., New York City.

**Belting, Leather**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Smith Belting Co., Toronto, Ont.
Sumner & Co., New York City.
Tullis & Son, Ltd., John, Glasgow, Scot.

**Belting, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.
Quaker City Rubber Co., Philadelphia, Pa.

**Belts, Abrasive**
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.

**Bench Countershaft Standards**
Ford-Smith Machine Co., Hamilton, Ont.

**Benches, Work**
Aikenhead Hardware Ltd., Toronto, Ont.

**Bending Machines, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bertrams Ltd., Edinburgh, Scotland.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Bins, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Blocks**
Ford Chain Block Co., Philadelphia, Pa.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Chain (See Hoists, Hand)**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.

## For list of Dealers see the last page of This Buyers' Directory

Ford Chain Block Co., Philadelphia, Pa.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Blocks, Die**
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Blocks, Pillow**
Can. Link-Belt Co., Toronto, Ont.

**Blowers**
Can. Blower & Forge Co., Ltd., Kitchener.
General Combustion Co. of Can., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Bolt and Nut Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Bolt and Nut Machinery, Automatic**
National Acme Co., Cleveland, Ohio.

**Bolts and Nuts**
London Bolt & Hinge Works, London, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Petrie, Ltd., H. W., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Bolt Threading Die Heads**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa

**Boosters**
Sturtevant Co., B. F., Boston, Mass.

**Boring and Turning Mills, Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.

**Boring, Drilling and Milling Machines, Horizontal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa.

**Boring, Drilling and Milling Mach., Vertical**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Boring Heads**
Aikenhead Hardware Ltd., Toronto, Ont.

**Boring Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Gisholt Machine Co., Madison, Wis.

**Brakes, Magnetic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Brass**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Brass Valves**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Brass Pipe Fittings**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Bricks, Fire**
Elk Firebrick Co. of Can., Ltd., Hamilton, Ont.

**Bridges**
Hamilton Bridge Works Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

**Broaching Machines**
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Bronze**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bronze, Phosphor**
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Bucket Carriers, Pivoted**
Can. Link-Belt Co., Toronto, Ont.

**Buffing or Polishing Machines (See Polishing and Buffing Machines)**
Blount Co., J. G., Everett, Mass.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O

**Bulldozers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Burners, Oil and Gas**
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

**Bushings**
Fisher Motor Co., Ltd., Orillia, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Cabinets, Oil**
S. F. Bowser & Co., Ltd., Toronto, Ont.

**Calipers**
Brown & Sharpe Mfg. Co., Providence, R.I.
Starrett Co., L. S., Athol, Mass.

**Cams**
Canada Foundries & Forgings Co., Welland, Ont.

**Can-Making Machinery (See Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

# BUYERS' DIRECTORY

**Cars, Ore**
MacKinnon Steel Co., Sherbrooke, Que.

**Castings, Aluminum**
Canada Electric Castings Co., Ltd. Orillia
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.

**Castings, Brass and Bronze**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Canada Electric Castings Co., Ltd. Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.

**Castings, Copper**
Canada Metal Co., Ltd., Toronto, Ont
Can. Hanson & Van Winkle Co., Toronto, Ont.

**Castings, Marine**
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Castings, Die Molded**
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Ferro-Alloy**
Can. Steel Foundries, Montreal, Que.

**Castings, Iron**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co. Ltd. Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont
Dominion Engineering Works, Limited, Montreal, Que

**Castings, Hyd. Press**
Can. Steel Foundries, Montreal, Que.

**Castings, Malleable Iron**
International Malleable Iron Co., Guelph, Ont
Kennedy & Sons, Ltd., Wm., Owen Sound, Ont.
Smith's Falls Malleable Castings Co., Smith's Falls, Ont.

**Castings, Monel Metal**
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

**Castings, Naval Bronze**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Castings, Nichrome**
Can. Driver-Harris Co., Walkerville, Ont.

**Castings, Nickel**
Can. Hanson & Van Winkle Co., Toronto, Ont.

**Castings, Semi-Steel**
Davidson Mfg. Co., Thos., Montreal, Que.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man
Dominion Engineering Works, Limited, Montreal, Que.

**Castings, Steel**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

**Cements, Iron**
Smooth Mfg. Co., Jersey City, N.J.

**Centering Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

**Chains (See Sprockets and Chains)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chains, Driving**
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

**Chasers**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chemists**
Toronto Testing Laboratory, Toronto, Ont.

**Chucking Machines**
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steptoe Turret Machine Co., Madison Wis.
Warner & Swasey Co., Cleveland, Ohio

**Chucks, Drill**
Jacobs Mfg. Co., Hartford, Conn.

**Chucks, Drill and Tap**
Aikenhead Hardware Ltd., Toronto, Ont
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Lathe**
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

**Chucks, Magnetic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Chucks, Planer**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Chucks, Vertical Boring Mill**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

**Clamps, Machinists'**
Columbia Hdwe. Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill
Starrett Co., L. S., Athol, Mass.

**Cleaners, Metal, Waste, General**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Clocks, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Clutches, Friction**
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

**Coal and Ash Handling Machinery**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Coal-Storage Systems**
Can. Link-Belt Co., Toronto, Ont.

**Cocks and Faucets**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Collars, Shaft or Set**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

**Collets**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Compounds, Carburizing, Case Hardening and Tempering**
Cataract Refining Co., Toronto, Ont.

**Compounds, Cleaning**
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont
Oakley Chemical Co., New York, N.Y.

**Compounds, Cutting, Drilling, Grinding, Screw Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Compressors, Air**
Curtis Pneumatic Machinery Co., St Louis, Mo.

**Compressors, Air and Gas**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que
Petrie, Ltd., H. W., Toronto, Ont.

**Cones, Friction**
Norton Co. of Can., Ltd., Hamilton, Ont.

**Connecting Rods and Straps**
Canada Foundries & Forgings Co., Welland, Ont.

**Contract Work**
Ford-Smith Machine Co., Hamilton, Ont
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Victoria Foundry Co., Ltd., Ottawa, Ont.

**Conveyors and Elevators (See Elevators)**
Jones & Glassco, Montreal, Que
Main Belting Co. of Can., Montreal, Que
Matthews Gravity Carrier Co., Port Hope, Ont.

**Conveyor Belt Joiners**
Flexible Steel Lacing Co., Chicago, Ill.

**Copper**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Cored Bronze Bars**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Cotter Pins**
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Counterbores**
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Counters, Revolution**
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Countershafts**
Bertram & Son Co., Ltd., The John, Dundas, Ont
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

**Countersinks**
Butterfield & Co., Inc., Rock Island Que
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Couplers, Car and Locomotive**
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont

**Couplings, Flexible**
Holden Co., Ltd., Montreal, Que.

**Couplings, Rigid**
Bernard Industrial Co., A., Fortierville, Que.

**Couplings, Shaft**
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

**Cranes, Electric**
Bertram & Son Co., Ltd., The John, Dundas, Ont
Can. Link-Belt Co., Toronto, Ont
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont
Northern Crane Works, Walkerville, Ont
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.

**Cranes, Hand (See Hoists, Hand)**
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont
Northern Crane Works, Walkerville, Ont
Sheffield Engineering Supplies, Ltd., Montreal, Que

**Cranes, Locomotive**
Can. Link-Belt Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que

**Cranes, Traveling**
Bertram & Son Co., Ltd., The John, Dundas, Ont
Can. Link-Belt Co., Toronto, Ont
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont
Northern Crane Works, Walkerville, Ont

**Crank Pin Turning Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia, Pa

**Cutters, Flue**
Holden Co., Ltd., Montreal, Que.

**Cutters, Gear**
Armstrong, Whitworth Co. of Can., Ltd., Montreal, Que
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, High Speed**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont
Kearney & Trecker Co., Milwaukee, Wis.
Madison Mfg. Co., Muskegon, Mich
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Milling**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Milling Machine Co., Cleveland
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.

**Cutters, Stay Bolt**
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Cutters, Thread**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt
Landis Machine Co., Inc., Waynesboro, Pa.

**Cutting-Off Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Etna Machine Co., Toledo, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Cutting-Off Machines, Pipe (See Pipe Cutting and Threading Machines)**
Landis Machine Co., Inc., Waynesboro, Pa.
McDougall Co., Ltd., R., Galt, Ont
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Cutting-Off Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Pilot Steel & Tool Co., Montreal, Que.

**Cutting Oil Filters (See Oil Filtering Systems)**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Cataract Refining Co., Toronto, Ont.

**Cutting, Oxy-Acetylene**
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

**Cutting, Oxy-Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Dealers, Machinery (See Searchlight Section)**
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Deckle Straps**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Diamonds, Black and Rough**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond, Carbon and Bortz**
Joyce-Koebel Co., Inc., New York, N.Y.

**Diamond Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Desmond-Stephan Co., Hamilton, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Wheel Trueing Tool Co., Detroit, Mich.

**Diamond Crossings**
Can. Steel Foundries, Montreal, Que.

**Die-Castings**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Dies, Pipe-Threading**
Jones & Lamson Machine Co., Springfield, Vt.

**Die Sinking Machines, Automatic**
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

**Die Sinkers**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Screw and Thread Cutting**
Ackworthie, Ltd., John, Birmingham Eng.
Butterfield & Co., Inc. Rock Island Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont
Jones & Lamson Machine Co., Springfield, Vt
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio.

**Dies, Sheet-Metal and Sub-Press (See Tool Work)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co. Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

# BUYERS' DIRECTORY

**Dies, Forging**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

**Dies, Hammer**
Kimber & Hillier, St. Catharines, Ont.

**Dies, Self-Opening, Adjustable**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Dies, Threading-Opening**
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

**Disc Cement**
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

**Dividing Heads**
Ackworthie, Ltd., John, Birmingham, Eng.
Dickow, Fred. C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Dogs, Lathe and Milling Machine**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drafting Boards and Tables**
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Drafting Materials**
American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

**Dressers, Grinding Wheel**
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

**Drill Holders**
Armstrong Bros. Tool Co., Chicago, Ill.

**Drill Rods**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Drill Speeders**
Canada Machinery Corp., Galt, Ont.

**Drilling Machine Heads**
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

**Drilling Machines, Automatic**
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

**Drilling Machines, Bench**
Beacon Engineering Co., Tipton, England.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Electric and Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Gang**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drilling Machines, Heavy Duty**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.

**Drilling Machines, Multiple Spindle**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

**Drilling Machines, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Drilling Machines, Portable**
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Radial**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Drilling Machines, Sensitive**
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Turret**
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

**Drilling Machines, Vertical**
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng.
Streiinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Drills, Center**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Drills, High Speed Twist**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Drills, Twist and Flat**
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Pilot Steel & Tool Co., Montreal, Que.

**Dust Handling Equipment**
Can. Blower & Forge Co., Ltd., Kitchener.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Electrical Instruments**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Electrical Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O.

**Elevating Trucks (See Trucks)**
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Elevators and Conveyors**
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

**Emery Wheels (See Grinding Wheels)**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Hart Products, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Engines, Capstan**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Engineers, Mechanical**
Dominion Engineering Works, Ltd., Montreal, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.

**Expanders, Tube**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Eyeglasses, Safety (See Goggles, Safety)**
Prest-O-Lite Co. of Can., Toronto, Ont.
Willson Goggles, Inc., Reading, Pa.

**Fans, Electric**
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Northern Electric Co., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Exhaust**
Can. Blower & Forge Co., Ltd., Kitchener.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fans, Ventilating**
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

**Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**File Handles**
Ingersoll File Co., Ltd., Ingersoll, Ont.

**Files and Rasps**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Filing Machines**
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Filler, Iron (See Cements, Iron)**
Smooth Mfg. Co., Jersey City, N.J.

**Fire Extinguishers**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Fittings, Pipe**
International Malleable Iron Co., Guelph, Ont.

**Flexible Shafts**
Aikenhead Hardware Ltd., Toronto, Ont.

**Flux, Galvanizing**
British Smelting & Refining Co., Ltd., Montreal, Que.

**Fluxes, Welding**
L'Air Liquide Society, Toronto, Ont.

**Forging Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Forgings, Drop**
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd., Toronto, Ont.

**Forgings, Hammer**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Foundry Equipment**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Foundry Supplies**
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Frogs, Spring or Rigid**
Can. Steel Foundries, Montreal, Que.

**Fuel Oil Burning System**
General Combustion Co. of Can., Ltd., Montreal, Que.

**Furnaces, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Coal**
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

**Furnaces, Heat Treating Oil and Gas**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces and Ovens, Electric**
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furnaces, Tempering and Annealing**
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Furniture, Machine Shop**
Garlock-Walker Mchy. Co., Toronto, Ont.

**Gages, Comparator**
Jones & Lamson Machine Co., Springfield, Vt.
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont.
Perdue, W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass.

**Gages, Measuring (See Tool Work)**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Q.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Gages, Recording**
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.
Taylor Instrument Co., Toronto, Ont.

# BUYERS' DIRECTORY

**Ackworthio, Ltd., John, Birmingham, Eng.**
**Brown & Sharpe Mfg. Co., Providence, R.I.**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Special Measuring (See Tool Work)**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Gages, Standard**
Armstrong Whitworth Co. of Can., Lt. Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis.
Johansson Inc., C. E., Windsor, Ont.

**Gages, Thread**
Ackworthie, Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

**Gas, Coal Compressed**
L'Air Liquide Society, Toronto, Ont.

**Gas, Compressed**
Prest-O-Lite Co. of Can., Toronto Ont.

**Gaskets**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

**Gauges, Vacuum and Pressure**
Lavet Instrument Co., Toronto, Ont.

**Gear Blanks**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario
Philadelphia Gear Works, Philadelphia, Pa.
Dominion Engineering Works, Limited, Montreal, Que.

**Gear Counters**
Hart Mfg. Co., R. A., Battle Creek, Mich.

**Gear-Cutting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

**Gear Testing Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.

**Gears, Cast**
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.
Dominion Engineering Works, Limited, Montreal, Que.

**Gears, Cut**
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hamilton Gear & Machine Co., Toronto, Ontario.
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Dominion Engineering Works, Limited, Montreal, Que.

**Gears, Dressed**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Gears, Forged**
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Gears, Herringbone**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

**Gears, Machine Moulded**
Can. Steel Foundries, Montreal, Que.

**Gears, Rawhide (See Gears, Cut)**
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

**Gear, Silent Chain**
Gardner & Son, Robt., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Can. Link-Belt Co., Ltd., Toronto, Can.
Hans Renold of Canada, Ltd., Montreal, Quebec.

**Gears, Worm**
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.

**Generators, Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Generators, Electric**
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

**Goggles, Safety**
Perfine, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

**Grab Buckets**
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont
Dominion Bridge Co., Ltd., Lachine, Que
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

**Grease Cups, Pressed Steel and Brass**
Can. Winkley Co., Ltd., Windsor, Ont.

**Greases, Lubricating**
Canadian SKF Co., Toronto, Ont.
Caternet Refining Co., Toronto, Ont.

**Grinding Discs**
Ritchey Supply Co., Toronto, Ont.

**Grinding Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal

**Grinding Machines, Abrasive Belt**
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Automatic**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Bench**
Aikenhead Hardware Ltd., Toronto, Ont.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Grinding Machines, Center**
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis

**Grinding Machines Chaser**
Jones & Lamson Machine Co., Springfield, Vt.

**Grinding Machines, Cutter and Reamer**
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Cylindrical**
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Die**
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

**Grinding Machines, Disc**
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Drill**
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Face**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Floor and Tool**
Beacon Engineering Co., Tipton, England.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Grinding Machines, Internal**
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

**Grinding Machines, Portable**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wisconsin Electric Co., Racine, Wis

**Grinding Machines, Power Oscillating Tool**
Herbert Ltd., Alfred, Toronto, Ont.

**Grinding Machines, Ring Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Grinding Machines, Snagging**
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.

**Grinding Machines, Surface**
Garlock-Walker Mchy. Co., Toronto Ont
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Grinding Machinery, Tool Post**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Universal**
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont

**Grinding Wheels**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

**Guards, Emery Wheel**
Ford-Smith Machine Co., Hamilton, Ont.

**Guards, Machinery and Window**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Guards, Electric Lamp**
Flexible Steel Lacing Co., Chicago, Ill.

**Gun-Barrel Machinery**
Steinle Turret Machine Co., Madison, Wis.

**Hack Saws, Power**
Ackworthie, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Hamilton, Canada.
Garlock-Walker Mchy. Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hammers, Chipping**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hammers, Drop**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

**Hammers, Electric**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Hammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Hammers, Power**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hammers, Rivetting**
Cleveland Pneumatic Tool Co., Toronto, Ont.

**Hangers, Shafting**
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Terry & Co., John C., Birmingham, Eng.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Hardening, Case-Hardening and Tempering**
Hamilton Gear & Machine Co., Toronto, Ont.

**Hardness Testing Apparatus**
Shore Instrument Co., Jamaica, N.Y.

**Heating**
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo

**Hobbing Machines**
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Hobs**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Hoists, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
**Can. Fairbanks-Morse Co., Ltd., Montreal.**
Garlock-Walker Mchy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

**Hoists, Hand**
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Hoists, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

**Holders-On, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill

**Hose, Flexible Steel**
**Can. Fairbanks-Morse Co., Ltd., Montreal.**
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Hose, Industrial**
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Hose, Rubber**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Foamite Firefoam Co., Hamilton, Ont.

**Hydraulic Leather**
Graton & Knight Mfg. Co., Worcester, Mass.

**Hydraulic Machinery**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Stewart & Co., Duncan, Glasgow Scot
Dominion Engineering Works, Limited, Montreal, Que.

**Hydrogen**
National Electro Products, Ltd., Toronto, Ont.

**Index Centers**
Dickow, Fred. C., Machinery Co., Chicago, Ill.

**Igniters, Gas Engine**
Canada Foundries & Forgings Co., Welland, Ont.

**Indicators, Speed and Test**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.

**Insulation**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Iron Valves**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Jacks, Hydraulic**
Norton, A. O., Boston, Mass.

**Jacks, Planer**
Armstrong Bros. Tool Co., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.
Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que.
**Crescent Machine Co., Ltd., Montreal, Q.**

# BUYERS' DIRECTORY

**Jigs and Fixtures (See Tool Work)**
[illegible] Ottawa Ont
[illegible] Hamilton, Ont
[illegible] Madison, Wis
[illegible] Engineering Service, Ltd., [illegible]
Ralph Lee & Machine Co., Lachine, Que

**Keyseating Machines**
[illegible] Bridgeport, Conn
[illegible] Toronto, Ont.
[illegible] Muskegon, Mich.
[illegible] H. W., Toronto, Ont.
[illegible] of Canada, Ltd., [illegible] Ont.

**Keys, Machine**
[illegible] Hamilton, Ont.
[illegible] Toronto, Ont
Muskegon Mfg. Co., Muskegon, Mich.

**Knives, Machine**
[illegible] E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
[illegible] Grand Rapids, Mich.
Shurly-Dietrich Saw Co., Montreal, Que.

**Knurl Holders**
Pratt & Whitney Co., of Canada, Ltd., [illegible] Ont.

**Lacing Leather**
Clipper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

**Lamps, Electric**
Electrical Engineering Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

**Lathe Attachments**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.

**Lathe Pans, Portable**
Canada Machinery Corp., Galt, Ont.

**Lathe Tools**
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

**Lathes, Automatic and Semi-Automatic**
Armstrong-Whitworth of Canada, Ltd., [illegible] Canada
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Bench**
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Lathes, Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

**Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont
McDougall Co., Ltd., R., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Lathes, Engine**
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hartridge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Sidney Machine Tool Co., Sidney, Ohio.
Sturtevant Co. of Can., Ltd., Chas. A., Windsor, Ont.
Walbott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Extension and Gap**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Lathes, Heavy Duty Projectile Boring**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blaskill Wire Machy. Co., Ltd., Montreal.
Sidney Machine Tool Co., Sidney, Ohio.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Lathes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio.
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio

**Lathes, Polishing (See Polishing and Buffing Machines)**
Ford-Smith Machine Co., Hamilton, Ont

**Lathes, Relieving**
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

**Lathe, Universal Hand**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Lathes, Screw-Cutting**
Jones & Lamson Machine Co., Springfield, Vt.

**Lathe, Speed and Hand**
Blount Co., J. G., Everett, Mass.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Macny. Co., Grand Rapids, Mich.

**Lathes, Spinning**
Terry & Co., John C., Birmingham, Eng.

**Lathes, Threading**
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

**Lathes, Vertical Turret**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

**Lathes, Wood Turning**
Blount Co., J. G., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Lead Pipe**
Canada Metal Co., Ltd., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Lighting Fixtures**
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

**Linoleum Mill Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Liquid Air Plants**
L'Air Liquide Society, Toronto, Ont.

**Lockers, Clothes**
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

**Lubricants**
Cateract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

**Lubricating Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Machinists**
Parker Co., Charles, Meriden, Conn.

**Machinists' Small Tools**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill
Starrett Co., L. S., Athol, Mass.
Sturtevant Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Mandrels, Expanding**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Mandrels, Solid**
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Measuring Machines**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Metals, Alloy**
British Smelting & Refining Co., Ltd. Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Metal Workers**
Parker Co., Charles, Meriden, Conn.

**Micrometer Calipers**
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Milling Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

**Milling Machines**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

**Milling Machines, Automatic**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Bench**
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Hand**
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

**Milling Machines, Horizontal and Planer Type**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

**Milling Machines, Plain**
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

**Milling Machines, Thread**
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Milling Machines, Universal**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Milling Machines, Vertical**
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill
Williams Machinery Co., A. R., Toronto, Ont.

**Monel Metal**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Motors, Electric**
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

**Moulded Rubber Goods**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Nail Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Nails and Staples**
Canada Metal Co., Ltd., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Nickel, Bars, Sheets, Wire, Etc.**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Nickel Plating Outfits**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Nickel Silver**
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

**Nitrogen**
L'Air Liquide Society, Toronto, Ont.

**Nut Tappers (See Bolt and Nut Machinery)**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

**Nuts, Finished and Semi-finished**
Galt Machine Screw Co., Galt, Ont.

**Nuts, Machine Screw**
Torrington Company, Ltd., Upper Bedford, Que.

**Nuts, S.A.E., Plain and Castellated**
Galt Machine Screw Co., Galt, Ont.

**Oil Cocks and Burners**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Oil Filtering and Storage Systems**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oil Storage Engineers**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Oils**
Canadian Oil Companies, Ltd., Toronto, Ont
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oil Hole Covers**
Can. Winkley Co., Ltd., Windsor, Ont.

**Oils, Soluble**
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

**Oxygen**
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

**Oxy-Acetylene Apparatus**
L'Air Liquide Society, Toronto, Ont.

**Packing, Hydraulic**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

**Packing, Steam**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

**Paper Mill Conveyors**
Bertrams Ltd., Edinburgh, Scotland
Dominion Engineering Works, Ltd., Montreal, Que.

**Patents**
Fetherstonhaugh & Co., Ottawa, Ont.
Marion & Marion, Montreal, Que.

**Pans, Wet and Dry**
Frost Mfg. Co., Chicago, Ill.

**Pattern-Shop Machinery (See Woodworking Machinery)**
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

**Patterns, Wood and Metal**
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Wraggis Pattern Works, Galt, Ont.

**Penstocks, Steel**
MacKinnon Steel Co., Sherbrooke, Que

# BUYERS' DIRECTORY

**Phosphor Tin**
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.

**Photographic Duplicating Machines**
Commercial Camera Co., Providence, R.I.

**Pig Iron**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Bending Machines**
American Pipe Bending Machine Co., Boston, Mass.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

**Pipe Couplings**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Pipe Cutting and Threading Machines**
Can. Fairbanks-Morse Co., Ltd., Montreal.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Pipe and Nipple Threading Machines**
Landis Machine Co., Inc., Waynesboro, Pa.

**Pipe Fitters' Tools**
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Pipe Threading Die Heads**
Landis Machine Co., Inc., Waynesboro, Pa.

**Piston-Ring Machines**
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

**Planers, Parallels**
L. & P. Mfg. Co., Niagara Falls, Ont.

**Planing Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Planing Machines, Rotary**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

**Plate Rolls**
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Plumbers' Brass Goods**
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

**Pneumatic Tools**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Polishing and Buffing Machines**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Blount Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

**Pots, Steel**
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

**Pressed Steel Parts**
Ackworthie, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich.
Can. Fairbanks-Morse Co., Ltd., Montreal.
L. & P. Manufacturing Company, Ltd., Niagara Falls, Ont.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

**Presses, Drop and Forging**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Foot and Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

**Presses, Forcing**
Atlas Press Co., Kalamazoo, Mich.
Stewart & Co., Duncan, Glasgow, Scot.

**Presses, Hydraulic**
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

**Presses, Power**
[illegible] Co., F. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

**Presses, Screw**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

**Profiling Machines**
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Protractors**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Propellers**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Pulleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

**Pulleys, Metal and Fibre**
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.
Dominion Engineering Works, Limited, Montreal, Que.

**Pulp and Paper Mill Equipment**
Dominion Engineering Works, Ltd., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Dominion Engineering Works, Limited, Montreal, Que.

**Pumps, Barrel and Boiler-feed**
Trahern Pump Co., Rockford, Ill.

**Pumps, Circulating and Coolant**
Trahern Pump Co., Rockford, Ill.

**Pumps, Geared and Hand**
Trahern Pump Co., Rockford, Ill.

**Pumps, Industrial**
Trahern Pump Co., Rockford, Ill.

**Pumps, Hydraulic**
Can. Fairbanks-Morse Co., Ltd., Montreal
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Dominion Engineering Works, Ltd., Montreal, Que.
Hepburn Ltd., John T., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.
Dominion Engineering Works, Limited, Montreal, Que.

**Pumps, Lubricant and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

**Pumps, Power**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

**Punches, Hand**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Jardine & Co., A. B., Hespeler, Ont.

**Punches, Power**
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

**Punching Machines, Horizontal**
Bertrams Ltd., Edinburgh, Scotland.

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Taylor Instrument Co., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Racks, Cut**
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

**Racks, Storage (See Furniture, Machine Shop)**
Brantford Oven & Rack Co., Brantford, Ont.

**Rammers, Foundry**
Holden Co., Ltd., Montreal, Que.

**Reamer Holders**
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.

**Reamers, Expanding**
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Reamers, Solid**
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

**Reamers, Taper**
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Recorders, Temperature**
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Recorders, Time**
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

**Regulators, Automatic (for electric furnaces)**
Volta Mfg. Co., Welland, Ont.

**Regulators, Temperature**
Taylor Instrument Co., Toronto, Ont.

**Rheostats**
Northern Electric Co., Montreal, Que.

**Resistance Materials**
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

**Rivets**
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

**Rivet Heaters**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

**Rivet-Making Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.

**Riveting Machines**
Bilton Machine Co., Bridgeport, Conn.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Schuster Co., F. B., New Haven, Conn.

**Rolling Mill Equipment**
Stewart & Co., Duncan, Glasgow, Scot.

**Rolls (Rubber Covered)**
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

**Rudder Frames, Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Rubber Goods, Mechanical**
Quaker City Rubber Co., Philadelphia, Pa.

**Rubber Machinery Makers**
Can. Consolidated Rubber Co., Ltd., Rubber Machinery Shops, Kitchener, Ont.

**Rules, Steel**
Chesterman & Co., Ltd., J., Sheffield, Eng.

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Rust Preventatives**
Oakley Chemical Co., New York, N.Y.

**Sand Equipment**
Can. Link-Belt Co., Toronto, Ont.

**Sand Mills**
Frost Mfg. Co., Chicago, Ill.

**Sanding Machinery**
Oliver Machy. Co., Grand Rapids, Mich.

**Sand Rammers, Pneumatic**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.

**Saw Frames and Blades, Hack**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Sawing Machines, Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.

**Sawing Machines, Power Hack**
Ackworthie, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Saw Sharpening Machines**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saw Tables, Universal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

**Saws, Circular Metal**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

**Saws, Hand**
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Hot and Cold**
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

**Saws, High Speed Steel**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Metal Band**
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

**Saws, Metal, Power**
Clemson Bros., Inc., Hamilton, Ont.

**Saws, Metal Cutting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

**Saws, Milling**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Saws, Screw Slotting**
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

**Saws, Swing Cut-off**
Oliver Machinery Co., Grand Rapids, Mich.

**Scales**
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal, Q.

**Screens**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Screens, Paper**
Dominion Engineering Works, Ltd., Montreal, Que.

**Screw Drivers, Optical, Jewelry and Novelty**
Torrington Co., Ltd., Upper Bedford, Que.

**Screw Driving Machine**
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

**Screw Extractors**
Cleveland Twist Drill Co., Cleveland, O.

**Screw Machine Work**
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
Tallman Brass & Metal Co., Hamilton, Ont.

# BUYERS' DIRECTORY

**Screw Machinery, Wood and Lag**
Cook Co., Asa S., Hartford, Conn.

**Screw Machines**
Brown & Sharpe Mfg Co., Providence, R.I.

**Screw Machines, Automatic**
Garlock-Walker Mchy Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

**Screw Machines, Plain or Hand**
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio.

**Screw Machine Products**
Torrington Company, Ltd., Upper Bedford, Que.

**Screw Plates**
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

**Screws, Cap and Set**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Lock Cap**
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Machine**
Barnes Co., Wallace, Bristol, Conn.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Safety Set**
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

**Screws, Side Knob**
Torrington Company, Ltd., Upper Bedford, Que.

**Screws, Thumb**
Torrington Company, Ltd., Upper Bedford, Que.

**Second-Hand Machinery**
See last page of directory
Petrie, Ltd., H. W., Toronto, Ont.

**Separators, Moisture and Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Separators, Oil and Waste**
Bowser, S. F., & Co., Ltd., Toronto, Can.

**Shafting**
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Shapes, Cold-Drawn Special Steel**
Union Drawn Steel Co., Hamilton, Ont.

**Shaping Machines**
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Walcott Lathe Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

**Shapers, Wood**
Oliver Machinery Co., Grand Rapids, Mich.

**Shears, Hand**
Can. Blower & Forge Co., Ltd., Kitchener.

**Shears, Power**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., Duncan, Glasgow, Scot.
Toledo Machine & Tool Co., Toledo, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.

**Shearing Machines, Angle, Iron Bar and Gate**
Bertrams Ltd., Edinburgh, Scotland.

**Sheet Lead**
Canada Metal Co., Ltd., Toronto, Ont.

**Sheet Metal Working Machinery**
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio.

**Sheets, Nickel, Resist, Alloy**
International Nickel Co. of Can., Ltd., Toronto, Ont.

**Sheets, Nickel, Monel and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

**Side Frames, Locomotive**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Slotting Attachments**
Ford-Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

**Slotting Machines**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

**Solders**
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.

**Snap Flasks**
Oliver Machy. Co., Grand Rapids, Mich.

**Special Machinery and Tools**
Brown Engineering Corp., Ltd., Toronto.
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

**Specialties, Swaged and Headed Work**
Torrington Company, Ltd., Upper Bedford, Que.

**Springs**
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

**Spring-making Machinery**
Sleeper & Hartley, Inc., Worcester, Mass.

**Sprockets and Chains**
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

**Squares**
Brown & Sharpe Mfg. Co., Providence, R.I.

**Stamping, Metal**
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Metal Stamping Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Stamps, Steel**
Diamond Saw & Stamping Works, Buffalo, N.Y.

**Stairways, Wrought Iron**
Can. Wire & Iron Goods Co., Hamilton, Ont.

**Steam Specialties**
Crane Ltd., Montreal, Que.

**Steel Plate**
Dom. Foundries & Steel, Hamilton, Ont.

**Steels, Tool**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel Blooms and Billets**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steel, Cold-Rolled Strip**
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Steel Castings**
Dom. Foundries & Steel, Hamilton, Ont.

**Steel Forgings**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Sheets, Open Hearth Steel**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steel, Shafting and Free Cutting Screw**
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

**Steel, Sheet**
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

**Steel, Stainless**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel Wire Rods**
Steel Co. of Canada, Ltd., Hamilton, Ont.

**Steels, Alloy, Open Hearth and Electric**
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
United Alloy Steel Corp., Canton, Ohio.

**Steels, Alloy and Carbon**
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steels, High-Speed**
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

**Steel, Magnet**
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

**Steel, Structural**
MacKinnon Steel Co., Sherbrooke, Que.

**Steel Tubing, Close Joint and Welded**
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

**Stern Frames, Cast Steel**
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

**Straightening Machinery**
Bertrams Ltd., Edinburgh, Scotland.

**Studs**
Galt Machine Screw Co., Galt, Ont.

**Surface Plates**
Bilton Machine Co., Bridgeport, Conn.

**Swaging Machines**
Atkins & Co., Inc., E. C., Indianapolis, I.
Etna Machine Co., Toledo, Ohio.

**Swaging Machine Parts**
Etna Machine Co., Toledo, Ohio.

**Switches, Railway**
Can. Steel Foundries, Montreal, Que.

**Switches and Switchboards**
Northern Electric Co., Montreal, Que.

**Tablets, Bronze, Memorial**
Tallman Brass & Metal, Ltd., Hamilton, Ont.

**Tachometers**
Aikenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

**Tanks, Steel**
MacKinnon Steel Co., Sherbrooke, Que.

**Tanks and Pumps, Oil**
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

**Taper Cutting Dies**
Jones & Lamson Machine Co., Springfield, Vt.

**Tap Holders**
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taper Pins**
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Tapes, Measuring**
Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass.

**Tapping Machines and Attachments**
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

**Taps and Dies**
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que
Can. Fairbanks-Morse Co., Ltd., Montreal
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Taps, Collapsing**
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

**Teeth, Dredge Bucket**
Kennedy & Sons, Wm., Owen Sound, Ont.

**Testing Metals and Materials**
Toronto Testing Laboratory, Toronto, Ont.

**Thermometers**
Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Toronto, Ont.

**Thread-Cutting Tools**
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

**Thread Cutting Machines**
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa.

**Threaded Wires**
Torrington Company, Ltd., Upper Bedford, Que.

**Threading Machines**
Acme Machinery Co., Cleveland, Ohio.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

**Thread Lead Testing Machines**
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

**Thread-Rolling Machines**
Bliss Co., E. W., Brooklyn, N.Y.

**Tongs**
Hepburn Ltd., John T., Toronto, Ont.

**Tool Cases**
Rice Lewis & Son, Ltd., Toronto, Ont.

**Tool Holders**
Armstrong Bros. Tool Co., Chicago, Ill.
Bilton Machine Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Markers, Electric**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Tool Posts, Lathe**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

**Tool Steels for all Purposes**
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

**Tools, Small (See Machinists' Small Tools)**
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Bertrams Ltd., Edinburgh, Scotland.
Burgess & Marchand, Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Chesterman & Co., Ltd., J., Sheffield, Eng.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.
National Machine Tool Co., Racine, Wis.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

**Tool Work**
Brown Engineering Corp., Ltd., Toronto.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.

# BUYERS' DIRECTORY

**Torches, Blow**
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

**Trackwork, Railway**
Can. Steel Foundries, Montreal, Que.

**Trackwork, Manganese Steel**
Can. Steel Foundries, Montreal, Que.

**Transformers**
Northern Electric Co., Montreal, Que.

**Transmission Machinery**
Can Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Jones & Glassco, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Toronto, Ont.
Renold (Hans) of Canada, Ltd., Montreal Que.

**Transportation Systems (See Trucks)**
Mathews Gravity Carrier Co., Port Hope, Ont.

**Treated Bits**
Can. Atlas Crucible Steel Co., Toronto Ont
Vanadium Alloys Steel, Latrobe, Pa.

**Trolleys and Tramways**
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.

**Trucks**
Can. Fairbanks-Morse Ltd., Montreal Q.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Maple Leaf Mfg. Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Trucks, Industrial Motor**
Maple Leaf Mfg. Co., Montreal, Que.
National Steel Car Corp., Ltd., Hamilton, Ont.

**Tube, Products**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Electric Welded or Oxy-Acetylene Welded**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Flexible**
Dunlop Tire & Rubber Goods Co., Ltd Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

**Tubing, Seamless Steel**
Tube Co. of Canada, Toronto, Ont.

**Tubing, Seamless Steel, Brass and Copper and Fibre**
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Steel Products Co., Brantford, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

**Tubing, Welded**
International Nickel Co. of Can., Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

**Tubing, Welded Steel**
Tube Co. of Canada, Toronto, Ont.

**Turbines, Water**
Dominion Engineering Works, Ltd., Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Dominion Engineering Works, Limited, Montreal, Que.

**Turret Heads**
Ackworthie, Ltd., John, Birmingham, Eng.
Bertram & Son Co., Ltd., The John, Dundas, Ont.

**Turret Machines (See Lathes, Horizontal Turret)**
Acme Machine Tool Co., Cincinnati, Ohio.
Cook Co., Asa S., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

**Turrets, Tool Post**
Gisholt Machine Co., Madison, Wis.

**Unions, Pipe**
Crane Ltd., Montreal, Que.

**Universal Joints**
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

**Valves**
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Crane Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Dominion Engineering Works, Limited, Montreal, Que.

**Vises, Drilling Machine**
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
Charles Parker Co., Meriden, Conn.

**Vises, Metal Workers'**
Aikenhead Hardware, Ltd., Toronto, Ont.
Columbia Hdwe. Division, Cleveland, O.
Charles Parker Co., Meriden, Conn.

**Vises, Milling Machine**
Brown & Sharpe Mfg. Co., Providence, R.I.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kearney & Trecker Co., Milwaukee, Wis.
Foss Machinery & Supply Co., Geo. F., Montreal, Que
Oliver Machy. Co., Grand Rapids, Mich
Charles Parker Co., Meriden, Conn.
Victor Tool Co., Waynesboro, Pa
Parmenter & Bulloch Co., Gananoque Ont.

**Voltmeters**
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

**Wagon Loaders**
Can. Link-Belt Co., Toronto, Ont.

**Washers**
Barnes Co., Wallace, Bristol, Conn.
Diamond State Fibre Co., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.

## DIRECTORY OF DEALERS

THE Buyers' Directory of CANADIAN MACHINERY was originally intended to contain information regarding lines actually manufactured by our advertisers. We now carry the advertising of leading machinery dealers, some of whom represent scores of manufacturers in addition to being manufacturers themselves in some cases. This necessarily widened the scope of our Directory, but it would be impracticable to list all the lines handled by all the dealers. We recommend, therefore, if our subscribers cannot find what they want in our Directory that they communicate with the dealers whose names appear herewith.

### MACHINE TOOLS AND METAL WORKING EQUIPMENT

Chas. P. Archibald & Co., Montreal, Que
The Canadian Fairbanks-Morse Co., Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
H. W Petrie Limited, Toronto, Ont.
The Standard Equipment & Tool Co., Montreal, Que.
Chas. A. Strelinger Co. of Canada, Limited, Windsor, Ont.
A. R Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Wilson-McGovern Limited, Toronto Ont.
Yeates Machinery Co., London, Ont

### MACHINE SHOP AND FACTORY SUPPLIES

Chas. P. Archibald & Co., Montreal Que.
The Canadian Fairbanks-Morse Co., Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
H. W Petrie Limited, Toronto, Ont
The Standard Equipment & Tool Co., Montreal, Que.
Chas. A. Strelinger Co. of Canada, Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Wilson-McGovern Limited, Toronto Ont.
Yeates Machinery Co., London, Ont.

### POWER EQUIPMENT AND SUPPLIES

The Canadian Fairbanks-Morse Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
H. W. Petrie Limited, Toronto, Ont.
The Standard Equipment & Tool Co. Montreal, Que.
Wilson-McGovern Limited, Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.

### WOODWORKING MACHINERY

Chas. P. Archibald & Co., Montreal, Que.
The Canadian Fairbanks-Morse Co., Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont
H. W. Petrie Limited, Toronto, Ont
Chas. A. Strelinger Co. of Canada, Limited, Windsor, Ont.
A. R Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Yeates Machinery Co., London, Ont

Kempsmith Mfg. Co., Milwaukee, Wis.
Charles Parker Co., Meriden, Conn

**Vises, Pipe**
Columbia Hdwe. Division, Cleveland, O.
Greenfield Tap & Die Corp., Galt, Ont.
Charles Parker Co., Meriden, Conn.

**Vises, Planer and Shaper**
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Superior Machine Co., London, Ont.

**Vises, Wood Workers'**
Columbia Hdwe. Division, Cleveland, O.
Torrington Company, Ltd., Upper Bedford, Que.

**Washers, Rubber**
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

**Welding Apparatus, Oxy-Acetylene**
L'Air Liquide Society, Toronto, Ont.

**Welding, Electric**
All-Weld Company, Toronto, Ont.
Carter Welding Co., Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
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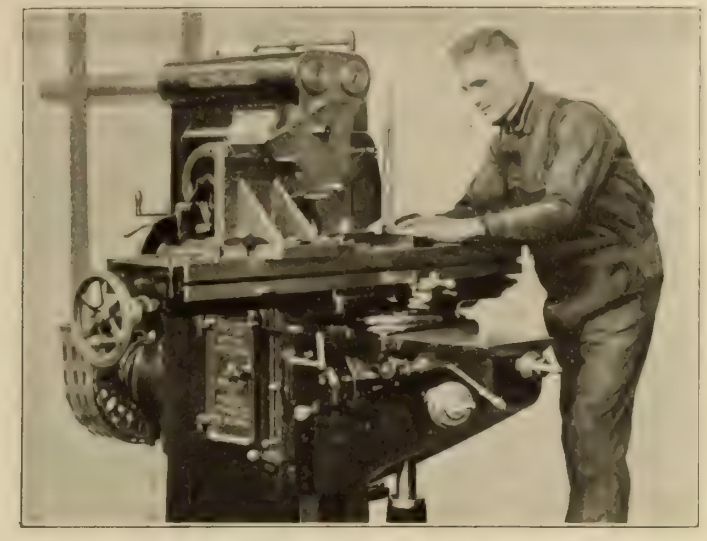
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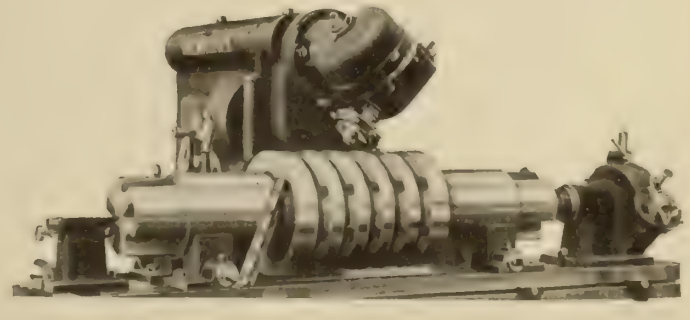
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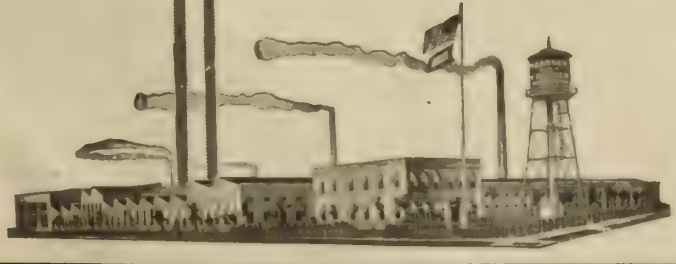
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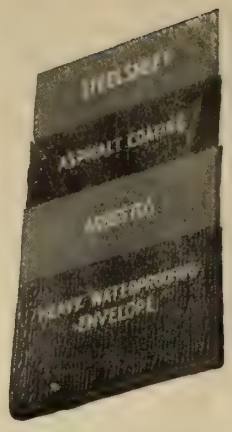


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